Appendix G

Preliminary Schedule 2 Multiple Accounts Analysis

Crawford Nickel Project: Preliminary Schedule 2 Multiple Accounts Analysis

November 22, 2024

Prepared for:

Canada Nickel Company

Prepared by:

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Acronyms and Abbreviations

AAQC	Ambient Air Quality Criteria
ANSI	Areas of Natural and Scientific Interest
ARD	Acid Rock Drainage
ASDB	Archaeological Sites Database
asl	Above Sea Level
BFI	Baseflow Index
CAAQS	Canadian Ambient Air Quality Standard
CCME	Canadian Council of Ministers of Environment
CWQG-FAL	Canadian Water Quality Guidelines for Protection of Freshwater Aquatic Life
CDA	Canadian Dam Association
CL	Centerline
CUC	Crawford Ultramafic Complex
DEM	Digital elevation Model
DS	Downstream
ECC	Environmental Consequence Classification
ECCC	Environment and Climate Change Canada
EDF	Environmental Design Flood
eDNA	Environmental DNA
FNETB	Far Northeast Training Board
HCT	Humidity Cell Test
IAA	*Impact Assessment Act*, 2019

IK	Indigenous knowledge
IA	Impact Assessment
LiDAR	Light Detection and Ranging
LRU	Land and Resource Use
MCM	Ministry of Citizenship and Multiculturalism
MDMER	Metal and Diamond Mining Effluent Regulations
ML	Metal Leaching
MINES	Ministry of Mines
MNR	Ministry of Natural Resources (Formerly Ministry of Natural Resources and Forestry [MNRF])
Mm^3	million cubic metres
Mt	million tonnes
MTCS	Ministry of Tourism, Culture, and Sports
MWMA	Mine Waste Management Area
NGO	Non-governmental Organization
Non-PAG	Non-potentially Acid Generating
OFSC	Ontario Federation of Snowmobile Clubs
OGS	Ontario Geological Survey
ONTC	Ontario Northland Transportation Commission
OWIT	Ontario Watershed Information Tool
PoPC	Parameter of Potential Concern
PWQMN	Ontario Provincial Water Quality Monitoring Network
PWQO	Ontario Provincial Water Quality Objectives
ROM	Run-of-Mine

SA	Study Area
SAR	Species at Risk
SFE	Shake Flask Extraction
SOCC	Species of Conservation Concern
SWH	Significant Wildlife Habitat
TDR	Technical Data Report
TIS Guidelines	Tailored Impact Statement Guidelines
TKLU	Traditional Knowledge and Land Use
tpd	tonnes per day
TMF	Tailings Management Facility
US	Upstream
VC	Valued Component
VPA	Victor M. Power Airport
WSC	Water Survey Canada
ZOI	Zone of Influence

Glossary of Technical Terms

Account	Four broad categories used for the assessment of alternatives. Accounts include Environmental, Technical, Project Economic, and Socio-Economic.
Acid Rock Drainage	The acidic water produced due to rock weathering and potentially intensified by large-scale earth works. Typically associated with sulphide minerals.
Baseline Conditions	Pre-project environmental conditions.
Bedrock	The solid rock layer beneath the soil and overburden.
Capital Expenditures	Capital expenditures refer to funds used to undertake new projects or investments as well as funds used to acquire or upgrade physical assets (e.g., property, buildings or equipment).
Contact Water	Water that comes into contact with mine activities.
Fault	A fracture in the Earth's crust along which movement has occurred.
Mineral Rights	The rights to minerals located in, or under the land. Also referred to as mining rights.
Overburden	The material that lies above bedrock. Overburden can include soil, sand, gravel, and other sediments that have not been compacted or lithified into solid rock.
Tailings	Crushed or ground rock and process effluents that are generated in a mine processing plant.
Unpatented	Referring to land or mining rights, means land or mining rights for which a patent, lease, license of occupation or any other form of Crown grant is not in effect.
Weighting Factors	Quantities that are applied by the analyst to indicators for reflecting stakeholders' value bias.

1 Introduction

Canada Nickel Company (Canada Nickel) proposes to develop, operate, and progressively reclaim the Crawford Nickel Project ('the Project'), a new Open Pit nickel mine and processing facility approximately 42 kilometres (km) north of Timmins, Ontario along Highway 655. The Project components include an Open Pit, ore stockpiles, ore processing facilities, Tailings Management Facility (TMF), Mine Waste Management Area (MWMA) (waste rock, sand/till, clay), ore stockpiles, collection ponds, and other associated buildings and infrastructure. Project activities include relocation of existing infrastructure (e.g., realignment of Highway 655 and a 500 kV transmission line) currently located within the Project footprint.

Stantec Consulting Ltd. (Stantec) has been retained by Canada Nickel to conduct alternatives assessment for the TMF and MWMA for the Project. The TMF and MWMA alternatives assessed for storage of mine waste for this Project are located in areas that overlay watercourses and waterbodies with observed or potential fish habitat. The use of a natural waterbody frequented by fish to store mine waste requires an amendment to the Metal and Diamond Mining Effluent Regulations (MDMER) through a listing under Schedule 2 of the MDMER. The completion of an alternatives assessment is required for obtaining an amendment. The alternatives assessment is conducted in accordance with the guidance provided by Environment and Climate Change Canada (ECCC) in the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*, referred to in this report as 'the Guidelines' (ECCC 2013).

The alternatives assessment study is carried out to demonstrate that the mine waste disposal approach in the Project satisfies the requirements of the Guidelines, and as a component of the federal impact assessment (IA) process in accordance with the *Canadian Impact Assessment Act*, 2019 and specifically the Crawford Project Tailored Impact Statement (TIS) Guidelines (Appendix A.1 of the Impact Statement)

1.1 Study Objectives

This TMF and MWMA alternatives assessment considers mine waste disposal alternatives, in an objective and rigorous way, to identify preferred alternatives for these mine waste disposal facilities based on the results of the assessment. The "overall objective of the alternatives assessment process is to minimize the environmental footprint of the disposal area" (ECCC 2013). This objective is apparent when reviewing the approach specified in the Guidelines, which places a significant bias on environmental impacts through account weightings (see Section 4.5 for TMF and Section 5.5 for MWMA alternatives assessment). The TMF alternatives are assessed first in Section 4, but its results do not influence the options assessed for the MWMA alternatives in Section 5.

The assessment also considers the advantages, disadvantages and effects of the alternatives, and provides transparent explanations of the rationale behind the evaluation of the identified alternatives.

1.2 Project Description

The Project is defined by a combination of 162 mining patents and 161 mining claims. As of the effective date of the report, Canada Nickel holds or is in the process of acquiring a 100% interest in the mining lands necessary to its execution that comprise the Project. The Project includes the development of an Open Pit, Stockpiles, two ore processing plants, and other mine related infrastructures, as well as new rail spur line and the relocation of Highway 655 and 500 kilovolt transmission line. Ore will be extracted from a single Open Pit that will be divided into an East Zone and Main Zone. The Project has a mineral reserve estimate of 1,715 million tonnes and an expected project life of 41 years.

The Project site is located approximately 42 km north of the City of Timmins, Ontario, in the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark and Prosser. A small portion of the Project extent within the geographic townships of Kidd and Wark also lies within the municipal boundary of the City of Timmins.

Based on the current Project design, the maximum rate of ore extraction will be up to 240,000 tonnes per day (tpd) during year 5 of operations and an average rate of 160,000 tpd over the life of mine. The two ore processing plants and associated service facilities will process run of mine ore delivered to primary crushers to produce nickel concentrate, iron concentrate, and tailings at a rate of approximately 60,000 tpd at the start of mine life, ramping up to a maximum of 120,000 tpd. In addition to nickel and iron, other metals such as cobalt, chromium, palladium and platinum are expected to be recovered from concentrate streams. Based on the proposed processing rate and current information regarding the ore body, the current life of the proposed Project is expected to be approximately 41 years. Mining would be completed at a faster pace than milling, thus mining of ore would occur for about 30 years, then milling alone for the last 11 years. The design and sequence of pit development allows for in-pit impoundment of tailings, thus reducing the size of the TMF. In-pit deposition of tailings will commence after the Main Zone is depleted in Year 17. Mining of the East Zone continues through Year 30. For the final 11 years of operation, the mill will be fed from two ore stockpiles.

Concentrate from the processing plants will be loaded onto rail cars and shipped via the rail spur line for refinement offsite.

During the operations phases, ore extraction and processing will operate 24-hours a day, seven days a week, 365 days a year. The process plant incorporates a staged expansion to deploy capital efficiently, allowing for throughput to be increased over the life of mine as presented below:

- Operations phase 1 (Year 1 to Year 5): will have a design capacity of 60 kilotonnes per day (kt/d) capacity with ore extraction or 21.9 Mt/a.
- Operations phase 2 (Year 5 to Year 30): expansion will duplicate the operations phase 1 design for a total capacity of 120 kt/d milling capacity with ore extraction reaching 43.8 Mt/a by Year 5 of operations.

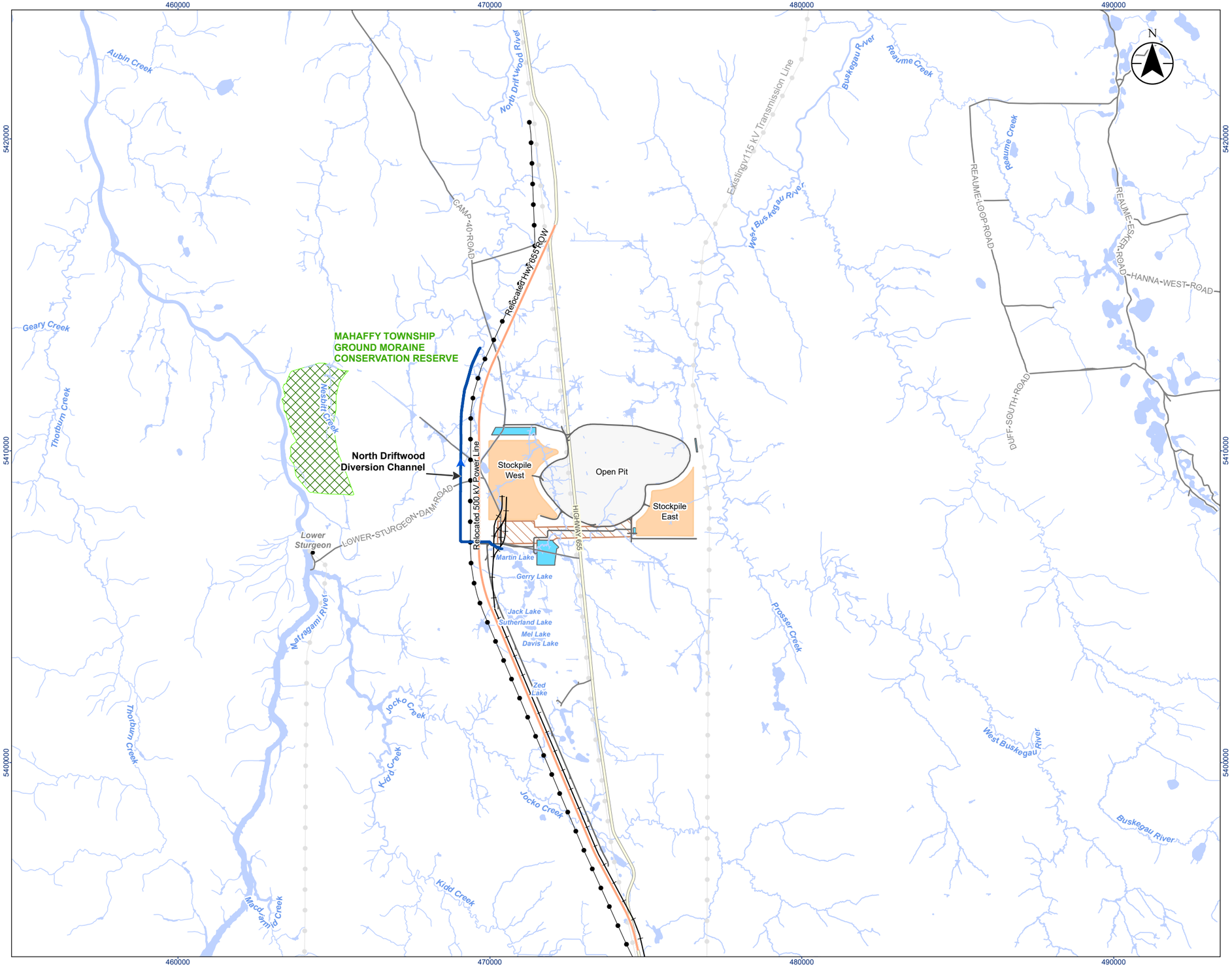
The overall Project development schedule will consist of the following main phases, during which various Project activities will be completed:

- Construction: estimated duration of 30 months
- Operations: estimated duration of 41 years. After 17 years of operation, tailings will be deposited into the Open Pit instead of in the TMF. The rehabilitation of the TMF will begin in Year 18. The construction of the MWMA will be ongoing along with targeted progressive rehabilitation during the operations phase until Mine Year 30 when the final rehabilitation of the facility will start.
- Decommissioning and Closure: estimated duration of 5 years for active closure; passive closure, including filling the Open Pit with water may require more than 100 years.

Infrastructure to support the Project will consist of the following key components:

- one mining pit with two zones (Main and East)
- mine waste storage facilities including TMF and MWMA
  - The MWMA, also referred to as the Impoundment Facility, will include a clay overburden zone, surrounded by a perimeter constructed of waste rock for pile stability, waste rock zone, and sand and till zone located between the waste rock and clay zones
- two ore Stockpiles, which will be present at the site during the construction and operations phases and are considered in this assessment as part of the MWMA
- Crushing Plants and mill feed ore storage area
- Process Plants
- water management facilities for contact and non-contact water including collection ditches and ponds
- site civil works
- buildings and associated infrastructure
- explosives storage facility
- existing roads and railways
- new access roads and 25 km rail spur
- the North Driftwood Diversion Channel, which accommodates the Open Pit footprint and Highway 655 realignment. The existing channel will be decommissioned
- site electrical services
- a 25 km section of Highway 655 will be realigned to the western boundary of the Project site and the existing Highway 655 section being by-passed will be decommissioned
- relocation of approximately 29 km of a 500 kV transmission line

Figure 1.1 presents the locations of the Project infrastructure without the TMF and MWMA alternatives. For the purpose of the alternative assessment, a Study Area (SA) was determined to encompass the Project infrastructure and locations of TMF and MWMA alternatives, which includes areas to the north and south of the open pit, and areas west of the North Driftwood River towards the Mahaffy Township Ground Moraine Conservation Reserve between Nesbitt Creek and the Mattagami River, and east of the West Buskegau River (Figure 1.1).



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Legend

Base Features
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Conservation Reserve (Regulated)
- Waterbody

Ancilliary Infrastructure
- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km
1:125,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.
3. Orthoimagery:



Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
1.1

Title
Project Infrastructure Locations

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2 Methodology

The alternatives assessment was performed following the seven-step process specified in the Guidelines, which is summarized below. The approach is described in more detail in Sections 4 and 5. Figure 2.1 presents a flow diagram of the seven-step process.

Step 1: Identify Candidate Alternatives: The Guidelines recommend the use of threshold criteria to "establish the regional boundaries for selecting candidate alternatives" (ECCC 2013). Among the example criteria presented in the Guidelines are exclusion based on distance, presence of protected areas, legal boundaries, and corporate policy. Upon the application of threshold criteria, the remaining areas within the Project boundaries are then reviewed and alternatives in those areas are identified.

One controlling factor in the process of alternatives identification is that no TMF or MWMA alternatives were considered at the location of the Open Pit and the process plant. The siting of the Open Pit and the process plant was performed based on the location of orebodies, foundation conditions and access logistics to the Open Pit. Moreover, the siting of mine waste storage areas shall not include areas with known or probable mineral resources causing subsequent sterilization of the resources by making them inaccessible for future use. As a result, the land available for the siting of the TMF or MWMA alternatives are limited to areas surrounding the Open Pit and the process plant.

Step 2: Pre-Screening Assessment: Pre-screening criteria are applied to enhance the decision-making process by removing alternatives that "do not meet certain unique minimum specifications which have been developed for the project" (ECCC 2013). The Guidelines describe this process as a "fatal-flaw analysis" where fatal flaws are defined as any site characteristic that is "so unfavorable or severe that, if taken singly, it would eliminate that site as a candidate" (ECCC 2013). Examples of pre-screening criteria that are presented in the Guidelines include, but are not limited to:

- Would the alternative preclude future exploration or mining of a potential resource?
- Is any part of the mine waste disposal system unproven technology?
- Will the alternative be too small to store the proposed quantity of waste?
- Will the alternative result in negative life of project economics?

Step 3: Alternative Characterization: Following pre-screening, characterization criteria are developed to describe the environmental, technical, economic, and socio-economic aspects of each remaining alternative.

Available desktop information was used in the assessment for the characterization of the identified alternatives. This information includes base mapping from government database sources, Indigenous knowledge and Traditional Knowledge and Land Use (TKLU) studies provided by the Indigenous nations through engagement with Canada Nickel, and inputs from consultation and previously reported studies

related to the Project. The information used in the assessments were also previously reported in different chapters and appendices of the Impact Statement.

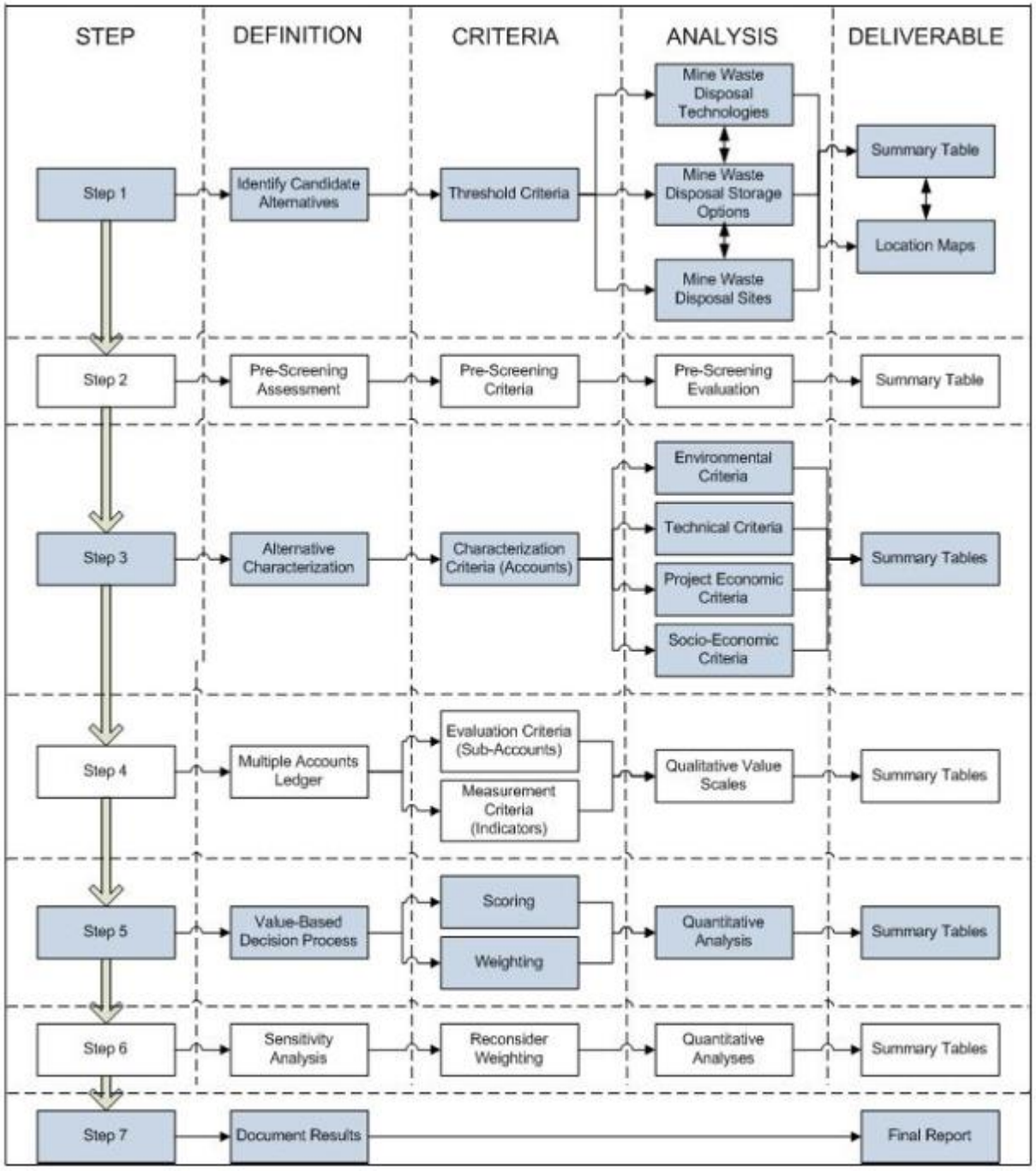
Step 4: Multiple Accounts Ledger: The multiple accounts ledger is a tool which is used to compare the alternatives based on the perceived impacts associated with each alternative. Accounts, sub-accounts and indicators are developed as part of this ledger. Sub-accounts and indicators were developed based on the available desktop information and were refined based on the professional judgment of the Project's expert technical leads and consultation input.

Step 5: Value-Based Decision Process: This process consists of scoring the indicators, applying weighting factors to the indicators, sub-accounts, and accounts, and performing a quantitative analysis to identify the preferred alternative. The relative importance of each indicator compared to the other indicators, sub-account relative to other sub-accounts, and account relative to other accounts was also considered in the assessment by assigning a weighting factor to each. In accordance with the Guidelines, weightings were assigned a value of one to six and were developed based on the professional judgment of the Project's technical leads and consultation input. This system is central to the alternatives assessment method and allows value judgments regarding the relative importance of varied impacts to be incorporated into the assessment.

Each alternative was then evaluated through the quantitative analysis process by multiplying the value assigned to each by the weighting selected for that particular indicator to obtain the indicator score for each alternative. The indicator scores within each sub-account are then summed. This summed score (termed the "sub-account score") is then normalized by dividing it by the sum of the weightings used in that sub-account. This resulting value is then termed the "sub-account rating". This normalization process is important as it allows each sub-account and account to be directly compared to other sub-accounts or accounts, regardless of the number of indicators or sub-account within each.

This process is then repeated at the account level by multiplying each sub-account ratings by the sub-account weighting and summing the resulting sub-account scores to obtain the account score, which is then divided by the sum of the weightings used in that account to obtain the account rating. These account ratings are then multiplied by the selected account weightings, summed, and divided by the sum of the account weightings to obtain the alternative rating. The alternative with the highest alternative rating is then considered the preferred alternative from the assessment (Figure 2.1).

Figure 2.1 Flow diagram of the process of assessing alternatives for mine waste disposal (ECCC 2013)



Due to this normalization process, for sub-accounts with only one indicator, the same sub-account rating will be obtained regardless of the weighting factor selected for that indicator. For consistency, for all sub-accounts with only one indicator, a weighting factor of 5 was selected in the TMF and MWMA alternatives assessment.

Step 6: Sensitivity Analysis: Sensitivity analyses are performed to evaluate the effect of the selected weighting factors on the results of the assessment and to determine the factors having the strongest influence on assessment results.

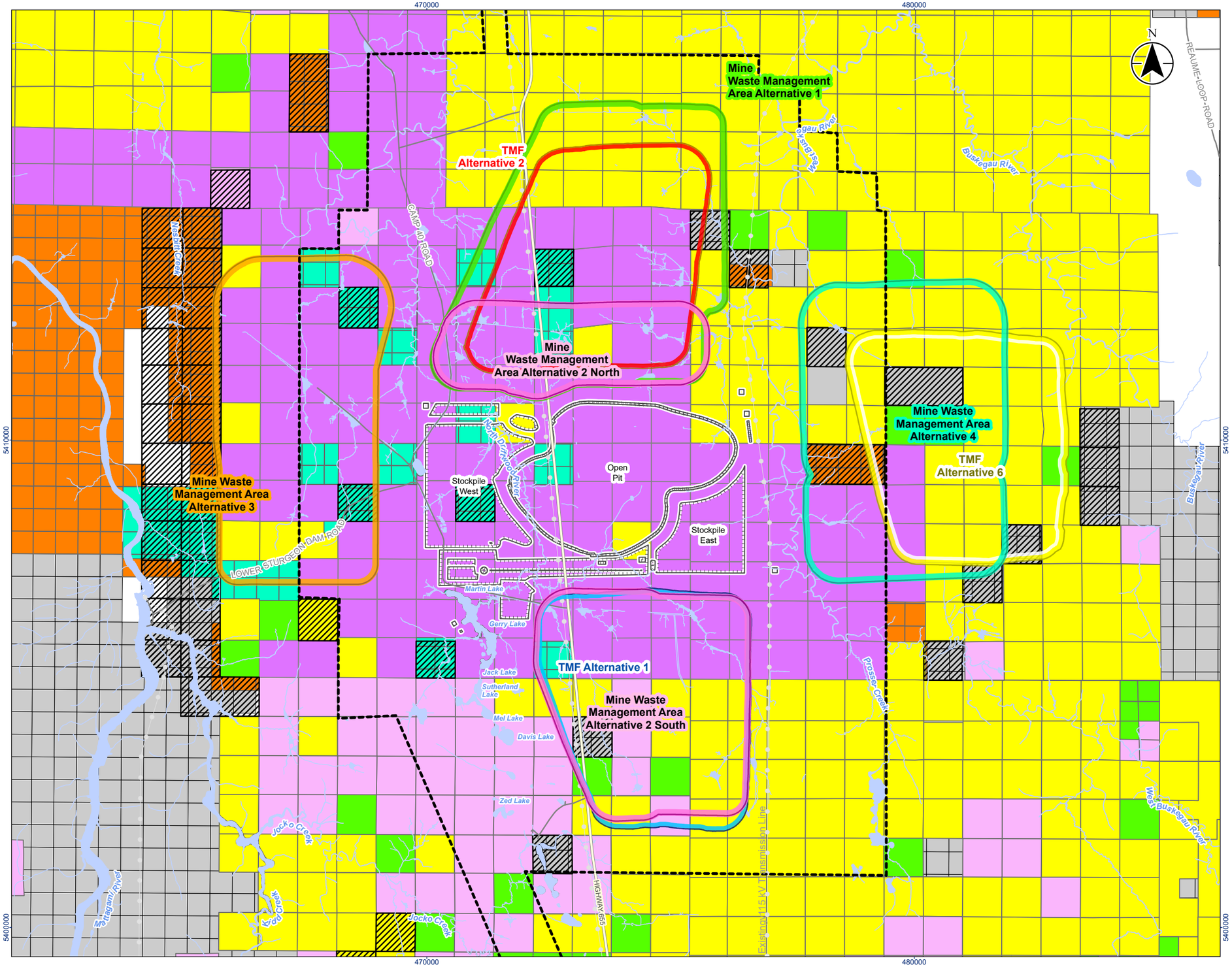
Step 7: Document Results: Reporting as described herein comprehensively documenting the mine waste disposal alternatives assessment process.

3 Project Setting

This section provides an overview of the Project setting to provide context for the alternatives assessment and provide a description of the general character of the area where the Project will be developed.

3.1 Land Tenure

The Project property consists primarily of patented lands with surface or mining rights, mineral claims, mineral leases with surface and mining rights, and unpatented Crown land. Most of the Project mining facilities are planned to be placed on patent mining lands, although some infrastructure may be located on unpatented lands. A large fraction of the SA consists of mining claims, claims to lease, and mining rights are owned by Canada Nickel. Within the SA, there are also patented lands with surface and/or mining rights, which are not owned by Canada Nickel. The TMF and MWMA alternatives assessed in the present study potentially overlie unoccupied Crown land. The extents of Canada Nickel owned mining claims, mining leases and rights not owned by Canada Nickel, unpatented Crown land, as well as unoccupied Crown land are presented in Figure 3.1.



Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Modelled Mine Boundary
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody
- CNC Claims To Lease
- CNC Claims
- CNC Mining Rights Only
- Surface Rights Only (Others)
- Mining Rights Only (Others)
- Patent Mining and Surface Right (Other)
- Mining Claims (Others)
- Unpatented Crown Land

0 2 4 km

1:80,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
3.1

Title
Land Tenure

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3.2 Topography

The topography of the SA is defined by a Light Detection and Ranging Digital Elevation Model (LiDAR DEM) provided by Canada Nickel and supplemented with provincially available topographic contour mapping (MNRF 2023b). The topography across the SA is flat to gently undulating with an overall topographic average slope of 1.7%, generally ranging between 265 m and 290 m above sea level (asl) and averaging about 15 m in local relief. The few rare areas of relief are associated to an esker complex, locally entrenched river systems, and a few rare bedrock-controlled hills. Figure A.1 (Appendix A) and B.1 (Appendix B) present the SA topography and the footprint boundaries of the TMF and MWMA alternatives, respectively, identified as a part of the assessment.

As with most of northern Ontario, the site is crossed by a number of minor waterbodies and tributaries to larger rivers. The Project site is located primarily between the North Driftwood River and the West Buskegau River, and is crossed by three watersheds including Jocko Creek watershed, the North Driftwood River watershed, and the West Buskegau River watershed. Elevations within the Jocko Creek watershed range from a minimum of 258.9 metres above sea level (masl) to a maximum of 322.3 masl with an overall average slope of 1.8%. The North Driftwood River watershed ranges from a minimum of 248.2 masl at the outlet of the watershed and a maximum of 303.1 m asl with a total average slope of 1.8%. The West Buskegau River watershed has a minimum elevation of 260.9 masl at the watershed outlet and a maximum elevation of 356.1 masl with a total average slope of 1.6% (Figure A.1; Appendix A). The average topographic elevation for all three watersheds is 276.7 masl. Channel slopes of the watershed vary from 0.05% within the West Buskegau River, 0.08% within the North Driftwood River, and 0.11% at Jocko Creek according to Ontario Watershed Information Tool (OWIT) (MNRF 2023a).

3.3 Regional Geology

The Project is located within the Lake Abitibi Ecoregion of Ontario (Ecoregion 3E), a part of the Ontario Shield. This region sits on top of the Precambrian Shield, that is overlain by diverse surficial geology which is composed of both glacial and post-glacial processes. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, and varies in thickness from less than 10 m to as much as 90 m (in the central portion of the Main Zone pit). A major fraction of the overburden is clay-dominated. This thick cover of glaciolacustrine sediments gives rise to the region's informal name, the "Abitibi Clay Belt". Underlying the clay is a discontinuous sand followed by glacial till (silt and/or clay) that overlies bedrock.

The most frequent surficial materials expected in the SA consist of (in order of importance) glaciolacustrine, followed by organics then till, as confirmed in the terrain mapping completed as part of the Soils and Terrain Baseline Report (Appendix B.1 of the Impact Statement).

The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills (Ontario Geological Survey (OGS) 2011). The main geological units from south to north are metasedimentary rocks (wacke, siltstone, argillite), followed by mafic to intermediate metavolcanic

flows (basalt, andesite, tuff and breccias), and by felsic to intermediate metavolcanic formations (dacitic and andesitic flows, tuffs and breccias). Within these units, there are intrusive contact rocks, mafic to ultramafic rock, and granitoid intrusions. In the north and middle metavolcanic formations, iron formations have a northwest-southeast orientation. Exposed bedrock has been observed on the west side of Highway 655, due west of Boundary Lake. Otherwise, unconsolidated sediments tend to be deep (up to 90 m), covering the bedrock over the majority of the SA.

Several regional faults are found in the SA, generally showing a north-northwest to south-southeast strike. The major regional faults following this trend are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as Crawford Ultramafic Complex (CUC) fault). Faults are not listed by OGS as inactive or active, and their activity level remains unknown. No earthquake of magnitude > 3 has occurred within the SA in the past 40 years (Appendix B.1 of the Impact Statement).

Figure A.2 (Appendix A) and B.2 (Appendix B) depicts the regional geology within the SA, the main faults, as well as the footprint boundaries of the TMF and MWMA alternatives, respectively, identified as a part of this assessment. Figure A.3 (Appendix A) and B.3 (Appendix B) demonstrate the surficial geology and the footprint of TMF and MWMA alternatives, respectively. Further information regarding soil and geological conditions in the SA have been provided in the soils and terrain baseline report (Appendix B.1 of the Impact Statement).

3.4 Geochemistry

The potential for metal leaching (ML) and acid rock drainage (ARD) from materials generated, exposed, and stored at the Project was investigated by WSP in the Crawford Geochemistry Characterization (Appendix H of the Impact Statement). The assessment was based on waste rock, ore, tailings and overburden samples. The capacity of a sample to generate acidity or neutralize acid is referred to as the acid potential (AP) and the neutralization potential (NP), respectively. The ratio of NP to AP is commonly used to evaluate the potential for a material to generate AP. Based on such a ratio, samples are classified as potentially acid generating (PAG), uncertain, or non-potentially acid generating (NPAG). The geochemical characterization methodology is outlined in the Crawford Geochemistry Characterization (Appendix H of the Impact Statement) guided by the Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials (MEND 2009), which is a nationally recognized guide for the evaluation of ML/ARD potential. Results provided in the Crawford Geochemistry Characterization (Appendix H of the Impact Statement) classified 100% of the tailings, ore and till samples, 98% of waste rock samples, 85% of the organic rich overburden samples and 100% of mineral rich overburden samples as NPAG. Overall, acid generation from excavated materials is not anticipated within the SA.

The ML assessment, consisting of elemental concentrations and shaker flask extraction (SFE) leachate concentrations, did not observe metal and metalloid parameter results that exceeded MDMER Schedule 4, Table 1 discharge criteria for waste rock and tailings. Chloride, fluoride and a number of metals and metalloids parameters exceeded Provincial Water Quality Objective (PWQO) and/or Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG-FAL) values in the ML assessment. It is anticipated that tailings deposited within each TMF alternative will have similar geochemical and physical properties. The waste rock deposited in each MWMA is also expected to have similar geochemical and physical properties.

Tailings produced in mine year 18 to the end of the operations phase will be placed as backfill in the Open Pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching. Further details about geochemical properties of waste material and ML and ARD management are included in the Crawford Geochemistry Characterization Report (Appendix H of the Impact Statement) and the Conceptual Metal Leaching and Acid Rock Drainage Management Plan (Appendix L of the Impact Statement).

3.5 Atmospheric Environment

The climate of the SA is typical of northern areas within the Canadian Shield, with long winters and short warm summers. The nearest permanent weather monitoring station with available long term current records is located at Timmins Victor M. Power Airport (VPA), approximately 24 km south of the site. This station, operated by ECCC, is a climate normal station with a comprehensive set of measurements and a similar setting to the SA. Timmins VPA has a mostly complete data set from 1951 up to 2012 for temperature, and a mostly complete data set from 1951 to 2009 for precipitation. As detailed in the Surface Water Resources Baseline Report (Appendix B.6 of the Impact Statement), to compute the updated climate normal between 1991 and 2020, data at Timmins Climate station (another regional climatic station operated by ECCC) supplemented the Timmins VPA data from 2009 to 2020. From the generated climate normal (1991-2020) dataset using the data at the two stations, the climate normal mean temperature ranges from -16.4ºC in January to 17.6ºC in July, with an annual average temperature of 2ºC. The climate normal annual precipitation (1991-2020) was determined from the combined stations, which was found to be 801.8 mm. Snow data are available at only the Timmins VPA station between 1955 and 2009. The previously reported ECCC climate normal (1980-2010) shows that, out of the annual precipitation of 834.6 mm, 311.3 mm occurred as snowfall (ECCC 2023)

According to monthly average wind speed and direction data (Chapter 12 of the Impact Statement), the most frequent wind direction is southerly and the annual average windspeed is 11.7 km/h. The highest average wind speeds occur in February, March and April. Maximum wind gusts ranged from 85 km/h (July) to 158 km/h (June) as indicated by climate normal data (Appendix B.2 of the Impact Statement).

Relative humidity climate normal data are available for the VPA station for 1971-2000. The SA has an average relative humidity of 83.2% (6 AM) and 59.5% (3 PM) annually. Morning humidity ranges from 77% in January to 92% in September, while the afternoon humidity ranges from 46% in May to 77% in December (Chapter 12 of the Impact Statement).

Ambient air quality was assessed in detail in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement) based on monitoring data from two different sources including the federal (Canadian) National Air Pollution Surveillance Network and onsite ambient monitoring. Baseline air quality will be influenced by existing operations at a base metal mine (located approximately 17 km south along Highway 655), traffic along Highway 655, as well as natural sources such as volatile organic emissions from vegetation, pollen or natural fires (Canada Nickel 2022). The monitoring data analyzed in the baseline report showed to be generally consistent with what would be expected for a remote location, and with the regional data (Appendix B.2 of the Impact Statement). More specifically, results for nitrogen dioxide, sulphur dioxide, volatile organic compounds, and metals were typically very low or below measurable levels (i.e., non-detect). There were 8 days during the measurement period when measured particulate matter less than 2.5 microns in diameter levels were above the 24-hour Canadian Ambient Air Quality Standard (CAAQS). Additionally, there was 1 day when measured particulate matter less than 10 microns in diameter was above the 24-hour Ambient Air Quality Criteria (AAQC). Some of these measurements may have been influenced by wildfire smoke.

Further information regarding the existing conditions for the atmospheric environments are included in the Surface Water Resources Baseline Report (Appendix B.6 of the Impact Statement) and Air Quality Assessment Technical Data Report (Chapter 12 of the Impact Statement).

3.6 Acoustic Environment

The existing wilderness areas surrounding the SA may be considered as Class 3, a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic (Canada Nickel 2022). There may be localized areas where noise emissions reflect road noises and recreational and exploration activities (Canada Nickel 2022). Baseline noise monitoring was completed for the Project in 2023 by WSP Canada Inc. (Appendix B.4 of the Impact Statement) where baseline noise data were collected to characterize the acoustic environment within the SA in two separate seasonal periods, the ‘leaves-off’ and ‘leaves-on’ seasons. The results indicated that the existing noise levels within the SA are primarily dominated by nature-based ambient sources including wind induced noise from vegetation, wildlife, and insects, and to a lesser degree by anthropogenic sources (such as local industry activity and traffic along Highway 655) (Appendix B.4 of the Impact Statement). No existing vibration sources were identified in the SA and surrounding area, except for an existing rail spur line for the Kidd Creek Mine.

Further information regarding the existing conditions for the acoustic environment are included in Baseline Noise Field Program Report (Appendix B.4 of the Impact Statement) and Noise and Vibration Assessment Technical Data Report (Appendix C.3 of the Impact Statement).

3.7 Groundwater

Groundwater conditions have been informed by surficial geology, topography, monitoring water level and hydraulic testing in monitoring wells, and groundwater sampling. Groundwater and seepage aspects were included in the characterization of the identified alternatives. Groundwater flow is anticipated to follow local topography and watershed divides and may also be influenced by bedrock topography below the overburden deposits. Existing hydrogeological conditions for the Project are presented in detail in the

Groundwater Baseline Report (Appendix B.5 of the Impact Statement). A summary of detailed findings in the baseline hydrogeological baseline study (Appendix B.5 of the Impact Statement) is provided in the following sections, in the context of the TMF and MWMA alternatives assessment.

3.7.1 Groundwater Quantity

Groundwater flow is generally in a south to north direction across the SA. Monitoring wells data collected between 2021 and 2022 indicate muted seasonal trend in the groundwater level data with generally lower groundwater levels in winter and with a slight rise in groundwater levels following the spring freshet.

A regional hydrology assessment conducted at selected nearby Water Survey of Canada (WSC) monitoring locations provides an average Baseflow Index (BFI) of 0.30 as shown in the Surface Water Baseline Report (Appendix B.6 of the Impact Statement). The BFI represents the proportion of total streamflow resulting from groundwater discharge to surface water. A moderate BFI of 0.30 suggests surface water features may be groundwater discharge points and that upward vertical gradients may be present.

Based on the desktop review and field investigations, the surficial hydrostratigraphic units interpreted across the assessment areas include organic deposits, eskers, and glaciolacustrine deposits. Beneath the surficial deposits, are varying layers of glacial overburden sediments, which include glaciofluvial deposits, till (silty sand / sandy till and clayey till), and bedrock.

As described in the Groundwater Baseline Report (Appendix B.5 of the Impact Statement), hydraulic response testing was completed in multiple monitoring wells to estimate the hydraulic conductivity of the various hydrostratigraphic units. One hydraulic response test was completed for the surficial clay unit, which was used to estimate a hydraulic conductivity of $2x10^{-8}$ m/s, consistent with literature values for a clay. The estimated hydraulic conductivity within buried sand or silty sand deposits (based on completed in-situ hydraulic conductivity testing) ranged from $5x10^{-7}$ m/s to $2x10^{-4}$ m/s, with a geomean of $1x10^{-5}$ m/s. For the clay till and/or silt till unit, the estimated hydraulic conductivity ranged from $1x10^{-8}$ m/s to $4x10^{-6}$ m/s, with a geomean of $2x10^{-7}$ m/s. The geometric means of hydraulic conductivity values estimated for different compartments of the bedrock were $1x10^{-9}$ m/s (in shallow weathered bedrock 0-10 m below top of rock), $1x10^{-8}$ m/s (in unweathered bedrock 10-200 m below the top of bedrock), and $1x10^{-9}$ m/s (in unweathered bedrock 200-400 m below the top of the bedrock).

3.7.2 Groundwater Quality

Groundwater quality monitoring was completed in 2022 and 2023 (Appendix B.5 of the Impact Statement). Elevated concentrations of arsenic, cyanide, fluoride, iron, manganese, phosphorous, and hardness were measured in overburden and bedrock wells in the SA which are typical of groundwater in Ontario and are reflective of the natural mineralization and geochemical processes in the area. Within bedrock monitoring wells, the mean groundwater concentrations in samples taken exceeded at least one regulatory criterion for pH, ammonia (unionized), boron and zinc. Within overburden monitoring wells, the mean groundwater concentrations in samples taken exceeded at least one regulatory criterion on a consistent basis for the following parameters considered atypical of groundwater in Ontario: pH, sodium

and zinc. Other parameters that were noted to be elevated above a regulatory criterion for mean concentrations in three or fewer wells included alkalinity, unionized ammonia, free cyanide, aluminum, cobalt, copper, silver, vanadium, and zirconium. Polycyclic aromatic hydrocarbons (PAHs) were generally non-detect in both overburden and bedrock wells.

Further information regarding groundwater quality conditions is included in Groundwater Baseline Report (Appendix B.5 of the Impact Statement).

3.8 Surface Water

Baseline surface water hydrology and water quality conditions were assessed as part of the Surface Water Resources Baseline Report (Appendix B.6 of the Impact Statement). The surface water information used in the alternatives assessment is from watershed mapping and field investigations. All streams and rivers in the SA are part of the Hudson Bay watershed. The SA is mainly located in the headwaters of the West Buskegau River and North Driftwood River watersheds, with a small portion of the site extending into the Jocko Creek watershed (Figure A.4 in Appendix A and Figure B.4 in Appendix B).

The West Buskegau River drains northwards and connects with the Abitibi River 25 km upstream from where the North Driftwood River meets with the Abitibi River. The West Buskegau River watershed (524.1 km^2) contains a slightly greater proportion of lakes in comparison to other watersheds in the SA, covering about 0.9% of its total drainage area (MNRF 2023a). The North Driftwood River connects with the Abitibi River, which continues on to confluence with the Moose River, about 55 km downstream from where the Mattagami River confluences with it as well. The North Driftwood River watershed (383 km^2) has less than 0.6% of the watershed area covered by lakes (MNRF 2023a). Jocko Creek leads into the Mattagami River, draining northwards towards James Bay. Mattagami River confluences with the Missinaibi River, which converges with the Moose River, one of the major rivers leading into James Bay. At the point of the Jocko Creek confluence, the Mattagami River covers a drainage area of 38,700 km^2 with a main channel length of approximately 550 km. Jocko Creek River watershed (109.6 km^2) has less than 0.5% of the watershed area covered by lakes as identified using the OWIT tool (MNRF 2023a).

Regional streamflow monitoring stations operated by the WSC were assessed to derive regression equations for characterizing the regional hydrology in the area. Eight WSC stations were included in the regional hydrological assessment. Regional hydrology assessment indicated that stream flow is highest in the spring and the fall. The response to the spring freshet commences in April with peak flows evident in May. For local hydrology baseline assessment, a field hydrometric monitoring program was conducted (2021-2023).

Regional and local water quality assessments were conducted to analyze and describe water quality conditions in the SA. Regional water quality data was obtained from seven Provincial Water Quality Monitoring Network (PWQMN) stations. In the SA, a total of 304 surface water quality samples were collected from 2021 to December 2023 at 33 watercourse locations and 13 waterbody locations across three main watersheds (Jocko Creek, the North Driftwood River and the West Buskegau River). Local general water quality in the watercourses and waterbodies identified slightly acidic conditions and

relatively low alkalinity with limited acid buffering potential. Waters within the SA are typically classified as medium hard with soft waters in Jocko Creek and the West Buskegau River.

Surface water quality data for each site and for each sampling event were compared to applicable regulatory guidelines, which were the PWQOs (and Interim PWQOs where applicable), and CCME CWQG-FALs. Water quality typically meets water quality guidelines with the exception of total phosphorus, dissolved aluminum (0.2µm diameter filter), and total iron, for which local watercourse and waterbody 75th percentile values exceeded the corresponding PWQO value. Regional water quality data were used to identify PoPCs, which were total aluminum, total arsenic, total cadmium, total cobalt, total copper, total iron, total lead, total phosphorus, total silver and total zinc. There were no substantial differences in water quality parameter results between the three watersheds (Jocko Creek, the North Driftwood River, and the West Buskegau River). Both the regional and local water quality exhibited seasonal trends for various parameters. Concentrations of parameters were typically higher in the late fall and winter months and lower in the spring and summer months. Aggregated water quality data by water feature type, specifically watercourses (including streams, rivers, and creeks) and waterbodies (lakes and ponds), observed typically lower concentrations of nutrients, metals and metalloids in waterbodies compared to watercourses with fewer regulatory guideline exceedances.

Figure A.4 (Appendix A) and B.4 (Appendix B) present the hydrologic baseline data applicable to the TMF and MWMA alternatives assessments, respectively. These figures include the watercourse and waterbody names and locations and the boundaries of the TMF and MWMA alternatives identified as a part of this assessment. Further hydrologic details are provided in the Surface Water Resources Baseline Report (Appendix B.6 of the Impact Statement).

3.9 Vegetation, Riparian and Wetland Environments

As detailed in Chapter 16 (Vegetation, Riparian and Wetland Environments) and Appendix B.7 (Terrestrial Baseline Reports) of the Impact Statement, the Project is located within the Abitibi Ecoregion (Ecoregion 3E) in northeastern Ontario within the Ontario Shield Ecozone (Crins et al. 2009). The Ecoregion is underlain by granitic or gneissic bedrock with intrusions of metavolcanic and metasedimentary rock. The northern portion of the Ecoregion is part of the Clay Belt and is underlain by deep, fine-textured, glaciolacustrine sediments from post-glacial Lake Barlow-Ojibway resulting in an extensive area of relatively low relief with poor drainage and large areas of extensive wetlands overlain by deep organic deposits. The southern portion of the ecoregion has more varied terrain with poorly developed, thinner soils, and large areas of exposed bedrock.

Most of the SA is in a relatively natural condition. Wetlands, primarily bogs, fens and swamps, are the dominant land cover type in the SA. Upland forests are present within the SA with coniferous forests as the dominant upland forest type. Open water is relatively uncommon in the SA and occurs as scattered ponds, small lakes, and rivers. Anthropogenic and other poorly vegetated areas represent a small area within the SA. This includes utility corridors, which account for the largest anthropogenic areas. These vegetation communities were used to inform the fish, bird and wildlife habitat assessments.

One ecosite (B133 – Hardwood Swamp) with the potential to support rare vegetation communities was identified in the SA but does not overlap the proposed alternatives for this study. Similarly, one occurrence of a species at risk (SAR), black ask (*Fraxinus nigra*), was identified west of TMF alternative 1 and MWMA alternative 2 but will not overlap these alternatives.

There are no provincially significant wetlands in the SA.

3.10 Fish and Fish Habitat

Fish habitat assessments were conducted at 38 riverine (lotic) sites and in six lake (lentic) sites between 2021 and 2023. The inland waterbodies within the SA are connected to mainstem streams and rivers through small streams and drainage channels. These channels are generally low gradient, low energy depositional environments with fine grained organic substrates. The larger mainstem streams where present, are in general wide (10 m to 20 m) with broad floodplains and fine substrates. Riparian habitat around lakes near or within the SA is comprised of fen mats, sedges, grasses, as well as sparse shrubs providing overhead cover nearshore.

Local fish communities generally represent a cool water thermal preference, with upper trophic level panfish and sportfish species present within the lakes in SA. Fish community survey results from baseline studies show the fish species are typical of those inhabiting northeastern Ontario. Fish communities predominantly consisted of forage species, as well as coarse fish and upper trophic predatory species. No aquatic SAR were anticipated within the inland watercourses and waterbodies, and none were physically encountered during the baseline studies for watercourses/waterbodies that are going to be overlain by the Project. Lake sturgeon (*Acipenser fulvescens*) are the only aquatic species at risk in the vicinity of the Project; lake sturgeon are known to inhabit the Mattagami River, the Abitibi River and the Frederick House River. Environmental DNA (eDNA) surveys within the North Driftwood River did not detect lake sturgeon despite the presence of lake sturgeon within the Mattagami River confirmed by the eDNA survey results. Additional field surveys in spring 2024 focused primarily on lake sturgeon, found impassible barriers to upstream sturgeon migration in the North Driftwood River 21.8 km upstream of its confluence with the Abitibi River and 63.3 km downstream of the SA. No similar barriers were identified in the West Buskegau River however, habitat assessments suggested that lake sturgeon presence in the vicinity of the Project was low as the habitat is primarily comprised of shallow, slow moving, depositional areas.

Figure A.5 (Appendix A) and B.5 (Appendix B) present fish and fish habitat baseline data applicable to the TMF and MWMA alternatives assessment, respectively, along with the footprint boundaries of the TMF and MWMA alternatives identified as a part of this study. Figures A.5 and B.5 presents fish habitat characterized into six categories including:

- Type A – Ponds
- Type B – Small inland lakes
- Type C – Entrenched mainstem watercourses
- Type D – Non-entrenched mainstems watercourse
- Type E – Large mainstem rivers
- Type F – Not fish habitat

Further information regarding the existing conditions for fish and fish habitat is included in the baseline reports (Appendix B.8.1 and B.8.2 of the Impact Statement) and Chapter 17 of the Impact Statement.

3.11 Birds and Bird Habitat

As detailed in Chapter 18 (Birds and Bird Habitat) and Appendix B.7 (Terrestrial Baseline Reports) of the Impact Statement, the SA has the potential to support habitat for Species of Conservation Concern (SOCC), SAR and a variety of bird groups including forest birds, other landbirds, raptors, upland gamebirds, marsh birds, shorebirds, waterbirds, and waterfowl. In addition to providing general habitat for birds, the following significant wildlife habitat (SWH) types have the potential to occur: waterfowl nesting area, Bald Eagle and Osprey nesting habitat, woodland raptor nesting habitat, Sharp-tailed Grouse lek habitat, marsh breeding bird habitat, shrub/early successional breeding bird habitat. All species and habitats are considered important to Indigenous nations.

Wetlands are the dominant vegetation community within the SA, providing habitat for most bird groups, particularly marsh birds, shorebirds, waterbirds and waterfowl, as well as two SAR, Lesser Yellowlegs (*Tringa flavipes*) and Short-eared Owl (*Asio flammeus*) and one SOCC, Yellow Rail (*Coturnicops noveboracensis)*. Forests are the second dominant vegetation community providing habitat for forest birds, other landbirds, raptors, upland gamebirds, and one SOCC, Evening Grosbeak (*Coccothraustes vespertinus).* Forest landbirds were also the most common and abundant species group within the SA. SAR and SOCC that use both wetland and forest habitat include one SAR, Canada Warbler (*Cardellina canadensis*), and three SOCC, Common Nighthawk (*Chordeiles minor)*, Olive-sided Flycatcher (*Contopus cooperi)*, and Rusty Blackbird (*Euphagus carolinus).*

Most of the bird habitats and species overlap a portion of the TMF alternatives (Figure A.6 and A.7, Appendix A) and MWMA alternatives (Figure B.6 and B.7, Appendix B).

3.12 Wildlife and Wildlife Habitat

As detailed in Chapter 19 (Wildlife and Wildlife Habitat) and Appendix B.7 (Terrestrial Baseline Reports) of the Impact Statement, the SA has the potential to support a diversity of wildlife and wildlife habitats. All species and habitats are considered important to Indigenous nations.

Wildlife groups used as key indicator species for biodiversity include amphibians and reptiles, moose (*Alces alces*), furbearers, SOCC (midland painted turtle [*Chrysemys picta marginata*], snapping turtle [*Chelydra serpentina*], monarch [*Danaus Plexippus*], yellow-banded bumble bee [*Bombus terricola]*) and SAR (Blanding's turtle *[Emydoidea blandingii]*, Boreal caribou [*Rangifer tarandus* pop. 14], and bats such as little brown myotis [*Myotis lucifugus]*, eastern red bat (*Lasiurus borealis*), hoary bat [*Lasiurus cinereus*], silver-haired bat [*Lasionycteris noctivagans*], Northern myotis [*Myotis septentrionalis*]),

The SA is reflective of the boreal forest, characterized by a landscape dominated by wetlands and woodland communities. However, forestry activities and a history of fires have altered the habitat, leading to various stages of regeneration. Wildlife and wildlife habitat are typical of boreal ecosystems with widespread distribution of moose, furbearers and bats (including SAR) throughout the SA. These species

utilize both wetland and woodlands during a portion of their life history. Specialized habitat for moose includes late winter cover, located along the northwest limits of the SA overlapping MWMA Alternative 1. Moose aquatic feeding areas are located along the southwest limits of the SA but do not overlap the TMF or MWMA alternatives.

The region includes areas that are considered as suitable habitat for amphibians and reptiles; however, most of these species are at the northern limit of their range, making them less abundant and difficult to detect. As a result, many have not been recorded or observed in the area. Species such as monarch and yellow-banded bumble bee have the potential to occur in relatively low abundance due to declining populations. Habitat for monarch is limited due to a lack of open habitat and meadow communities supporting milkweed populations. Yellow-banded bumble bee is a habitat generalist, although requires a continuous supply of floral resources to support colony growth, with mixed woodlands used for nesting and overwintering.

Historical records of Blanding's turtle outside of the SA were identified from the background review. This includes two records east of the SA and one record several kilometers west of the SA. Habitat is primarily wetlands and waterbodies, although woodlands and other habitat types are used during movement. Category 2 and 3 habitat (as defined by the Ministry of the Environment, Conservation and Parks [MECP]) extends into the SA for one of the records along the east boundary overlapping TMF Alternative 6. Category 2 habitat has a moderate level of tolerance to alteration before its function is compromised. Category 3 habitat is considered important for movement corridors between wetlands and has the highest tolerance to alteration.

The southern limit of the Kesagami Caribou Range begins within the central portion of the SA. The southern portion of the Kesagami Caribou Range south of Highway 11, considered as Category 3 habitat, has historically had low occupancy and there have been no records of boreal caribou in the area since the early 2000s. The SA is considered to have low habitat suitability based on current conditions such as early successional forests, disturbance and alternate prey (moose) and associated predators (northern gray wolf).

Figure A.8 (Appendix A) and Figure B.8 (Appendix B) present wildlife and wildlife habitat baseline data applicable to the TMF and MWMA alternatives assessment identified as a part of this study, respectively.

3.13 Labour and Economy

Economic conditions were assessed by Stantec in the Social and Economic Conditions Baseline Study (Appendix B.9 of the Impact Statement) and the Assessment of Potential Effects on Economic Conditions (Chapter 23 of the Impact Statement). The Far Northeast Training Board (FNETB) has developed sector-specific labour forecasts for current and projected mining projects in northeastern Ontario in a geographic area similar to the areas that include the SA. It was determined that the mining workforce requirements are expected to expand by 14% by 2027 with 30% of the current mining workforce being retired by then (FNETB 2018), leaving a 44% vacancy rate of positions needing replacements. With a decreasing trend observed in population between 2016 and 2021, the vacancy rate will likely be higher than 44%

throughout the duration of the Project (Appendix C.10 of the Impact Statement [Economic Impact Statement]).

The Project is located in northern Ontario where a primary economic driver for the regional economy is the mining industry. In the assessment region considered in the baseline socio-economic study reported in Appendix B.9 of the Impact Statement, which are beyond the boundary of the SA, employment opportunities include mining, quarrying, and oil and gas extraction, construction, manufacturing, transportation and warehousing, and professional, scientific, and technical services. These categories are based on North American Industry Classification System used by Statistics Canada (2022).

Further information regarding the existing economic conditions is included in the Economic Impact Assessment (Appendix C.10 of the Impact Statement) and Chapter 23 of the Impact Assessment.

3.14 Community Services

The Project is located in an area well-connected by local infrastructure. The Project is bisected by Highway 655, a two-laned paved provincial highway connecting Highway 101 to Highway 11 (Trans-Canada Highway). The property is readily accessible year-round by a network of bush roads accessed from Highway 655. The Project site is accessible from Timmins and South Porcupine from the south, as well as the communities of Smooth Rock Falls and Cochrane to the north on Highway 11.

An existing rail spur line connects Glencore's existing Kidd Mine west of Highway 655 to the Kidd Metallurgical Site to the southeast of the Project site. Other local infrastructure includes a regional transmission line (500 kV), which parallels Highway 655 and extends from the Hydro One Porcupine Transformer Station located east of Timmins. In addition, a 115 kV transmission line runs north south along the east side of the Project. A hydro-electric generating station, Lower Sturgeon, is located along Mattagami River to the west of the SA, within the boundaries of Mahaffy Township. No municipal infrastructure was located within the areas where the TMF and MWMA alternative are located.

The alignment of the existing Highway 655 runs north to south, through the western portion of the Project site, dividing the proposed Open Pit footprint into two parts. A section of Highway 655 will be realigned to the western boundary of the Project site and the existing Highway 655 section being by-passed will be decommissioned.

The Victor M. Power Airport is located 47 km (driving) from the site and is serviced by several daily flights to Toronto Pearson International Airport and Billy Bishop Toronto City Airport. Ontario Northland Transportation Commission (ONTC) is a provincial agency operating bus and railway services in northern Ontario. There are ONTC stations in Timmins, Cochrane, Iroquois Falls, and Smooth Rock Falls. However, only the Cochrane Railway Station is connected to the passenger railway system; the other stations are only serviced by ONTC bus service. The Cochrane Railway Station is also the southernmost stop of the Polar Bear Express, a passenger train operated by ONTC in northern Ontario.

Infrastructure was considered in the assessment and is presented in the figures included in Appendix A and Appendix B.

3.15 Land and Resource Use

Current land and resource use has been informed by available desktop information and engagement. Land and resource use (LRU) was considered in the alternatives assessment using the baseline overview that was organized into land use, recreation activities, and resource use, as detailed in Chapter 22 of the Impact Statement.

The SA consists of lands made up of patented lands (privately owned), provincial Crown lands (assumed unpatented land, including shore lands and the beds of most lakes and rivers), and unoccupied Crown land (Figure 3.1). The SA does not include provincial parks or First Nation reserves, even though such land uses exist within the broader regional area. The Mahaffy Township Ground Moraine Conservation Reserve is located west of the study area between Nesbitt Creek and the Mattagami River (Figure 1.1). The majority of the Project mining facilities are planned to be placed on patent mining lands and other infrastructure may be located on unpatented lands (provincial Crown lands). Crown lands within the land and resource use are designated as General Use in the Crown Land Use Policy Atlas (MNRF 2023c), which encourages mineral exploration and development activities. Crown land recreation, hunting, sport fishing and road use activities in these areas are also permitted and managed. The extent of mining claims/rights owned by Canada Nickel and other entities are presented in Figure 3.1.

The Project is not located near any federal lands. The closest lands under federal jurisdiction are the Taykwa Tagamou Nation Reserve lands. The primary Reserve lands of the Taykwa Tagamou Nation are the New Post 69A Reserve located 14 km southeast of Cochrane and 68 km northeast of Timmins, 37 km from the SA.

The Project site is located approximately 42 km north of the City of Timmins, Ontario, in the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark and Prosser. A small portion of the Project extent within the geographic townships of Kidd and Wark also lies within the municipal boundary of the City of Timmins.

There are no Areas of Natural and Scientific Interest (ANSI) sites in the SA.

The region plays host to many trails, some of which cross through the SA including those associated with the Arctic Riders and Timmins Snowmobile Clubs, and Polar Bear Riders Trail ‘A.’ Five trails cross through the SA, including the three trails referenced above plus the Ontario Federation of Snowmobile Clubs (OFSC) official trail and Polar Bear Riders Snowmobile Club. An additional 36 trails (e.g., canoeing, hiking, cross-country skiing), identified through baseline studies (See Appendix B.9 of the Impact Assessment), cross through the area beyond the SA representing a linear distance of approximately 1,460 km.

Preliminary evaluation of the potential for navigable watercourses within the SA was conducted, and results were reported in Chapter 22 of the Impact Statement. Recreational navigation may be possible throughout the entire open water season, or high-water season only, with obstacles, including the North Driftwood River, West Buskegau River, and Jocko Creek. Several lakes (Martin Lake, Gerry Lake, Jack Lake, Mel Lake, Sutherland Lake, Zed Lake, an unnamed lake south of Zed Lake, and Davis Lake) in the

area are connected by tributaries of North Driftwood River and Jocko Creek that are overlapped by the SA (Figures A.4 and B.4). While Zed Lake and an unnamed lake south of Zed Lake are within Jocko Creek watershed, other lakes listed above are located in the North Driftwood River watershed.

The Study Area overlies Ontario Ministry of Natural Resources (MNR) regulated trapline and bear management areas, which are areas for the management of furbearing mammals harvesting and black bear hunting, respectively. The SA also overlies Wildlife Management Area 30, which is also regulated by the Ontario MNR and has customized hunting regulations.

Figure A.9 (Appendix A) and Figure B.9 (Appendix B) present further LRU baseline data considered applicable to the TMF and MWMA alternatives assessment, respectively. Further details on LRU baseline conditions are provided in the Social and Economic Conditions Report (Appendix B.9 of the Impact statement) and Chapter 23 of the Impact Statement.

3.16 Cultural Heritage

The archaeological setting has been informed by the registered archaeological site records for the province of Ontario as included in the Ministry of Citizenship and Multiculturalism's (MCM) Ontario Archaeological Sites Database (ASDB). Based upon existing archaeological data drawn from the MCM ASDB, there are no archaeological sites currently registered within any of the proposed TMF or MWMA alternatives. Further information regarding archaeological conditions is included in the Stage 1 Archeological Assessment (Appendix B.11 of the Impact Statement). A cultural heritage screening report was prepared by WSP (Appendix B.10 of the Impact Statement) where known and potential built heritage resources and cultural heritage landscape in the area were investigated. No known or potential built heritage resources and cultural heritage landscapes were identified in the SA (Appendix B.10 of the Impact Statement).

3.17 Traditional Knowledge and Traditional Land Use

Where made available by Indigenous nations through engagement, information gathering, and voluntary information sharing with Canada Nickel, TKLU information has been reviewed and considered in the context of alternatives assessment for the TMF and MWMA for the Project. Refer to the Description of Engagement with Indigenous Peoples (Chapter 7 of the Impact Statement) for detailed methods regarding the incorporation of traditional knowledge to the Impact Statement.

The TKLU information considered in the alternatives assessment include areas identified by the Indigenous nations for the exercise of Aboriginal and/or Treaty rights of the Indigenous Peoples recognized and affirmed in section 35 of the *Constitution Act*, 1982, (e.g., hunting, trapping, fishing, camping, ceremonies, plant gathering), as well as areas more broadly associated with cultural continuity and sustenance. Generalized locations attributed to such uses were extrapolated from the Project-specific reports prepared by the Indigenous nations (AAN 2024; FPFN 2023; MGFN 2023; MNO 2024; MTFN 2023; TTN 2024).

There are no First Nation Reserve lands within or near the identified TMF and MWMA alternatives. A description of the traditional territories and reserve lands administered by the Indigenous nations is provided below and is based on information provided by the Indigenous nations.

The Project is within the boundaries of Treaty 9 (also known as the James Bay Treaty) (GoC 1964). Treaty 9 covers approximately two-thirds of Ontario's total landmass, (~58,676,063), and spans from the Great Lakes watershed encompassing the Hudson Bay and James Bay drainage basins (GOC 1964). The following Indigenous nations were included on the Crown Consultation list for the Project and are signatories of Treaty 9:

- Apitipi Anicinapek Nation: Apitipi Anicinapek Nation's traditional territory comprises the lands and waters stretching north along both sides of the Ottawa River and to the area around Lake Abitibi and the Harricana River, in the district of Cochrane in northern Ontario, within Treaty 9. Apitipi Anicinapek Nation's reserve, Abitibi 70, is located on the south shore of Lake Abitibi and is approximately 95 km east of the SA.
- Taykwa Tagamou Nation: Taykwa Tagamou Nation's traditional territory encompasses the southern portion of the James Bay watershed in the Moose River Basin in northern Ontario, within Treaty 9. Taykwa Tagamou Nation's reserve, New Post 69A, is located approximately 37 km northeast of the SA and the Nation's other reserve, New Post 69, is located approximately 102 km north of the SA.
- Flying Post First Nation: Flying Post First Nation's traditional territory encompasses the areas near Nipigon and lands northwest of Timmins, along the Groundhog River in northern Ontario, within Treaty 9. Flying Post First Nation's reserve, Flying Post 73, is located approximately 46 km southwest of the SA.
- Matachewan First Nation: Matachewan First Nation's traditional territory encompasses the areas of Kirkland Lake, Timmins and Timiskaming in northern Ontario, within Treaty 9. Matachewan First Nation's reserve, Matachewan 72, is located approximately 85 km southeast of the SA.
- Mattagami First Nation: Mattagami First Nation's traditional territory encompasses the Mattagami River and Mattagami Lake areas and stretches as far as the Moose River head waters on the James Bay coast in northern Ontario, within Treaty 9. Mattagami First Nation's reserve, Mattagami 71, is located approximately 85 km southwest of the SA.

Figures A.10 (Appendix A) and B.10 (Appendix B) present the proximity of the Indigenous nation's reserves to the TMF and MWMA alternatives, respectively.

The Project is also located within the Métis Nation of Ontario - Region 3's area of interest and the Nation was included on the Crown consultation list for the Project. The Métis Nation of Ontario - Region 3's area of interest includes areas used by the Métis Nation of Ontario for sustenance, social, economic and ceremonial purposes. There is no unique land base administered or serviced by the Métis Nation Ontario. Based on review of publicly available information, it has been determined that the Métis areas of interest may encompass the identified TMF and MWMA alternatives (see Figures A.10 and B.10).

Further information regarding the existing conditions for the Indigenous and/or Treaty Rights and interests of the Indigenous nations and the TKLU studies prepared for the Project is provided in Chapters 25–28 of the Impact Statement.

Canada Nickel has provided resources to support the participation of the Indigenous nations in the assessment process, including the formation of agreements for the preparation of Nation-led TKLU studies for the Project. The TKLU baseline data applicable to the TMF and MWMA alternatives assessment was adapted from the third party sources retained by the Indigenous nations to prepare the TKLU studies for the Project (AAN 2024; FPFN 2023; MGFN 2023; MNO 2024; MTFN 2023; TTN 2024)[1].The spatial analysis was further conducted by Stantec on the TKLU data for the purpose of the alternative assessment to quantify areas such as cultural continuity, hunting, trapping, hunting subsistence, plant harvesting and plant harvesting subsistence areas. The spatial TKLU data is not visually presented in this report.[1]

Assumptions regarding the TKLU baseline data considered in the TMF and MWMA alternatives assessments include:

- Assessments in the context of the TKLU data were based on generalized and representative locations identified by the Indigenous nations
- An area within the SA was targeted for data collection/site mapping and was made available to the nations when preparing their TKLU studies. Thus, estimations were made regarding the TKLU information within the alternatives located outside of the targeted date collection/site mapping area but within the SA.
- Conservative assumptions were made regarding the use of provincial Crown lands for the exercise of Indigenous and/or Treaty rights.
- Land use data used in the TKLU assessment was limited to mining land tenure and non-mining land tenure as a private land proxy approximation.

[1] The TKLU reports (AAN 2024; FPFN 2023; MGFN 2023; MNO 2024; MTFN 2023; TTN 2024) have been provided to Canada Nickel by the Indigenous nations for consideration by the Crown and Canada Nickel in the Project regulatory process. Canada Nickel acknowledges that the information contained in the reports remains the property of these Indigenous nations and may not be used for any other purpose without the express consent of these Indigenous Nations. For further information regarding the terms of use of the reports contact Canada Nickel and Apitipi Anicinapek Nation (AAN 2024), Flying Post First Nation (FPFN 2023), Matachewan First Nation (MTFN 2023), Mattagami First Nation (MGFN 2023), Taykwa Tagamou Nation (TTN 2023) and the Métis Nation of Ontario - Region 3 (MNO 2024).

4 Tailings Management Facility Alternatives Assessment

The TMF alternatives assessment was performed according to the requirements of the Guidelines, as discussed in the following section.

4.1 Step 1: Identify Candidate Alternatives

Step 1 of the alternatives assessment process is to develop a list of all “reasonable, conceivable and realistic mine waste disposal alternatives” (ECCC 2013). The range of alternatives considered was based on examples in Canada and other jurisdictions (a range of geographies and project scales) and assessed based on Project specific parameters and environmental conditions. The following presents a discussion of this process.

4.1.1 Threshold Criteria

Threshold criteria were used to “establish the regional boundaries for selecting candidate alternatives” (ECCC 2013). The following five threshold criteria were applied to the SA:

1. **Exclusion based on distance:** The Guidelines state that distance to the disposal area is commonly applied as a threshold criterion due to the effects of distance on project economics. As a result, the maximum distance for pumping/transporting tailings before it becomes uneconomical was calculated to be 15 km.

2. **Exclusion based on probable mineral resources:** Siting of the TMF locations was performed to exclude areas with known or probable mineral resources causing subsequent sterilization of the resources by making them inaccessible for future use.

3. **Exclusion based on public infrastructure:** Given the distance between the site and residential areas in the region, no existing public infrastructure is present that would impede the selection of candidate alternatives.

4. **Exclusion based on unallowed areas and key watercourses/waterbodies:** The Guidelines note that there may be areas where overlaying with mine waste would not be allowed and in such cases, these areas can justifiably be excluded from evaluation. The Mahaffy Township Ground Moraine Conservation Reserve is located west of Nesbitt Creek protects significant natural and cultural features and alternatives were not placed within its boundaries. There are no other unallowed areas or key watercourses/waterbodies located within the SA that would limit placement of an alternative. The North Driftwood River will be realigned due to the Open Pit layout and is not influenced by this exclusion criterion.

5. **Exclusion based on mine infrastructure:** Siting of the Open Pit, process plant and run-of-mine (ROM) pad are based on foundation conditions and access planning to the Open Pit and were conducted prior to the TMF alternatives assessment. As a result, these areas were excluded from the evaluation.

4.1.2 Tailings Management Facility Alternatives

Various waste disposal methods, dam construction methods, and alternative sites were considered in developing alternatives. The SA is constrained by various lakes and creeks/rivers, Highway 655, and two transmission lines, which combine to limit the locations available for tailings disposal. The following presents a summary of the identified TMF alternatives.

4.1.2.1 Location Alternatives

A desktop siting study was performed to identify “reasonable, conceivable, and realistic” (ECCC 2013) alternative locations. The following six alternative TMF locations, which are presented in Figure 4.1, were identified and considered for use:

TMF-1. South of Open Pit with In-Pit Disposal

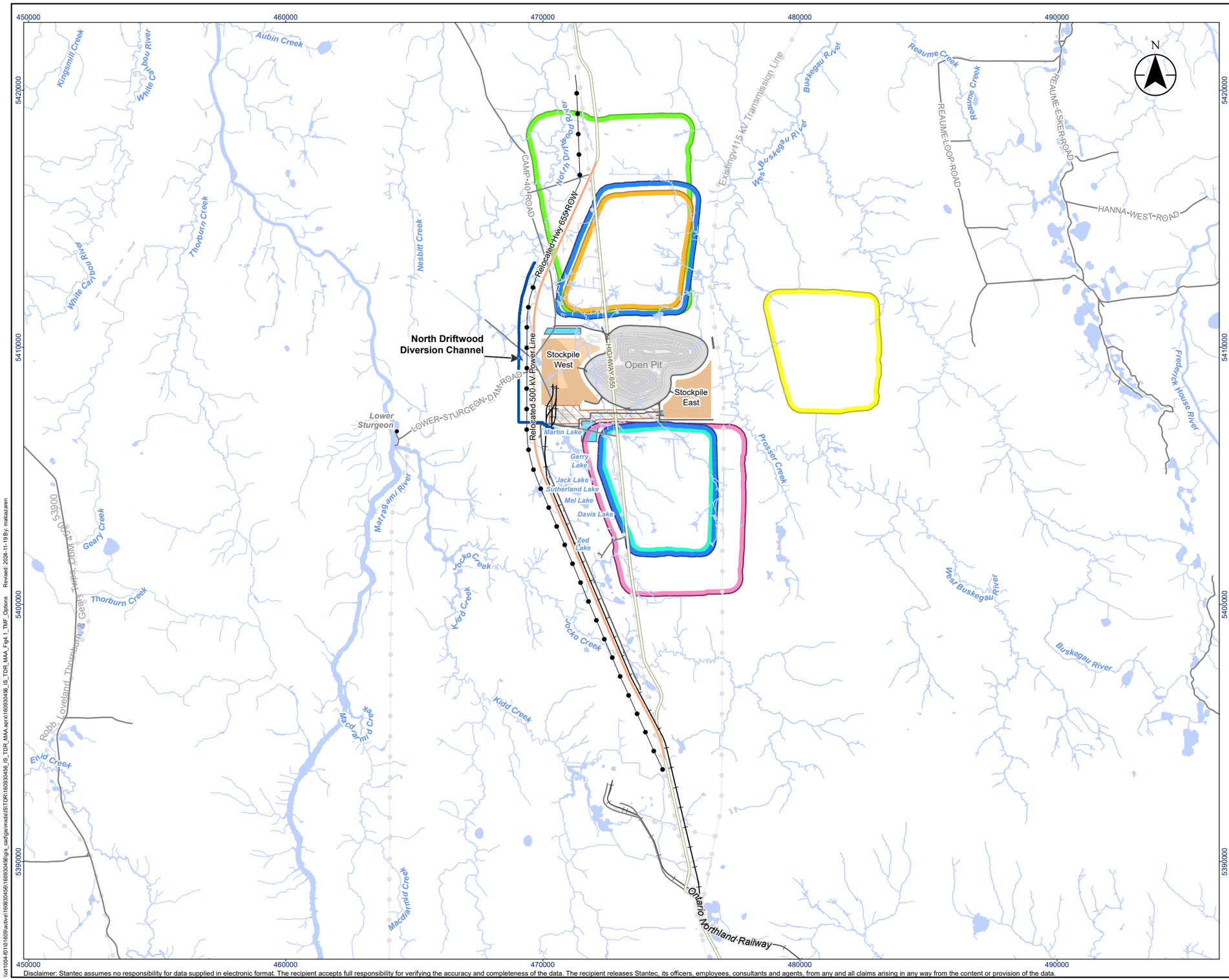
TMF-2. North of Open pit with In-Pit Disposal

TMF-3. South of Open Pit (All Above Ground Disposal)

TMF-4. North of Open Pit (All Above Ground Disposal)

TMF-5. North and South of Open Pit (All Above Ground Disposal)

TMF-6. East of the West Buskegau River with In-Pit Disposal



Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 3
- TMF Alternative 4
- TMF Alternative 5
- TMF Alternative 6

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

1:150,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
4.1

Title
Identified TMF Location Alternatives

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

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4.1.2.2 Waste Disposal Method Alternatives

The storage and management of tailings depend on a number of factors such as the chemical and physical properties and the surrounding landscape of the mine site. Six candidate waste disposal methods were identified and considered for use, as follows:

1. Conventional slurry: this method involves discharging the tailings slurry from the mill at low solid content by weight through a pipeline to the TMF.
2. Thickened tailings: this method involves producing a tailings slurry with no tendency towards segregation upon placement. High-density or deep-cone thickeners are used in this method to increase solid content of the slurry. The thickened tailings technology produces a steeper beach slope (relative to the conventional slurry deposition method), which results in an increased TMF storage capacity and a limited perimeter dam height.
3. Pressure filtered tailings: this method involves removal of water by pressure methods to further increase slurry solid content. The densification process of tailings reduces the need for storage capacity and overall tailings footprint. The pressure filtered tailings are transported to the TMF with trucks or conveyor.
4. Co-mixing with waste rock (conventional/thickened): this method involves full blending of the two materials (waste rock and tailings) to a specific mixture that is dense and well-graded and has low compressibility and high water retaining capacity. Mixing is followed by deposition of the new material.
5. Co-mixing with waste rock (pressure filtered): this method is similar to method 4 with the difference that pressure filtered tailings, and not the conventional or thickened slurry, are mixed with waste rock.
6. In-pit disposal: storing mine tailings in the Open Pit of the mine is an efficient use of space and reduces the footprint of the TMF and the height of the TMF dam. This reduction would also lower closure and remediation costs. This method is viable in a multi-pit or excavation zone operation because the disposal of tailings in the pit/zone must occur when mining has ceased.

Additional details regarding the identified waste disposal methods are provided in Appendix E.

4.1.2.3 Dam Construction Method Alternatives

Three dam construction methods were identified and considered for use, as follows:

1. Upstream
2. Downstream
3. Centerline

A discussion of each of the dam construction method alternatives is presented below.

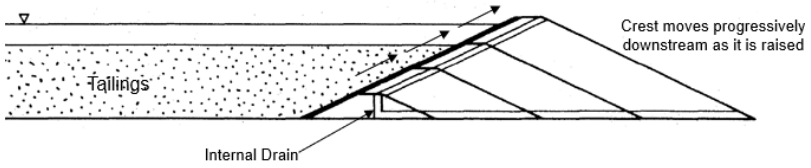
Downstream (DS) Construction:

DS construction entails raising of the dam such that the dam crest moves progressively downstream, or outwards from the stored tailings (see schematic in Figure 4.2(a)). In general, this method of dam construction has the lowest probability of failure, as compared to the upstream and centerline raise methods, as both the upstream and downstream portions of the dam are founded on native ground, bedrock or supported by engineered material.

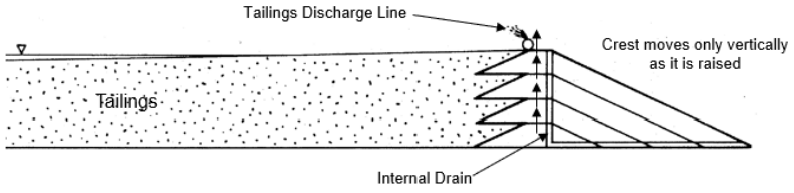
DS construction is generally well suited for conditions where storage of large quantities of water within the impoundment is required, as the impact of the water on the upstream stability of the dam is typically more limited compared to the other two noted methods. However, this construction method also has the largest dam footprint, which can impact the use of this method in areas with space limitations.

The main disadvantage of the DS construction method is the volume of dam construction material, and thus material availability and construction costs, required. As such, the DS construction method is typically more expensive than the other two dam construction methods.

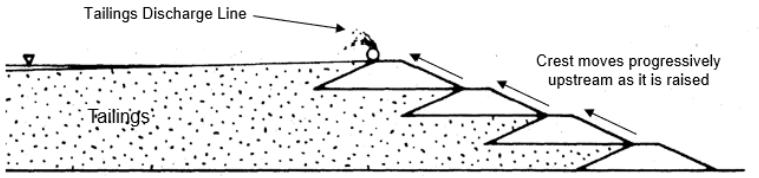
Figure 4.2 Tailings Dam Construction Methods (Adapted from Vick, 1990)



(a) Downstream Method



(b) Centreline Method



(c) Upstream Method

Centerline (CL) Construction:

CL construction entails vertical raising the dam such that the embankment crest remains the same plan position as the dam is raised (Figure 4.2(b)).

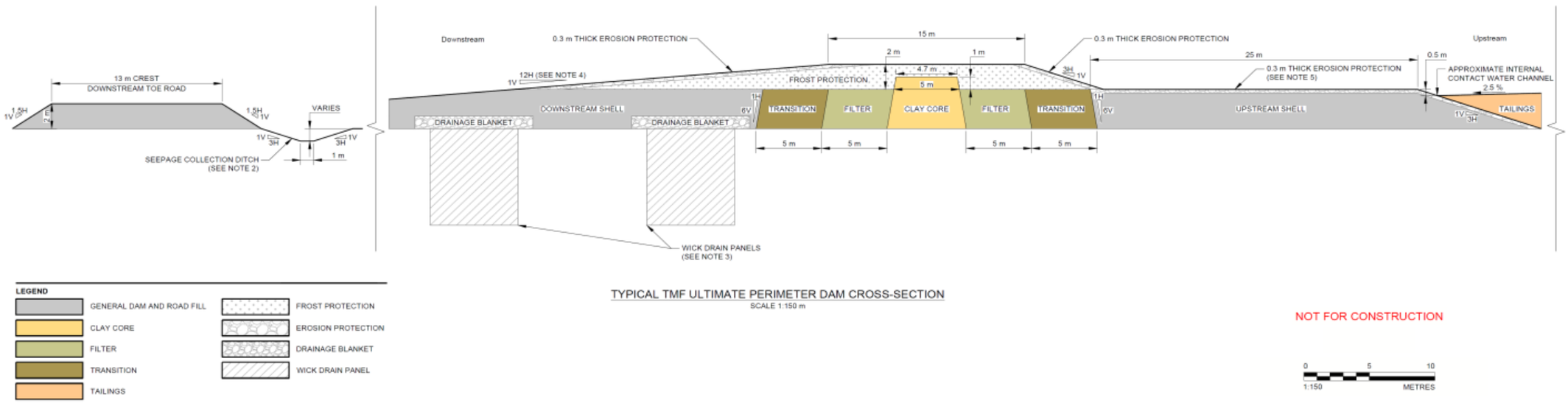
The stability of the upstream portion of a centerline constructed dam relies significantly on the strength and stability of the impounded tailings and, as such, is a function of tailings properties such as liquefaction potential and TMF operational practices, including tailings deposition and water management, which may impact the impounded tailings strength. This option typically requires less embankment construction material than the DS method but more material than the upstream (US) construction method. In general, it has a higher probability of failure than the DS construction method as the upstream stability of the structure relies partially on the stability and strength of the impounded tailings, which are: generally more difficult to control and characterize than dam construction materials, have characteristics that are a function of facility operation (e.g., deposition method, water management), and are more sensitive to static and dynamic strength reductions than dam construction materials.

Internal drainage and low-permeability zones can be incorporated into centerline constructed dams, which can reduce the impact of ponded water in the facility on the downstream stability of the dam. However, storing large amounts of water in the facility will increase the loading on the dam, impacting downstream stability and may reduce the stability and strength of the impounded tailings, impacting upstream stability.

Proposed Project Dam Centerline Construction Method:

The proposed design for the is referred to as centerline in the Feasibility Study and a typical cross-section is presented in Figure 4.3 (Ausenco 2023). The design has a clay core that stays in the same position as the dam is raised, but the core with filter and transition layers is 25 m wide. In addition, there is a 25 m wide flat section on the upstream shell before the beginning of the inside dam slope that will follow the centerline construction method described above. The downstream slope of the dam is 12H:1V to the dam toe. Based on these widths and slopes, a 40 m high dam would have an outside shell width of 530 m including the clay core and upstream shell, and an inside slope width of 114 m, equating to a ratio of 4.6. This proposed centerline construction method has a higher embankment volume and dam footprint than the typical centerline method described above providing additional stability and limiting the impact of water on the upstream stability of the dam. For the alternatives assessment, the proposed centerline dam construction method is classified as the centreline method given its overall width and improved stability for this alternatives assessment.

Figure 4.3 Proposed typical TMF Dam Cross-Section



Source: Ausenco 2023

Upstream (US) Construction:

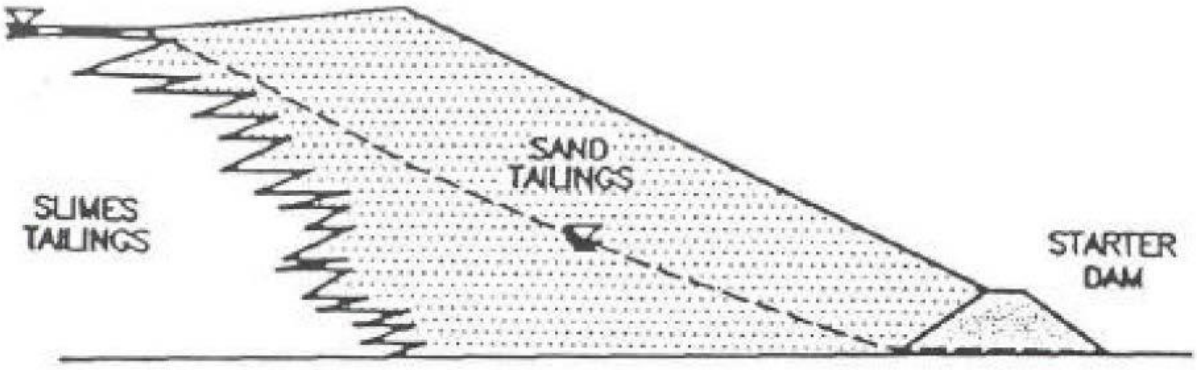
US construction entails raising of the dam such that the dam crest moves progressively upstream, over previously deposited tailings (Figure 4.2(c)). US construction has historically been the most common approach for impoundment of tailings. Historically, upstream construction was often performed by depositing segregating tailings from a small starter dam. The segregating tailings would result in the deposition of coarse tailings (sands) near the deposition point and fine tailings (slimes) away from the deposition point. The deposition spigots were then progressively raised upstream over the previously deposited sands, forming an outer containment structure constructed of tailings sands (as presented in Figure 4.4).

This method has further evolved to include modifications such as compaction of the tailings sands (to provide increased strength and liquefaction resistance) and hydrocyclone separation of tailings sands. Additionally, US construction can be performed by constructing the dam either partially or fully with other construction materials (such as earthfill or rockfill).

US construction is generally the least expensive option as it requires significantly less dam construction material than the other methods. However, this method is considered to have a higher probability of failure than the other methods as it relies on the deposited tailings for both upstream and downstream stability and the characteristics of the tailings are heavily dependent on operational methods and are more difficult to fully define than the characteristics of engineered and placed embankment materials. This method is also more susceptible to seismic and static liquefaction as it relies on the stability and strength of the overlain impounded tailings, which are typically contractive and may be saturated and susceptible to strength reductions. This method is more sensitive to variations in water management practices and less suitable for storage of large quantities of water as this would raise the phreatic surface within the upstream dam and negatively impact stability.

Following the 1965 La Ligua earthquake and the resulting seismically induced failure of the upstream constructed El Cobre tailings dam, the use of the upstream method for tailings storage was outlawed in Chile. This raise method is still used in other locations but is often only considered feasible for areas of relatively low seismicity and low rainfall.

Figure 4.4 Upstream Dam Construction Schematic (Martin and McRoberts 1999)



4.2 Step 2: Pre-Screening Criteria

Step 2 consists of applying pre-screening criteria to exclude alternatives that are “non-compliant with certain unique minimum specifications that have been developed for the project” (ECCC 2013). The Guidelines describes this process as a “fatal-flaw analysis” where fatal flaws are defined as any site characteristic that is “so unfavorable or severe that, if taken singly, it would eliminate that site as a candidate” (ECCC 2013). Pre-screening criteria are defined such that there is a simple “yes” or “no” response to whether or not the alternative complies with the criteria and a “yes” response eliminates the alternative from further evaluation.

4.2.1 Identification of Pre-Screening Criteria

Four pre-screening criteria were used in the TMF pre-screening process. These pre-screening criteria and their rationale are summarized in the following section. The application of these criteria to the identified TMF alternatives is presented in Section 4.2.2.

1. **Is the mine waste disposal system not technically feasible for the Site?** – Waste disposal methods which are technically infeasible based on industry precedent and site characteristics were removed from further consideration.

2. **Would the mine waste disposal method have insufficient capacity for the proposed mine life?** – If the mine waste disposal method does not provide sufficient capacity for the proposed life of mine quantity of waste, the method can be removed from further consideration in the assessment.

3. **Would the mine waste disposal storage volume result in negative life of mine economics?** – If the TMF storage volume required for managing the tailings is large enough to result in negative life of mine economics that location should be excluded from further consideration.

4. **Does the stability of dam construction rely significantly on the properties of the impounded tailings and/or consistent water and tailings management practices?** – Dam construction methods that rely significantly on the properties of the impounded tailings and/or operational practices increase the risk associated with tailings storage. This criterion is intended to reduce the risk of failure of the facility through a reduced reliance on operational practices. This criterion was selected to remove methods that rely to a significant extent on tailings for stability.

5. **Does the dam construction method footprint potentially overlay project infrastructure or larger watercourses/waterbodies?** – Dam construction methods that extent the alternative footprint to potential overlay project infrastructure (e.g., open pit, processing plant) are removed from consideration as the option is considered to negatively impact the Project development. Additionally, construction method footprints that expand the TMF alternative area to cover large watercourses/waterbodies (e.g., North Driftwood River headwater lakes, West Buskegau River) reduce more sensitive fish habitats and are removed from consideration.

4.2.2 Application of Pre-Screening Criteria

The following presents a discussion regarding the application of the pre-screening criteria to the alternatives. Alternatives which do not comply with the pre-screening criteria were removed from further consideration in the assessment.

Criterion 1 - Is the mine waste disposal system not technically feasible for the Site?

A site-specific review of the proposed alternatives was performed and tailings disposal methods that required pressure-filtering tailings were considered not to be technically feasible for the Project. Pressure-filtered tailings disposal has been adopted in only a small number of mining operations. Mines that utilize pressure-filtered tailings disposal are typically relatively low production rate mines (on the order of 4,000 tpd or less) and are often located in very arid regions where the cost of water is high, where there is limited space available for tailings storage, or where there are specific environmental concerns that make pressure-filtered tailings advantageous. Many of the commonly recognized advantages of pressure-filtered tailings would not be realized at the Project due to site characteristics. For example, the site is located in (i) an area which appears to have relatively low-cost access to water, (ii) in a region of relatively low seismicity, (iii) in a considerably less advantageous climate (notably, higher amounts of precipitation and relatively large seasonal variations in temperature), and (iv) a Project requiring much higher production rates than observed for other pressure-filtered tailings applications.

Difficulties in filtration of residues are attributed to clay particles and fine brucite as well as chrysotile fibers. This difficulty has also required significant experimental work to define ore processing parameters, which eliminate the problems of viscous pulps in the flotation and magnetic separation circuits. Moreover, in the pressure-filtered tailings approach, the transfer of residues to a deposition area cannot be done by pumping. The use of conveyors is difficult to envisage given the distance, the winter climate and the need to frequently move the discharge point due to the very high rate of residue production. This approach is typically applicable to low processing rates only (a few thousand tonnes per day). Transfer by truck would be the most plausible transport solution. However, it would not be economical, without considering the

significant environmental impacts resulting from noise, dust and the generation of greenhouse gases (trucks and spreading and compaction equipment).

Due to technical infeasibility of disposal of pressure-filtered tailings, as explained above, disposal methods 3 (pressure-filtered tailings) and 5 (co-mixing of pressure-filtered tailings with waste rock) were removed from further consideration based on criterion 1.

Criterion 2 - Would the mine waste disposal method have insufficient capacity for the proposed mine life?

A site-specific review of the proposed alternatives was performed and the following tailings disposal methods were considered to have insufficient capacity to store the required quantity of tailings within a single facility in combination with in-pit disposal (if required) and were removed from further consideration:

Co-mixing with Waste Rock Disposal (conventional/thickened/pressure filtered)

Co-mixing of tailings with waste rock can be appropriate when there are advantages to combining both the waste rock and tailings streams into one disposal area. It can be used to mitigate ARD/ML from waste rock by surrounding potentially acid generating waste rock with tailings material, which reduces the conductivity of the mass to both air and water, and may also increase neutralization potential thus reducing the risk of ARD/ML. Co-mixing is used most widely in the coal mining industry and is much less common at metals mines. This is partially due to the typically lower ratio of waste rock to tailings at metals mines, which would result in reduced waste rock particle contact and deposit strength.

At this time there appears to be no substantial geochemistry-related advantages to co-disposal of the full tailings and waste rock volume given the available geochemistry for the Project site with the potential for PAG and ML. Mixing can be energy-consuming and expensive due to alignment of the production and sequencing of the two feed streams, including optimizing the mixing ratio. There is also a gap of 11 years between mine year 30 and 41 when active mining stops and only tailings will be produced where co-mixing will not work as a disposal method. Furthermore, in the Project site, there is not adequate room within the individual TMF site options and the Open Pit for storing combined tailings and waste rock materials. As a result, it is anticipated that co-disposal method would have insufficient capacity for the mine life, and the adoption of this method would result in additional design complexity without any significant geochemistry-related benefits. Accordingly, co-disposal of tailings and waste rock, which is the case in methods 4 and 5, was removed from further evaluation in the assessment.

In-pit Disposal

In-pit disposal is often more feasible at sites with multiple pits or excavation zones where waste deposition can begin after mining of a pit is completed. This avoids double handing of tailings and can significantly reduce costs. In cases where the pit is below the groundwater level and hydraulically contained (i.e., groundwater flows towards the pit), in-pit storage can be an attractive option for storing PAG tailings as it maintains saturation of the material and does not require the construction of typically more costly and higher risk embankments. This option was not included as a singular disposal option as one or more of the pits or excavation zones would be required to be fully excavated prior to placement of

tailings. This implies that, from the Criterion 3 standpoint, only in-pit disposal of tailings would not provide sufficient capacity during the mine life (i.e., during first stages of mining). As such, another TMF would potentially be required to store tailings prior to in-pit disposal could occur, which is what is proposed in the TMF-1, TMF-2 and TMF-6 options.

Criterion 3 - Would the mine waste disposal storage volume result in negative life of mine economics?

Alternatives TMF-3, TMF-4, and TMF-5 refer to the disposal of tailings in areas north and south of the pit, all above-ground. Unlike TMF-1 and TMF-2, these tailings deposition alternatives do not use the Open Pit for the storage of tailings. This requires a larger area to be allocated to TMF alternatives 3-5 (in comparison to TMF alternatives 1-2), which may overlay larger waterbodies and watercourses (e.g., West Buskegau River, Jocko Creek) that would require realignment or substantial offsetting (e.g., Martin Lake, Gerry Lake). Additionally, the realignment of the hydro transmission line on the east side of the Project site (TMF-3 and 4) would represent an additional capital cost. Constructing full size TMF options without using the Open Pit to support disposal with the combined potential for infrastructure and watercourse realignments is considered a negative impact on life of mine economics. Therefore, based on this criterion, alternatives TMF-3, TMF-4, and TMF-5 were removed from further evaluation in the assessment.

Criterion 4 - Does the stability of dam construction rely significantly on the properties of the impounded tailings and/or consistent water and tailings management practices?

As discussed in Section 4.1.2.3, upstream and typical centerline dam construction methods rely significantly on the properties of the impounded tailings for stability. The proposed centerline method for the Project has a high width to height ratio with the width extending more than 300 m for dams 23 m and higher from the edge of the tailings storage area providing substantial stability while relying less on tailings properties compared to the typical centreline method. As the Project is not yet in operation, there is currently limited information available regarding the engineering characteristics of the tailings, which represents a greater risk associated with the upstream construction method.

Furthermore, the tailings properties are a function of the water and tailings management practices employed at the facility and thus stability of the facility would rely to a greater extent on operational practices if upstream or centerline construction methods were adopted. This criterion is intended to reduce the risk of failure of the facility if variations in water management occur.

Based on this criterion, the upstream dam construction method was removed from further evaluation in the assessment.

Moreover, the high clay content in the ore, in comparison to typical hard rock ores, will make the solids concentration in the slurry very low (11%) if the conventional slurry waste disposal method is used. Storage of slurry with higher water content and the abundance of fine particles in the tailings requires a perimeter dam with a large height and volume. The thickened tailings waste disposal method, however, is considered as a more appropriate alternative because it increases water recovery rates, provides sloping

sides for self-supporting the deposit, and therefore, requires small perimeter dams. Hence, conventional slurry waste disposal method was removed from further evaluation in the assessment.

Criterion 5 - Does the dam construction method footprint potentially overlay project infrastructure or larger watercourses/waterbodies?

The proposed Project centerline construction method will have tailings dam widths that extend over 300 m from the edge of the tailings storage area for heights greater than 23 m (Figure 4.3) and Section 4.1.2.3. The width of the dam is controlled by the underlying surficial clay tills to maintain dam stability. The downstream dam construction method would extend the dam footprint even further than the proposed Project centerline method as the clay core would be angled and push the extent of the downstream toe farther out, potentially by 100 m or more. The upstream dam construction method would have a dam footprint width narrower than the centerline method.

TMF-1, TMF-2, TMF-3, TMF-4 and TMF-5 are all located north and south of the open pit and extending the dam footprints using the downstream method would push the disposal facility extents at these locations into the footprints of other Project infrastructure, including low grade ore stockpiles, the open pit shell and process plant. These options are further constrained by the North Driftwood River main channel headwater lakes to the west, and the West Buskegau River main channel to the east, and extending the TMF alternative footprints to overlay these features would require realignment and offsetting of the largest water systems within the SA, which also provide more sensitive fish habitat in comparison to the tributaries. TMF-6 which is located between the West Buskegau River and Buskegau River would also have its footprint expanded by the downstream construction method to overlay one or both of the river system main channels, which also provide more sensitive fish habitat than the river system tributaries.

Based on this criterion of potential interference with project infrastructure and reducing potential impacts to larger waterbodies and watercourses with more sensitive fish habitat, the downstream dam construction method was removed from further evaluation in the assessment for the six TMF locations assessed.

The results of the pre-screening are presented in Table 4.1.

Table 4.1 TMF Pre-Screening Criteria Summary Table

Pre-Screening Criterion	Waste Disposal Method						Dam Construction Method			TMF Location					
	Conventional Slurry	Thickened Tailings	Pressure Filtered Tailings	Co-mixing with Waste Rock (Conventional /thickened)	Co-mixing with Waste Rock (Pressure Filtered)	In-pit Disposal	US	CL[3]	DS	1	2	3	4	5	6
1. Is the mine waste disposal system not technically feasible for the Site?	No	No	**Yes**	No	**Yes**	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. Would the mine waste disposal method have insufficient capacity for the proposed mine life?	No	No	No	**Yes**	**Yes**	**Yes** [1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3. Would the mine waste disposal storage volume result in negative life of mine economics?[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	**Yes**	**Yes**	**Yes**	No
4. Does the stability of dam construction rely significantly on the properties of the impounds tailings and/or consistent water and tailings management practices?	**Yes**	No	No	No	No	No	**Yes**	No	No	N/A	N/A	N/A	N/A	N/A	N/A
5. Does the dam construction method footprint potentially overlay project infrastructure or larger watercourses/waterbodies?	N/A	N/A	N/A	N/A	N/A	N/A	No	No	**Yes**	N/A	N/A	N/A	N/A	N/A	N/A
Should the alternative be excluded from further assessment?	**Yes**	No	**Yes**	**Yes**	**Yes**	No[1]	**Yes**	No	**Yes**	No	No	**Yes**	**Yes**	**Yes**	No

Notes:
1. Until a pit has been fully excavated, a storage facility would be needed to hold tailings. As such the TMF options proposed include a separate TMF along with in-pit disposal as the complete storage alternative.
2. Alternatives TMF-3 through TMF-5 are removed as they are related to full storage of tailings above ground, which is not a financially sound approach.
3. Proposed Project centerline dam construction method given its planned width, including the clay core and upstream shell is classified as the centerline construction method.

Following the application of the pre-screening criteria, the following three alternatives remain and were carried forward into Step 3 (Section 4.3) of the alternatives assessment. Centreline dam construction, which includes the proposed Project centerline construction method with its longer width, and the thickened tailings approach will be considered in these three alternatives:

- TMF-1
- TMF-2
- TMF-6

The Guidelines note that, while there is no ideal number of alternatives to consider in Step 3, a minimum of three is a typical rule-of-thumb. The TMF alternatives assessment complies with these requirements as three alternatives are carried forward into Step 3 of the assessment process. The Guidelines also recommend that at least one of the alternatives carried through the pre-screening into Step 3 of the assessment should not impact a natural waterbody frequented by fish "unless it can be demonstrated that the potential of identifying such a site does not reasonably exist based on site-specific circumstances" (ECCC 2013). The presence of numerous watercourses and waterbodies in the region did not allow design of an alternative that would avoid impacting natural waterbodies that are frequented by fish. Loss was assessed for the TMF alternative locations based on three types:

1. Direct overlay of the alternative on fish habitat (MDMER Schedule 2)
2. Direct overlay of the alternative on surface water features not considered to be fish habitat (*Fisheries Act* Section 34/35)
3. Direct overlay that due to centralized water management (e.g., sedimentation ponds) discharges outside the existing drainage area and indirectly reduces flow downstream to fish habitat (*Fisheries Act* Section 34/35)

Substantial efforts have been made to avoid directly overlaying lakes and watercourses and the development of alternatives has been successful in avoiding key fish habitat waterbodies and watercourses in the SA. The alternatives carried forward into Step 3 of the assessment are the TMF-1, TMF-2 and TMF-6 locations, which include footprints that overlie small water features with fish habitat. The surface water features will be removed prior to TMF construction or waste deposition and are considered to potentially require Schedule 2 listing. For example:

- Unnamed tributaries and waterbodies with fish habitat that are overlain by TMF-1, would be removed prior to deposition of waste rock and fish habitat would be compensated/offset.
- Unnamed tributaries and waterbodies with fish habitat that are overlain by TMF-2, would be removed prior to deposition of waste rock and fish habitat would be compensated/offset.
- Unnamed tributaries and waterbodies with fish habitat that are overlain by TMF-6, would be removed prior to deposition of waste rock and fish habitat would be compensated/offset.

4.2.3 Design Basis and Criteria

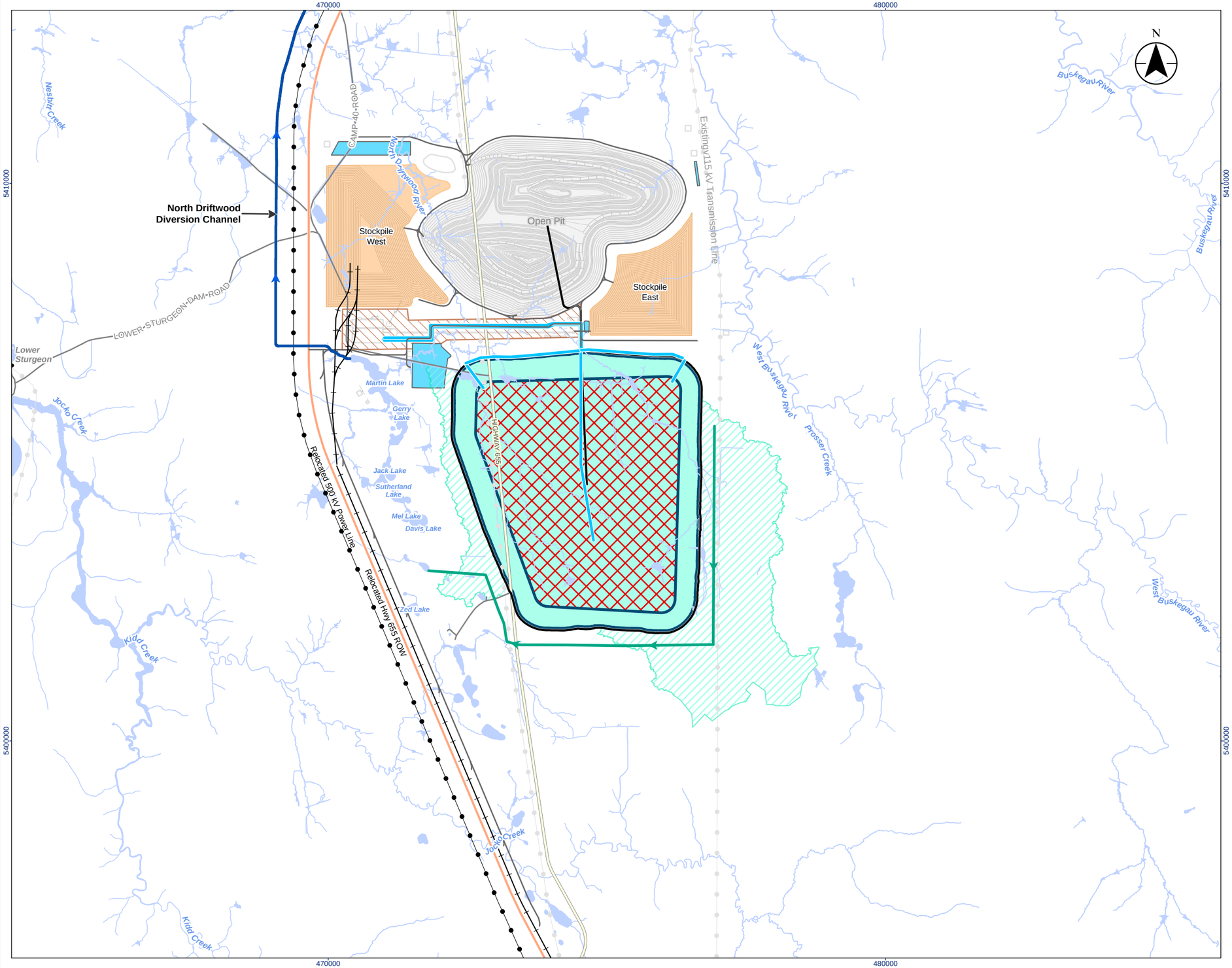
A conceptual design was developed for the alternatives listed above based on design criteria presented in Table 4.2. The conceptual design for the three alternatives carried through into Step 3 of the assessment are presented in Figure 4.5 through Figure 4.7. The final design and capacity of the constructed piles may vary due to work performed as part of ongoing Project planning and engineering design and variations in the mine plan during operations.

Table 4.2 Design Basis and Criteria for Conceptual Design of TMF Alternatives

Design Basis Item	Value
Total Quantity of Produced Tailings (1)	1,638 Mt
Deposited Dry Density (2)	1.26 t/m^3
Minimum TMF Storage Capacity (1)	495 Mm^3
Tailings Deposition Method (2)	Thickened
Tailings Density (2)	39% solids
Beach Slope (2)	2.5%
Tailings Freeboard (2,3)	2.5 m
External Reclaimed Water Freeboard (4)	0.5 m
Dam Crest Width (2)	15 m
Number of TMF Facilities (2)	1 (with in-pit disposal)
Dam Construction Method	Staged Construction with Starter Dam and Centerline Raises
Dam Type (2)	Rock-fill with central impervious core
Dam Structural Material (2)	Clay (Core), Waste Rock (Downstream Shell), Sand (Upstream Shell)
Dam Impermeable Material (2)	Clay
Dam Upstream Slope (2)	3H:1V
Dam Downstream Slope (2)	12H:1V

Notes:

1. Total quantity of tailings produced over the mine lifetime, estimated based on a total of 1.3 Bm^3 of tailings and a dry density of 1.26 t/m^3 available in the Tailings Management Feasibility Design (WSP 2023).
2. Based on Tailings Management Feasibility Design (WSP 2023)
3. The tailings freeboard is the vertical distance from the crest of the dam to the maximum tailings elevation adjacent to the dam.
4. The external reclaim water pond freeboard is the vertical distance from the top of the surface of the impounded reclaim water to the crest of the reclaim water pond dam. The value is taken from the Site-Wide Water Management Plan (Appendix J of the Impact Statement)
5. The use of a single TMF site is consistent with the recommendations of the Guidelines.



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Legend

- TMF Alternative 1
- Tailings Deposition Area
- TMF-1 Non-Contact Drainage Area
- TMF-1 Tailings Dam
- Haul Road / Contact Water Ditching
- Tailings and Reclaim Water Pipelines
- TMF-1 Non Contact Water Diversion Ditch

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

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Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
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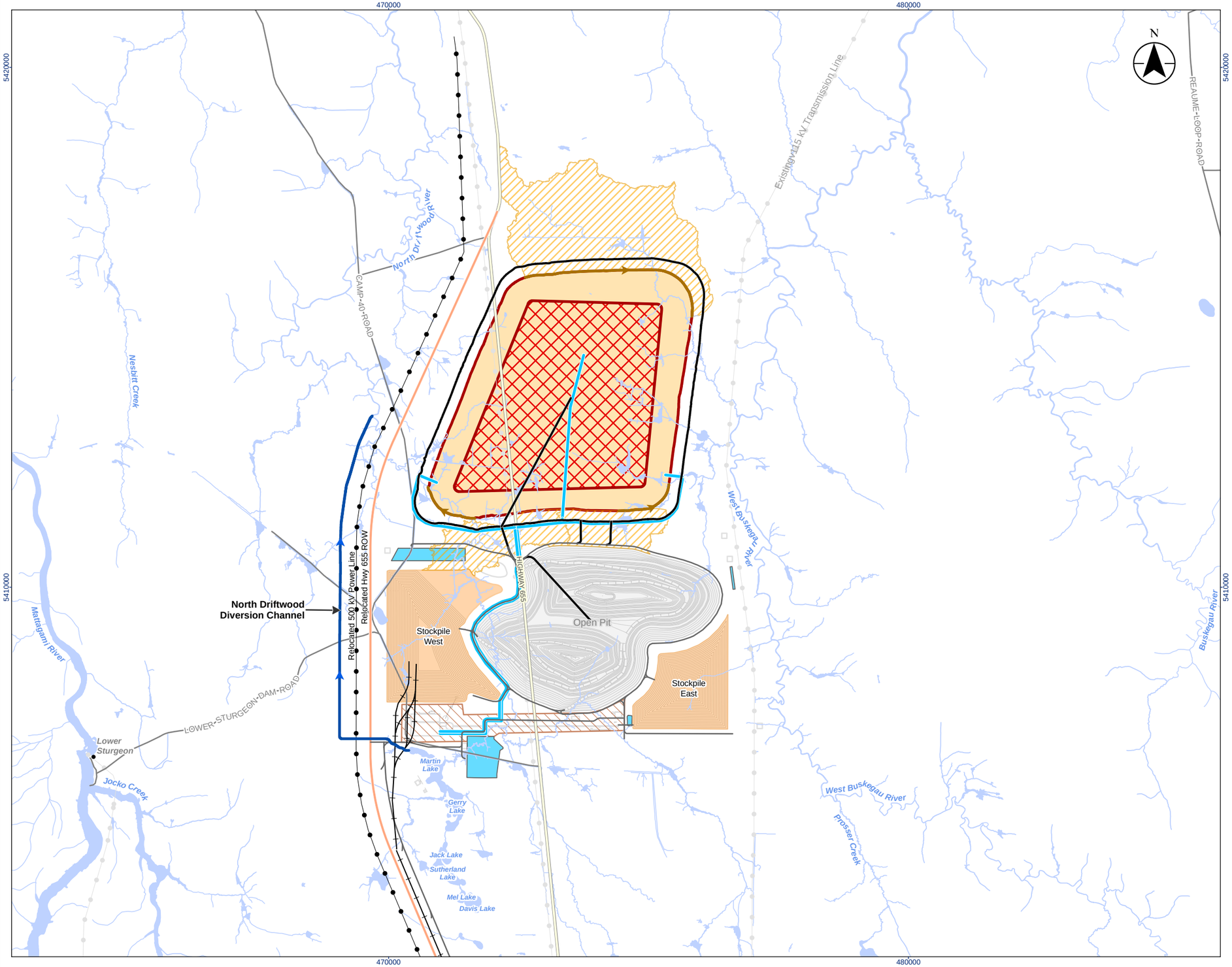
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
4.5

Title
TMF-1 Alternative - Conceptual Design

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CANADA NICKEL COMPANY

Legend

- TMF Alternative 2
- Tailings Deposition Area
- TMF-2 Non-Contact Drainage Area
- TMF-2 Tailings Dam
- Haul Road / Contact Water Ditching
- Tailings and Reclaim Water Pipelines
- TMF-2 Non Contact Water Diversion Ditch

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

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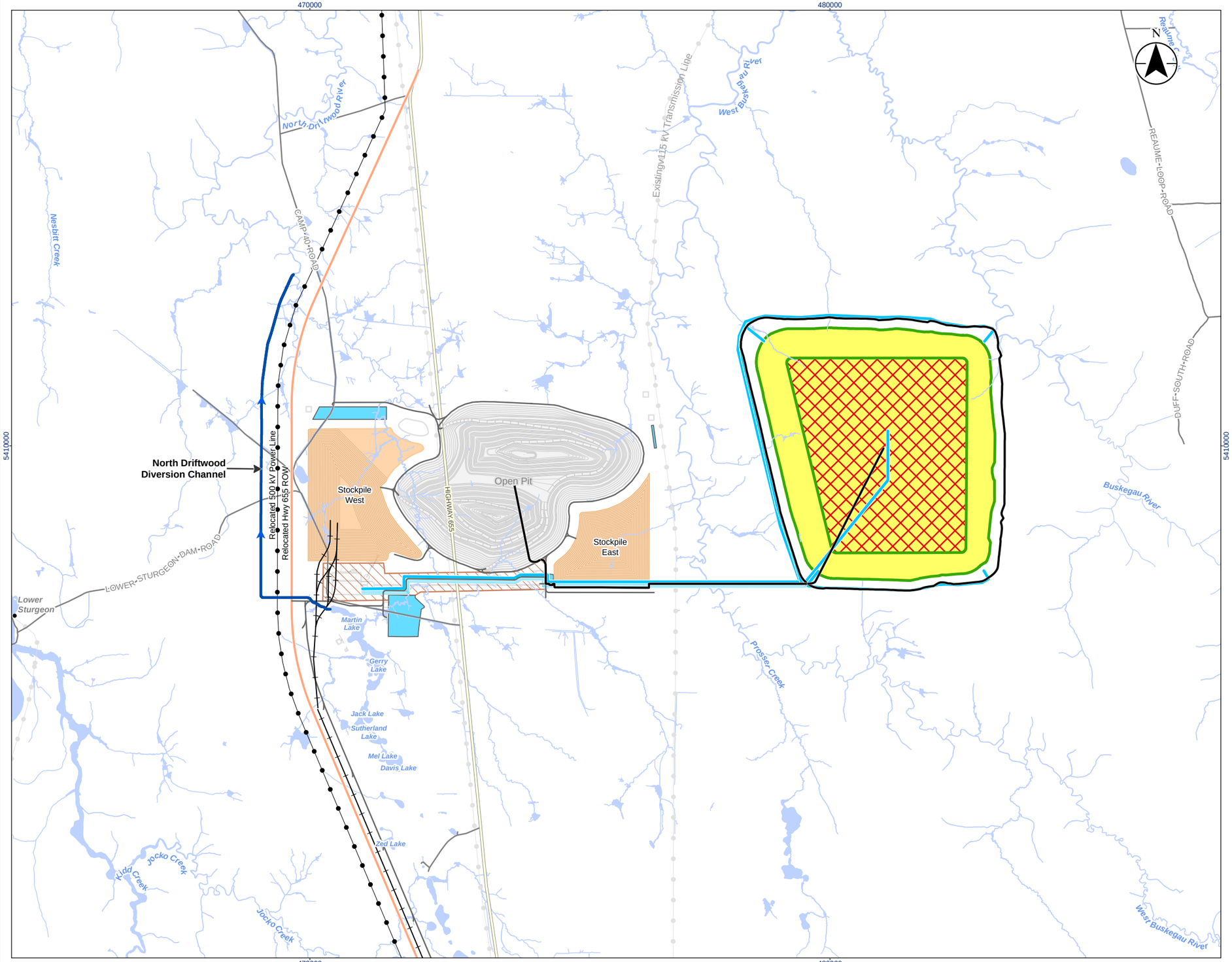
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
4.6

Title
TMF-2 Alternative - Conceptual Design

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 6
- Tailings Deposition Area
- TMF-6 Tailings Dam
- Haul Road / Contact Water Ditching
- Tailings and Reclaim Water Pipelines

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

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Notes

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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
4.7

Title
TMF-6 Alternative - Conceptual Design

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4.2.4 TMF Failure

The consideration of dam failure in an alternatives assessment is not common as failure is a rare occurrence and an assessment of failure is typically performed using a dam breach analysis, which requires detailed information that is not normally available during the environmental assessment phase. However, a review of the potential impacts of a dam breach of the alternative TMF-1 was completed by Stantec (Appendix P of the Impact Statement [Tailings Dam Breach Consequence Assessment Report]) based on the results of dam breach and inundation modelling conducted by Ausenco (2024). The aim of the Tailings Dam Breach Consequence Assessment Report (Appendix P of the Impact Statement) was to assign a Canadian Dam Association (CDA) classification to the TMF dam that represents an assessment of dam breach consequence or losses from various events categories including loss of life, environmental, infrastructure, and socio-economic (CDA 2019). The design of TMF-1 is similar to TMF-2 and TMF-6 with the same tailings type (thickened) and dam heights (40 m). The dam breach assessment study of TMF-1 was used to estimate consequence assessment results for TMF-2 and TMF-6.

For the TMF-1 dam breach analysis, tailings were assumed to be susceptible to liquefaction (regardless of what triggers the dam failure) and mobilize in the event of a dam failure (Ausenco 2024). Two hydrologic conditions were used for failure mode assessment, namely, “Sunny Day” or fair weather failure and “Flood-induced” failure due to a large flooding event. The location of the breach was considered in the Sunny Day scenario to be at where the height of the dam is greatest. In the Flood-induced scenario, the location of the breach was considered to be in the place of the ponding areas where the greatest volume of water from the storm event accumulates. Four breaches were considered in the Sunny Day dam breach scenario of TMF-1, including west towards the North Driftwood River and chain of lakes, south towards Jocko Creek, east towards the West Buskegau River and north toward the Open Pit. In the Flood-induced scenario, an overtopping event results in breaches simulated at the NW and NE corners proximal to the spillways and to the north center and east corner. Assessment in both scenarios were conducted based on CDA guideline recommendations (CDA 2019).

The TMF-1 assessments indicated that the CDA classification of Extreme would be applied to the Loss of Life category as a result of more than 100 mine workers that may be at risk during a Flood-induced dam failure at a breach of the north dam or the northwest spillway location during operations and active closure. A breach outflow deflector berm was proposed to protect workers working in mine facilities north of the TMF and the Process Plant to the northwest of the TMF. With the installation of such a deflector berm extending from the ore Stockpile East west past the Process Plant, the TMF facility CDA classification was assigned as Significant during operations and active closure. The Population at Risk in this case would be temporary persons driving along Highway 655, or along the rail spur or mine roads and the Loss of Life potential would be reduced to Unspecified. During passive closure phase, the CDA classification is maintained at Significant.

The environmental and cultural values losses for TMF-1 were assessed based on the guidance in the CDA Technical Bulletin (CDA 2023) to determine the Environmental Consequence Classification (ECC) associated to the TMF dam. The environmental and cultural losses in the event of a dam breach during operations was Low as a result of the loss of lake, river, and wetland habitat. As the TMF will remain

during closure, this CDA ECC classification is not expected to change between operations and passive closure phases.

The CDA infrastructure and economics classification from construction through to passive closure phase was assigned as Significant due to the potential loss to recreational use of North Driftwood lakes, and the West Buskegau River, damage to transportation routes (i.e., Highway 655, rail line, and infrequently used hydro line access/rural roads) and temporary impact on the access to these transportation routes. Overall, if the deflector berm is implemented, the CDA classification of Significant in the Loss of Life category, combined with the CDA ECC classification of Low and the infrastructure and economics classification of Significant would result in the overall classification of Significant for the TMF-1 dam.

The consequences assessment results for TMF-1 were used as an analogue for assessing the TMF-2 and TMF-6 options. In the case of the TMF-2 alternative, located north of the Open Pit, if breaches occur to the east and north, the CDA classification in the Loss of Life category would be Low as there are no population at risk or workers impacted by such breaches. Environmental and infrastructure and economics effects for these breaches would be similar to those of TMF-1. If a breach occurs to the west of TMF-2, the environmental and infrastructure and economic effects would be maintained at the same level of north and east breaches. The CDA classification of Loss of Life in this case would be similar to that of TMF-1 due to the effects on the workers working in the Open Pit and temporary persons driving along Highway 655, along the rail spur, or mine roads. Similar to the case of TMF-1, if a deflector berm is implemented to the north of the pit, the CDA classification would be improved.

For TMF-6, which is located further away from the Open Pit than TMF-1 and TMF-2, the effects of dam breach would be less. More specifically, there would be no Loss of Life effects because no populations at risk or mine workers would be in the vicinity of the alternative. The environmental effects due to breaches in TMF-6 would be similar to those of TMF-1 and TMF-2. From the infrastructure and economics impact perspective, if breaches occur to the east, north, and south in TMF-6, the impact is minimal. If a breach occurs to the west of the facility, the infrastructure and economics effects would be similar to those of the northeast Flood-induced failure in TMF-1. The parameters analyzed in this section are also provided in the characterization tables in Step 3 (Tables C-1 and C-4).

4.3 Step 3: Alternative Characterization

4.3.1 Alternative Characterization

In Step 3, each of the alternatives remaining after the Step 2 Pre-Screening are characterized. This process is intended to provide a summary of relevant information related to each of the alternatives and assist in considering key aspects of the alternatives in the assessment. Site specific characterization criteria are developed and applied to each alternative. As required by the Guidelines, the characterization criteria used in this assessment are divided into four categories: Environmental, Technical, Project Economic, and Socio-Economic.

Table C-1 through Table C-4 in Appendix C present the completed characterization criteria summary tables for each account. These tables are required by the Guidelines as the deliverable from Step 3 of the assessment process. The tables include a summary of the rationale for each characterization criterion and a column which lists the basis for the presented information, in compliance with Guidelines' recommendations that the information presented should be clear and well documented.

4.3.2 Non-Differentiating Characteristics

In accordance with the Guidelines, only characteristics that are differentiating among the alternatives are applicable for use in the alternatives assessment. Table D-1 through Table D-4 in Appendix D present a summary of characteristics that are considered to be non-differentiating among the alternatives, separated by the characterization category, and a discussion regarding why each is considered non-differentiating. This information is presented to provide rationale regarding the indicators and sub-accounts that were used in the alternatives assessment.

4.4 Step 4: Multiple Accounts Ledger

In Step 4, a multiple accounts ledger is developed. The ledger is divided into accounts, sub-accounts, and indicators.

4.4.1 Accounts

Accounts are intended to separate the effects associated with the alternatives into broad categories and allow for a comparison of the alternatives at a high level. Consistent with the recommendations of the Guidelines, four accounts were used in this assessment: Environmental, Technical, Project Economics, and Socio-Economic.

4.4.2 Sub-Accounts

Each account is further divided into sub-accounts, which are also described as evaluation criteria. The Guidelines require that sub-accounts be impact driven, differentiating, understandable, non-redundant, and able to be independently judged (i.e., not depend on the value in another sub account).

The characterization criteria presented in Tables C-1 through C-4 (Appendix C) were reviewed and impacts associated with these characteristics were identified and used to develop sub-accounts to represent impacts associated with the alternatives. A summary table was prepared for each account to present the selected sub-accounts and a description of the rationale behind each. These tables are recommended by the Guidelines as a deliverable from Step 4 of the assessment process. The following sections present the sub-account summary tables for each of the four adopted accounts.

4.4.2.1 Environmental Account – Selected Sub-Accounts

The Environmental account addresses the anticipated impacts of tailings storage on the environment. The account was broken down into sub-accounts to incorporate impacts on land, water and air, and the wildlife within them. Table 4.3 presents a summary of the selected sub-accounts within the Environmental account and the rationale for each.

Table 4.3 Environmental Account – Sub-Account Summary Table

Sub-Account	Rationale
Water Management	Alternatives which manage larger quantities of water result in greater amounts of contact water and may present a higher risk of loss of containment and associated environmental impacts.
Aquatic Life and Habitat	Alternatives which have a greater impact on aquatic habitat (watercourses and waterbodies) and impact more sensitive aquatic habitats and spawning areas pose a greater environmental impact.
Surface Water Impacts	Alternatives which result in larger impacts to existing surface water flows (through diversions or loss of the catchment captured by the TMF or through emergency spillway discharges) represent a larger impact to downstream habitats.
Terrestrial Life and Habitat	Alternatives which result in the loss or disturbance of more terrestrial habitat pose a greater environmental impact.
Geotechnical Foundation Conditions	Facilities with lower strength foundations pose a higher stability risk.
Air Quality	Tailings storage may impact air quality due to dust generation associated with waste rock haulage for dam construction and dusting from exposed tailings surfaces.
Climate Change	Alternatives which require greater fuel consumption result in higher carbon emissions and have greater impacts on climate change.
Hydrogeology, Seepage and Leakage Risk	TMF seepage will be mitigated through engineering design. However, alternatives that overlie more pervious foundation materials present a higher risk of seepage which presents a higher risk of environmental impacts. In addition, alternatives which require greater lengths of tailings and reclaim water pipelines are considered to represent a greater risk of malfunction and leakage and thus a greater risk of environmental impacts.
TMF Failure Likelihood	Natural ground is more resistant to instability and failure than human-made dams. Facilities that fully rely on perimeter dams to provide containment are considered to have a greater risk of failure than facilities which utilize the natural ground surface to provide containment, assuming other aspects being identical. Moreover, facilities with shorter perimeter lengths and thus less dam length are superior to those with longer perimeter dam length from TMF failure likelihood perspective.

4.4.2.2 Technical Account – Selected Sub-Accounts

The Technical account considers the engineering elements and technical risks associated with each alternative. The Technical account was summarized into two sub-accounts. Table 4.4 presents a summary of the selected sub-accounts within the Technical account and the rationale for each.

Table 4.4 Technical Account – Sub-Account Summary Table

Sub-Account	Rationale
Design and Operational Complexity	Alternatives with greater dam heights or lengths, less favorable foundation conditions, longer non-contact water diversions, greater distances from the operational areas, and more complicated deposition requirements present additional design and operational complexity.

4.4.2.3 Project Economics Accounts – Selected Sub-Accounts

The Project Economics account addresses the differentiating portions of the lifecycle costs of the alternatives. Three sub-accounts were selected within this account. Table 4.5 presents a summary of the selected sub-accounts within the Project Economics account and the rationale for each.

Table 4.5 Project Economics Account – Sub-Account Summary Table

Sub-Account	Rationale
Capital Cost	Capital costs have a significant impact on the ability to successfully commission a mine.
Operating Cost	Operating costs impact life of mine economics.
Closure Cost	Closure costs can be significant and can have a substantial impact on initial project economics due to requirements for financial assurance.

4.4.2.4 Socio-Economic Account – Selected Sub-Accounts

The Socio-Economic account is divided into sub-accounts which capture the anticipated impacts of tailings on local and traditional land users. Table 4.6 presents a summary of the selected sub-accounts within the Socio-Economic account and the rationale for each.

Table 4.6 Socio-Economics Account – Sub-Account Summary Table

Sub-Account	Rationale
Land and Resource Use – Animal Harvesting	Alternatives which impact larger amounts of hunting area have a larger socio-economic impact.
Land Access	Impacts to land access represent a socio-economic impact.
Land and Mineral Use Rights	Facilities overlying areas where land or mineral use rights exist present risks of socio-economic impacts and may impact the ability to successfully permit and operate a mine.
Traditional Knowledge and Land Use	Alternatives with greater loss of unoccupied Crown land have greater socio-economic impacts on Indigenous users due to availability of unoccupied Crown land for Indigenous activities. In addition, alternatives with greater loss of land where Indigenous cultural continuity occurs have greater socio-economic impacts. Cultural continuity is comprised of numerous interrelated values that are important for cultural persistence and way of life, including knowledge transmission, spirituality, sense of place, and identity.
Traditional Knowledge and Land Use – Animal Harvesting and Subsistence	Alternatives with greater impacts on Indigenous users' subsistence and animal harvesting (hunting, fishing, and trapping) activities have greater socio-economic impacts.

Sub-Account	Rationale
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Alternatives with greater impacts on Indigenous users' subsistence, plant harvesting and gathering activities have greater socio-economic impacts.

4.4.3 Indicators

Each of the sub-accounts are then divided into indicators which allow the impacts associated with each alternative to be measured. The measurements for each indicator are referred to as "indicator quantities." Scoring of each indicator occurs as a part of the next step (Step 5; Section 4.5) of the assessment process by applying the quantitative value scale adopted for each indicator to the indicator quantity.

Table 4.7 through Table 4.14 present the indicator summary tables and value scale summary tables selected for the assessment, divided by account. The indicator summary tables present the rationale and measurement metric for each indicator. The measurement metric defines each indicator quantity (i.e., if it is a distance measurement, what distance is being measured) and the rationale describes why the indicator was included in the assessment and what it represents. The value scale summary tables are used to define the score for each indicator based on the indicator quantity value.

In certain cases, the same measurement metric was utilized for multiple indicators. This is considered consistent with the Guidelines which recommend that the selected sub-accounts be non-redundant, meaning they should each represent a differing impact, and that indicators should then be developed to measure the impact associated with each sub-account. For example, it could be appropriate to utilize the area of waterbodies overlain by the TMF as a measure of aquatic life and habitat impacts in the Environment account while also using the same area as a measure associated with the loss of fishing in the land and resources use sub-account in the Socio-Economic account.

Consistent with the Guidelines, a 6-point value scale system was adopted for the indicators in this assessment.

Table 4.7 Environmental Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Water Management	Internal Water Management - Precipitation	Water requiring management within the TMF consists of precipitation that falls on the TMF and supernatant water that separates from the tailings at deposition. This water will be collected and conveyed to the process plant for reuse as reclaim water. Larger catchment areas will generate more water that will require management. Larger flows are considered to represent a greater risk of loss of containment and requirement for potential treatment and discharge to the environment. Alternatives with a smaller internal TMF catchment area are preferred in this indicator.	The catchment area associated with precipitation that reports to the internal surface water management system. This is measured as the two-dimensional area of the facility within the perimeter dam.	Area	ha	1,891.1	1,891.5	1,924.7
	External Water Management – Perimeter Ditch	The proposed surface water management system concept includes of perimeter seepage collection ditches constructed around the TMF which collect seepage and overland water from downstream slope of TMF dam and convey flows to collection ponds. Collected flows will be conveyed to the process plant for reuse as reclaim water. Larger catchment areas will generate more water which will require management. Larger flows are considered to represent a greater risk of loss of containment and requirement for potential treatment and discharge to the environment. Alternatives with a smaller catchment area reporting to perimeter TMF seepage collection ditches are preferred in this indicator.	The contact and non-contact water catchment area reporting to the alternative perimeter ditch. This catchment area is measured as the downstream face of the TMF dams (contact water) and the catchment area upstream of the facility (non-contact water). Due to the implementation of berms/ditching, no non-contact water would flow from the upstream catchment areas into the perimeter ditches. Therefore, the catchment area reporting to the perimeter ditches is limited to the downstream face of the TMF dams (contact water).	Area	ha	1,316.3	1,123.7	1,133.7
	External Water Management – Non-contact Water	Construction of water diversion berms and ditches (if required) will reroute surface water flows to the same receiving bodies but results in short-term perturbation to aquatic life in the construction area. Alternatives with smaller non-contact water drainage area equating to smaller lengths of diversion berms are preferred in this indicator.	Non-contact water catchment area diverted due to the construction of berms.	Area	ha	1,093.3	983.4	0.0
Aquatic Life and Habitat	Loss of Watercourses	Alternatives which overlie a greater extent of aquatic habitat have a greater environmental impact. For this assessment, it is assumed that all mapped or field surveyed watercourses are fish bearing. The area of watercourses was used to measure overlain aquatic habitat. Alternatives that overlie lower extents of watercourses are preferred in this indicator.	Area of watercourses overlain by the alternative.	Area	ha	6.9	9.7	0.3
Aquatic Life and Habitat	Loss of Waterbodies	Alternatives which overlie a greater extent of aquatic habitat have a greater environmental impact. For this assessment, it is assumed that all waterbodies are fish bearing. An area of watercourse measurement was used to measure overlain aquatic habitat in waterbodies. Alternatives that overlie lesser extents of waterbodies are preferred in this indicator.	Area of waterbody (pond, lake) overlain by the alternative.	Area	ha	21.0	32.1	0.8

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
	Sensitivity of Impacted Fish Habitat	The environmental impacts associated with tailings storage includes impacts to fish habitat. The impacts to fish habitat are a function of the sensitivity of the impacted fish to changes in environmental conditions, the dependence of the species on the habitat they reside in, and the rarity of the habitat and/or species. These items are measured by this indicator and are included in addition to length and area measurements of the impacted watercourses and waterbodies to incorporate the characteristics of the impacted fish habitat into the assessment. Alternatives classified as overlaying Low Sensitivity fish habitat are preferred in this indicator.	Qualitative evaluation of the sensitivity of fish habitat overlain by the alternative based on the following classification system, which is based on the MTO/Fisheries and Oceans Canada (DFO)/MNRF Environmental Guide for Fish and Fish Habitat: 1. Rare – Critical habitat for species at risk or otherwise uncommon habitats 2. Highly sensitive – critical habitat for fish species (e.g., spawning habitat) 3. Moderately-high – complex habitat that supports diverse multiple fish species communities 4. Moderate – simple homogeneous habitat (e.g., pond) that supports multiple fish communities at young of year/juvenile/adult stages 5. Moderately Low – simple homogenous habitat (e.g., pond) that supports a single non-salmonid fish community 6. Low Sensitivity – no fish habitat overlain or indirect fish habitat that does not directly support a fish population (e.g., ephemeral watercourse) Classification performed based on overlain areas of watercourses and waterbodies that were classified into (A) ponds, (B) shallow inland lakes, (C) entrenched mainstem watercourses, (D) non-entrenched mainstem watercourses, (E) headwater watercourses, and (F) large mainstem rivers.	Value	#	4.97	4.05	5.00
Surface Water Impacts	Loss of Headwaters due to TMF	TMF construction will reduce the surface water flows that previously reported to downstream receiving bodies. These reductions in flow will have impacts on downstream aquatic life. Alternatives which overlie smaller catchment areas are preferred in this alternative.	Catchment area overlain by the facility that would no longer report to downstream receiving bodies. This area includes the two-dimensional alternative footprint plus the area of water management infrastructure.	Area	ha	1,924.1	1,927.5	1,960.7
	Surface Water Impacts from Emergency Spillway Discharge	The conceptual TMF design includes an emergency spillway to mitigate overtopping of the TMF dam. The emergency spillway would only operate in the case of significant storm events that exceed the environmental design flood (EDF). Spillway discharges that report to larger waterbodies and/or watercourses with greater flows will have a greater assimilative capacity and result in lower environmental impacts. Alternatives with a larger catchment area reporting to the receiving body are preferred in this indicator.	Catchment area upstream of the receiving body at the point of intersection of the receiving body and the emergency spillway of each TMF alternative. For alternatives where the emergency spillway will likely be moved between the initial operations and later operations and closure, the measurement metric is the average of the receiving body catchment area during the initial operations and the receiving body catchment area during final operations and closure.	Area	ha	17,479	31,565	32,010
	Infrastructure Disturbance – Water Crossings	Alternatives which require additional water crossings for access roads and pipeline alignments result in additional environmental impacts through the disturbance of existing watercourses. These impacts are not captured in the other identified indicators. Alternatives that require the construction of fewer water crossings are preferred in this indicator.	Number of water crossings required for construction of the access road and pipeline alignments from the process plant and Open Pit to the alternative.	Quantity	#	0	0	2
Terrestrial Life and Habitat	Habitat Fragmentation	Alternatives with shorter distances of roads or pipelines through forested areas and wetlands are preferred in this indicator.	Length of new roads or pipelines through forested areas or wetlands required for the alternative. As the haul roads and pipelines often run along the same alignment, the total length of new disturbance required for haul roads or pipelines was used as a measurement metric.	Length	km	28.8	36.8	77.1
	Loss of Moose late winter cover Habitat Area	Alternatives which overlie larger moose later wintering areas have a greater environmental impact, reducing habitat for moose. Alternatives that overlie less moose later winter habitat areas are preferred in this indicator.	The area of mapped moose late winter cover within the footprint of the alternative.	Area	ha	0.0	91.7	225.5

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
	Loss of Blanding's Turtle Habitat Area	Alternatives which overlie larger Blanding's turtle critical habitat have a greater environmental impact, reducing habitat for Blandin's turtle. Alternatives that overlie less Blanding's turtle critical habitat areas are preferred in this indicator.	The area of mapped Blanding's turtle critical habitat within the footprint of the alternative.	Area	ha	1.0	0.0	38.6
	Loss of Boreal Caribou Habitat Area	Alternatives which overlie larger boreal caribou critical habitat have a greater environmental impact, reducing habitat for boreal caribou. Alternatives that overlie less boreal caribou critical habitat areas are preferred in this indicator.	The area of mapped boreal caribou critical habitat within the footprint of the alternative.	Area	ha	559.8	1,472.7	1,924.7
	Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate waterfowl nesting, candidate sharp-tailed grouse lek, and candidate marsh breeding bird. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of mapped bird significant wildlife habitat within the footprint of the alternative associated to candidate waterfowl nesting, candidate sharp-tailed grouse lek, and candidate marsh breeding bird.	Area	ha	755.3	1,088.3	452.1
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to bald eagle and osprey nesting. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of mapped bird significant wildlife habitat within the footprint of the alternative associated to bald eagle and osprey nesting.	Area	ha	70.9	0.0	0.0
	Loss of Woodland Raptor Nesting Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate woodland raptor nesting. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of mapped bird significant wildlife habitat within the footprint of the alternative associated to candidate woodland raptor nesting.	Area	ha	375.7	647.2	81.9
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate shrub/early successional breeding bird. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of mapped bird significant wildlife habitat within the footprint of the alternative associated to candidate shrub/early successional breeding bird.	Area	ha	94.1	46.3	0.0
	Loss of Upland Gamebirds Habitat Area	Alternatives which overlie larger upland gamebirds habitat have a greater environmental impact, reducing habitat for upland gamebirds species. Alternatives that overlie fewer upland gamebirds habitat areas are preferred in this indicator.	The area of mapped upland gamebirds habitat within the footprint of the alternative.	Area	ha	476.6	803.2	569.8
	Loss of SoCC (Common Nighthawk and Evening Grosbeak)	Alternatives which overlie larger habitat for bird SOCC including common nighthawk, evening grosbeak, and yellow rail have a greater environmental impact, reducing habitat for such bird species. Alternatives that overlie less habitat for bird SOCC areas are preferred in this indicator.	The area of mapped bird SOCC including common nighthawk, evening grosbeak, and yellow rail within the footprint of the alternative.	Area	ha	426.0	719.1	113.1

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
	Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	Alternatives which overlie larger habitat for bird SAR including short-eared owl and lesser yellowlegs have a greater environmental impact, reducing habitat for such bird species. Alternatives that overlie less habitat for bird SAR areas are preferred in this indicator.	The area of mapped bird SAR including short-eared owl and lesser yellowlegs within the footprint of the alternative.	Area	ha	153.6	392.9	477.8
	Loss of Wetlands	Alternatives which overlie larger areas of wetlands have a higher environmental impact as they reduce habitat for wildlife and reduce the positive impacts on water quality associated with wetlands. Alternatives that overlie less wetland area are preferred in this indicator.	The area of wetlands within the footprint of the alternative.	Area	ha	1,481.4	1,211.7	1,811.6
	Loss of Forested Area	Alternatives which overlie larger areas of forest have a higher environmental impact, reducing habitat for wildlife. Alternatives that overlie less forested area are preferred in this indicator.	The area of forest within the footprint of an alternative.	Area	ha	375.7	647.2	113.1
	Infrastructure Disturbance - Haul Roads	Alternatives which require the construction of larger lengths of new haul roads result in additional environmental impacts through the disturbance of additional land surface. These impacts are not captured in the other identified indicators. Alternatives that require the construction of shorter lengths of new haul roads are preferred in this indicator.	The length of new haul roads.	Length	km	17.8	21.0	24.2
Geotechnical Foundation Conditions	Surficial Geology	Alternatives constructed in areas with lower strength foundations and more hydraulically conductive foundation materials pose a higher stability risk and require additional mitigation to meet design criteria. Alternatives constructed in areas with underlying bedrock are preferred in this indicator.	The alternatives overlie different surficial geologies: Bedrock, Till and Organic Deposits. The stability ranking of different surficial geologies was developed and applied to each material type: 1. Organic Deposits (lowest stability, higher conductivity) (weight 1) 2. Till (low conductivity) (weight 2) 3. Bedrock (highest stability) (weight 6) A weighted average classification value was estimated for each alternative based on overlain materials	Value	#	2.00	2.04	1.76
Air Quality	Potential for Dust Generation – Haul Traffic	Waste rock hauling for embankment construction is considered to be one of the primary sources of dust generation resulting from tailings storage. Larger quantity of waste rock hauled over greater distances will result in more dust generation which will have greater impacts on terrestrial and aquatic life. Alternatives with a shorter haul distance are preferred in this indicator.	Average haul distance to the alternative. Average haul distance is measured as the distance from the center of the Open Pit to the center of the facility along the anticipated haul route.	Length	km	5.0	7.0	10.5
	Potential for Dust Generation – Exposed Tailings	Exposed tailings are considered to be one of the primary sources of dust generation resulting from tailings storage. No differentiation in dusting potential was made based on the tailings deposition method as dust generation capacity will vary based on tailings characteristics and operational management. Alternatives with a smaller exposed tailings surface are preferred in this indicator.	Two-dimensional footprint area of the alternative as a proxy for three-dimensional area of exposed tailings under normal operating conditions.	Area	ha	1,891.1	1,891.5	1,924.7

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Seepage and Leakage Risk	Hydrogeology and seepage characteristics	Alternatives constructed in areas with higher seepage to groundwater pose a higher contamination risk and require additional mitigation to meet design criteria. Alternatives that overlie areas with underlying till deposits are preferred in this indicator.	The alternatives overlie different surficial geologies: Bedrock, Till and Organic Deposits. The seepage characteristics of different surficial geologies was developed and applied to each material type: 1. Bedrock (highest seepage to groundwater) (weight 1) 2. Organic deposit (high seepage to groundwater) (weight 2) 3. Till (lowest seepage to groundwater) (weight 6) A weighted average classification value was estimated for each alternative based on surficial materials overlain by each alternative.	Value	#	5.98	5.95	5.06
	Seepage to receiver	Alternatives constructed in areas with a higher drawdown to Open Pit dewatering result in less water available for potential seepage to surface water. Alternatives with less seepage to receiver are preferred in this indicator.	The alternatives overlie different drawdown zones of influence (ZOI) due to Open Pit dewatering, including 10 m and 1 m ZOI. The seepage characteristics to receiver were determined based on weights associated to the following areas overlain by each alternative: 1. Outside the 1 m drawdown ZOI (weight 1) 2. Within the 1 m drawdown ZOI (weight 3) 3. Within the 10 m drawdown ZOI (weight 6) A weighted average classification value was estimated for each alternative based on overlain areas.	Value	#	1.78	4.22	1.00
	Tailings Pipeline Malfunction	There is a risk of leakage associated with pipeline conveyance of tailings which is considered to be largely a function of the pipeline length. Tailings leakage represents an environmental impact. The associated environmental impact is considered to be similar for both thickened and conventional tailings. Alternatives with shorter lengths of tailings delivery pipelines are preferred in this indicator.	Length of tailings pipeline overlying the ground surface required for the alternative. This excludes the length of pipeline within the TMF as it is assumed that any leakage within the TMF would be mitigated via the TMF liner and/or seepage collection system.	Length	km	4.3	6.8	8.9
	Water Reclaim Pipeline Malfunction	There is a risk of leakage associated with pipeline conveyance of reclaim water which is considered to be largely a function of the pipeline length. Reclaim water leakage represents an environmental impact. Alternatives with shorter lengths of water reclaim pipelines are preferred in this indicator.	Length of water reclaim pipeline overlying the ground surface required for the alternative. This excludes the length of pipeline within the TMF as it is assumed that any leakage within the TMF would be mitigated via the TMF liner and/or seepage collection system.	Length	km	12.4	18.2	54.0
Climate Change	Greenhouse Gas Emissions	Alternatives with a greater haul distance require the use of larger quantities of fuel and have greater carbon emissions which contribute to climate change. Climate change may increase climate variability. Alternatives with a shorter haul distance are preferred in this indicator.	Average haul distance to the alternative. Average haul distance is measured as the distance from the center of the Open Pit to the center of the facility along the anticipated haul route.	Length	km	5.0	7.0	10.5
TMF Failure Likelihood	Length of Dam Containment	Generally, natural ground is more resistant to instability and failure than human-made dams. All other things being equal, facilities which fully rely on perimeter dams to provide containment are considered to have a greater risk of failure than facilities which utilize the natural ground surface to provide containment or facilities with shorter perimeter lengths and thus less dam length. Facilities with shorter perimeter lengths comprised of dams are preferred in this indicator.	Length of facility perimeter (along the dam toe) comprised of dams (rather than natural ground). This length is represented by the length of the perimeter ditches.	Length	km	14.6	16.8	16.7

Notes:

- Additional information presented in the TMF characterization criteria tables in Appendix C.
- Conceptual designs of the TMFs are presented in Figures 4.4 through 4.6.
- Baseline information is presented in the figures included in Appendix A.

Table 4.8 Environmental Account – Quantitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Water Management	Internal Water Management - Precipitation	6: Less than or equal to 1,800 5: Between 1,800 and ≤1,860 4: Between 1,860 and ≤1,920 3: Between 1,920 and ≤1,980 2: Between 1,980 and 2,040 1: Greater than or equal to 2,040	Area, ha
	External Water Management – Perimeter Ditch	6: Less than or equal to 1,000 5: Between 1,000 and ≤1,200 4: Between 1,200 and ≤1,400 3: Between 1,400 and ≤1,600 2: Between 1,600 and 1,800 1: Greater than or equal to 1,800	Area, ha
	External Water Management – Non-contact Water	6: Less than or equal to 0 5: Between 0 and ≤300 4: Between 300 and ≤600 3: Between 600 and ≤900 2: Between 900 and ≤1,200 1: Greater than or equal to 1,200	Area, ha
Aquatic Life and Habitat	Loss of Watercourses	6: Less than or equal to 0 5: Between 0 and ≤3 4: Between 3 and ≤6 3: Between 6 and ≤9 2: Between 9 and 12 1: Greater than or equal to 12	Area, ha
	Loss of Waterbodies	6: Less than or equal to 0 5: Between 0 and ≤10 4: Between 10 and ≤20 3: Between 20 and ≤30 2: Between 30 and 40 1: Greater than or equal to 40	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	Sensitivity of Impacted Fish Habitat	6: Greater than or equal to 6 5: Between 6 and ≥5 4: Between 5 and ≥4 3: Between 4 and ≥3 2: Between 3 and ≥2 1: Less than to 2	Value, #
Surface Water Impacts	Loss of Headwaters due to TMF	6: Less than or equal to 1,900 5: Between 1,900 and ≤1,940 4: Between 1,940 and ≤1,980 3: Between 1,980 and ≤2,020 2: Between 2,020 and ≤2,060 1: Greater than or equal to 2,060	Area, ha
	Surface Water Impact Areas from Emergency Spillway Discharge	6: Greater than or equal to 40,000 5: Between 40,000 and ≥35,000 4: Between 35,000 and ≥30,000 3: Between 30,000 and ≥25,000 2: Between 25,000 and 20,000 1: Less than or equal to 20,000	Area, ha
	Infrastructure Disturbance – Water Crossings	6: Less than or equal to 0.0 5: Between 0.0 and ≤1.0 4: Between 1.0 and ≤2.0 3: Between 2.0 and ≤3.0 2: Between 3.0 and ≤4.0 1: Greater than 4.0	Quantity, #
Terrestrial Life and Habitat	Habitat Fragmentation	6: Less than or equal to 20 5: Between 20 and ≤32 4: Between 32 and ≤44 3: Between 44 and ≤56 2: Between 56 and 68 1: Greater than or equal to 68	Length, km
	Loss of Moose Late Winter Cover Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤50 4: Between 50 and ≤100 3: Between 100 and ≤150 2: Between 150 and 200 1: Greater than or equal to 200	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	Loss of Blanding's Turtle Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤10 4: Between 10 and ≤20 3: Between 20 and ≤30 2: Between 30 and 40 1: Greater than or equal to 40	Area, ha
	Loss of Boreal Caribou Habitat Area	6: Less than or equal to 500 5: Between 500 and ≤800 4: Between 800 and ≤1,100 3: Between 1,100 and ≤1,400 2: Between 1,400 and 1,700 1: Greater than or equal to 1,700	Area, ha
	Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	6: Less than or equal to 400 5: Between 400 and ≤540 4: Between 540 and ≤680 3: Between 680 and ≤820 2: Between 820 and 960 1: Greater than or equal to 960	Area, ha
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤20 4: Between 20 and ≤40 3: Between 40 and ≤60 2: Between 60 and 80 1: Greater than or equal to 80	Area, ha
	Loss of Woodland Raptor Nesting Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤200 4: Between 200 and ≤400 3: Between 400 and ≤600 2: Between 600 and 800 1: Greater than or equal to 800	Area, ha
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤20 4: Between 20 and ≤40 3: Between 40 and ≤60 2: Between 60 and 80 1: Greater than or equal to 80	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	Loss of Upland Gamebirds Habitat Area	6: Less than or equal to 1,800 5: Between 1,800 and ≤1,840 4: Between 1,840 and ≤1,880 3: Between 1,880 and ≤1,920 2: Between 1,920 and 1,960 1: Greater than or equal to 1,960	Area, ha
	Loss of SoCC (Common Nighthawk and Evening Grosbeak) Habitat Area	6: Less than or equal to 100 5: Between 100 and ≤240 4: Between 240 and ≤380 3: Between 380 and ≤520 2: Between 520 and 660 1: Greater than or equal to 660	Area, ha
	Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	6: Less than or equal to 150 5: Between 150 and ≤220 4: Between 220 and ≤290 3: Between 290 and ≤360 2: Between 360 and 430 1: Greater than or equal to 430	Area, ha
	Loss of Wetlands	6: Less than or equal to 1,000 5: Between 1,000 and ≤1,200 4: Between 1,200 and ≤1,400 3: Between 1,400 and ≤1,600 2: Between 1,600 and 1,800 1: Greater than or equal to 1,800	Area, ha
	Loss of Forested Area	6: Less than or equal to 100 5: Between 100 and ≤220 4: Between 220 and ≤340 3: Between 340 and ≤460 2: Between 460 and 580 1: Greater than or equal to 580	Area, ha
	Infrastructure Disturbance - Haul Roads	6: Less than or equal to 15 5: Between 15 and ≤17 4: Between 17 and ≤19 3: Between 19 and ≤21 2: Between 21 and 23 1: Greater than or equal to 23	Length, km

Sub-Account	Indicator	Rating	Measurement, Unit
Geotechnical Foundation Conditions	Surficial Geology	6: Less than or equal to 6 5: Between 6 and ≥5 4: Between 5 and ≥4 3: Between 4 and ≥3 2: Between 3 and ≥2 1: Greater than 2	Value, #
Air Quality	Potential for Dust Generation – Haul Traffic	6: Less than or equal to 5.0 5: Between 5.0 and ≤6.2 4: Between 6.2 and ≤7.4 3: Between 7.4 and ≤8.6 2: Between 8.6 and 9.8 1: Greater than or equal to 9.8	Length, km
	Potential for Dust Generation – Exposed Tailings	6: Less than or equal to 1,800 5: Between 1,800 and ≤1,860 4: Between 1,860 and ≤1,920 3: Between 1,920 and ≤1,980 2: Between 1,980 and 2,040 1: Greater than or equal to 2040	Area, ha
Seepage and Leakage Risk	Hydrogeology and seepage characteristics	6: Less than or equal to 6 5: Between 6 and ≥5 4: Between 5 and ≥4 3: Between 4 and ≥3 2: Between 3 and 2 1: Greater than or equal to 2	Value, #
	Seepage to receiver	6: Less than or equal to 6 5: Between 6 and ≥5 4: Between 5 and ≥4 3: Between 4 and ≥3 2: Between 3 and 2 1: Greater than or equal to 2	Value, #
	Tailings Pipeline Malfunction	6: Less than or equal to 4 5: Between 4 and ≤5 4: Between 5 and ≤6 3: Between 6 and ≤8 2: Between 8 and 9 1: Greater than or equal to 9	Length, km

Sub-Account	Indicator	Rating	Measurement, Unit
	Water Reclaim Pipeline Malfunction	6: Less than or equal to 10 5: Between 10 and ≤20 4: Between 20 and ≤30 3: Between 30 and ≤40 2: Between 40 and 50 1: Greater than or equal to 50	Length, km
Climate Change	Greenhouse Gas Emissions	6: Less than or equal to 5.0 5: Between 5.0 and ≤7.0 4: Between 7.0 and ≤9.0 3: Between 9.0 and ≤11.0 2: Between 11.0 and 13.0 1: Greater than or equal to 13.0	Length, km
TMF Failure Likelihood	Length of Dam Containment	6: Less than or equal to 13.0 5: Between 13.0 and ≤14.4 4: Between 14.4 and ≤15.8 3: Between 15.8 and ≤17.2 2: Between 17.2 and 18.6 1: Greater than or equal to 18.6	Length, km

Table 4.9 Technical Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Design and Operational Complexity	Stability Design - Foundation	Lower strength foundation materials may require more complex designs and construction activities due to greater levels of foundation preparation. Organic, glaciolacustrine and glaciofluvial materials are considered to be of relatively lower strength than glacial till or bedrock due to their deposition environment. Alternatives with dams that overlie less organic, glaciolacustrine, or glaciofluvial materials and more bedrock are preferred in this indicator.	Qualitative evaluation of the strength of the foundation materials overlain by the alternative based on the surface area of exposed bedrock, till, and organic deposits. The following weighting was considered with organic deposits as the least preferred material and bedrock as the most preferred material: - Exposed bedrock (Weight 6) - Till (Weight 2) - Organic deposits (Weight 1)	Value	#	2.00	2.04	1.76
	Length of Required Non-Contact Water Diversion	This indicator measures the increased design and operational complexity associated with alternatives that require non-contact water diversion as a function of the length of non-contact water diversion. Alternatives that require no diversions or shorter diversions are preferred in this indicator.	Length of non-contact water diversion required.	Length	km	9.9	6.2	0.0
	Length of Dam Containment	Alternatives with longer perimeter dams will require additional surveillance (such as visual inspections and instrumentation) which represents increased operational complexity. Facilities with shorter perimeter lengths comprised of dams are preferred in this indicator.	Length of facility perimeter (along the dam toe) comprised of dams (rather than natural ground). This length is represented by the length of perimeter ditches.	Length	km	14.6	16.8	16.7
	River / Highway Bridge Crossings	Large watercourse or highway bridge crossings for haul roads and pipeline infrastructure add additional design and operational complexity to the option. Facilities with smaller number of watercourse or highway bridge crossings are preferred in this indicator.	Number of water crossings required for construction of the access road and pipeline alignments from the process plant and Open Pit to the alternative.	Value	#	0	0	2
	Operational Oversight	Alternatives located a greater distance from the Open Pit and the majority of the Project components present increased operational complexity due to the increased travel time and access complications associated with their construction and operation. For example, facilities located a greater distance will require more wintertime snow removal and have an increased risk of temporary loss of access. Alternatives located in closer proximity to the Open Pit are preferred in this indicator.	Average distance to the alternative. Average distance is measured as the distance from the center of the Open Pit to the center of the facility along the anticipated haul route.	Distance	km	5.0	7.0	10.5

Notes:

- Additional information presented in the TMF characterization criteria tables in Appendix C.
- Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-4 through Figure 4-6.
- Baseline information is presented in the figures included in Appendix A.

Table 4.10 Technical Account – Quantitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Design and Operational Complexity	Stability Design - Foundation	6: Greater than or equal to 6 5: Between 6 and ≥5 4: Between 5 and ≥4 3: Between 4 and ≥3 2: Between 3 and 2 1: Less than or equal to 2	#
	Length of Required Non-Contact Water Diversion	6: Less than or equal to 0 5: Between 0 and <2 4: Between 2 and <4 3: Between 4 and <6 2: Between 6 and 8 1: Greater than or equal to 8	Length, km
	Length of Dam Containment	6: Less than or equal to 13.0 5: Between 13.0 and <14.4 4: Between 14.4 and <15.8 3: Between 15.8 and <17.2 2: Between 17.2 and 18.6 1: Greater than or equal to 18.6	Length, km
	River/Highway Bridge Crossings	6: Less than or equal to 0.0 5: Between 0.0 and ≤1.0 4: Between 1.0 and ≤2.0 3: Between 2.0 and ≤3.0 2: Between 3.0 and ≤4.0 1: Greater than 4.0	Value, #
	Operational Oversight	6: Less than or equal to 5 5: Between 5 and <7 4: Between 7 and <9 3: Between 9 and <11 2: Between 11 and <13 1: Greater than or equal to 13	Length, km

Table 4.11 Project Economics Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Capital Cost	CAPEX - Dam Construction, Roads, Pipeline and Pumps, Water Management and Fish Habitat Compensation	Capital costs have a significant impact on the ability to successfully commission a mine. Alternatives which result in lower capital expenditures are preferred in this indicator.	Estimated costs associated with site preparation (clearing, grubbing, and stripping), foundation treatment (installation of wick drain panels within the dam downstream shell footprint), drainage blanket, dam construction (including all zones), seepage collection ditches, and gravel for perimeter access road base. The assumptions made in the capital cost estimate include the following: 1. Dam construction – all embankment alternatives are assumed to be composed of a clay core, filter, transition, 2 m thick frost protection, and erosion protection. The ultimate width of the transition, filter, and clay core is set at 5.0 m. Upstream and downstream shells are made of waste rock. For comparative purposes, the estimate includes the full construction of the TMF dam and related activities. Staged construction was not considered at this conceptual phase. 2. The minimum expected thickness for the drainage blanket is 1.0 m. The drainage blankets are required to facilitate wick drain installation. 3. Site preparation, including clearing, grubbing, stripping and tree clearing activities. 4. Roads – Only TMF perimeter access roads have been considered, which are assumed to be 15.0 m wide (Ausenco 2023)*. The cost is related only to the road base (gravel). 5. Pipeline and Pumps – An HDPE pipeline and a booster pump will be used in the three alternatives to pump tailings from the process plant to the TMF. Unit costs calculated from estimates provided in the feasibility study (Ausenco 2023)* were used to determine total pumping and pipelines capital costs related to each alternative. 6. Water Management – Unit costs calculated from estimates provided in the feasibility study (Ausenco 2023)* were used to determine total water management capital costs related to each alternative. Water treatment is not included as it is assumed to be a non-differentiating indicator. 7. Fish habitat compensation – A unit cost of $1,000,000 per ha is assumed. For loss of fish-bearing waterbodies, the area to be compensated is assumed to be equal to the area of waterbodies overlain by the TMF alternative. For loss of fish-bearing streams, the area to be compensated is calculated by multiplying the total length of the stream by the width of streams overlain by the TMF alternative. A width of 1 m is assumed for 1st order streams and 2 m is assumed for second order streams.	Cost	M$	911.7	1,374.8	1,440.1
	CAPEX - Water Crossings		Number of water crossings required for construction of the access road and pipeline alignments from the process plant and Open Pit to the alternative.	Value	#	0.0	0.0	2.0
Operational Cost	OPEX - Land Use	Alternatives partially lie within areas owned by Canada Nickel and within the Canada Nickel claim boundary. As such, land use costs are considered between alternatives. Alternatives with higher portions of Canada Nickel claims and rights are preferred in this indicator.	Sum of unpatented Crown land and land with claims and rights not owned by Canada Nickel.	Value	%	62.4	37.2	88.3
	OPEX - Pumping	Operating costs impact life of mine economics. Estimated annual operating costs associated with tailings pumping. Alternatives which result in lower operating pumping costs are preferred in this indicator.	Estimated annual operating costs associated with TMF pumping.	Cost	M$	2.3	3.1	3.8

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Closure Cost	Cover Construction Cost	Closure costs are an important economic consideration. The anticipated TMF closure concept includes the placement of cover/amendment of the tailings surface and revegetation. Closure costs associated with the alternatives are anticipated to be similar with the exception of variations in area requiring the placement of closure cover. Alternatives which result in lower closure costs are preferred in this indicator.	Estimated cost to place a 0.15-meter thick cap over the tailings surface of the alternative, including revegetation. Cover construction unit cost obtained from the feasibility study report (Ausenco 2023)[4].	Cost	M$	27.9	27.9	28.4

Notes:

- Additional information presented in the TMF characterization criteria tables in Appendix C.

- Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-4 through Figure 4-6.

- Baseline information is presented in the figures included in Appendix A.

* Crawford Nickel Sulphide Project Nl 43-101 Technical Report and Feasibility Study (Ausenco 2023)

Table 4.12 Project Economics Account – Quantitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Capital Cost	CAPEX - Dam Construction, Roads, Pipeline and Pumps, Water Management and Fish Habitat Compensation	6: Less than or equal to 500 5: Between 500 and ≤800 4: Between 800 and ≤1100 3: Between 1100 and ≤1400 2: Between 1400 and 1700 1: Greater than or equal to 1700	Cost, M$
	CAPEX - Water Crossings	6: Less than or equal to 0.0 5: Between 0.0 and ≤1.0 4: Between 1.0 and ≤2.0 3: Between 2.0 and ≤3.0 2: Between 3.0 and ≤4.0 1: Greater than or equal to 3.2	Value, #
Operational Cost	OPEX - Land Use	6: Less than or equal to 30 5: Between 30 and ≤44 4: Between 44 and ≤58 3: Between 58 and ≤72 2: Between 72 and 86 1: Greater than or equal to 86	Percentage, %
	OPEX - Pumping	Less than or equal to 2.0 5: Between 2.0 and ≤2.6 4: Between 2.6 and ≤3.2 3: Between 3.2 and ≤3.8 2: Between 3.8 and <4.4 1: Greater than or equal to 4.4	Cost, M$
Closure Cost	Cover Construction Cost	6: Less than or equal to 27.0 5: Between 27.0 and ≤27.6 4: Between 27.6 and ≤28.2 3: Between 28.2 and ≤28.8 2: Between 28.8 and 29.4 1: Greater than or equal to 29.4	Cost, M$

Table 4.13 Socio-Economic Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Land and Resource Use - Animal Harvesting	Loss of Hunting	Alternatives which impact larger amounts of hunting area have a larger socio-economic impact by reducing the amount of habitat available for wildlife foraging and breeding and the amount of land available for hunting activities. For LRU, it is assumed that both forest and wetland areas may be used for hunting and that both are equally valuable for hunting activities. Alternatives which overlie less forest or wetland areas are preferred in this indicator.	Area of forests or wetlands overlain by the alternative. As the forested areas and wetlands do not overlap in the mapping used for this assessment, the total area of forests or wetlands was used as a measurement metric.	Area	ha	1,857.1	1,858.8	1,924.7
	Loss of Fishing – Watercourses	Alternatives which overlie greater lengths of watercourses may have a greater impact on fisheries and thus have larger socio-economic impacts. For LRU, considering the limited available baseline information used in this assessment, for this indicator, all mapped watercourses are assumed to be fish bearing and considered to be of equivalent fishing value. Alternatives which overlie shorter lengths of watercourses are preferred in this indicator.	The length of watercourses overlain by the alternative.	Length	km	34.4	35.4	4.7
	Loss of Fishing – Waterbodies	Alternatives which overlie greater lengths of watercourses may have a greater impact on fisheries and thus have larger socio-economic impacts. Considering the limited available baseline information used in this assessment, for this indicator, all mapped waterbodies are assumed to be fish bearing and considered to be of equivalent fishing potential. Alternatives which overlie smaller areas of waterbodies are preferred in this indicator.	The area of waterbodies (lake, pond) overlain by the alternative.	Area	ha	21.0	32.1	0.8
	Loss of Bear Management Areas	Alternatives which overlie a larger extent of bear management areas reduce the land available for bear habitat and the available land for bear hunting. It is understood that bear hunting activities are economically beneficial in the area and reductions in bear hunting would have a socio-economic impact by reducing the ability of locals to obtain economic benefit from the land. Alternatives which overlie smaller areas of bear management areas are preferred in this indicator.	Area of bear management areas overlain by the alternative.	Area	ha	95.8	359.4	0.0
	Loss of Bear Management Areas - Number	Alternatives which overlie multiple bear management areas impact a larger number of licensed tourist outfitters/resident licence holders and have a larger socio-economic impact by reducing the number of users who are able to obtain benefits from bear hunting. This indicator was included in addition to the “Loss of Bear Management Areas - Area” indicator to allow the impacts on multiple tenure holders to be incorporated into the assessment along with the extent of the bear management areas that are overlain. Alternatives which overlie fewer bear management areas are preferred in this indicator.	Number of bear management areas overlain by the alternative.	Value	#	2	1	0
	Loss of Trapline Areas	Alternatives which overlie a larger extent of trapline areas reduce the land available for animal habitat and trapping. It is understood that trapping is economically beneficial in the area and the reductions in animal yield from trapping would have socio-economic impacts. Alternatives which overlie smaller areas of trapline areas are preferred in this indicator.	Area of trapline areas overlain by the alternative.	Area	ha	1,891.1	1,891.5	1,924.7

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Land and Resource Use - Animal Harvesting	Loss of Trapline Areas - Number	Alternatives which overlie multiple trapline areas impact a larger number of registered trappers and have a larger socio-economic impact by reducing the number of users who are able to obtain benefits from trapping. This indicator was included in addition to the “Loss of Trapline Areas - Area” indicator to allow the impacts on multiple tenure holders to be incorporated into the assessment along with the extent of the trapline areas that are overlain. Alternatives which overlie fewer trapline areas are preferred in this indicator.	Number of trapline areas overlain by the alternative.	Value	#	2	2	1
Land Access	Loss of Access Roads	The identified alternatives overlie and would prevent direct access to roads used by local users. Loss of access to these roads represents a socio-economic impact. Alternatives which overlie and impact access to shorter lengths of routinely maintained access roads are preferred in this indicator.	The length of routinely maintained access roads overlain by the alternative due to the construction of the alternatives.	Length	km	7.4	5.5	17.5
Land and Mineral Use Rights	Unpatented Crown Land	Facilities overlying areas where unpatented crown land or mineral use claims/rights exist present a higher risk of socio-economic impacts and may impact the ability to successfully permit and operate a mine. Alternatives which overlie lesser areas of unpatented Crown land and lands with claims and rights not owned by Canada Nickel are preferred in this indicator.	Percentage of unpatented Crown land overlain by the alternative.	Value	%	0.0	0.0	6.7
	Land with Claims/Rights Owned by Others		Percentage of land with mining claims and mineral use rights owned by others, which are overlain by the alternatives.	Value	%	62.4	37.2	81.6
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	Alternatives which overlie larger areas of unoccupied Crown lands impact the area available for current and future Indigenous users to practice traditional land use activities. Alternatives which overlie lesser areas of unoccupied Crown lands are preferred in this indicator.	Area of the alternative overlying unoccupied Crown land.	Area	ha	62.9	83.7	215.2
	Loss of Cultural Continuity Areas	Cultural Continuity is comprised of numerous interrelated values that are important for cultural persistence and way of life, including knowledge transmission, spirituality, sense of place, and identity. Alternatives, which overlie lesser areas where cultural continuity practices occur, are preferred in this indicator.	Alternatives which overlie (or impact access to) smaller cultural community areas of are preferred in this indicator. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	2,815.6	2,797.1	7,607.6
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Loss of Hunting and Trapping Areas	Indigenous users have documented a variety of hunting and trapping areas that are overlain by the alternatives. This Indigenous knowledge has been included in the assessment through this indicator. The loss of these areas represents a loss of potential hunting and trapping opportunities. Alternatives which overlie (or impact access to) smaller areas of identified hunting areas are preferred in this indicator.	Hunting Areas overlain by the alternative, which were identified through engagement with Indigenous nations. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	2,634.2	2,704.8	7,218.2
	Loss of Hunting Subsistence Areas	The identified alternatives overlie subsistence areas documented by Indigenous users. Subsistence areas are understood to represent areas with activities through which culture is lived and transmitted, thereby enabling cultural continuity for current and future generations. Loss of subsistence areas represent a socio-economic impact. Alternatives which overlie smaller extents of mapped subsistence areas for hunting and trapping are preferred in this indicator.	Hunting Subsistence Gathering Areas overlain by the alternative, which were identified through engagement with Indigenous nations. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	181.2	135.5	429.0

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	TMF-1	TMF-2	TMF-6
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	Indigenous users have documented plant harvesting areas. Alternatives which overlie a larger extent of mapped plant harvesting areas represent a greater socio-economic impact to traditional users. Alternatives which overlie smaller areas used for plant harvesting are preferred in this indicator.	Harvesting Areas related to plants overlain by the alternative, which were identified through engagement with Indigenous communities. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	1,528.3	1,253.8	3,786.4
	Loss of Plant Harvesting Subsistence Areas	The identified alternatives overlie subsistence areas documented by Indigenous users. Subsistence areas are understood to represent areas with activities through which culture is lived and transmitted, thereby enabling cultural continuity for current and future generations. Loss of subsistence areas represent a socio-economic impact. Alternatives which overlie smaller extents of mapped subsistence areas for plants are preferred in this indicator.	Plants Subsistence Gathering Areas overlain by the alternative, which were identified through engagement with Indigenous communities. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	674.9	725.5	1,885.0
Aesthetics	Highway 655	Due to their varying locations, the TMF alternatives have varied aesthetic impacts on the realigned Highway 655. As such, aesthetic impacts represent a socio-economic impact. Alternatives which have lower aesthetic impacts are preferred in these indicators.	Distance from the alternative to realigned Highway 655.	Length	km	2.1	0.8	8.2

Notes:

- Additional information presented in the TMF characterization criteria tables in Appendix C.
- Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-4 through Figure 4-6.
- Baseline information is presented in the figures included in Appendix A.

Table 4.14 Socio-Economic Account – Quantitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Land and Resource Use - Animal Harvesting	Loss of Hunting	6: Less than or equal to 1,850 5: Between 1,850 and ≤1,866 4: Between 1866 and ≤1,882 3: Between 1,882 and ≤1,898 2: Between 1,898 and 1,914 1: Greater than or equal to 1,914	Area, ha
	Loss of Fishing – Watercourses	6: Less than or equal to 4 5: Between 4 and <11 4: Between 11 and <18 3: Between 18 and <26 2: Between 26 and 33 1: Greater than or equal to 33	Length, km
	Loss of Fishing – Waterbodies	6: Less than or equal to 0 5: Between 0 and <7 4: Between 7 and <14 3: Between 14 and <21 2: Between 21 and 28 1: Greater than or equal to 28	Area, ha
	Loss of Bear Management Areas	6: Less than or equal to 90 5: Between 90 and <152 4: Between 152 and <214 3: Between 214 and <276 2: Between 276 and 338 1: Greater than or equal to 338	Area, ha
	Loss of Bear Management Areas - Number	6: Less than or equal to 1 5: Between 1 and <2 4: Between 2 and <3 3: Between 3 and <4 2: Between 4 and 5 1: Greater than or equal to 5	Value, #

Sub-Account	Indicator	Rating	Measurement, Unit
Land and Resource Use - Animal Harvesting	Loss of Trapline Areas	6: Less than or equal to 1,700 5: Between 1,700 and <1,800 4: Between 1,800 and <1,900 3: Between 1,900 and <2,000 2: Between 2,000 and 2,100 1: Greater than or equal to 2100	Area, ha
	Loss of Trapline Areas - Number	6: Less than or equal to 0 5: Between 0 and <1 4: Between 1 and <2 3: Between 2 and <3 2: Between 3 and 4 1: Greater than or equal to 4	Value, #
Land Access	Loss of Access Roads	6: Less than or equal to 5 5: Between 5 and <8 4: Between 8 and <10 3: Between 10 and <13 2: Between 13 and 15 1: Greater than or equal to 15	Length, km
Land and Mineral Use Rights	Unpatented Crown Land	6: Less than or equal to 0 5: Between 0 and <2 4: Between 2 and <4 3: Between 4 and <6 2: Between 6 and 8 1: Greater than or equal to 8	Percentage, %
	Land with Claims/Rights Owned by Others	6: Less than or equal to 37 5: Between 37 and <46 4: Between 46 and <55 3: Between 55 and <64 2: Between 64 and 73 1: Greater than or equal to 73	Percentage, %

Sub-Account	Indicator	Rating	Measurement, Unit
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	6: Less than or equal to 60 5: Between 60 and <92 4: Between 92 and <124 3: Between 124 and <156 2: Between 156 and 188 1: Greater than or equal to 188	Area, ha
Traditional Knowledge and Land Use	Loss of Cultural Continuity Areas	6: Less than or equal to 2,700 5: Between 2,700 and <3,700 4: Between 3,700 and <4,700 3: Between 4,700and <5,700 2: Between 5,700 and 6,700 1: Greater than or equal to 6,700	Area, ha
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Loss of Hunting and Trapping Areas	6: Less than or equal to 2,600 5: Between 2,600 and <3,540 4: Between 3,540 and <4,480 3: Between 4,480 and <5,420 2: Between 5,420 and 6,360 1: Greater than or equal to 6,360	Area, ha
	Loss of Hunting Subsistence Areas	6: Less than or equal to 130 5: Between 130 and <190 4: Between 190 and <250 3: Between 250 and <310 2: Between 310 and 370 1: Greater than or equal to 370	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	6: Less than or equal to 1,200 5: Between 1,200 and <1,720 4: Between 1,720 and <2,240 3: Between 2,240 and <2,760 2: Between 2,760 and 3,280 1: Greater than or equal to 3,280	Area, ha
	Loss of Plant Harvesting Subsistence Areas	6: Less than or equal to 600 5: Between 600 and <860 4: Between 860 and <1,120 3: Between 1,120 and <1,380 2: Between 1,380 and 1,640 1: Greater than or equal to 1,640	Area, ha
Aesthetics	Realigned Highway 655	6: Less than or equal to 10 5: Between 10 and ≥8 4: Between 8 and ≥6 3: Between 6 and ≥4 2: Between 4 and 3 1: Greater than or equal to 3	Length, km

4.5 Step 5: Value-Based Decision Process

After developing the multiple accounts ledger, the alternatives identification and characterization stages of the alternatives assessment are complete and the assessment process shifts to the “value-based decision process” where value judgments are applied through weightings and the remaining alternatives are compared to identify a preferred alternative. The value-based decision process performed in Step 5 consists of scoring and weighting the indicators and applying weightings to the sub-accounts and accounts. Once all scoring and weighting is completed, the quantitative analysis is completed and the preferred alternative is identified.

4.5.1 Scoring and Weighting

Scoring is performed by applying the value scales presented in Section 4.4 to the indicator quantities for each indicator. Weightings are then applied and the quantitative analysis is performed by multiplying weightings by scores to obtain merit scores and dividing the merit scores by the sum of the weightings to obtain normalized merit ratings. This process is in accordance with the requirements of the Guidelines.

Weightings allow for the incorporation of value judgments into the assessment. By assigning weightings, the relative value of indicators, sub-accounts, and accounts is considered. Weighting values were selected based on input from Stantec’s technical analysts. Table 4.15 to Table 4.18 present a summary of the weightings applied to each indicator, sub-account and account along with a rationale for each weighting.

When reviewing weightings, note that the weighting magnitude is only important relative to the other indicators within a specific sub-account, to the other sub-accounts within a specific account, or other accounts. This is due to the normalization performed on each sub-account, account, and alternative as part of the quantitative analysis process, as discussed in Section 2. This process can be seen in the quantitative analysis tables (see Section 4.5.2) where the calculated scores are divided by the sum of weightings to obtain a rating.

Table 4.15 Environmental Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Water Management	3	The weighting of 3 reflects the perceived importance of water management on TMF operation and risk of environmental impact. A judgment was made to not select a higher weighting as this sub-account measures potential environmental impacts associated with water management while many of the other sub-accounts in the environmental account measure direct impacts associated with the TMF footprint (such as “Aquatic Life and Habitat” and “Terrestrial Life and Habitat”).	Internal Water Management - Precipitation	5	The combined internal management system indicators were assigned a higher total weighting (5+3=8) than the “Perimeter Ditch” indicator (3) to reflect the greater risk of environmental impact (through emergency spillway discharge and the discharge of contact water) associated with internal water management. The “supernatant water” indicator was assigned a lower weighting (3) than the “Precipitation” indicator (5) to reflect the higher level of variability associated with precipitation as compared to the relatively uniform nature of ongoing water flows from tailings deposition. The “perimeter ditch” indicator was assigned the same weight (3) as that of the “supernatant water” indicator as both indicators refer to contact-water that eventually flows into the water management ponds. The non-contact water indicator was assigned the lowest weight (2) among indicators in this sub-account to reflect the lower risk of environmental impacts associated with non-contact water compared with contact-water and supernatant.
			Internal Water Management- Supernatant Water	3	
			External Water Management – Perimeter Ditch	3	
			External Water Management – Non-Contact Water	2	
Aquatic Life and Habitat	3	A combined weighting of 6 (3+3) was assigned to the Aquatic Life and Habitat and Surface Water Impacts sub-accounts. This reflects a value judgment that the impacts to aquatic life and habitat are relatively significant compared to other sub-accounts in the Environmental account. These two sub-accounts were assigned a higher weighting than the “water management” sub-account as the water management sub-account represents risk items while the Aquatic Habitat and Surface Water Impacts sub-accounts assess known impacts (e.g., areas overlain by the proposed TMF alternatives).	Loss of Watercourses	6	The “Loss of Watercourses” and “Loss of Waterbodies” indicators were assigned weighting of 6 to reflect the importance of watercourses and waterbodies to the environment.
			Loss of Waterbodies	6	
			Sensitivity of Overlain Fish Habitat	6	The weighting of 6 was assigned to the “Sensitivity of Overlain Fish Habitat” indicator to reflect the high perceived importance associated with sensitive and rare habitats and populations.
Surface Water Impacts	3		Loss of Headwaters due to Facility	4	A weighting of 4 was assigned to this indicator to reflect the moderate perceived level of impact associated with diverting water away from the downstream receiving environment.
			Surface Water Impacts from Emergency Spillway Discharge	1	A weighting of 1 was assigned to this indicator to reflect the low likelihood of emergency spillway discharges.
			Infrastructure Disturbance – Water Crossings	2	A weighting of 2 was assigned to this indicator to incorporate the risk of aquatic impact through leakage/rupture of tailings delivery and reclaim piping at water crossings into the assessment while recognizing that the impacts due to crossings would largely be temporary (during construction of culverts or bridges) and would be relatively minor compared to the other indicators in this sub-account.
Terrestrial Life and Habitat	4	A weighting of 4 was assigned to the terrestrial habitat sub-account. This reflects the importance of forests as a habitat and the importance of wetlands as both a habitat and a water quality buffer in the local ecosystem. This sub-account was assigned a slightly lower weighting than the aquatic life and habitat sub-account to reflect the greater sensitivity of aquatic life to loss of habitat as compared to terrestrial life, which can more easily relocate to adjacent terrestrial areas in the case of development.	Habitat Fragmentation	4	This indicator was assigned a weighting of 4 to reflect the perceived less significant impacts associated with habitat fragmentation as compared to direct loss of habitat through overlaying with the TMF (as measured in the “Loss of Forested Area” indicator) and proximity to raptor nests.
			Loss of Moose Late Winter Cover Habitat Area	6	This indicator was given a weighting of 6 to reflect the relatively highest importance of moose late winter cover habitat areas for the species.
			Loss of Blanding's Turtle Habitat Area	6	This indicator was given a weighting of 6, reflecting the highest importance of Blanding's turtle habitat area for the species given their limited mobility compared to other species.
			Loss of Boreal Caribou Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of boreal caribou habitat area as there has been no record of presence in the study area.
			Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	4	This indicator was given a weighting of 4 to reflect the relatively high importance of bird nesting and habitat area as there is limited habitat available in the overall study area for these species.
			Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of birds of prey as there is abundant habitat available in the study area beyond the alternative footprints.

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
			Loss of Woodland Raptor Nesting Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of raptor nesting habitat area as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Shrub/Early Successional Breeding Bird Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of shrub/early successional breeding bird habitat area as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Upland Gamebirds Habitat Area	2*	This indicator was given a weighting of 2 to reflect the relatively lower importance of upland gamebirds habitat area as there is abundant habitat available in the overall study area outside the alternative footprints.
			Loss of SoCC (Common Nighthawk and Evening Grosbeak) Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of Common Nighthawk and Evening Grosbeak habitat area as there is abundant habitat available in the region beyond the alternative footprints.
			Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	5	This indicator was given a weighting of 5, reflecting relatively high importance of SAR birds. Given, there is abundant habitat available in the study area beyond the alternative footprints, it has not been assigned a weighting of 6.
			Loss of Wetlands Area	2	This indicator was assigned a weighting of 3, reflecting the relative importance of wetlands as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Forested Area	2	This indicator was assigned a weighting of 3, reflecting the relative importance of forested areas as there is abundant habitat available in the study area beyond the alternative footprints.
			Infrastructure Disturbance - Haul Roads	2	This indicator was assigned a weighting of 2 to reflect the relatively lower importance of infrastructure disturbance due to haul roads as the habitat is of a low quality (e.g., pollinator species like Monarch) and pose a risk of mortality to some species.
Geotechnical Foundation Conditions	3	A weighting of 3 was assigned to the Geotechnical Foundation Conditions sub-account which reflects on the strength of surficial material under the constructed dam around the TMF. Engineering mitigation measures are typically implemented to meet the foundation design criteria, reducing the likelihood of foundation failure. As such, this weighting is considered appropriate in comparison to the other sub-accounts in this account with measurements of direct impacts from the alternative (e.g., direct overlaying of aquatic and terrestrial habitat and air quality impacts).	Surficial Geology	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
Air Quality	3	A weighting of 3 was assigned to this sub-account as air quality impacts are considered to be less important than the impacts to aquatic or terrestrial life and habitat that are also considered in this account.	Potential for Dust Generation – Exposed Tailings	4	A weighting of 4 was assigned to the “Exposed Tailings” indicator as exposed tailings are considered to have a higher ability to generate dust than haul truck traffic and the dust generated from tailings is considered to potentially have greater impacts than access road generated dust. This is during construction of the TMF, including dam raises and initial placement of tailings in the TMF. Haul traffic was assigned a weighting of 2.
			Potential for Dust Generation - Haul Traffic	2	
Climate Change	1	A weighting of 1 was assigned to this sub-account as the impacts associated with the other sub-accounts in this account (such as terrestrial and aquatic life and habit) are considered significantly higher than the overall influence of haul truck traffic from this individual project on climate change.	Greenhouse Gas Emissions	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
Hydrogeology and Seepage and Leakage Risk	4	A weighting of 4 was assigned to the hydrogeology component. This reflects the perceived importance of hydrogeology and seepage conditions. A judgment was made to not select a higher than aquatic life and habitat weighting as this sub-account measures potential environmental impacts associated with hydrogeology and seepage conditions while many of the other sub-accounts in the environmental account measure direct impacts associated with the TMF footprint (such as “Aquatic Life and Habitat” and “Terrestrial Life and Habitat”).	Seepage Characteristics	4	A weighting of 4 was assigned to the two indicators in the Hydrogeology and Seepage Risks sub-account. Given the receptor for discharge/seepage to groundwater is humans and that the receptor for discharge/seepage to surface water is humans and aquatic species, impacts to groundwater and surface water through seepage are considered of the same level of importance.
			Seepage to Receivers	4	
			Tailings Pipeline Malfunction	2	The same level of risk was considered for tailings and reclaim water pipeline malfunction.
			Water Reclaim Pipeline Malfunction	2	

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
TMF Failure Likelihood	3	A weighting of 3 was assigned to the TMF Failure sub-account which measure risk of failure (where risk is equivalent to the product of likelihood and consequence). This weighting is considered appropriate in comparison to the other sub-accounts in this account with measurements of direct impacts from the alternative (e.g., direct overlaying of aquatic and terrestrial habitat and air quality impacts).	Length of Dam Containment	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
Note: The importance of all species and habitats to Indigenous nations is well acknowledged. A low indicator weighting does not suggest that the species or habitat is not important, rather that habitat is abundant throughout the SA.					

Table 4.16 Technical Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Design and Operational Complexity	6	A weighting of 6 was assigned to this sub-account as the variation in design and operational complexity between the identified alternatives are considered relatively significant.	Stability Design – Foundation	6	A value of 6 was assigned as stability of the TMF is considered an important design factor that impacts its overall design complexity.
			Length of Required Non-Contact Water Diversion	4	A weighting of 4 was assigned to reflect the relatively moderate level of operational complexity associated with alternatives with longer non-contact water diversions.
			Length of Dam Containment	4	A weighting of 4 was assigned to reflect the relatively moderate level of operational complexity associated with longer dam lengths.
			River/Highway Bridge Crossings	4	A weighting of 4 was assigned as large watercourse or highway bridge crossings for haul roads and pipeline infrastructure add additional design and operational complexity to the option.
			Operational Oversight	5	A weighting of 5 was assigned to reflect the slightly lower level of operational complexity associated with increased distances from the Open Pit and process plant area in comparison to foundation and stability design.

Table 4.17 Project Economics Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Capital Cost	6	Capital costs typically have the highest impact on mine financial calculations as they represent a substantial portion of the estimated net present value costs (which apply discounting to account for the time value of money) for a proposed project. Accordingly, the highest possible weighting of 6 was assigned to this sub-account as it is considered to have a higher impact on overall project economics than operating cost and closure cost.	CAPEX	6	A value of 6 was assigned to general capital cost for the TMF option itself, associated pipelines and fisheries offsetting. This construction cost is higher than the bridge crossing capital cost input as the TMF construction cost will be substantially higher.
			Highway/Bridge Crossings	4	A weighting of 4 was assigned as the bridge crossing capital cost will be substantially lower than other TMF capital costs (e.g., pipelines, dams)
Operating Cost	4	A weighting of 4 was assigned to this sub-account to represent the fact that operating costs are e a significant component of the overall mine costs while also recognizing that they are discounted over the life of the mine.	OPEX – Land Use	5	A weighting of 5 was assigned to this indicator to reflect the slightly lower level of operating cost perceived to be associated to land use costs as compared to pumping.
			OPEX – Pumping	6	A value of 6 was assigned to this operating cost indicator as pumping costs are more important than land use payments from the operating cost perspective.
Closure Cost	2	Closure costs associated with each TMF is anticipated to be a relatively small component of the overall cost associated with the TMF (capital and operating costs). As a result, weighting of 2 was assigned to this sub-account.	Cover Construction Cost	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.

Table 4.18 Socio-economic Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Land and Resource Use – Animal Harvesting	5	The impacts associated with the indicators in this sub-account are considered to be slightly lower than those in the TKLU sub-account and as such, a weighting of 5 was assigned to this sub-account (versus a weighing of 6 for the TKLU sub-account).	Loss of Hunting	6	The loss of hunting and loss of fishing are assumed to impact a larger number of people (both the local population and regional visitors) than the bear management or trapline areas indicators. Thus, the hunting and fishing indicators were assigned higher weightings (6 each). It is assumed that hunting and fishing are of equivalent value and, as such, equivalent weightings were assigned to the "Loss of Hunting" indicator and the "Loss of Fishing – Watercourses/Waterbodies" indicators.
			Loss of Fishing – Watercourses	6	
			Loss of Fishing – Waterbodies	6	
			Loss of Bear Management Areas and Number of Bear Management Areas	2	A weighting of 2 was assigned to the bear management areas and number of the bear management areas indicator as the areas disturbed by TMF alternatives are relatively small in relation to the overall bear management area, the area of typical overall bear home ranges and the existing level of disturbance in the area. Also, impacts to bear management areas are considered to impact a smaller number of people than impacts to hunting (which considers hunting of a variety of species) and fishing.
			Loss of Trapline Areas and Number of Trapline Areas	2	A weighting of 2 was assigned to the trapline indicator as the disturbed area is relatively small in relation to the overall trapline area and impacts to trapline areas are considered to affect a smaller number of people than impacts to hunting and fishing activities.
Land Access	3	A weighting of 3 was assigned to the land access sub-account as loss of access routes is considered to be lower compared to the loss of hunting and fishing opportunities.	Loss of Access Roads	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
Land and Mineral Use Rights	2	The impacts associated with the indicators in this sub-account are considered to be lower than those in the TKLU sub-account and as such, a weighting of 2 was assigned to this sub-account (versus a weighing of 6 for the TKLU sub-account).	Unpatented Crown Lands	3	A weighting of 3 was assigned to Unpatented Crown Lands indicator as impacts to unpatented Crown land is perceived slightly less important than loss of lands with Claims/Rights Owned by Others (with a weighting of 4).
			Lands with Claims/Rights Owned by Others	4	
TKLUs	6	The highest possible weighting of 6 was assigned to this sub-account to reflect the importance of managing potential adverse impacts on Indigenous land uses. The TKLU sub-account addresses potential disruptions to the ability of Indigenous nations to practice traditional land uses.	Loss of Unoccupied Crown Land	4	A weighting of 4 was assigned to this indicator as it is thought to measure less direct impacts to TKLUs than the other indicator in this sub-account (Loss of Cultural Continuity Areas).
			Loss of Cultural Continuity Areas	6	A weighting of 6 was assigned to this indicator as it is thought to measure more direct impacts to TKLUs than Loss of Unoccupied Crown Land indicator.
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	6	The impacts associated with the indicators in this sub-account are considered to be as important as those in the TKLU sub-account because animal harvesting and subsistence can be practiced within unoccupied Crown lands. As such, a weighting of 6 was assigned to this sub-account.	Loss of Hunting and Trapping Areas	6	A weighting of 6 was assigned as loss of identified hunting and trapping areas by Indigenous nations compared to loss of general TKLU subsistence areas for the other indicator in this sub-account.
			Loss of Subsistence Areas	4	A weighting of 4 was assigned as the loss of animal-based subsistence areas by the alternatives is moderate in comparison to the loss of hunting and trapping areas as the other indicator in this sub-account.
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	6	The impacts associated with the indicators in this sub-account are considered to be as important as those in the TKLU sub-account because plant harvesting and subsistence can be practiced within unoccupied Crown lands. As such, a weighting of 6 was assigned to this sub-account.	Loss of Plant Harvesting Area	6	A weighting of 6 was assigned as loss of identified plant harvesting areas by Indigenous nations compared to loss of general TKLU subsistence areas for the other indicator in this sub-account.
			Loss of Subsistence Areas	4	A weighting of 4 was assigned as the loss of plant-based subsistence areas by the alternatives is moderate in comparison to the loss of identified plant harvesting areas as the other indicator in this sub-account.
Aesthetics	1	A weighting of 1 was assigned to the aesthetics sub-account due to the low importance of this sub-account in comparison to other sub-accounts in the socio-economic account. This weighting reflects the value judgement that impacts to LRU and TKLU pose a greater socio-economic impact compared to the visual impacts in the Aesthetics sub-account.	Proximity to Highway 655	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.

The “Base Case” account weightings suggested by the Guidelines, summarized in Table 4.19, were utilized as weightings for the accounts. However, the account weightings might be later varied as part of the sensitivity analysis stage (Step 6) of the alternatives assessment.

Table 4.19 Summary of Rationale for Account Weighting

Account	Weighting	Weighting Rationale
Environmental	6	As recommended by the Guidelines for the “Base Case” quantitative analysis
Technical	3	
Economic	1.5	
Socio-Economic	3	

4.5.2 Quantitative Analysis

After assigning scores to each indicator and selecting weightings for each indicator, sub-account, and account, the quantitative analysis is performed to compare the alternatives and identify the preferred alternative. The following sections present the results of the quantitative analysis at an indicator, sub-account and account level.

4.5.2.1 Quantitative Analysis for Indicators

The results of the quantitative analysis for indicators are divided by account and presented in Table 4.20 to Table 4.23.

4.5.2.1.1 Environmental

The internal catchment area and the length of internal and perimeter ditches are similar among the three TMF alternatives (Table 4.20). Lack of non-contact water drainage area for TMF-6 has resulted in a slightly higher water management score for TMF-6 in comparison to the other two alternatives giving it the higher score.

Table 4.20 Quantitative Analysis – Environmental Indicators

Sub-Account	Indicator	Indicator Parameter	Indicator Quantity Unit	Indicator Weight (W_{ind})	TMF-1		TMF-2		TMF-6	
					Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})
Water Management	Internal Water Management - Precipitation	Area	ha	5	4.0	20.0	4.0	20.0	3.0	15.0
	Internal Water Management - Supernatant Water	Length	km	3	4.0	12.0	5.0	15.0	5.0	15.0
	External Water Management – Perimeter Ditch	Area	ha	3	4.0	12.0	5.0	15.0	5.0	15.0
	External Water Management – Non-contact Water	Area	ha	2	2.0	4.0	2.0	4.0	6.0	12.0
	Sub-account score ($\sum${S *W_{ind}})					48.0		54.0		57.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					**3.69**		**4.15**		**4.38**
Aquatic Life and Habitat	Loss of Watercourses	Length	km	6	3.0	18.0	2.0	12.0	5.0	30.0
	Loss of Waterbodies	Area	ha	6	3.0	18.0	2.0	12.0	5.0	30.0
	Sensitivity of Impacted Fish Habitat	Value	#	6	4.0	24.0	4.0	24.0	5.0	30.0
	Sub-account score ($\sum${S *W_{ind}})					60.0		48.0		90.0
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)					**3.33**		**2.67**		**5.00**
Surface Water Impacts	Loss of Headwaters due to TMF	Area	ha	4	5.0	20.0	5.0	20.0	4.0	16.0
	Surface Water Impacts from Emergency Spillway Discharge	Area	ha	1	1.0	1.0	4.0	4.0	4.0	4.0
	Infrastructure Disturbance – Water Crossings	Value	#	2	6.0	12.0	6.0	12.0	4.0	8.0
	Sub-account score ($\sum${S *W_{ind}})					33		36		28
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)					**4.71**		**5.14**		**4.00**
Terrestrial Life and Habitat	Habitat Fragmentation	Length	km	4	5.0	20.0	4.0	16.0	1.0	4.0
	Loss of Moose Late Winter Cover Habitat Area	Area	ha	6	6.0	36.0	4.0	24.0	1.0	6.0
	Loss of Blanding's Turtle Habitat Area	Area	ha	6	5.0	30.0	6.0	36.0	2.0	12.0
	Loss of Boreal Caribou Habitat Area	Area	ha	2	5.0	10.0	2.0	4.0	1.0	2.0
	Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	Area	ha	4	3.0	12.0	1.0	4.0	5.0	20.0
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	Area	ha	2	2.0	4.0	6.0	12.0	6.0	12.0
	Loss of Woodland Raptor Nesting Habitat Area	Area	ha	2	4.0	8.0	2.0	4.0	5.0	10.0
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	Area	ha	2	1.0	2.0	3.0	6.0	6.0	12.0
	Loss of Upland Gamebirds Habitat Area	Area	ha	2	6.0	12.0	6.0	12.0	6.0	12.0
	Loss of SoCC (Common Nighthawk and Evening Grosbeak) Habitat Area	Area	ha	2	3.0	6.0	1.0	2.0	5.0	10.0
	Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	Area	ha	5	5.0	25.0	2.0	10.0	1.0	5.0
	Loss of Wetlands	Area	ha	2	3.0	6.0	4.0	8.0	1.0	2.0
	Loss of Forested Area	Area	ha	2	3.0	6.0	1.0	2.0	5.0	10.0
	Infrastructure Disturbance - Haul Roads	Length	km	2	4.0	8.0	3.0	6.0	1.0	2.0
	Sub-account score ($\sum${S *W_{ind}})					185.0		146.0		123.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					**4.30**		**3.40**		**2.77**

Sub-Account	Indicator	Indicator Parameter	Indicator Quantity Unit	Indicator Weight (W_{ind})	TMF-1		TMF-2		TMF-6	
					Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})
Geotechnical Foundation Conditions	Surficial Geology	Value	#	5	2	10.0	2	10.0	1	5.0
	Sub-account score ($\sum${S *W_{ind}})					10.0		10.0		5.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					2.00		2.00		1.00
Air Quality	Potential for Dust Generation – Haul Traffic	Length	km	2	5.0	10.0	4.0	8.0	1.0	2.0
	Potential for Dust Generation – Exposed Tailings	Area	ha	4	4.0	16.0	4.0	16.0	3.0	12.0
	Sub-account score ($\sum${S *W_{ind}})					26.0		24.0		14.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					**4.33**		**4.00**		**2.33**
Climate Change	Greenhouse Gas Emissions	Length	km	5	5.0	25.0	4.0	20.0	3.0	15.0
	Sub-account score ($\sum${S *W_{ind}})					25.0		20.0		15.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					**5.00**		**4.00**		**3.00**
Seepage and Leakage Risk	Seepage Characteristics	Value	#	4	5.0	4.0	5.0	16.0	5.0	4.0
	Seepage to Receivers	Value	#	4	1.0	20.0	4.0	20.0	1.0	20.0
	Tailings Pipeline Malfunction	Length	km	2	5.0	10.0	3.0	6.0	1.0	2.0
	Water Reclaim Pipeline Malfunction	Length	km	2	5.0	10.0	5.0	10.0	1.0	2.0
	Sub-account score ($\sum${S *W_{ind}})					44.0		52.0		28.0
	Sub-account rating (R_{sub} = $\sum${S*Wind}/$\sum W_{ind}$)					**3.67**		**4.33**		**2.33**
TMF Failure Likelihood	Length of Dam Containment	Length	km	5	4.0	20.0	3.0	15.0	3.0	15.0
	Sub-account score ($\sum${S *W_{ind}})					20.0		15.0		15.0
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)					**4.00**		**3.00**		**3.00**

Alternative TMF-6 is the highest ranked in the aquatic life and habitat sub-account as it overlays smaller areas of mapped watercourses and waterbodies than TMF-1 and TMF-2. The sensitivity of the impacted fish habitat is slightly higher in TMF-1 (with the sensitivity of 4.97) and TMF-2 (with the sensitivity of 4.05) in comparison to TMF-6 (with the sensitivity of 5). The alternatives TMF-1 and TMF-2 overlay both the headwater and mainstem watercourses, while the alternative TMF-6 overlays only headwater streams. Mainstem watercourses and headwater streams were associated with “moderate” and “moderately low” fish habitat sensitivity, respectively. As such, the alternatives TMF-1 and TMF-2 ranked slightly lower than the alternative TMF-6 from the fish habitat sensitivity perspective.

Alternative TMF-2 is the highest ranked in the surface water impacts sub-account due to the collective effects of the loss of headwaters, the impact of spillway discharge, and infrastructure disturbance. Alternative TMF-1 is ranked lower than alternative TMF-2 and TMF-6 as the spillway discharge drains into a receiver with a smaller upstream drainage area. Alternative TMF-6 ranking is lower than the other two alternatives because it requires the construction of two water crossings.

TMF-1 is associated with the highest score for seven out of 14 indicators in the terrestrial life and habitat sub-account and has the highest ranking. Among the three alternatives, the TMF-6 alternative has the longest length of haul roads, the largest habitat areas related to moose late wintering, Blanding’s turtle, boreal caribou, and bird SAR. This resulted in the lowest ranking for the alternative TMF-6.

Alternative TMF-1 and TMF-2 are rated higher than TMF-6 in the geotechnical foundation conditions sub-account due to the relatively larger area of organic deposits overlain by TMF-6 as indicated by the surficial geology data.

Alternative TMF-1 is rated highest in the air quality sub-account due to the relatively smaller area of exposed tailings in comparison to the other two alternatives and its close proximity to the Open Pit with the shortest haul road lengths. Longer haulage distance for TMF-6 has resulted in the lowest air quality score for TMF-6 in comparison to the other two alternatives.

The TMF-1 alternative is the highest ranked in the climate change sub-account due to the shortest haul road lengths from the Open Pit of the three alternatives.

The TMF-2 alternative is the highest ranked in the seepage and leakage risk sub-account. Alternative TMF-1 is ranked higher than the other two alternatives in three out of the four indicators in the seepage and leakage sub-account. TMF-6 is ranked the lowest in three out of the four indicators in this sub-account resulting in its lowest overall score in the seepage and leakage sub-account. Because alternative TMF-6 is located the furthest to the mine infrastructure than then other two alternatives, long pipeline and tailings pipeline contributed to its low rank.

The TMF-1 alternative is the highest ranked in the TMF failure likelihood sub-account as it has the shortest dam length of the three alternatives.

4.5.2.1.2 Technical

Alternative TMF-1 is the highest ranked in the Design and Operational Complexity sub-account due to its overall higher score than that of the TMF-2 and TMF-6 alternatives (Table 4.21). Alternative TMF-1 overlies sub-surficial materials that are predicted to be relatively stable, has the shortest length of perimeter ditches, and is located in relatively close proximity to the Open Pit and the majority of the other Project infrastructure reducing complexity.

Table 4.21 Quantitative Analysis – Technical Indicators

Sub-Account	Indicator	Indicator Parameter	Indicator Quantity Unit	Indicator Weight (W_{ind})	TMF-1		TMF-2		TMF-6	
					Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Design and Operational Complexity	Stability Design - Foundation	Area	ha	6	2.0	12.0	2.0	12.0	1.0	6.0
	Length of Non-Contact Water Diversion Required	Length	km	4	1.0	4.0	2.0	8.0	6.0	24.0
	Length of Dam Containment	Length	km	4	4.0	16.0	3.0	12.0	3.0	12.0
	River/Highway Bridge Crossings	Value	#	4	6.0	24.0	6.0	24.0	4.0	16.0
	Operational Oversight	Distance	km	5	5.0	25.0	4.0	20.0	3.0	15.0
	Sub-account score ($\sum\{S * W_{ind}\}$)					81		76		73
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)					**3.52**		**3.30**		**3.17**

4.5.2.1.3 Project Economic Indicators

Alternative TMF-1 is the highest ranked in the Capital Cost sub-account as the dam construction cost associated to this alternative is lower than that of TMF-2 and TMF-6 alternatives (Table 4.22). In addition, as the TMF-1 alternative is located closer to the process plant and Open Pit with the shortest lengths of haul roads, tailings pipeline and reclaim water pipelines. These attributes lower construction material hauling costs and capital expenditures for haul road construction and piping installation. Fish habitat compensation costs associated to the TMF-6 are lower than the other two alternatives due to the lowest watercourse lengths and waterbody areas overlain by the alternative.

Table 4.22 Quantitative Analysis – Project Economics Indicators

Sub-Account	Indicator	Indicator Parameter	Indicator Quantity Unit	Indicator Weight (W_{ind})	TMF-1		TMF-2		TMF-6	
					Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Capital Cost	CAPEX	Cost	M$	6	4.0	24.0	3.0	18.0	2.0	12.0
	Highway/Bridge Crossings	Value	#	4	6.0	24.0	6.0	24.0	4.0	16.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		48.0		42.0		28.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**4.80**		**4.20**		**2.80**
Operational Cost	OPEX – Pumping	Cost	M$	6	5.0	30.0	4.0	24.0	3.0	18.0
	OPEX - Land Use	Value	%	5	3.0	15.0	5.0	25.0	1.0	5.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		45.0		49.0		23.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**4.09**		**4.45**		**2.09**
Closure Cost	Cover Construction Cost	Cost	M$	5	4.0	20.0	4.0	20.0	3.0	15.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		20.0		20.0		15.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**4.00**		**4.00**		**3.00**

From the operating cost perspective, the rating of TMF-2 is highest among the three alternatives as the fraction of the footprint overlying unpatented and unoccupied Crown land in the TMF-2 alternative is lower resulting in reduced land use costs.

In the closure cost sub-account, the TMF-1 and TMF-2 alternatives are rated equally due to the similarity between their footprint areas which would have similar vegetated cover placement requirements.

4.5.2.1.4 Socio-Economic Indicators

Alternative TMF-6 is highest ranked in the LRU – Animal Harvesting sub-account as it is associated with a lesser loss of the indicators included in that sub-account (Table 4.23). Alternatives TMF-1 and TMF-2 have larger areas overlain by hunting areas, fishing areas (both watercourses and waterbodies), and trapline and bear management areas compared to the TMF-6 alternative. The TKLU assessments involve assumptions that were stated in Section 3.17.

Table 4.23 Quantitative Analysis – Socio-Economic Indicators

Sub-Account	Indicator	Indicator Parameter	Indicator Quantity Unit	Indicator Weight (W_{ind})	TMF-1		TMF-2		TMF-6	
					Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Land and Resource Use - Animal Harvesting	Loss of Hunting	Area	ha	6	5.0	30.0	5.0	30.0	1.0	6.0
	Loss of Fishing – Watercourses	Length	km	6	1.0	6.0	1.0	6.0	5.0	30.0
	Loss of Fishing – Waterbodies	Area	ha	6	2.0	12.0	1.0	6.0	5.0	30.0
	Loss of Bear Management Areas – Number	Value	#	2	5.0	10.0	6.0	12.0	6.0	12.0
	Loss of Bear Management Areas – Area	Area	ha	2	5.0	10.0	1.0	2.0	6.0	12.0
	Loss of Trapline Areas - Number	Value	#	2	4.0	8.0	4.0	8.0	5.0	10.0
	Loss of Trapline Areas	Area	ha	2	4.0	8.0	4.0	8.0	3.0	6.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		84.0		72.0		106.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**3.23**		**2.77**		**4.08**
Land Access	Loss of Access Roads	Length	km	5	5.0	25.0	5.0	25.0	1.0	5.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		25.0		25.0		5.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**5.00**		**5.00**		**1.00**
Land and Mineral Use Rights	Unpatented Crown Land	Value	%	3	6.0	18.0	6.0	18.0	2.0	6.0
	Lands with Claims/Rights Owned by Others	Value	%	4	3.0	12.0	5.0	20.0	1.0	4.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		30.0		38.0		10.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**4.29**		**5.43**		**1.43**
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	Area	ha	4	5.0	20.0	5.0	20.0	1.0	4.0
	Loss of Cultural Continuity Areas	Area	ha	6	5.0	30.0	5.0	30.0	1.0	6.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		50.0		50.0		10.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**5.00**		**5.00**		**1.00**
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Loss of Hunting and Trapping Areas	Area	ha	6	5.0	30.0	5.0	30.0	1.0	6.0
	Loss of Hunting Subsistence Areas	Area	ha	4	5.0	20.0	5.0	20.0	1.0	4.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		50.0		50.0		10.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**5.00**		**5.00**		**1.00**
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	Area	ha	6	5.0	30.0	5.0	30.0	1.0	6.0
	Loss of Plant Harvesting Subsistence Areas	Area	ha	4	5.0	20.0	5.0	20.0	1.0	4.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		50.0		50.0		10.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**5.00**		**5.00**		**1.00**
Aesthetics	Highway 655	Distance	km	5	1.0	5.0	1.0	5.0	5.0	25.0
				Sub-account score ($\sum\{S * W_{ind}\}$)		5.0		5.0		25.0
				Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)		**1.00**		**1.00**		**5.00**

Alternative TMF-1 and TMF-2 are rated equally and higher than the TMF-6 alternative in the Land Access sub-account due to the shorter access road lengths.

In the Land and Mineral Use Rights sub-account, the TMF-2 alternative rates highest due to its smaller faction of unpatented and unoccupied Crown land in comparison to the TMF-1 and TMF-6 alternatives.

The TMF-1 and TMF-2 alternatives have equal ranking values and are ranked highest in the TKLU sub-account. The amount of unoccupied Crown land and the areas overlain by alternative TMF-6 that are expected to be used for Indigenous cultural continuity practices are larger than those for TMF-1 and TMF-2. Alternative TMF-6 overlies the longest length of access roads and the largest amount of unoccupied Crown land and cultural continuity areas among the three alternatives resulting in the lowest rank in the TKLU sub-accounts. TMF-1 and TMF-2 were ranked similar and higher than TMF-6 for the TKLU Animal Harvesting, Plant Harvesting and Subsistence indicators due the reduced Crown land areas identified as potential harvesting and subsistence areas.

The TMF-6 alternative is rated higher than the other two alternatives in the Aesthetic sub-account as it is located a greater distance from the Highway 655 compared to TMF-1 and TMF-2.

4.5.2.2 Sub-account Quantitative Analysis

The sub-account quantitative analysis for each of the four accounts is presented in Table 4.24. Alternatives TMF-1 is ranked highest in the Environmental account, followed by the TMF-2 and TMF-6 alternatives. There are nine sub-accounts included the Environmental account. Alternative TMF-1 is ranked the highest in five sub-accounts (Terrestrial Life and Habitat, Geotechnical Foundation Conditions, Air Quality, Climate Change, and TMF Failure Likelihood) out of the nine sub-accounts in the Environmental account. This results in the highest rank for alternative TMF-1 in the Environmental account. Alternative TMF-6 is ranked the highest in two (Water Management and Aquatic Life and Habitat) out of the nine sub-accounts in the Environmental accounts, which makes its rank the lowest in this account.

Alternative TMF-1 is rated highly in the Technical account, which has one sub-account (Design and Operational Complexity). Alternative TMF-6 is rated the lowest among the three TMF alternatives in the Technical account.

Alternative TMF-1 is rated highest in the Project Economics account for two (Capital Cost and Closure Cost) of the three sub-accounts. Alternative TMF-6 receives the lowest rating in this account for the capital, operating and closure costs sub-accounts. Alternatives TMF-1 and TMF-2 are rated highly in two out of three sub-accounts (Capital Cost and Closure Cost for alternative TMF-1, and Operational Cost and Closure Cost for alternative TMF-2), whereas alternative TMF-6 is not ranked highly in any sub-accounts.

In the Socio-Economic account with seven sub-accounts, alternative TMF-1 is ranked the highest due to its high ranks in Land Access and TKLU sub-accounts. TMF-2 had a ranking value of 4.51 equal to that of TMF-1 (4.51). TMF-6 was ranked highest in two sub-accounts (Land and Resource Use – Animal Harvesting, Aesthetics) sub-accounts, but is ranked the lowest in the Socio-Economic account.

Table 4.24 Quantitative Analysis – Sub-Accounts

Account	Sub-Account	Sub-Account Weight (W_{sub})	TMF-1		TMF-2		TMF-6	
			Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)	Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)	Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)
Environmental	Water Management	3	3.69	11.08	4.15	12.46	4.38	13.15
	Aquatic Life and Habitat	3	3.33	10.00	2.67	8.00	5.00	15.00
	Surface Water Impacts	3	4.71	14.14	5.14	15.43	4.00	12.00
	Terrestrial Life and Habitat	4	4.30	17.21	3.40	13.58	2.77	11.07
	Geotechnical Foundation Conditions	3	2.00	6.00	2.00	6.00	1.00	3.00
	Air Quality	3	4.33	13.00	4.00	12.00	2.33	7.00
	Climate Change	1	5.00	5.00	4.00	4.00	3.00	3.00
	Seepage and Leakage Risk	4	3.67	14.67	4.33	17.33	2.33	9.33
	TMF Failure Likelihood	3	4.00	12.00	3.00	9.00	3.00	9.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			103.10		97.80		82.56
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**3.82**		**3.62**		**3.06**
Technical	Design and Operational Complexity	6	3.52	21.13	3.30	19.83	3.17	19.04
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			21.10		19.83		19.04
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**3.52**		**3.30**		**3.17**
Economics	Capital Cost	6	4.80	28.80	4.20	25.20	2.80	16.80
	Operational Cost	4	4.09	16.36	4.45	17.82	2.09	8.36
	Closure Cost	2	4.00	8.00	4.00	8.00	3.00	6.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			53.16		51.02		31.16
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**4.43**		**4.25**		**2.60**
Socio-economic	Land and Resource Use - Animal Harvesting	5	3.23	16.15	2.77	113.85	4.08	20.38
	Land Access	3	5.00	15.00	5.00	15.00	1.00	3.00
	Land and Mineral Use Rights	2	4.29	8.57	5.43	10.86	1.43	2.86
	Traditional Knowledge and Land Use	6	5.00	30.00	5.00	30.00	1.00	6.00
	Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	6	5.00	30.00	5.00	30.00	1.00	6.00
	Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	6	5.00	30.00	5.00	30.00	1.00	6.00
	Aesthetics	1	1.00	1.00	1.00	1.00	5.00	5.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			130.73		130.70		49.24
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**4.51**		**4.51**		**1.70**

4.5.2.3 Account Quantitative Analysis

The account quantitative analysis is performed after completing the sub-accounts quantitative analysis. The “Base Case” account weighting factors recommended by the Guidelines were used for the account quantitative analysis. Table 4.25 presents the results of the account quantitative analysis.

Table 4.25 Quantitative Analysis – Accounts

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	6	3.82	22.91	3.62	21.73	3.07	18.35
Technical	3	3.52	10.57	3.30	9.91	3.17	9.52
Economics	1.5	4.43	6.65	4.25	6.38	2.60	3.90
Socio-economic	3	4.51	13.52	4.51	13.52	1.86	5.09
Alternative score ($\sum\{R_a * W_a\}$)			53.64		51.55		36.86
Alternative Rating ($\sum\{R_a * W_a\}$)/$\sum W_a$			**3.97**		**3.82**		**2.73**

Alternative TMF-1 is rated highest overall and is the preferred alternative considering the “Base Case” account weightings required by the Guidelines. This reflects the fact that alternative TMF-1 is rated relatively highly in each account whereas alternatives TMF-2 and TMF-6 are rated relatively poorly in one or more of the accounts. Alternative TMF-2 is also rated second in the assessment for the four sub-accounts. The TMF-6 alternative is rated consistently lowest in the four sub-accounts and has the lowest ranking.

To further evaluate the TMF alternatives and the impact of the weightings applied in the analysis, sensitivity analyses were performed. These analyses are discussed in Section 4.6.

4.6 Step 6: Sensitivity Analysis

The quantitative analyses presented in the preceding section were performed using the “Base Case” account weighting factors required by the Guidelines.

Following the completion of the quantitative analyses, a set of sensitivity analyses were performed. This process is recommended by the Guidelines as a way to test the impacts of variations in weightings on the assessment outcomes and provide stakeholders with a further understanding of the implications of the various value judgments used in the assessment process. The guidelines describe each set of varied weightings as a “scenario”. The Guidelines note that the sensitivity analyses are not prescriptive and should be project-specific and consider feedback received from stakeholders, including Indigenous nations, throughout the assessment process.

The following five sensitivity analyses were performed:

- **Scenario 1 – Equivalent Account Weightings –** An equivalent weighting factor (1) was applied to all accounts. This is based on a scenario recommended in the Guidelines in which all weighting factors are assigned an equal value (i.e., a weighting of 1).
- **Scenario 2 – Environmental Account Bias –** A weighting factor of (1) was applied to the Technical, Project Economic, and Socio-Economic accounts and a weighting factor of (6) was applied to the Environmental account. This scenario identifies the preferred alternative if non-environmental factors are largely removed from the evaluation.
- **Scenario 3 – Technical Account Bias –** A weighting factor of (1) was applied to the Environmental, Project Economics, and Socio-Economic accounts and a weighting factor of (6) was applied to the Technical account. This scenario identifies the preferred alternative if non-technical factors are largely removed from the evaluation.
- **Scenario 4 – Project Economics Account Bias –** A weighting factor of (1) was applied to the Environmental, Technical, and Socio-Economic accounts and a weighting factor of (6) was applied to the Project Economics account. This scenario identifies the preferred alternative if non-project economics factors are largely removed from the evaluation.

- **Scenario 5 – Socio-Economic Account Bias –** A weighting factor of (1) was applied to the Environmental, Technical, and Project Economics accounts and a weighting factor of (6) was applied to the Socio-Economic account. This scenario identifies the preferred alternative if non-socio-economic factors are largely removed from the evaluation.

4.6.1 Results

The results of the sensitivity analyses are presented in Table 4.26 through Table 4.30 with results from the original “Base Case” analysis presented in italicized parentheses in each table.

For Scenario 1, where all account weighting factors are equivalent (Table 4.26):

- The TMF-1 alternative is highest ranked. The TMF-6 alternative is the lowest ranked alternative.
- The relationship between alternatives scores (that is, TMF-1 > TMF-2 > TMF-6) is observed in Scenario 1 as it was for the “Base Case”.

Table 4.26 Scenario 1 – Equivalent Account Weightings

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.82	3.82	3.62	3.62	3.06	3.06
Technical	1	3.52	3.52	3.30	3.30	3.17	3.17
Economics	1	4.43	4.43	4.25	4.25	2.60	2.60
Socio-Economic	1	4.51	4.51	4.51	4.51	1.70	1.70
Alternative score ($\sum\{R_a * W_a\}$)			16.28		15.69		10.53
Alternative Rating ($\sum\{R_a * W_a\}/\sum W_a$			**4.07**		**3.92**		**2.63**

Scenario 2 is heavily biased towards the Environmental account (Table 4.27):

- The TMF-1 alternative is highest ranked with its rating in close proximity to that of TMF-1 in the base case scenario.
- Similar to the “Base Case” scenario, the TMF-6 alternative is the lowest ranked alternative.
- The relationship between alternatives scores (that is, TMF-1 > TMF-2 > TMF-6) still holds in Scenario 2.

Table 4.27 Scenario 2 – Environmental Account Bias

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	6	3.82	22.91	3.62	21.73	3.06	18.35
Technical	1	3.52	3.52	3.30	3.30	3.17	3.17
Economics	1	4.43	4.43	4.25	4.25	2.60	2.60
Socio-Economic	1	4.51	4.51	4.51	4.51	1.70	1.70
Alternative score ($\sum\{R_a * W_a\}$)			35.37		33.80		25.81
Alternative Rating ($\sum\{R_a * W_a\}$)/$\sum W_a$			**3.93**		**3.76**		**2.87**

For Scenario 3, which is heavily biased towards the Technical account (Table 4.28):

- The TMF-1 alternative remains the most highly ranked alternative.
- Similar to the base case scenario, the TMF-6 alternative is the lowest ranked alternative.
- The relationship between alternatives scores (that is, TMF-1 > TMF-2 > TMF-6) still holds in Scenario 3.

Table 4.28 Scenario 3 – Technical Account Bias

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.82	3.82	3.60	3.62	3.06	3.06
Technical	6	3.52	21.13	3.30	19.83	3.17	19.04
Economics	1	4.43	4.43	4.25	4.25	2.60	2.60
Socio-Economic	1	4.51	4.51	4.51	4.51	1.70	1.70
Alternative score ($\sum\{R_a * W_a\}$)			33.89		32.21		26.40
Alternative Rating ($\sum\{R_a * W_a\}$)/$\sum W_a$			**3.77**		**3.58**		**2.93**

For Scenario 4, which is heavily biased towards the Project Economic account (Table 4.29), and Scenario 5, which is heavily biased towards the Socio-Economic account (Table 4.30):

- The TMF-1 alternative is the highest ranked alternative.
- Similar to the “Base Case” scenario, the two TMF-6 alternatives remain the lowest ranked alternative.
- The relationship between alternatives scores (that is, TMF-1 > TMF-2 > TMF-6) still holds in Scenario 4 and 5.

Table 4.29 Scenario 4 – Project Economics Account Bias

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.82	3.82	3.62	3.62	3.06	3.06
Technical	1	3.52	3.52	3.30	3.30	3.17	3.17
Economics	6	4.43	26.58	4.25	25.51	2.60	15.58
Socio-Economic	1	4.51	4.51	4.51	4.51	1.70	1.70
Alternative score ($\sum\{R_a * W_a\}$)			38.43		36.94		23.51
Alternative Rating ($\sum\{R_a * W_a\}/\sum W_a$			**4.27**		**4.10**		**2.61**

Table 4.30 Scenario 5 – Socio-Economic Account Bias

Account	Account Weight (W_a)	TMF-1		TMF-2		TMF-6	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.82	3.82	3.62	3.62	3.06	3.06
Technical	1	3.52	3.52	3.30	3.30	3.17	3.17
Economics	1	4.43	4.43	4.25	4.25	2.60	2.60
Socio-Economic	6	4.51	27.05	4.51	27.04	1.70	10.19
Alternative score ($\sum\{R_a * W_a\}$)			38.82		38.22		19.02
Alternative Rating ($\sum\{R_a * W_a\}/\sum W_a$			**4.31**		**4.25**		**2.11**

4.6.2 Discussion

The calculated alternative ratings and rankings for the “Base Case” and the sensitivity analyses are presented numerically in Table 4.31. The ranking of each alternative as calculated in the quantitative analysis and sensitivity analysis are presented graphically in Figure 4.8.

Consistent with the conclusions from the “Base Case” analysis, the variations in account weightings considered in the sensitivity analyses do not alter the overall results of the alternatives assessment. More specifically, varying the accounts varying factors for the four accounts equal (Scenario 1), Environment Bias (Scenario 2), Technical bias (Scenario 3), Project Economic bias (Scenario 4), and Socio-Economic bias (Scenario 5) produced the same ranking results as the “Base Case” with the TMF-1 alternative as the preferred alternative. This means that the "Base Case" value judgements and the corresponding account weightings required by the Guidelines does not impact the assessment. Overall, this provides additional confidence in the assessment results identifying the preferred alternative as TMF-1.

Figure 4.8 TMF Quantitative and Sensitivity Analysis Ranking Results

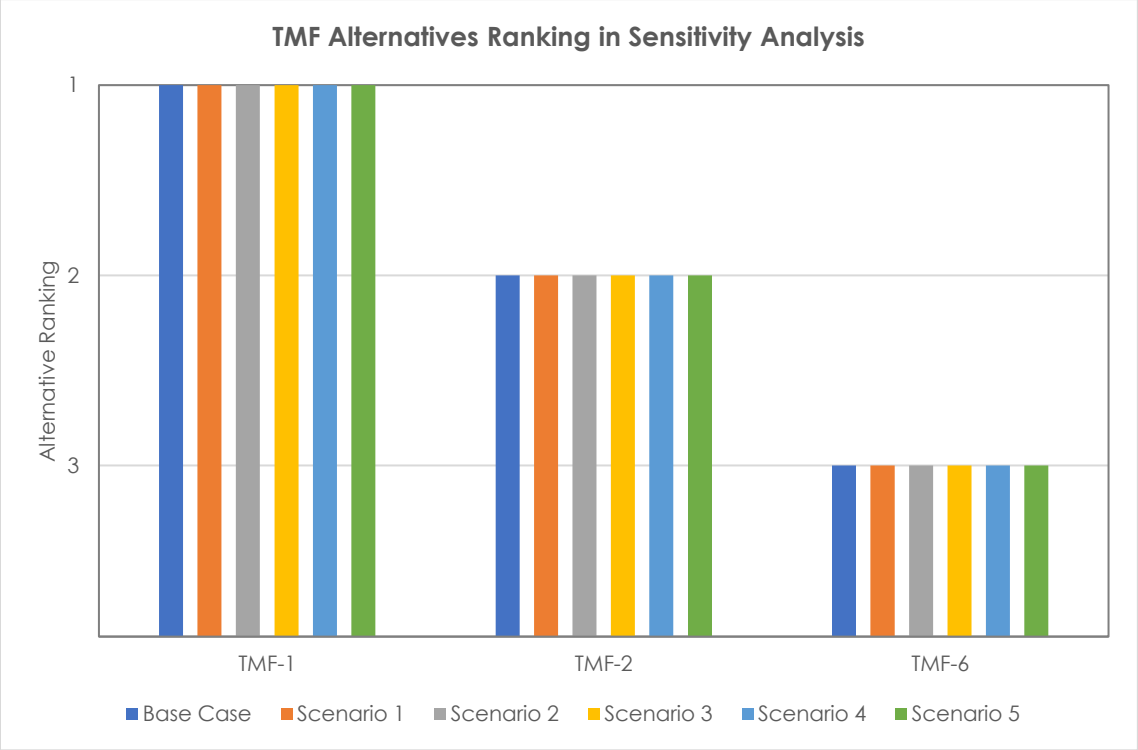


Table 4.31 Summary of Results of TMF Sensitivity Analysis

	Base Case		Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	(ECCC Recommended Weightings)		(All Account Weightings Equal)		(Environmental Account Bias)		(Technical Account Bias)		(Project Economics Account Bias)		(Socio-Economic Account Bias)	
Alternative	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking
TMF-1	3.97	1	4.07	1	3.93	1	3.77	1	4.27	1	4.31	1
TMF-2	3.82	2	3.92	2	3.76	2	3.58	2	4.10	2	4.25	2
TMF-6	2.73	3	2.63	3	2.87	3	2.93	3	2.61	3	2.11	3

5 Mine Waste Management Area Alternatives Assessment

The MWMA alternatives assessment was performed according to the requirements of the Guidelines, as discussed in the following section.

5.1 Step 1: Identify Candidate Alternatives

Step 1 of the alternatives assessment process is to develop a list of all “reasonable, conceivable and realistic mine waste disposal alternatives” (ECCC 2013). The range of alternatives considered was based on examples in Canada and other jurisdictions (a range of geographies and project scales) and assessed based on Project specific parameters and environmental conditions. The following presents a discussion of this process.

5.1.1 Threshold Criteria

Threshold criteria were used to “establish the regional boundaries for selecting candidate alternatives” (ECCC 2013). The following five threshold criteria were applied:

1. **Exclusion based on distance:** The Guidelines state that distance to the disposal area is commonly applied as a threshold criterion as distance influences project economics. Based on Project economics, it was noted that hauling waste rock more than 30 km has a substantial negative impact on Project feasibility. Therefore, locations with a haul distance in excess of 30 km were excluded from evaluation.

2. **Exclusion based on probable mineral resources:** Siting of the mine waste was performed to not include areas with known or probable mineral resources causing subsequent sterilization of the resources by making them inaccessible for future use.

3. **Exclusion based on Public Infrastructure:** . Given the distance between the site and residential areas in the region, no existing public infrastructure is present that would impede the selection of candidate alternatives.

4. **Exclusion based on unallowed areas and key waterbodies:** The Guidelines note that there may be areas where overlaying with mine waste would not be allowed. In such cases, these areas can justifiably be excluded from evaluation. There are no unallowed areas or key watercourses/waterbodies located within the Project site that would limit placement of an alternative. The North Driftwood River will be realigned due to the Open Pit layout and is not influenced by this exclusion criterion.

5. **Exclusion based on Project components:** Siting of the Open Pit and the process plant was performed prior to the MWMA alternatives assessments based on foundation conditions and access planning to the Open Pit.

5.1.2 Mine Waste Management Area Alternatives

Various waste rock disposal methods and mine waste management area locations were considered in developing alternatives. The SA is constrained by various lakes and creeks/rivers, Highway 655, and two transmission lines, which combine to limit the locations available for waste rock storage. The following presents a summary of the identified MWMA alternatives.

5.1.2.1 Location Alternatives

A desktop siting study was performed within the area defined by the MWMA threshold criteria to identify "reasonable, conceivable, and realistic" (ECCC 2013) alternative locations. Each alternative location includes the ore stockpiles present on the east and west sides to of the Open Pit (Stockpile West and Stockpile East) as they will be present up to 40 years over the life of the mine. The following four alternative locations, which are presented in Figure 5.1, were identified and considered for use:

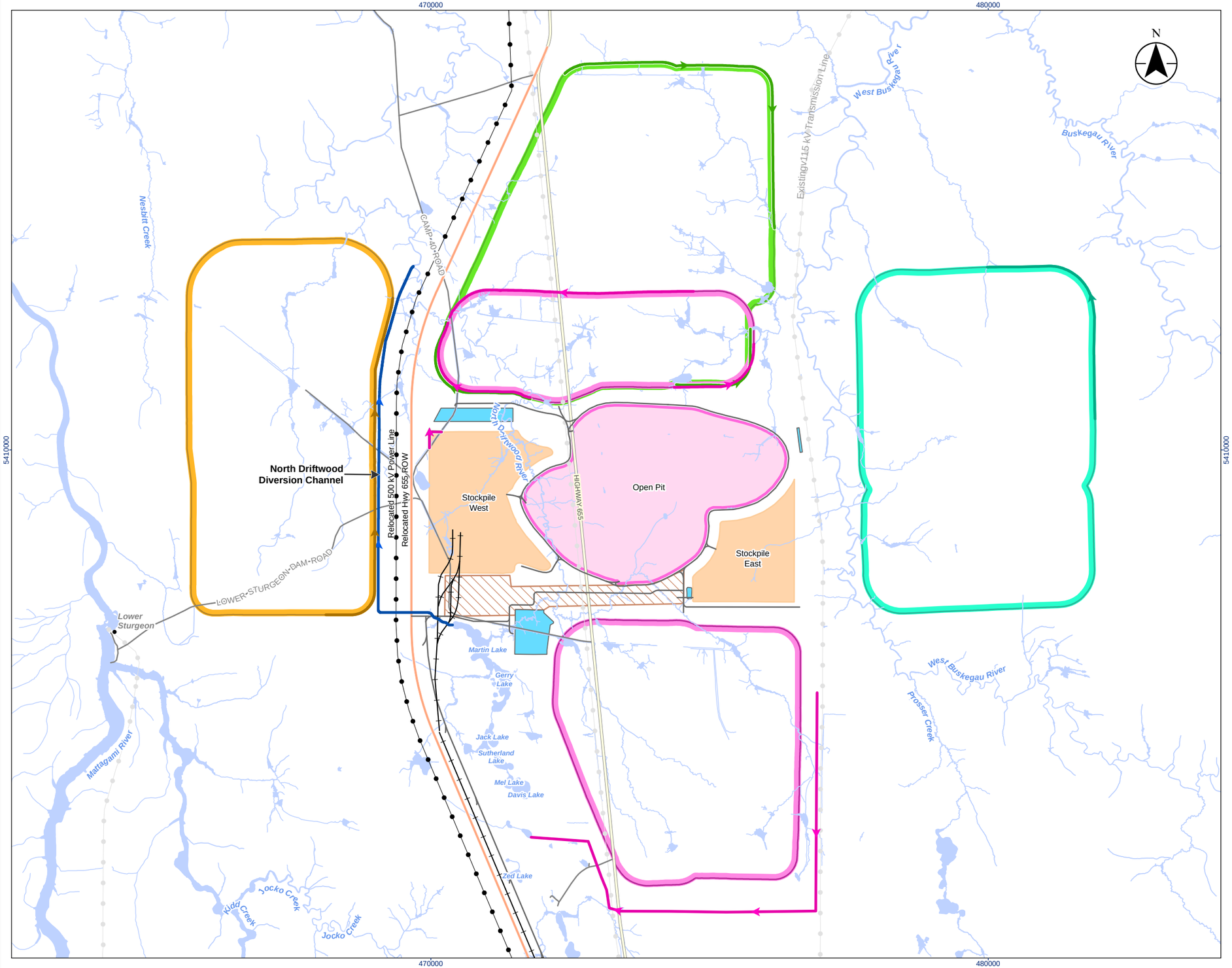
- MWMA-1 – This alternative refers to the mine waste management facility located north of the Open Pit
- MWMA-2 – This alternative consists of two mine waste management facilities with one located south of the Open Pit and a smaller mine waste management facility located north of the Open Pit
- MWMA-3 – This alternative consists of the mine waste management facility located west of realigned Highway 655 and North Driftwood River
- MWMA-4 – This alternative refers to an area to the east of West Buskegau River and the 115 kV transmission line

5.1.2.2 Waste Disposal Method Alternatives

The following five candidate waste disposal methods were identified and considered for use:

1. In-pit Storage of Non-Segregated Waste Rock
2. Above Ground Storage of Non-Segregated Waste Rock
3. Co-mixing of Waste Rock and Tailings (Conventional/Thickened)
4. Co-mixing of Waste Rock and Tailings (Pressure Filtered)
5. Above Ground Storage of Segregated Waste Rock due to ARD/ML Potential

A discussion regarding each of the identified waste disposal method alternatives is presented in Section 5.2.2. As discussed in Section 4.2.2, the methods of co-mixing of waste rock and tailings (3. conventional/thickened and 4. pressured filtered) were omitted from further evaluation in the assessment.



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Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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Notes

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Figure No.
5.1

Title
Identified MWMA Location Alternatives

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\\cd1004-f01\1609\active\160930456\160930456gis_cad\gis\mxds\STDR\160930456_IS_TDR_MAA.aprx\160930456_IS_TDR_MAA_Fig5-1_MWMA_Options

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5.2 Step 2: Pre-Screening Criteria

Step 2 consists of applying pre-screening criteria to the identified alternatives to exclude alternatives that are “non-compliant with certain unique minimum specifications that have been developed for the project” (ECCC 2013). The Guidelines describe this process as a “fatal-flaw analysis” where fatal flaws are defined as any site characteristic that is “so unfavorable or severe that, if taken singly, it would eliminate that site as a candidate” (ECCC 2013). Pre-screening criteria are defined such that there is a simple “yes” or “no” response to whether or not the alternative complies with the criteria and a “yes” response eliminates the alternative from further evaluation.

5.2.1 Identification of Pre-Screening Criteria

Four pre-screening criteria were used in the MWMA pre-screening process. These pre-screening criteria and their rationale are summarized in the following section. The application of these criteria to the identified MWMA alternatives is presented in Section 5.2.2.

1. **Would the mine waste disposal method have insufficient capacity for the proposed mine life?** – If the mine waste disposal method does not provide sufficient capacity for the proposed life of mine quantity of waste, the method can be removed from further consideration in the assessment.

2. **Would the mine waste disposal method/location storage volume result in negative life of mine economics?** – If the proposed mine waste disposal method would have significant economic impacts it can be argued that the method should be excluded from further consideration.

3. **Does the mine waste disposal method present a substantive risk of ARD and/or ML?** – Mine waste disposal methods that present a substantive risk of ARD/ML generation and resulting potential environmental impacts should be removed from further consideration in the assessment.

5.2.2 Application of Pre-Screening Criteria

The following presents a discussion regarding the application of the pre-screening criteria to the alternatives. Alternatives that do not comply with the pre-screening criteria were removed from further consideration in the assessment.

Criterion 1 - Would the mine waste disposal method have insufficient capacity for the proposed mine life?

Co-disposal of waste rock and tailings – as previously discussed in Section 4.2.2, co-disposal of waste rock and tailings was removed from further evaluation in the assessment due to insufficient capacity for the proposed mine life.

Criterion 2 – Would the mine waste disposal method/management area storage volume result in negative life of mine economics?

In-pit storage of non-segregated waste rock – This disposal method consists of backfilling the Open Pit with non-segregated waste rock. This approach is not economically feasible due to the displacement of tailings for in-pit disposal, which would then need to be stored in a surface TMF that has a substantially higher cost per cubic metre of material compared to waste rock for construction.

The storage volumes proposed for the four MWMA locations are similar and are economically feasible, so none would be removed from further evaluation in the assessment.

Criterion 3 – Does the mine waste disposal method present a substantive risk of ARD and/or ML?

The ML/ARD assessment completed by WSP is provided in the Crawford Geochemistry Characterization Report (Appendix H of the Impact Statement) and included static and kinetic testing of overburden, waste rock and ore samples. Testing of waste rock, ore and till samples classified these excavated materials as NPAG and acid generation is not anticipated within the SA.

Confirmatory samples will be collected during the construction phase and the first three years of the operations phase and results will be reviewed by a qualified professional to evaluate potential for ML/ARD (Appendix L of the Impact Statement). If confirmatory sampling indicates waste rock, ore or till is PAG, ARD generation can be potentially managed by encapsulating selected PAG materials in specific layers in a stockpile that are surrounded or encapsulated with thicker layers of non-PAG waste rock overtop and non-PAG and/or acid consuming waste rock layer(s) placed underneath.

As the waste rock, till and ore is anticipated to be NPAG, waste rock segregation is not necessary and will not be conducted. Segregation of PAG presents a higher risk of ARD and ML and would add additional technical complexity and cost to waste storage. Based on waste rock segregation not being required, this storage method was removed from further evaluation in the MWMA alternatives assessment.

The results of pre-screening are presented in Table 5.1.

Table 5.1 MWMA Pre-Screening Criteria Summary Table

Pre-Screening Criterion	Waste Disposal Method					MWMA Location			
	In-pit storage of non-segregated waste rock	**Above ground storage of non-segregated waste rock**	**Co-disposal of waste rock and tailings (Conventional/Thickened)**	**Co-disposal of waste rock and tailings (Pressured Filtered)**	**Above ground storage with segregation of waste rock due to acid rock drainage/metal leaching potential**	**1**	**2**	**3**	**4**
1. Would the mine waste disposal method have insufficient capacity for the proposed mine life?	No	No	**Yes**	**Yes**	No	N/A	N/A	N/A	N/A
2. Would the mine waste disposal method/management area storage volume result in negative life of mine economics?	**Yes**	No	**Yes**	**Yes**	No	No	No	No	No
3. Does the mine waste disposal method present a substantive risk of acid rock drainage (ARD) and/or metals leaching (ML)?	No	No	No	No	**Yes**	N/A	N/A	N/A	N/A
Should the alternative be excluded from further assessment?	**Yes**	No	**Yes**	**Yes**	**Yes**	No	No	No	No

Notes:

Yes – Method or location does not meet pre-screening criterion/criteria and is removed from further evaluation

No – Method or location meets pre-screening criterion/criteria and is moved forward to the multiple accounts ledger

N/A – not applicable

Following the application of the pre-screening criteria, the following four alternatives remain and are carried forward into Step 3 of the alternatives assessment:

- MWMA-1 with above ground storage of non-segregated waste rock
- MWMA-2 with above ground storage of non-segregated waste rock
- MWMA-3 with above ground storage of non-segregated waste rock
- MWMA-4 with above ground storage of non-segregated waste rock

The Guidelines note that, while there is no ideal number of alternatives to consider in Step 3, it is recommended that three or more be the target. While the options for MWMA are constrained by multiple factors (e.g., lakes, creeks, Highway 655, transmission lines, Project infrastructure) this assessment complies with that recommendation as four alternatives are carried forward into Step 3.

The Guidelines also recommend that at least one of the alternatives considered in Step 3 should not affect a natural waterbody frequented by fish “unless it can be demonstrated that the potential of identifying such a site does not reasonably exist based on site-specific circumstances” (ECCC 2013). This is considered to be the case as the number of fish-bearing water features in the SA limit the number of alternatives available for identification that are “reasonable, conceivable, and realistic” (ECCC 2013). As such, the alternatives carried forward in the MWMA assessment are considered compliant with the Guidelines. Loss was assessed for the MWMA alternative locations based on three types:

1. Direct overlay of the alternative on fish habitat (MDMER Schedule 2)
2. Direct overlay of the alternative on surface water features not considered to be fish habitat (*Fisheries Act* Section 34/35)
3. Direct overlay that due to centralized water management (e.g., sedimentation ponds) discharges outside the existing drainage area and indirectly reduces flow downstream to fish habitat (*Fisheries Act* Section 34/35)

Substantial efforts have been made to avoid directly overlaying lakes and watercourses in the SA and the development of alternatives has been successful in avoiding key fish habitat waterbodies in the SA. The alternatives carried forward into Step 3 of the assessment are the MWMA-1, MWMA-2, MWMA-3 and MWMA-4 locations, which include footprints that overlie small water features with fish habitat. The surface water features will be removed prior to MWMA construction or waste deposition and are considered to require Schedule 2 listing.

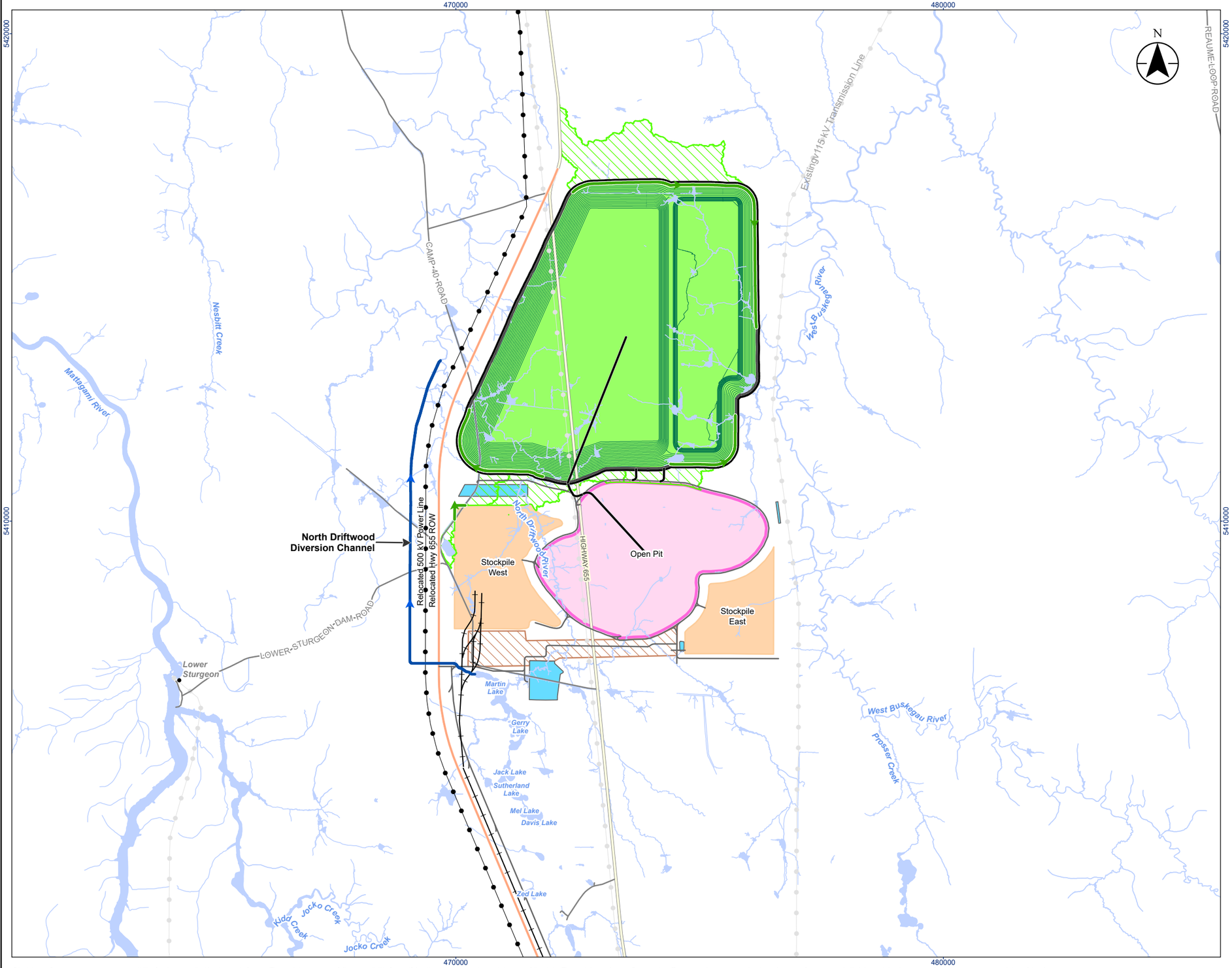
5.2.3 Design Basis and Criteria

The conceptual design of each alternative is based on the design basis and criteria presented in Table 5.2.

Table 5.2 Design Basis and Criteria for Conceptual design of MWMA Alternatives

Design Basis Item	Value
Estimated Total Quantity of Produced Waste Rock, Clay, Sand and Till (tonnage)	3,991 Mt
Density of Waste Material in MWMA	1.58* t/m^3
Minimum Total Capacity of Alternative (volume)	1,674 Mm^3
Mine Waste Management Area Angle of Repose	37 degrees
Design Criteria Item	**Value**
Bench Width	Varies from 10 to 20 m
Inter-Bench Pile Slope	Angle of repose
Pile Slope of Clay Impoundment Pile Slope of Sand and Till Impoundment Pile Slope of Rock Impoundment	6H:1V 3.5H:1V 3.5H:1V
Note: -Taken from the Crawford Nickel Sulphide Project NI 43-101 Technical Report and Feasibility Study (Ausenco 2023)	

The conceptual designs of MWMA-1, MWMA-2, MWMA-3 and MWMA-4 are presented in Figure 5.2 through Figure 5.5, respectively. The final design and capacity of the constructed piles may vary due to work performed as part of ongoing Project planning and engineering design and variations in the mine plan during operations.



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Legend

- MWMA Alternative 1
- MWMA-1 Drainage Area
- Haul Road / Contact Water Ditching
- MWMA-1 Non-Contact Water Drainage
- MWMA Impoundment Contour

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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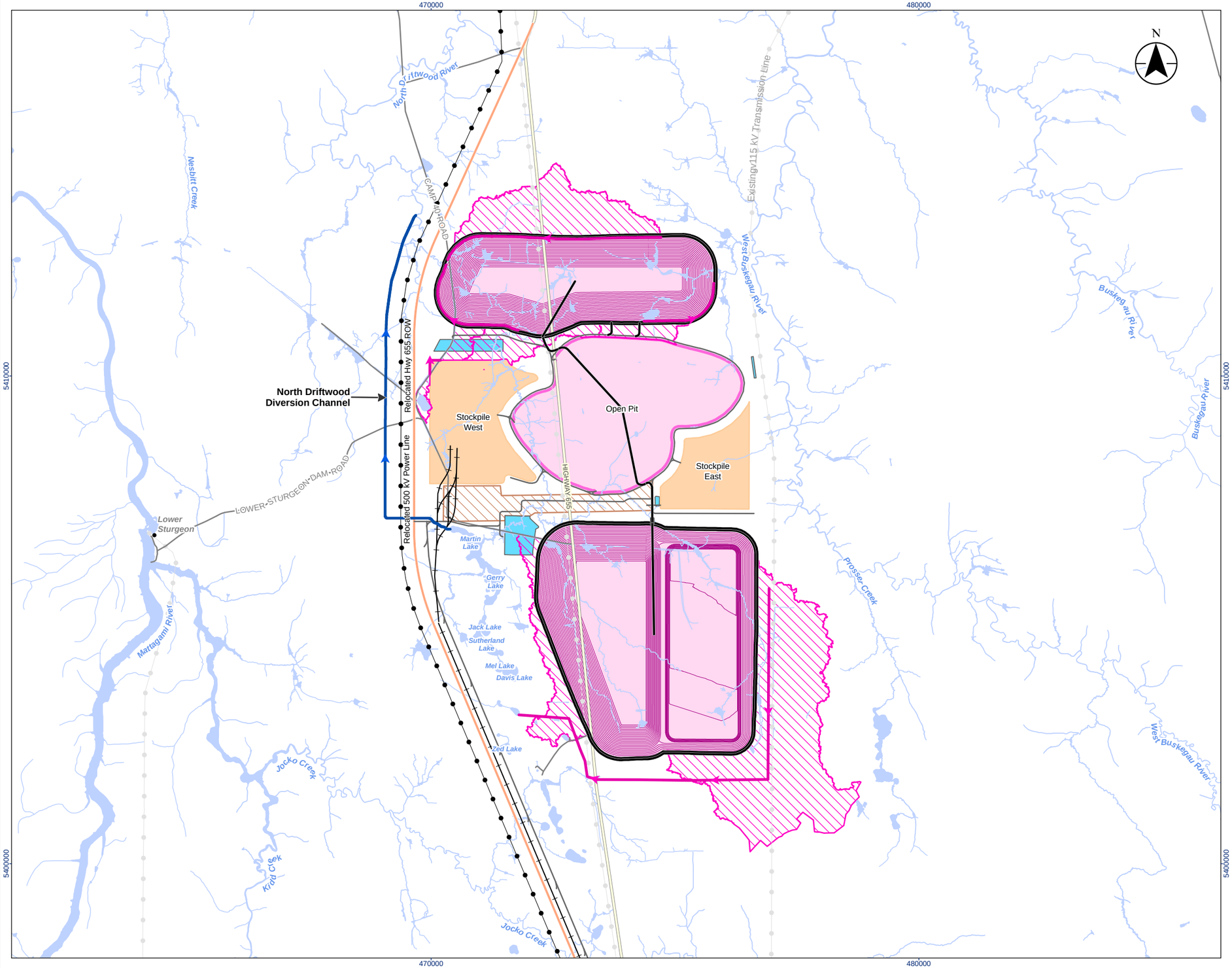
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Figure No.
5.2

Title
MWMA-1 Alternative - Conceptual Design

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Legend

- MWMA Alternative 2
- MWMA-2 Drainage Area
- Haul Road / Contact Water Ditching
- MWMA-2 Non-Contact Water Drainage
- MWMA Impoundment Contour

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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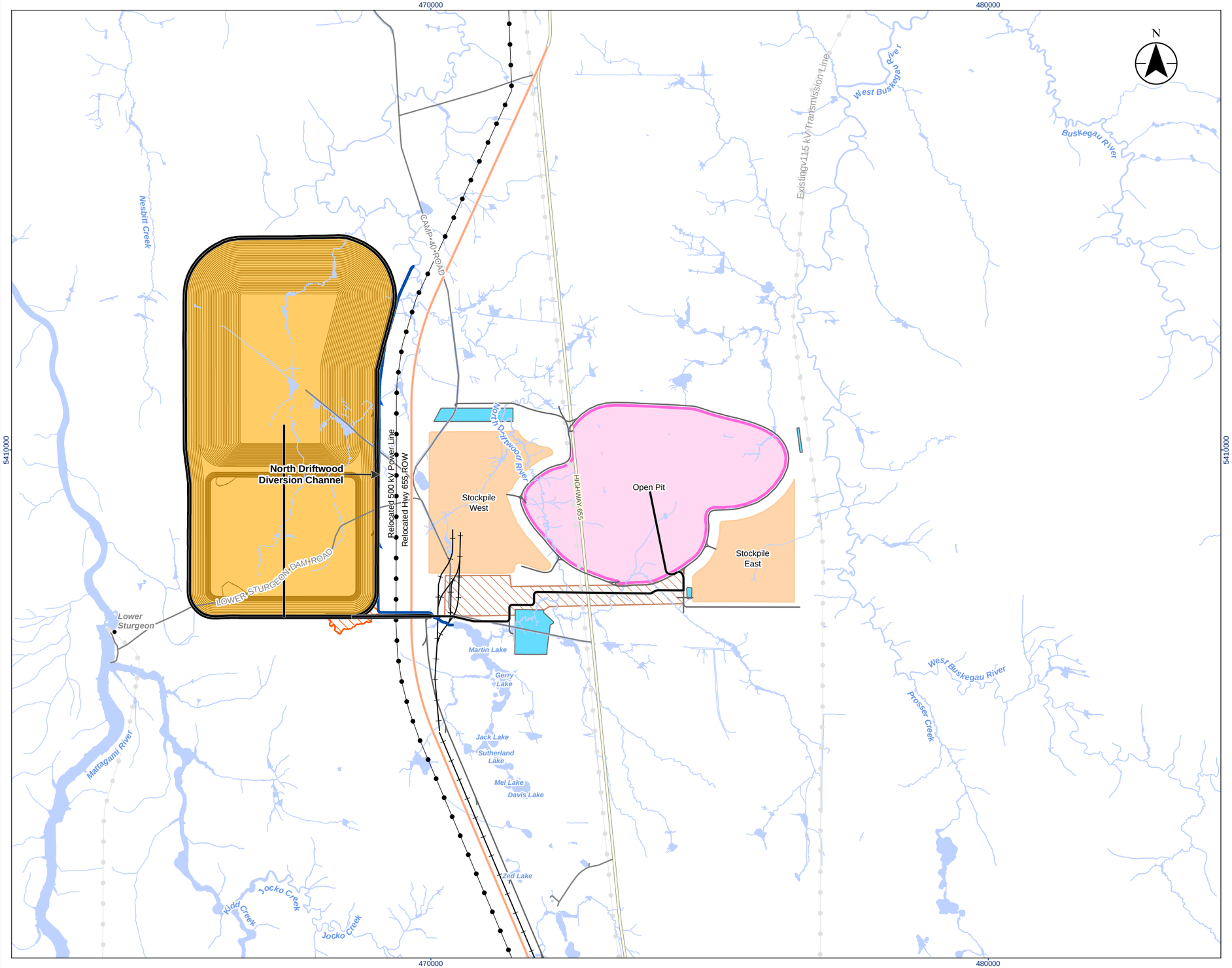
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5.3

Title
MWMA-2 Alternative - Conceptual Design

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CANADA NICKEL COMPANY

Legend

- MWMA Alternative 3
- MWMA-3 Drainage Area
- Haul Road / Contact Water Ditching
- MWMA-3 Non-Contact Water Drainage
- MWMA Impoundment Contour

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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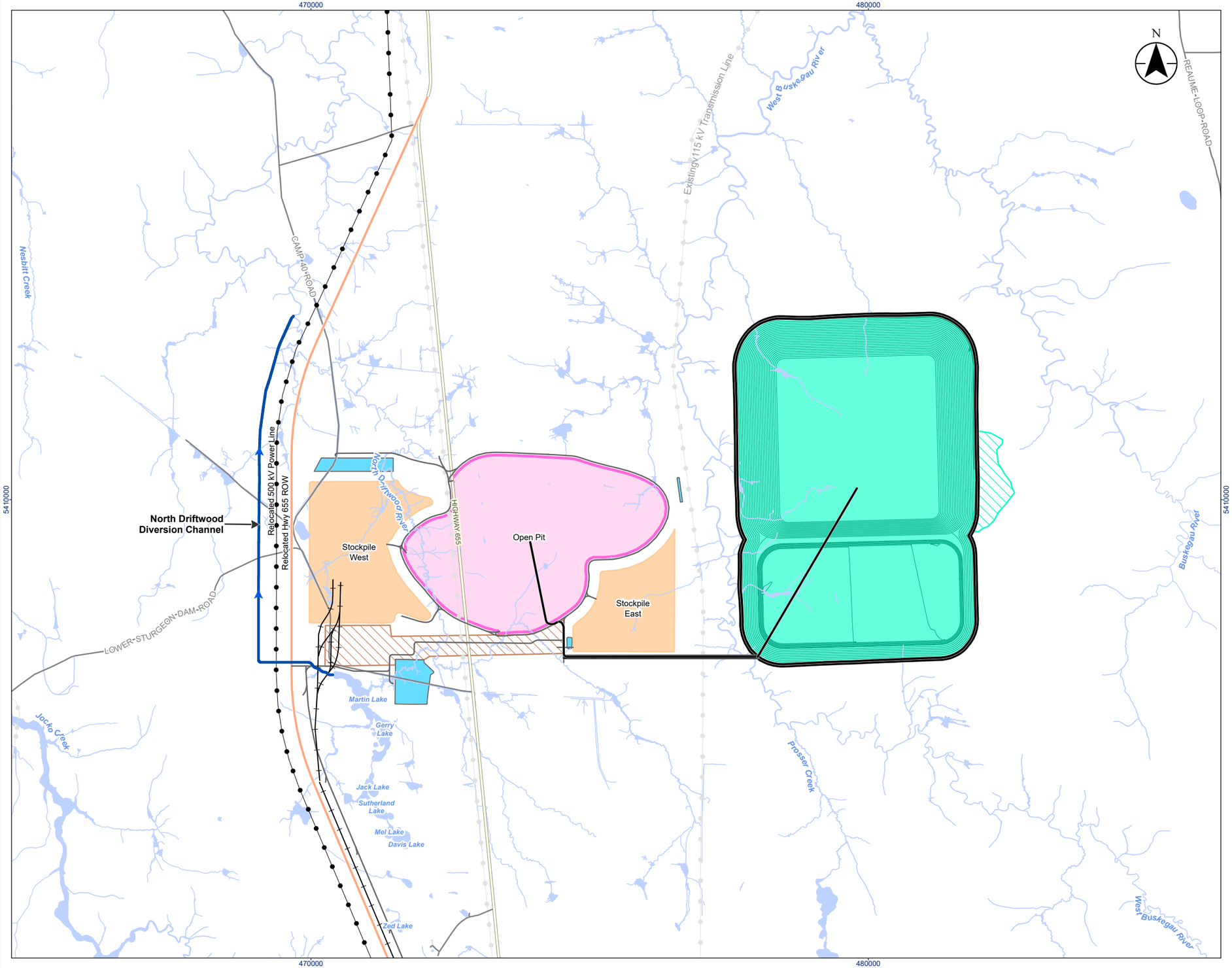
Figure No.
5.4

Title
MWMA-3 Alternative - Conceptual Design

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CANADA NICKEL COMPANY

Legend

- MWMA Alternative 4
- MWMA-4 Drainage Area
- Haul Road / Contact Water Ditching
- MWMA-4 Non-Contact Water Drainage
- MWMA Impoundment Contour

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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5.5

Title
MWMA-4 Alternative - Conceptual Design

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5.3 Step 3: Alternative Characterization

5.3.1 Alternative Characterization

In Step 3, each of the alternatives remaining after the Step 2 Pre-Screening are characterized. This process is intended to provide a summary of relevant information related to each of the alternatives and assist in considering key aspects of the alternatives in the assessment. Site specific characterization criteria are developed and applied to each alternative. As required by the Guidelines, the characterization criteria used in this assessment are divided into four categories: Environmental, Technical, Project Economics and Socio-Economic.

Tables F-1 through F-4 in Appendix F present the characterization criteria summary tables for each alternative and characterization category. These tables are required by the Guidelines as the deliverable from Step 3 of the assessment process. The tables include a summary of the rationale for each characterization criterion and a column which lists the basis for the presented information, in compliance with the Guidelines' requirement that the information presented should be clear and well documented.

5.3.2 Non-Differentiating Characteristics

In accordance with the Guidelines, only impacts that are differentiating between the alternatives are applicable for use in the alternatives assessment. Tables G-1 through G-4 in Appendix G present a summary of characteristics that are considered to be non-differentiating between the alternatives, separated by the characterization category, and a discussion regarding why each is considered non-differentiating. This information is presented to provide rationale regarding the indicators and sub-accounts that were used in the alternatives assessment.

5.4 Step 4: Multiple Accounts Ledger

In Step 4, a multiple accounts ledger is developed. The ledger is divided into accounts, sub-accounts, and indicators.

5.4.1 Accounts

Accounts are intended to separate the effects associated with the alternatives into broad categories and allow for a comparison of the alternatives at a high level. Consistent with the recommendations of the Guidelines, four accounts were used in this assessment: Environmental, Technical, Project Economics, and Socio-Economic.

5.4.2 Sub-Accounts

Each account is further divided into sub-accounts, which are also described as evaluation criteria. The Guidelines require that sub-accounts be impact driven, differentiating, understandable, non-redundant, and able to be independently judged (i.e., not depend on the value in another sub account).

The characterization criteria presented in Tables F-1 through F-4 (Appendix F) were reviewed and impacts associated with these characteristics were identified and used to develop sub-accounts to represent impacts associated with the alternatives. A summary table was prepared for each account to present the selected sub-accounts and a description of the rationale behind each. These tables are recommended by the Guidelines as a deliverable from Step 4 of the assessment process. The following sections present the sub-account summary tables for each of the four adopted accounts.

5.4.2.1 Environmental Account – Selected Sub-Accounts

The Environmental account addresses the anticipated impacts of waste rock storage on the environment. The account was broken down into sub-accounts to incorporate impacts on land, water and air, and the wildlife within them. Table 5.3 presents a summary of the selected sub-accounts within the Environmental account and the rationale for each.

Table 5.3 Environmental Account – Sub-Account Summary Table

Sub-Account	Rationale
Water Management	Alternatives which manage larger quantities of water result in greater amounts of contact water and may present a higher risk of loss of containment and associated environmental impacts.
Aquatic Life and Habitat	Alternatives which have a greater impact on aquatic habitat (watercourses and waterbodies) and impact more sensitive aquatic habitats and spawning areas pose a greater environmental impact.
Terrestrial Life and Habitat	Facilities overlying more terrestrial habitat pose a greater environmental impact.
Geotechnical Foundation Conditions	Facilities with lower strength foundations pose a higher stability risk.
Hydrogeology and Seepage Risk	MWMA seepage will be mitigated through engineering design. However, alternatives that overlie more pervious foundation materials present a higher risk of seepage that could reach local surface water receivers and the local groundwater system.
Air Quality	Waste storage may impact air quality due to dust generation associated with waste rock haulage.
Climate Change	Alternatives which require greater fuel consumption result in higher carbon emissions and greater impacts on climate change.

5.4.2.2 Technical Account – Selected Sub-Accounts

The Technical account considers the engineering elements and technical risks associated with each alternative. Table 5.4 presents a summary of the selected sub-accounts within the Technical account and the rationale for each.

Table 5.4 Technical Account – Sub-Account Summary Table

Sub-Account	Rationale
Design and Operational Complexity	Alternatives with greater pile heights, require longer non-contact water diversions or require construction of river/highway bridge crossings may present additional complexity in design and construction.

5.4.2.3 Project Economics Accounts -Selected Sub-Accounts

The Project Economics account addresses the differentiating portions of the lifecycle costs of the alternatives. Table 5.5 presents a summary of the selected sub-accounts within the Project Economics account and the rationale for each.

Table 5.5 Project Economics Account – Sub-Account Summary Table

Sub-Account	Rationale
Capital Cost	Capital costs have a significant impact on the ability to successfully commission a mine.
Operating Cost	Operating costs impact life of mine economics.
Closure Cost	Closure costs can be significant and can have a substantial impact on initial project economics due to requirements for financial assurance.

5.4.2.4 Socio-Economic Account – Selected Sub-Accounts

The Socio-Economic account is divided into sub-accounts which capture the anticipated impacts of waste rock storage on local and traditional land users. Table 5.6 presents a summary of the selected sub-accounts within the Socio-Economic account and the rationale for each.

Table 5.6 Socio-Economics Account – Sub-Account Summary Table

Sub-Account	Rationale
LRU – Animal Harvesting	Alternatives which impact larger amounts of hunting area have a larger socio-economic impact.
Land and Mineral Use Rights	Facilities overlying areas where land or mineral use rights exist present risks of socio-economic impacts and may impact the ability to successfully permit and operate a mine.
TKLU	Alternatives with greater loss of unoccupied Crown land have greater socio-economic impacts on Indigenous users due to availability of unoccupied Crown land for Indigenous activities. In addition, alternatives with greater loss of land where Indigenous cultural continuity occurs have greater socio-economic impacts. Cultural continuity is comprised of numerous interrelated values that are important for cultural persistence and way of life, including knowledge transmission, spirituality, sense of place, and identity.
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Alternatives with greater impacts on Indigenous users' subsistence and animal harvesting (hunting, fishing, and trapping) activities have greater socio-economic impacts.

Sub-Account	Rationale
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Alternatives with greater impacts on Indigenous users' subsistence, plant harvesting and gathering activities have greater socio-economic impacts.

5.4.3 Indicators

Each of the sub-accounts are then divided into indicators which allow the impacts associated with each alternative to be measured. The measurements for each indicator are referred to as "indicator quantities." Scoring of each indicator occurs as a part of the next step (Step 5; Section 5.5) of the assessment process by applying the quantitative value scale adopted for each indicator to the indicator quantity.

Table 5.7 through Table 5.14 present the indicator summary tables and value scale summary tables selected for the assessment, divided by account. The indicator summary tables present the rationale and measurement metric for each indicator. The measurement metric defines each indicator quantity (i.e., if it is a distance measurement, what distance is being measured) and the rationale describes why the indicator was included in the assessment and what it represents. The value scale summary tables are used to define the score for each indicator based in the indicator quantity value.

In certain cases, the same measurement metric was utilized for multiple indicators. This is considered consistent with the Guidelines which recommend that the selected sub-accounts be non-redundant, meaning they should each represent a differing impact, and that indicators should then be developed to measure the impact associated with each sub-account.

Consistent with the Guidelines, a 6-point value scale system was adopted for the indicators in this assessment.

Table 5.7 Environmental Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
Water Management	Contact and Non-Contact Water Management	The proposed contact water collection system concept consists of perimeter shallow groundwater seepage and surface runoff collection ditches constructed around each pile which convey flows to collection ponds. Discharge from the collection pond will be conveyed to mine water treatment systems prior to discharge at final discharge points to local receivers. The perimeter collection ditches will be surrounded by diversion berms to direct non-contact surface water runoff away from the contact water management system. Larger catchment areas will generate more water requiring management. Larger flows are considered to represent a higher risk of loss of containment and loss of water to the environment. Alternatives with a smaller total contact water catchment area are preferred in this indicator.	The sum of contact and non-contact water area for each alternative, where the areas are defined as follows: Contact Water Area – The catchment area reporting to the internal contact water collection system of the piles (i.e., the pile area) Non-Contact Water Area – the catchment area outside of the piles reporting to the pile's contact water collection system	Area	ha	3,492	4,589	2,341	2,675
Aquatic Life and Habitat	Loss of Watercourse	Alternatives which overlie a greater extent of aquatic habitat have a greater environmental impact. For this assessment, it is assumed that all overlain watercourses are fish bearing. The watercourse length measurement was used to measure overlain aquatic habitat. Alternatives that overlie smaller areas of watercourses are preferred in this indicator.	The area of watercourses overlain by an alternative.	Area	ha	14.87	15.22	9.52	1.10
	Loss of Waterbodies	Alternatives which overlie a greater extent of aquatic habitat have a greater environmental impact. For this assessment, it is assumed that overlain waterbodies are aquatic habitat. The waterbody area measurement was used to measure overlain aquatic habitat. Alternatives that overlie lesser extents of waterbodies are preferred in this indicator.	Area of waterbodies (pond, lake) overlain by the alternative.	Area	ha	47.84	54.35	31.36	3.62

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
	Sensitivity of Overlain Fish Habitat	The environmental impacts associated with an MWMA include impacts to fish habitat. The impacts to fish habitat are a function of the sensitivity of the impacted fish to changes in environmental conditions, the dependence of the species on the habitat they reside in, and the rarity of the habitat and/or species. These items are measured by this indicator and are included in addition to length and area measurements of the impacted watercourses and waterbodies to incorporate the characteristics of the impacted fish habitat into the assessment.	Qualitative evaluation of the sensitivity of fish habitat overlain by the alternative based on the following classification system, which is based on the MTO/DFO/MNRF Environmental Guide for Fish and Fish Habitat: 1. Rare – critical habitat for species at risk or otherwise uncommon habitats 2. Highly sensitive – critical habitat for gamefish species (e.g., spawning habitat) 3. Moderately-high – complex habitat that supports a diverse baitfish and gamefish community 4. Moderate – simple homogeneous habitat (e.g., beaver pond complex) that supports a multitrophic baitfish and gamefish community 5. Moderately Low – simple homogenous habitat (e.g., beaver pond complex) that supports a simple baitfish community 6. Low Sensitivity – no fish habitat overlain or indirect fish habitat that does not directly support a fish population (e.g., ephemeral watercourse) Classification performed qualitatively by Stantec technical lead based on watercourse mapping and aerial photography.	Value	#	4.94	4.94	5.00	5.00
Terrestrial Life and Habitat	Habitat Fragmentation	Alternatives with shorter distances of roads or pipelines through forested areas and wetlands are preferred in this indicator.	Length of new roads through forested areas or wetlands required for the alternative. As the haul roads often run along the same alignment, the total length of new disturbance required for haul roads was used as a measurement metric.	Length	Km	29.1	27.0	38.9	31.3
	Loss of Moose Late Winter Cover Habitat Area	Alternatives which overlie larger moose later wintering areas have a greater environmental impact, reducing habitat for moose. Alternatives that overlie less moose later winter habitat areas are preferred in this indicator.	The area of moose late winter cover habitat overlain by the alternative	Area	ha	170.70	0.0	0.0	119.15
	Loss of Blanding's Turtle Habitat Area	Alternatives which overlie larger Blanding's turtle critical habitat have a greater environmental impact, reducing habitat for Blandin's turtle. Alternatives that overlie less Blanding's turtle critical habitat areas are preferred in this indicator.	The area of Blanding's turtle habitat overlain by the alternative	Area	ha	0.0	0.43	0.0	489.64
	Loss of Boreal Caribou Habitat Area	Alternatives which overlie larger boreal caribou critical habitat have a greater environmental impact, reducing habitat for boreal caribou. Alternatives that overlie less boreal caribou critical habitat areas are preferred in this indicator.	The area of boreal caribou habitat overlain by the alternative	Area	ha	2,185.99	1,194.01	1,693.80	2,529.22

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
	Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate waterfowl nesting, candidate sharp-tailed grouse lek, and candidate marsh breeding bird. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird habitat overlain by the alternative	Area	ha	1467.42	1373.23	1034.80	840.12
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to bald eagle and osprey nesting. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of confirmed bald eagle and osprey nesting habitat overlain by the alternative	Area	ha	0.0	47.82	0.0	0.0
	Loss of Woodland Raptor Nesting Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate woodland raptor nesting. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of woodland raptor nesting habitat overlain by the alternative	Area	ha	995.15	700.60	326.74	204.26
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	Alternatives which overlie larger bird significant wildlife habitat areas have a greater environmental impact. The habitat areas in this indicator are associated to candidate shrub/early successional breeding bird. Alternatives that overlie less bird significant wildlife habitat areas are preferred in this indicator.	The area of shrub/early successional breeding bird habitat overlain by the alternative	Area	ha	65.94	123.79	257.50	21.80
	Loss of Upland Gamebirds Habitat Area	Alternatives which overlie larger upland gamebirds habitat have a greater environmental impact, reducing habitat for upland gamebirds species. Alternatives that overlie fewer upland gamebirds habitat areas are preferred in this indicator.	The area of upland gamebirds habitat overlain by the alternative	Area	ha	1,127.31	865.36	963.91	739.24
	Loss of SOCC (Common Nighthawk and Evening Grosbeak)	Alternatives which overlie larger habitat for bird SOCC including common nighthawk, evening grosbeak, and yellow rail have a greater environmental impact, reducing habitat for such bird species. Alternatives that overlie less habitat for bird SOCC areas are preferred in this indicator.	The area of common nighthawk and evening grosbeak habitat overlain by the alternative	Area	ha	1,932.72	1,685.60	611.98	231.96

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
	Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	Alternatives which overlie larger habitat for bird SAR including short-eared owl and lesser yellowlegs have a greater environmental impact, reducing habitat for such bird species. Alternatives that overlie less habitat for bird SAR areas are preferred in this indicator.	The area of SAR and SoCC bird habitat overlain by the alternative	Area	ha	536.50	373.98	461.40	567.01
	Loss of Wetlands	Alternatives which overlie larger areas of wetlands have a higher environmental impact as they reduce habitat for wildlife and reduce the positive impacts on water quality associated with wetlands. Alternatives that overlie less wetland area are preferred in this indicator.	The area of wetlands within the footprint of the alternative.	Area	ha	1,830.65	2,041.21	1,651.61	2,296.21
	Loss of Forested Area	Alternatives which overlie larger areas of forest have a higher environmental impact, reducing habitat for wildlife. Alternatives that overlie less forested area are preferred in this indicator.	The area of forest within the footprint of an alternative.	Area	ha	995.15	700.60	586.80	231.49
Terrestrial Life and Habitat	Infrastructure Disturbance - Haul Roads	Alternatives which require the construction of larger lengths of new haul roads result in additional environmental impacts through the disturbance of additional land surface. These impacts are not captured in the other identified indicators. Alternatives that require the construction of shorter lengths of new haul roads are preferred in this indicator.	The length of new haul roads within the footprint of an alternative.	Length	km	22.43	32.47	26.32	23.88
Geotechnical Foundation Conditions	Surficial Geology	Alternatives constructed in areas with lower strength foundations and more hydraulically conductive foundation materials pose a higher stability risk and require additional mitigation to meet design criteria.	The alternatives overlie different surficial geologies: Bedrock, Till and Organic Deposits. The stability ranking of different surficial geologies was developed and applied to each material type: 1. Organic Deposits (lowest stability, higher conductivity) (weight 1) 2. Till (low conductivity) (weight 2) 3. Bedrock (highest stability) (weight 6) A weighted average classification value was estimated for each alternative based on overlain materials	Value	#	2.15	2.00	1.85	1.78
Hydrogeology and Seepage Risks	Hydrogeology and seepage characteristics	Alternatives constructed in areas with higher seepage to groundwater pose a higher contamination risk and require additional mitigation to meet design criteria.	The alternatives overlie different surficial geologies: Bedrock, Till and Organic Deposits. The seepage characteristics of different surficial geologies was developed and applied to each material type:1. Bedrock (highest seepage to groundwater) (weight 1)2. Organic deposit (high seepage to groundwater) (weight 2)3. Till (lowest seepage to groundwater) (weight 6)A weighted average classification value was estimated for each alternative based on surficial materials overlain by each alternative.	Value	#	5.81	5.99	5.40	5.12

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
	Seepage to receiver	Alternatives constructed in areas with a higher drawdown to Open Pit dewatering result in less water available to potentially seepage to receivers. Alternatives with less seepage to receiver are preferred in this indicator.	The alternatives overlie different drawdown ZOI due to Open Pit dewatering, including 10 m and 1m ZOI. The seepage characteristics to receiver were determined based on weights associated to the following areas overlain by each alternative: 1. Outside the 1 m drawdown ZOI (weight 1) 2. Within the 1 m drawdown ZOI (weight 3) 3. Within the 10 m drawdown ZOI (weight 6) A weighted average classification value was estimated for each alternative based on overlain areas.	Value	#	3.97	2.94	1.00	1.00
Air Quality	Potential for Dust Generation - Haul Traffic	Waste rock hauling is considered to be the primary source of dust generation due to waste rock storage. The exposed waste rock surface area is not anticipated to significantly impact air quality due to the relatively coarse grained nature of the waste rock, including within the clay impoundment with waste rock. Longer haul distances will result in more dust generation which will have greater impacts on terrestrial and aquatic life. Alternatives with shorter haul distances are preferred in this indicator.	The haul distance to an alternative which was calculated based on the distance from center of the Open Pit to center of the alternative.	Length	km	6.1	9.2	12.0	9.4
Climate Change	Greenhouse Gas Emissions	Alternatives with longer haul distances require the use of larger quantities of fuel and have higher carbon emissions which contribute to climate change. Climate change may increase climate variability and impact the viability of local wildlife in the long-term. Alternatives with shorter haul distances are preferred in this indicator.	The haul distance to an alternative.	Length	km	6.14	9.23	12.01	9.43
MWMA Failure	Maximum Pile Height	Greater pile heights may pose higher risk of failure. Alternatives with lesser pile heights are preferred in this indicator.	The maximum height of pile measured at the maximum section of the pile.	Height	m	100.00	130.00	170.00	120.00
	Foundation Stability	Alternatives constructed in areas with lower strength foundations pose a higher stability risk.	The alternatives overlie different surficial geologies: Bedrock, Till and Organic Deposits. The stability ranking of different surficial geologies was developed and applied to each material type: 1. Organic Deposits (lowest stability, higher conductivity) (weight 1) 2. Till (low conductivity) (weight 2) 3. Bedrock (highest stability) (weight 6) A weighted average classification value was estimated for each alternative based on overlain materials	Value	#	2.15	2.00	1.85	1.78

Notes:
- Additional information presented in the MWMA characterization criteria tables in Appendix F.
- Conceptual designs of the MWMAs are presented in Figure 5.2 through Figure 5.5.
- Baseline information is presented in the figures included in Appendix B.

Table 5.8 Environmental Account – Quantitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Water Management	Contact and Non-Contact Water Management	6: Less than or equal to 2,000 5: Between 2,000 and ≤2,300 4: Between 2,300 and ≤2,600 3: Between 2,600 and ≤2,900 2: Between 2,900 and 3,200 1: Greater than or equal to 3200	Area, ha
Aquatic Life and Habitat	Loss of Watercourse	6: Less than or equal to 1 5: Between 1 and ≤4 4: Between 4 and ≤7 3: Between 7 and ≤10 2: Between 10 and 13 1: Greater than or equal to 13	Area, ha
	Loss of Waterbodies	6: Less than or equal to 0 5: Between 0 and ≤12 4: Between 12 and ≤24 3: Between 24 and ≤36 2: Between 36 and 48 1: Greater than or equal to 48	Area, ha
	Sensitivity of Overlain Fish Habitat	6: Greater than or equal to 6 5: Between 6 and >5 4: Between 5 and >4 3: Between 4 and >3 2: Between 3 and 2 1: Less than or equal to 2	Value, #

Sub-Account	Indicator	Rating	Measurement, Unit
Terrestrial Life and Habitat	Habitat Fragmentation	6: Less than or equal to 26 5: Between 26 and ≤28.8 4: Between 28.8 and ≤31.6 3: Between 31.6 and ≤34.4 2: Between 34.4 and 37.2 1: Greater than or equal to 37.2	Length, km
	Loss of Moose late winter cover Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤40 4: Between 40 and ≤80 3: Between 80 and ≤120 2: Between 120 and 160 1: Greater than or equal to 160	Area, ha
	Loss of Blanding's Turtle Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤100 4: Between 100 and ≤200 3: Between 200 and ≤300 2: Between 300 and 400 1: Greater than or equal to 400	Area, ha
	Loss of Boreal Caribou Habitat Area	6: Less than or equal to 1,000 5: Between 1,000 and ≤1,320 4: Between 1,320 and ≤1,640 3: Between 1,640 and ≤1,960 2: Between 1,960 and 2,280 1: Greater than or equal to 2,280	Area, ha
	Loss of Candidate Waterfowl Nesting, Candidate Sharp-tailed Grouse Lek, and Candidate Marsh Bird Breeding Habitat Area	6: Less than or equal to 800 5: Between 800 and ≤940 4: Between 940 and ≤1,080 3: Between 1,080 and ≤1,220 2: Between 1,220 and 1,360 1: Greater than or equal to 1,360	Area, ha
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤10 4: Between 10 and ≤20 3: Between 20 and ≤30 2: Between 30 and 40 1: Greater than or equal to 40	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	Loss of Woodland Raptor Nesting Habitat Area	6: Less than or equal to 200 5: Between 200 and ≤360 4: Between 360 and ≤520 3: Between 520 and ≤680 2: Between 680 and 840 1: Greater than or equal to 840	Area, ha
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	6: Less than or equal to 0 5: Between 0 and ≤60 4: Between 60 and ≤120 3: Between 120 and ≤180 2: Between 180 and 240 1: Greater than or equal to 240	Area, ha
	Loss of Upland Gamebirds Habitat Area	6: Less than or equal to 2,000 5: Between 2,000 and ≤2,200 4: Between 2,200 and ≤2,400 3: Between 2,400 and ≤2,600 2: Between 2,600 and 2,800 1: Greater than or equal to 2,800	Area, ha
	Loss of SoCC (Common Nighthawk and Evening Grosbeak)	6: Less than or equal to 0 5: Between 0 and ≤400 4: Between 400 and ≤800 3: Between 800 and ≤1,200 2: Between 1,200 and 1,600 1: Greater than or equal to 1,600	Area, ha
	Loss of SAR (Short-eared Owl, Lesser Yellowlegs, and Yellow Rail) Habitat Area	6: Less than or equal to 350 5: Between 350 and ≤400 4: Between 400 and ≤450 3: Between 450 and ≤500 2: Between 500 and 550 1: Greater than or equal to 550	Area, ha
	Loss of Wetlands	6: Less than or equal to 1,600 5: Between 1,600 and ≤1,740 4: Between 1,740 and ≤1,880 3: Between 1,880 and ≤2,020 2: Between 2,020 and 2,160 1: Greater than or equal to 2,160	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	Loss of Forested Area	6: Less than or equal to 200 5: Between 200 and ≤360 4: Between 360 and ≤520 3: Between 520 and ≤680 2: Between 680 and 840 1: Greater than or equal to 840	Area, ha
	Infrastructure Disturbance - Haul Roads	6: Less than or equal to 22 5: Between 22 and ≤24.4 4: Between 24.4 and ≤26.8 3: Between 26.8 and ≤29.2 2: Between 29.2 and 31.6 1: Greater than or equal to 31.6	Length, km
Geotechnical Foundation Conditions	Surficial Geology	6: Greater than or equal to 2.2 5: Between 2.2 and >2.12 4: Between 2.12 and >2.04 3: Between 2.04 and >1.96 2: Between 1.96 and 1.88 1: Less than or equal to 1.88	Value, #
Air Quality	Potential for Dust Generation - Haul Traffic	6: Less than or equal to 6 5: Between 6 and ≤7.2 4: Between 7.2 and ≤8.4 3: Between 8.4 and ≤9.6 2: Between 9.6 and 10.8 1: Greater than or equal to 10.8	Length, km
Climate Change	Greenhouse Gas Emissions	6: Less than or equal to 6 5: Between 6 and ≤7.2 4: Between 7.2 and ≤8.4 3: Between 8.4 and ≤9.6 2: Between 9.6 and 10.8 1: Greater than or equal to 10.8	Length, km

Table 5.9 Technical Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
Design and Operational Complexity	Maximum Pile Height	Greater pile heights may require more complex designs including foundation preparation and construction. Alternatives with lesser pile heights are preferred in these indicators.	The maximum height of pile measured at the maximum section of the pile.	Height	m	100.00	130.00	170.00	120.00
	Length of Required Non-Contact Water Diversion	Non-contact water diversion is relatively more technically complex compared to pile construction. This indicator measures this increased complexity as a function of the length of non-contact water diversion. The complexity associated with the diversion is accounted for in the sub-account weighting. Alternatives that require no diversions or shorter diversions are preferred in this indicator	Length of non-contact water diversion required.	Length	km	14.19	21.83	6.42	4.30
	River/Highway Bridge Crossings	River /Highway Bridge Crossing is relatively more technically complex compared to pile construction. This indicator measures this increased complexity as a function of construction of river/highway bridge crossing.	Number of river/highway bridge crossing required.	Value	#	0.0	0.0	4.00	2.00

Note:
- Additional information presented in the MWMA characterization criteria tables in Appendix F.
- Conceptual designs of the MWMAs are presented in Figure 5.2 through Figure 5.5.
- Baseline information is presented in the figures included in Appendix B.

Table 5.10 Technical Account – Qualitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Design and Operational Complexity	Maximum Pile Height	6: Less than or equal to 100 5: Between 100 and ≤120 4: Between 120 and ≤140 3: Between 140 and ≤160 2: Between 160 and 180 1: Greater than or equal to 180	Height, m
	Length of Required Non-Contact Water Diversion	6: Less than or equal to 4 5: Between 4 and ≤7.6 4: Between 7.6 and ≤11.2 3: Between 11.2 and ≤14.8 2: Between 14.8 and 18.4 1: Greater than or equal to 18.4	Length, km
	River/Highway Bridge Crossings	6: Less than or equal to 0 5: Between 0 and ≤1 4: Between 1 and ≤2 3: Between 2 and ≤3 2: Between 3 and 4 1: Greater than or equal to 4	Quantity, #

Table 5.11 Project Economics Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
Capital Cost	CAPEX - Haul Road	MWMA capital construction includes construction of the MWMA haul roads. Alternatives which require the construction of shorter haul road lengths are preferred in this indicator.	Total length of new roads required to haul waste rock to an alternative.	Length	km	22.4	32.47	26.32	23.88
	CAPEX – Perimeter Ditch	The contact water collection system concept includes the construction of perimeter collection ditches and collection ponds to manage contact water. The capital costs associated with perimeter collection ditch construction are considered to be a function of the length of the perimeter collection ditches which are a function of the MWMA perimeter length. Alternatives with shorter perimeters are preferred in this indicator.	Total length of perimeter of the alternative.	Length	km	21.30	30.40	19.50	19.70
	CAPEX – Collection Pond	The contact water collection system concept includes the construction of perimeter collection ditches and collection ponds to manage contact water. The capital costs associated with collection pond construction are considered to be a function of the MWMA catchment area. Alternatives with a smaller total contact water catchment area are preferred in this indicator.	The catchment area reporting to the internal surface water management system of an alternative (i.e., the total area of an alternative with mine water management system)	Area	ha	2,940.00	2,880.00	2,320.00	2,590.00
	CAPEX - Non-Contact Water Diversion Costs	Alternatives will require the construction of a diversion to reroute around the pile. The diversion will likely consist of relatively significant earthworks given the site topography and may include the construction of a diversion dam and expansion of a portion of the existing watercourse which extends from the diversion channel. The anticipated cost associated with non-contact water diversion costs were incorporated into the assessment though the application of a high weighting factor for the indicator. It may be possible to stage construction of the pile to avoid construction of the diversion as a part of initial Project operation and, as such, non-contact water diversion costs could be considered as sustaining capital costs. However, for conceptual alternatives assessment purposes, it is assumed that non-contact water diversions would be constructed as part of initial capital expenditures and this indicator was included in the capital costs sub-account. Alternatives with shorter non-contact water diversion lengths are preferred in this indicator.	Length of non-contact water diversion required for each alternative.	Length	km	14.19	21.83	6.42	4.30
	Fish Habitat Compensation Costs - Watercourse	Impacts to fish bearing waterbodies require offsetting under the *Fisheries Act* and MDMER. Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring and contingency, based on the cost of a third party completing the work. These costs are included in the CAPEX subaccount as a letter of credit and considered a capital expenditure. For this assessment, it is assumed that all watercourses are fish bearing. A length of watercourse measurement was used as a measure of the amount of required fish habitat compensation. It is assumed that the costs associated with fish habitat compensation are a function of the length of overlain watercourses. Alternatives that overlie shorter lengths of watercourses are preferred in this indicator.	The area of watercourses overlain by MWMA alternatives.	Area	ha	14.874	15.22	9.52	1.10
	Fish Habitat Compensation Costs - Waterbody	Impacts to fish bearing waterbodies require offsetting under the *Fisheries Act* and MDMER. Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring and contingency, based on the cost of a third party completing the work. These costs are included in the CAPEX subaccount as a letter of credit and considered a capital expenditure. For this assessment, it is assumed that all waterbodies are fish bearing. An area of waterbody measurement was used as a measure of the amount of required fish habitat compensation. It is assumed that the costs associated with fish habitat compensation are a function of the area of overlain waterbodies. Alternatives that overlie smaller areas of waterbodies are preferred in this indicator.	The area of waterbodies overlain by MWMA alternatives.	Area	ha	47.84	54.35	31.36	3.62
	CAPEX - River/Highway Bridge Crossing	Number of highway crossings required for construction of the access road to the alternative.	The number of highway crossing (e.g., bridges, controlled access) required by MWMA alternatives.	Value	#	0.0	0.0	4.00	2.00

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
	CAPEX - Foundation Preparation	MWMA capital construction includes foundation preparation which is anticipated to consist of clearing, grubbing, and stripping. Alternatives with smaller footprints are anticipated to have lower foundation preparation costs. Alternatives with smaller footprint areas are preferred in this indicator.	The two-dimensional area of the footprint of the MWMA alternatives.	Value	#	2.15	2.00	1.85	1.78
Operating Cost	OPEX – Waste Rock Hauling	Hauling costs are a significant component of a project's operating costs. Waste rock hauling is considered the key differentiating component of operating costs associated with waste rock management. Waste rock hauling costs are considered a function of haul distance. Other MWMA-related operating cost components (such as pile maintenance) are anticipated to be similar for all alternatives. Alternatives that have shorter haul distance are preferred in this indicator.	The haul distance to an alternative which was calculated based on the distance from center of the Open Pit to center of the alternative.	Length	km	6.14	9.23	12.01	9.43
	OPEX - Land Use	Alternatives partially lie within areas owned by Canada Nickel and within the Canada Nickel claim boundary. As such, land use costs are considered between alternatives. Alternatives within higher portions of Canada Nickel claims and surface rights are preferred in this indicator.	Sum of unpatented Crown land and land with claims and rights not owned by Canada Nickel.	Value	%	46.09	47.74	25.24	72.83
Closure Cost	Cover Construction Costs	Closure costs are an important economic consideration. The MWMA closure concept includes the placement of cover material over the top platform of the piles and bench surfaces and side slopes. Closure costs associated with the alternatives are anticipated to be similar with the exception of variations in area requiring the placement of closure cover. As such, the closure cover costs are assumed to be a function of the area of the pile as it is assumed that unit rates for cover placement will be similar between alternatives. Alternatives with a smaller two-dimensional pile area are preferred in this indicator.	The two-dimensional area of the MWMA alternatives.	Area	ha	2,873.80	2,789.83	2,253.17	2,529.22

Notes:
- Additional information presented in the MWMA characterization criteria tables in Appendix F.
- Conceptual designs of the MWMAs are presented in Figure 5.2 through Figure 5.5.
- Baseline information is presented in the figures included in Appendix B.

Table 5.12 Project Economics Account – Qualitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Capital Cost	CAPEX - Haul Road	6: Less than or equal to 20 5: Between 20 and ≤22.8 4: Between 22.8 and ≤25.6 3: Between 25.6 and ≤28.4 2: Between 28.4 and 31.2 1: Greater than or equal to 31.2	Length, km
	CAPEX – Perimeter Ditch	6: Less than or equal to 10 5: Between 10 and ≤16 4: Between 16 and ≤22 3: Between 22 and ≤28 2: Between 28 and 34 1: Greater than or equal to 34	Length, km
	CAPEX – Collection Pond	6: Less than or equal to 2,000 5: Between 2,000 and ≤2,200 4: Between 2,200 and ≤2,400 3: Between 2,400 and ≤2,600 2: Between 2,600 and 2,800 1: Greater than or equal to 2,800	Area, ha
	CAPEX - Non-Contact Water Diversion Costs	6: Less than or equal to 4 5: Between 4 and ≤6 4: Between 6 and ≤8 3: Between 8 and ≤11 2: Between 11 and 13 1: Greater than or equal to 13	Length, km
	Fish Habitat Compensation Costs - Watercourse	6: Less than or equal to 2 5: Between 2 and ≤4.6 4: Between 4.6 and ≤7.2 3: Between 7.2 and ≤9.8 2: Between 9.8 and 12.4 1: Greater than or equal to 12.4	Area, ha
	Fish Habitat Compensation Costs - Waterbody	6: Less than or equal to 0 5: Between 0 and ≤10 4: Between 10 and ≤20 3: Between 20 and ≤30 2: Between 30 and 40 1: Greater than or equal to 40	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
	CAPEX - River/Highway Bridge Crossing	6: Less than or equal to 0 5: Between 0 and ≤1 4: Between 1 and ≤2 3: Between 2 and ≤3 2: Between 3 and 4 1: Greater than or equal to 4	Quantity, #
	CAPEX - Foundation Preparation	6: Greater than or equal to 2.2 5: Between 2.2 and >2.12 4: Between 2.12 and >2.04 3: Between 2.04 and >1.96 2: Between 1.96 and 1.88 1: Less than or equal to 1.88	Area, ha
Operating Cost	OPEX – Waste Rock Hauling	6: Less than or equal to 6 5: Between 6 and ≤7 4: Between 7 and ≤8 3: Between 8 and ≤10 2: Between 10 and 11 1: Greater than or equal to 11	Length, km
	OPEX - Land Use	6: Less than or equal to 25 5: Between 25 and ≤35 4: Between 35 and ≤40 3: Between 45 and ≤50 2: Between 55 and 60 1: Greater than or equal to 65	Value, %
Closure Cost	Cover Construction Costs	6: Less than or equal to 2,000 5: Between 2,000 and ≤2,600 4: Between 2,600 and ≤3,200 3: Between 3,200 and ≤3,800 2: Between 3,800 and 4,400 1: Greater than or equal to 4,400	Area, ha

Table 5.13 Socio-Economic Account – Selected Indicators

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
Land and Resource Use - Animal Harvesting	Loss of Hunting	Alternatives which impact larger amounts of hunting area have a larger socio-economic impact by reducing the amount of habitat available for wildlife foraging and breeding and the amount of land available for hunting activities. For LRU, it is assumed that both forest and wetland areas may be used for hunting and that both are equally valuable for hunting activities. Alternatives which overlie less forest or wetland areas are preferred in this indicator.	Area of forests or wetlands overlain by an alternative. As the forested areas and wetlands do not overlap in the mapping used for this assessment, the total area of forests or wetlands was used as a measurement metric.	Area	ha	1,706.04	1,489.52	1,288.43	1,043.51
	Loss of Fishing - Watercourses	Alternatives which overlie greater lengths of watercourses may have a greater impact on fisheries and thus have larger socio-economic impacts. For LRU, all mapped watercourses were assumed to be fish bearing and were considered to be of equivalent fishing value. Alternatives which overlie shorter length of watercourses are preferred in this indicator.	The length of watercourses overlain by the alternative.	Length	km	50.93	48.90	26.57	17.68
	Loss of Fishing – Waterbodies	Alternatives which overlie greater extents of waterbodies may have a greater impact on fisheries and thus have larger socio-economic impacts. For LRU, it is assumed that all mapped waterbodies are of equivalent fishing value. Alternatives which overlie smaller areas of waterbodies are preferred in this indicator	The area of waterbodies overlain by the alternative.	Area	ha	47.84	54.35	31.36	3.62
	Loss of Bear Management Areas	Alternatives which overlie a larger extent of bear management areas reduce the land available for bear habitat and the available land for bear hunting. It is understood that bear hunting activities are economically beneficial in the area and reductions in bear hunting would have a socio-economic impact by reducing the ability of locals to obtain economic benefit from the land. This indicator was included in addition to the “Loss of Bear Management Areas - Area” indicator to allow the area of lost bear management areas to be incorporated into the assessment along with the impacts on multiple license holders. Alternatives which overlie smaller areas of bear management areas are preferred in this indicator.	Area of bear management areas overlain by the alternative.	Area	ha	672.02	497.53	808.32	0.0
	Loss of Bear Management Areas - Number	Alternatives which overlie multiple bear management areas impact a larger number of licensed tourist outfitters/resident license holders and have a larger socio-economic impact by reducing the number of users who are able to obtain benefits from bear hunting. This indicator was included in addition to the “Loss of Bear Management Areas - Area” indicator to allow the impacts on multiple tenure holders to be incorporated into the assessment along with the extent of the bear management areas that are overlain. Alternatives which overlie fewer bear management areas are preferred in this indicator.	Number of bear management areas overlain by the alternative.	Value	#	1	2	1	0
	Loss of Trapline Areas	Alternatives which overlie a larger extent of trapline areas reduce the land available for animal habitat and trapping. It is understood that trapping is economically beneficial in the area and the reductions in animal yield from trapping would have socio-economic impacts. This indicator was included in addition to the “Loss of Trapline Areas - Area” indicator to allow the area of lost trapline areas to be incorporated into the assessment along with the impacts on multiple tenure holders. Alternatives which overlie smaller areas of trapline areas are preferred in this indicator.	Area of trapline areas overlain by the alternative.	Area	ha	2,873.80	2,789.83	2,253.17	2,529.22
	Loss of Trapline Areas - Number	Alternatives which overlie multiple trapline areas impact a larger number of registered trappers and have a larger socio-economic impact by	Number of trapline areas overlain by the alternative.	Value	#	2	2	3	1

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
		reducing the number of users who are able to obtain benefits from trapping. This indicator was included in addition to the "Loss of Trapline Areas - Area" indicator to allow the impacts on multiple tenure holders to be incorporated into the assessment along with the extent of the trapline areas that are overlain. Alternatives which overlie fewer trapline areas are preferred in this indicator.							
	Loss of Travel Route	The identified alternatives overlie travel routes documented by traditional users. Alternatives which overlie travel routes have a greater socio-economic impact and impact the ability of traditional users to access not only the land overlain by the alternative but also lands which were previously accessed via the overlain route. For this assessment, it is assumed that all mapped travel routes are of equivalent importance. Alternatives which overlie lesser areas of mapped travel routes are preferred in this indicator.	Area of mapped travel routes overlain by the alternative.	Area	ha	12.96	15.30	27.86	23.14
Land and Mineral Use Rights	Loss of Unpatented Crown Land	Facilities overlying areas where unpatented crown land or mineral use claims/rights exist present a higher risk of socio-economic impacts and may impact the ability to successfully permit and operate a mine. Alternatives which overlie lesser areas of unpatented Crown land and lands with claims and rights not owned by Canada Nickel are preferred in this indicator.	Percentage of the area of unoccupied Crown land overlain by the alternative.	Value	%	0	0	0	10
	Lands with Claims/Rights Owned by Others		Percentage of land or mineral use rights owned by others overlain by the alternatives.	Value	%	46.09	47.74	25.24	62.88
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	Alternatives which overlie larger areas of unoccupied Crown lands impact the area available for current and future Indigenous users to practice traditional land use activities. Alternatives which overlie lesser areas of unoccupied Crown lands are preferred in this indicator.	Area of the alternative overlying unoccupied Crown land.	Area	ha	119.39	62.93	128.08	345.45
	Loss of Cultural Continuity Areas	Cultural continuity is comprised of numerous interrelated values are important for cultural persistence and way of life, including knowledge transmission, spirituality, sense of place, and identity.	Alternatives which overlie (or impact access to) smaller cultural community areas of are preferred in this indicator. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	4,195.92	4,292.48	8,412.34	6,986.80
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Loss of Hunting and Trapping Areas	Indigenous users have documented a variety of hunting and trapping areas that are overlain by the alternatives. This Indigenous knowledge has been included in the assessment through this indicator. The loss of these areas represents a loss of potential hunting and trapping opportunities. Alternatives which overlie (or impact access to) smaller areas of identified hunting areas are preferred in this indicator.	Hunting Areas overlain by the alternative, which were identified after engagement with Indigenous communities. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	3,763.29	4,099.40	9,285.14	7,711.70
	Loss of Hunting Subsistence Areas	The identified alternatives overlie subsistence areas documented by Indigenous users. Subsistence areas are understood to represent areas with activities through which culture is lived and transmitted, thereby enabling cultural continuity for current and future generations. Loss of subsistence areas represent a socio-economic impact. Alternatives which overlie smaller extents of mapped subsistence areas for hunting and trapping are preferred in his indicator.	Hunting subsistence gathering areas overlain by the alternative, which were identified after engagement with Indigenous communities. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	162.02	198.21	348.19	289.19
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	Indigenous users have documented plant harvesting areas. Alternatives which overlie a larger extent of mapped plant harvesting areas represent a greater socio-economic impact to traditional users. Alternatives which overlie smaller areas used for plant harvesting are preferred in this indicator.	Harvesting areas related to plants overlain by the alternative, which were identified after engagement with Indigenous nations. Individual nation community areas are assessed cumulatively when located within	Area	ha	1,796.21	2,269.98	3,983.32	3,308.32

Sub-Account	Indicator	Rationale for Indicator	Indicator Quantity Measurement Metric	Indicator Parameter	Indicator Quantity Unit	MWMA-1	MWMA-2	MWMA-3	MWMA-4
			the same alternative, which can equate to values larger than the alternative footprint area.						
	Loss of Plant Harvesting Subsistence Areas	The identified alternatives overlie subsistence areas documented by Indigenous users. Subsistence areas are understood to represent areas with activities through which culture is lived and transmitted, thereby enabling cultural continuity for current and future generations. Loss of subsistence areas represent a socio-economic impact. Alternatives which overlie smaller extents of mapped subsistence areas for plants are preferred in his indicator.	Plants subsistence gathering areas overlain by the alternative, which were identified after engagement with Indigenous nations. Individual nation community areas are assessed cumulatively when located within the same alternative, which can equate to values larger than the alternative footprint area.	Area	ha	983.54	1,066.06	2,033.45	1,688.86
Notes: - Additional information presented in the MWMA characterization criteria tables in Appendix F. - Conceptual designs of the MWMAs are presented in Figure 5.2 throughFigure 5.5. - Baseline information is presented in the figures included in Appendix B.									

Table 5.14 Socio-Economic Account – Qualitative Value Scale

Sub-Account	Indicator	Rating	Measurement, Unit
Land and Resource Use - Animal Harvesting	Loss of Hunting	6: Less than or equal to 2,200 5: Between 2,200 and ≤2,360 4: Between 2,360 and ≤2,520 3: Between 2,520 and ≤2,680 2: Between 2,680 and 2,840 1: Greater than or equal to 2,840	Area, ha
	Loss of Fishing - Watercourses	6: Less than or equal to 10 5: Between 10 and ≤18 4: Between 18 and ≤26 3: Between 26 and ≤34 2: Between 34 and 42 1: Greater than or equal to 42	Length, km
	Loss of Fishing – Waterbodies	6: Less than or equal to 0 5: Between 0 and ≤10 4: Between 10 and ≤20 3: Between 20 and ≤30 2: Between 30 and 40 1: Greater than or equal to 40	Area, ha
	Loss of Bear Management Areas	6: Less than or equal to 400 5: Between 400 and ≤500 4: Between 500 and ≤600 3: Between 600 and ≤700 2: Between 700 and 800 1: Greater than or equal to 800	Area, ha
	Loss of Bear Management Areas - Number	6: Less than or equal to 0 5: Between 0 and ≤1 4: Between 1 and ≤2 3: Between 2 and ≤3 2: Between 3 and 4 1: Greater than or equal to 4	
	Loss of TraplineAreas	6: Less than or equal to 2,000 5: Between 2,000 and ≤2,200 4: Between 2,200 and ≤2,400 3: Between 2,400 and ≤2,600 2: Between 2,600 and 2,800 1: Greater than or equal to 2800	Area, ha
	Loss of Trapline Areas - Number	6: Less than or equal to 0 5: Between 0 and ≤1 4: Between 1 and ≤2 3: Between 2 and ≤3 2: Between 3 and 4 1: Greater than or equal to 4	
	Loss of Travel Route	6: Less than or equal to 0 5: Between 0 and ≤8 4: Between 8 and ≤16 3: Between 16 and ≤24 2: Between 24 and 32 1: Greater than or equal to 32	Area, ha

Sub-Account	Indicator	Rating	Measurement, Unit
Land and Mineral Use Rights	Loss of Unpatented Crown Land	6: Less than or equal to 0 5: Between 0 and ≤2 4: Between 2 and ≤4 3: Between 4 and ≤6 2: Between 6 and 8 1: Greater than or equal to 8	Area, ha
	Lands with Claims/Rights Owned by Others	6: Less than or equal to 20 5: Between 20 and ≤36 4: Between 36 and ≤52 3: Between 52 and ≤68 2: Between 68 and 84 1: Greater than or equal to 84	Area, ha
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	6: Less than or equal to 50 5: Between 50 and ≤120 4: Between 120 and ≤190 3: Between 190 and ≤260 2: Between 260 and 330 1: Greater than or equal to 330	Area, ha
	Loss of Cultural Continuity Areas	6: Less than or equal to 4,000 5: Between 4,000 and ≤5,000 4: Between 5,000 and ≤6,000 3: Between 6,000 and ≤7,000 2: Between 7,000 and 8,000 1: Greater than or equal to 8,000	Area, ha
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	Loss of Hunting and Trapping Areas	6: Less than or equal to 3,000 5: Between 3,000 and ≤4,400 4: Between 4,400 and ≤5,800 3: Between 5,800 and ≤7,200 2: Between 7,200 and 8,600 1: Greater than or equal to 8600	Area, ha
	Loss of Hunting Subsistence Areas	6: Less than or equal to 150 5: Between 150 and ≤190 4: Between 190 and ≤230 3: Between 230 and ≤270 2: Between 270 and 310 1: Greater than or equal to 310	Area, ha
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	6: Less than or equal to 1,700 5: Between 1,700 and ≤2,160 4: Between 2,160 and ≤2,620 3: Between 2,620 and ≤3,080 2: Between 3,080 and 3,540 1: Greater than or equal to 3,540	Area, ha
	Loss of Plant Harvesting Subsistence Areas	6: Less than or equal to 900 5: Between 900 and ≤1,140 4: Between 1,140 and ≤1,380 3: Between 1,380 and ≤1,620 2: Between 1,620 and 1,860 1: Greater than or equal to 1,860	Area, ha

5.5 Step 5: Value-Based Decision Process

After developing the multiple accounts ledger, the assessment process shifts to the “value-based decision process” where value judgments are applied through weighting factors and the assessed alternatives are compared to identify a preferred alternative. The value-based decision process performed in Step 5 consists of assigning scoring and weighting factor values to the indicators and weighting factor values to the sub-accounts and accounts. With the application of scoring and weighting factors, the quantitative analysis is completed, and the preferred alternative is identified.

5.5.1 Scoring and Weighting

Scoring is performed by applying the value scales presented in Section 5.3.2 to the indicator quantities for each indicator. Weighting factors are then applied, and the quantitative analysis is conducted by multiplying weighting factor values by scores to obtain merit scores and dividing the merit scores by the sum of the weightings to obtain normalized merit ratings. This process is in accordance with the requirements of the Guidelines.

Weighting values allow for the incorporation of value judgments into the assessment. By assigning weighting factors, the relative value of indicators, sub-accounts, and accounts is considered. Weighting factor values were selected based on input from Stantec’s expert technical discipline leads. Table 5.15 to Table 5.18 present a summary of the weighting factors applied to each indicator, sub-account, and account along with a rationale for each weighting.

When reviewing weighting factor values, note that the weighting magnitude is only important relative to the other indicators within a specific sub-account, to the other sub-accounts within a specific account, or other accounts. This is due to the normalization performed on each sub-account, account, and alternative as part of the quantitative analysis process, as discussed in Section 2. This process is presented in the quantitative analysis tables (Section 5.5.2) where the calculated scores are divided by the sum of weighting factor values to obtain a rating.

Table 5.15 Environmental Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Water Management	2	A weighting of 2 was assigned to the water management sub-account. A judgment was made to not select a higher weighting as this sub-account measures potential environmental impacts associated with water management while many of the other sub-accounts in the environmental account measure direct impacts associated with the MWMA footprint (such as “Aquatic Life and Habitat” and “Terrestrial Life and Habitat”).	Contact and Non-Contact Water Management	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment. See discussion in Section 2 regarding this concept.
Aquatic Life and Habitat	6	A weighting of 6 was assigned to the aquatic life and habitat sub-account to reflect the value judgment that the impacts to aquatic life and habitat associated with the MWMA alternatives are higher than the other sub-accounts in the Environmental account and the fact that the water management sub-account represents risk items while the Aquatic Life and Habitat sub-account largely measures known impacts (such as areas overlain by the proposed alternative).	Loss of Watercourses	6	This indicator was given a weighting of 6 to reflect the relatively high ecological value associated with fish habitat in waterbodies.
			Loss of Waterbodies	6	
			Sensitivity of Overlain Fish Habitat	6	This indicator was assigned a weighting of 6 to reflect the high perceived importance associated with sensitive and rare habitats and populations.
Terrestrial Life and Habitat	4	A weighting of 4 was assigned to the terrestrial habitat sub-account. This weighting reflects the importance of wildlife and wildlife habitat while recognizing the lesser impacts on terrestrial life and habitat associated with the MWMA alternatives as compared to the impacts on aquatic life and habitat. Additionally, this sub-account was assigned a lower weighting than the aquatic life and habitat sub-account to reflect the greater sensitivity of aquatic life to loss of habitat as compared to terrestrial life, which can more easily adapt to adjacent terrestrial areas in the case of development.	Habitat Fragmentation	4	This indicator was assigned a weighting of 4 to reflect the perceived less significant impacts associated with habitat fragmentation as compared to direct loss of habitat through overlaying with the MWMA (as measured in the “Loss of Forested Area” indicator) and proximity to raptor nests.
			Loss of Moose late winter cover Habitat Area	6	This indicator was given a weighting of 6 to reflect the relatively highest importance of moose late winter cover habitat area for the species.
			Loss of Blanding's Turtle Habitat Area	6	This indicator was given a weighting of 6, reflecting the high importance of Blanding's turtle habitat area for the species given their limited mobility compared to other species.
			Loss of Boreal Caribou Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of boreal caribou habitat area as there has been no record of presence in the study area.
			Loss of Waterfowl Nesting, Sharp-tailed Grouse lek, Marsh Breeding Bird and Yellow rail Habitat Area	4	This indicator was given a weighting of 4 to reflect the relatively high importance of bird nesting and habitat area as there is limited habitat available in the overall study area for these species.
			Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of birds of prey as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Woodland Raptor Nesting Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of raptor nesting habitat area as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Shrub/Early Successional Breeding Bird Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of shrub/early successional breeding bird habitat area as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Upland Gamebirds Habitat Area	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of upland gamebirds habitat area as there is abundant habitat available in the overall study area beyond the alternative footprints.
			Loss of SOCC (Common Nighthawk and Evening Grosbeak)	2	This indicator was given a weighting of 2 to reflect the relatively lower importance of common nighthawk and evening grosbeak habitat area as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of SAR Birds Habitat Area	5	This indicator was given a weighting of 5, reflecting relatively high importance of SAR birds. Given, there is abundant habitat available in the study area beyond the alternative footprints, it has not been assigned a weighting of 6.

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
			Loss of Wetland Area	2	This indicator was assigned a weighting of 2, reflecting the relative importance of wetlands as there is abundant habitat available in the study area beyond the alternative footprints.
			Loss of Forested Area	2	This indicator was assigned a weighting of 2, reflecting the relative importance of forested areas as there is abundant habitat available in the study area beyond the alternative footprints.
			Infrastructure Disturbance - Haul Roads	2	This indicator was assigned a weighting of 2 to reflect the relatively lower importance of infrastructure disturbance due to haul roads as the habitat is of a low quality (e.g. pollinator species like Monarch) and pose a risk of mortality to some species.
Geotechnical Foundation Conditions	3	A weighting of 3 was assigned to the geotechnical foundation conditions. A judgment was made to not select a higher weighting as this sub-account measures potential environmental impacts associated with geotechnical foundation conditions while many of the other sub-accounts in the environmental account measure direct impacts associated with the MWMA footprint (such as “Aquatic Life and Habitat”).	Surficial Geology	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment. See discussion in Section 2 regarding this concept.
Hydrogeology and Seepage Risks	4	A weighting of 4 was assigned to the hydrogeology component. A judgment was made to not select a higher value similar to the aquatic life and habitat weighting as this sub-account measures potential environmental impacts associated with hydrogeology and seepage conditions while many of the other sub-accounts in the environmental account measure direct impacts associated with the MWMA footprint (such as “Aquatic Life and Habitat”).	Hydrogeology and seepage characteristics	4	A weighting of 4 was assigned to the two indicators in the Hydrogeology and Seepage Risks sub-account. Given the receptor for discharge/seepage to groundwater is humans and that the receptor for discharge/seepage to surface water is humans and aquatic species, impacts to groundwater and surface water through seepage are considered of the same level of importance.
			Seepage to receiver	4	
Air Quality	3	A weighting of 3 was assigned to this sub-account as air quality impacts are considered to be less important than the impacts to aquatic or terrestrial life and habitat that are also considered in this account.	Potential for Dust Generation	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment. See discussion in Section 2 regarding this concept.
Climate Change	1	A weighting of 1 was assigned to this sub-account as the environmental impacts associated with the other sub-accounts in this account (such as terrestrial and aquatic life and habit) are considered significantly higher than the overall influence of haul truck traffic from this individual project on climate change.	Greenhouse Gas Emissions	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment. See discussion in Section 2 regarding this concept.
MWMA Failure	2	A weighting of 2 was assigned to the MWMA Failure sub-account which measures risk of failure (where risk is equivalent to the product of likelihood and consequence). This weighting is considered appropriate as a failed waste rock and stockpiled clay and sand/till slope will not have the same run out lengths as a TMF slope failure and potential impacts to aquatic habitat, and it does not represent a direct impact within the alternative footprint.	Maximum Pile Height	3	A weighting of 3 was assigned to the two indicators as failure of a pile is function of the pile height and stability of the foundation with the contribution of pile height and foundation stability to failure considered of the same level of importance.
			Foundation Stability	3	

Table 5.16 Technical Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Design and Operational Complexity	5	As there is only one sub-account within this account, the assigned weighting does not impact the alternatives assessment. (See discussion in Section 2 regarding this concept).	Maximum Pile Height	5	A weighting of 5 was assigned to this indicator to represent the higher design complexity considered to be associated with the pile height of the pile as compared to the technical impacts of non-contact water diversion. Note that the technical complexity of non-contact water diversions is also considered to be generally limited but are of relatively lower importance than those associated with pile design.
			Length of Required Non-Contact Water Diversion	4	A weighting of 4 was assigned to this indicator to reflect the higher perceived technical impacts associated with non-contact water diversion length as compared to pile height.
			Number of River/Highway Bridge Crossings	4	A weighting of 4 was assigned as large watercourse or highway bridge crossings for haul roads and pipeline infrastructure add additional design and operational complexity to the option.

Table 5.17 Project Economics Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Capital Cost	6	Capital costs typically have the highest impact on Project financial calculations as they represent a significant portion of the estimated net present value costs (which apply discounting to account for the time value of money) for a proposed project. Accordingly, a weighting of 6 was assigned to this sub-account as it is considered to have a greater impact on overall Project economics than operating cost and closure cost.	CAPEX – Haul Road	2	The costs associated with haul road construction are anticipated to be lower than those associated with fish habitat compensation. As such, a weighting of 2 was assigned to this indicator.
			CAPEX – Perimeter Collection Ditch	2	The costs associated with construction of the contact water collection system (perimeter collection ditch and collection pond) are anticipated to be relatively low compared to those associated with fish habitat compensation. As such, a weighting of 3 was adopted as the sum of these two indicators. Perimeter collection ditch construction is anticipated to have a higher cost than collection pond construction and thus was given a higher weighting.
			CAPEX – Collection Pond	1	
			CAPEX - Non-Contact water Diversion Costs	4	The costs associated with non-contact water diversion are anticipated to be lower than those associated with fish habitat compensation but higher than those of collection pond and ditch. As such, a weighting of 4 was assigned to this indicator.
			Fish Habitat Compensation Cost - Watercourse	5	The costs associated with fish habitat compensation are anticipated to be relatively significant. Accordingly, a weighting of 5 was assigned to this indicator.
			Fish Habitat Compensation Cost - Waterbody	5	The costs associated with fish habitat compensation are anticipated to be relatively significant. Accordingly, a weighting of 5 was assigned to this indicator.
			CAPEX – Watercourse Crossing	4	The costs associated with construction of watercourse crossings is anticipated to be relatively significant but less than that of fish habitat compensation. Accordingly, a weighting of 4 was assigned to this indicator.
			CAPEX –River/Highway Bridge Crossing	5	The costs associated with construction of highway crossings is anticipated to be significant in comparison to the other costs in this account. Accordingly, a weighting of 6 was assigned to this indicator.
			CAPEX – Foundation Preparation	3	The costs associated with foundation preparation are anticipated to be moderate in comparison to the other costs in this account. Accordingly, a weighting of 3 was assigned to this indicator
Operating Cost	4	A weighting of 4 was assigned to this sub-account to represent the fact that operating costs are a significant component of the overall mine costs while recognizing that they are discounted over the life of the mine and thus have less impact on the estimated net present value costs than capital expenditures.	OPEX – Waste Rock Hauling	4	The costs associated with waste rock hauling is anticipated to be slightly higher in comparison to the land use costs in this sub-account. Accordingly, a weighting of 4 was assigned to this indicator.
			OPEX - Land Use	2	The costs associated with land use costs is anticipated to be slightly lower in comparison to the waste rock hauling costs in this sub-account. Accordingly, a weighting of 2 was assigned to this indicator.
Closure Cost	2	A weighting of 2 was assigned to this sub-account as closure costs associated are anticipated to be a relatively small component of the overall costs associated for each MWMA.	Cover Construction Cost	5	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment. See discussion in Section 2 regarding this concept.

Table 5.18 Socio-Economic Account – Summary of Rationale for Indicator and Sub-Account Weightings

Sub-Account	Weighting	Weighting Rationale	Indicator	Weighting	Weighting Rationale
Land and Resource Use – Animal Harvesting	5	The impacts associated with the indicators in this sub-account are considered to be slightly lower than those in the TKLU sub-account and as such, a weighting of 5 was assigned to this sub-account (versus a weighing of 6 for the TKLU Use sub-account).	Loss of Hunting	6	The loss of hunting and loss of fishing are assumed to impact a larger number of people (both the local population and regional visitors) than the bear management or trapline areas indicators. Thus, the hunting and fishing indicators were assigned higher weightings (6 each). It is assumed that hunting and fishing are of equivalent value and, as such, equivalent weightings were assigned to the "Loss of Hunting" indicator and the "Loss of Fishing – Watercourses/Waterbodies" indicators.
			Loss of Fishing – Watercourses	6	
			Loss of Fishing – Waterbodies	6	
			Loss of Bear Management Areas and Number of Bear Management Areas	2	A weighting of 2 was assigned to the bear management areas and number of the bear management areas indicator as the areas disturbed by MWMA alternatives are relatively small in relation to the overall bear management area, the area of typical overall bear home ranges and the existing level of disturbance in the area. Also, impacts to bear management areas are considered to impact a smaller number of people than impacts to hunting (which considers hunting of a variety of species) and fishing.
			Loss of Trapline Areas and Number of Trapline Areas	2	A weighting of 2 was assigned to the trapline indicator as impacts to trapline areas are considered to affect a smaller number of people than impacts to hunting and fishing activities.
			Loss of Travel Route	3	A weighting of 3 was assigned to the travel route indicator as impacts to the loss of travel route are considered to be lower compared to the loss of hunting and fishing, but slightly larger than bear management and tapeline areas. As a result, a weighting of 3 was assigned to each of these indicators.
Land and Mineral Use Rights	2	The impacts associated with the indicators in this sub-account are considered to be lower than those in the TKLU Use sub-account and as such, a weighting of 2 was assigned to this sub-account (versus a weighing of 6 for the TKLU sub-account).	Loss of Unpatented Crown Land	3	A weighting of 3 was assigned to this indicator as impacts to unpatented crown land is perceived slightly less important than loss of lands with Claims/Rights Owned by Others.
			Loss of Lands with Claims/Rights Owned by Others	4	A weighting of 4 was assigned to this indicator as impacts to Claims/Rights Owned by Others is perceived slightly more important than the loss of unpatented crown land.
TKLU	6	The highest possible weighting of 6 was assigned to this sub-account to reflect the importance of managing potential adverse impacts on Indigenous land uses. The TKLU sub-account addresses potential disruptions to the ability of Indigenous nations to practice traditional land uses.	Loss of Unoccupied Crown Land	4	A weighting of 4 was assigned to this indicator as it is thought to measure less direct impacts to TKLUs than the other indicator in this sub-account.
			Loss of Cultural Continuity Areas	6	A weighting of 6 was assigned to this indicator as it is thought to measure more direct impacts to TKLUs than the other indicator in this sub-account.
Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	6	The impacts associated with the indicators in this sub-account are considered to be as important as those in the TKLU sub-account because animal harvesting and subsistence can be practiced within unoccupied Crown lands. As such, a weighting of 6 was assigned to this sub-account.	Loss of Hunting and Trapping Areas	6	A weighting of 6 was assigned as loss of identified hunting and trapping areas by Indigenous communities compared to loss of general TKLU subsistence areas for the other indicator in this sub-account.
			Loss of Subsistence Areas	4	A weighting of 4 was assigned as there will be direct loss of animal-based subsistence areas by the alternatives.
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	6	The impacts associated with the indicators in this sub-account are considered to be as important as those in the TKLU sub-account because plant harvesting and subsistence can be practiced within unoccupied Crown lands. As such, a weighting of 6 was assigned to this sub-account.	Loss of Plant Harvesting Area	6	A weighting of 6 was assigned as loss of identified plant harvesting areas by Indigenous nations compared to loss of general TKLU subsistence areas for the other indicator in this sub-account.
			Loss of Subsistence Areas	4	A weighting of 4 was assigned as there will be direct loss of plant-based subsistence areas by the alternatives.

The “Base Case” account weightings suggested by the Guidelines, summarized in Table 5.19**,** were utilized as weightings for the accounts. However, as discussed in Section 5.6, the account weightings were later varied as part of the sensitivity analysis stage (Step 6) of the alternatives assessment.

Table 5.19 Summary of Rationale for Account Weightings

Account	Weighting	Weighting Rationale
Environmental	6	As recommended by the Guidelines for the “Base Case” quantitative analysis.
Technical	3	
Economic	1.5	
Socio-Economic	3	

5.5.2 Quantitative Analysis

After assigning scores to each indicator and selecting weightings for each indicator, sub-account, and account, the quantitative analysis is performed and the results discussed.

The following sections present the results of the quantitative analysis at an indicator, sub-account and account level.

5.5.2.1 Quantitative Analysis for Indicators

The results of the quantitative analysis for indicators are divided by account and presented in Table 5.20 to Table 5.23.

5.5.2.1.1 Environmental

The quantitative analysis for indicators in the Environmental account is provided in Table 5.20. MWMA-3 and MWMA-4 alternatives scored the highest with ratings of 4 and 3, respectively, due to the lower non-contact water areas to be managed due to their locations along a watershed divide in comparison to MWMA-1 and MWMA-2.

MWMA-4 is scored highest in the aquatic life and habitat sub-account followed by MWMA-3. MWMA-4 overlies shorter lengths of watercourses and waterbody areas compared to other alternatives. Sensitivity of fish habitat overlain by both MWMA-3 and MWMA-4 alternatives were anticipated to be moderately low, while sensitivity of fish habitat overlain by both MWMA-1 and MWMA-2 alternatives were anticipated to be moderate. MWMA-2 has the lowest rank in the aquatic life and habitat sub-account as it overlies the largest extent of watercourses and waterbodies.

Generally, forested and wetland areas represent wildlife and wildlife habitat. MWMA-3 is scored highest in the terrestrial life and habitat sub-account as it overlies a lesser forested area than the other three alternatives as well as a lesser wetland area than MWMA-1 and MWMA-2. Although MWMA-3 is not the closest alternative to the Open Pit, this alternative has fewer habitat areas such as moose late winter cover habitat, Blanding’s turtle habitat and SAR bird habitat. MWMA-1 is rated lowest in the terrestrial life

and habitat sub-account as they overlay larger forest areas. MWMA-2 and MWMA-4 are scored the second and third highest in the terrestrial life and habitat sub-account.

MWMA-1 is scored higher in the geotechnical foundation conditions sub account as it has bedrock within the footprint area contributing to an increased pile stability and fewer organic deposits in comparison to the other alternatives.

MWMA-1 is located within a shorter center-to-center distance to the Open Pit than the other three alternatives and has the lowest anticipated air quality and climate change impacts. MWMA-3- scores lowest in the air quality and climate change sub-accounts. MWMA-2 and MWMA-4 are located within similar distance to the Open Pit (i.e., center-to-center distance) and thus would have similar impacts on climate change and haul truck related dust generation. In the MWMA Failure sub-account, MWMA-1 is scored highest as the maximum pile height for this alternative is lowest and it overlies more stable surficial geology with a portion overlaying bedrock and no area overlaying organic deposits.

Table 5.20 Quantitative Analysis – Environmental Indicators

Sub-Account	Indicator	Indicator Weight (W_{ind})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
			Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})	Indicator Value (S)	Indicator Score (S * W_{ind})
Water Management	Contact and Non-Contact Water Management	5	1.0	5.0	1.0	5.0	4.0	20.0	3.0	15.0
	Sub-account score ($\sum${S *W_{ind}})			5.00		5.00		20.00		15.00
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)			**1.00**		**1.00**		**4.00**		**3.00**
Aquatic Life and Habitat	Loss of Watercourse	6	1.0	6.0	1.0	6.0	3.0	18.0	5.0	30.0
	Loss of Waterbodies	6	2.0	12.0	1.0	6.0	3.0	18.0	5.0	30.0
	Sensitivity of Overlain Fish Habitat	6	4.0	24.0	4.0	24.0	5.0	30.0	5.0	30.0
	Sub-account score ($\sum${S *W_{ind}})			42.00		36.00		66.00		90.00
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)			**2.33**		**2.00**		**3.67**		**5.00**
Terrestrial Life and Habitat	Habitat Fragmentation	4	4.00	16.0	5.00	20.0	1.00	4.0	4.00	16.0
	Loss of Moose late winter cover Habitat Area	6	1.00	6.0	6.00	36.0	6.00	36.0	3.00	18.0
	Loss of Blanding's Turtle Habitat Area	6	6.00	36.0	5.00	30.0	6.00	36.0	1.00	6.0
	Loss of Boreal Caribou Habitat Area	2	2.00	4.0	5.00	10.0	3.00	6.0	1.00	2.0
	Loss of Waterfowl Nesting, Sharp-tailed Grouse lek, Marsh Breeding Bird Habitat Area	4	1.00	4.0	1.00	4.0	4.00	16.0	5.00	20.0
	Loss of Confirmed Bald Eagle and Osprey Nesting Habitat Area	2	6.00	12.0	1.00	2.0	6.00	12.0	6.00	12.0
	Loss of Woodland Raptor Nesting Habitat Area	2	1.00	2.0	2.00	4.0	5.00	10.0	5.00	10.0
	Loss of Shrub/Early Successional Breeding Bird Habitat Area	2	4.00	8.0	3.00	6.0	1.00	2.0	5.00	10.0
	Loss of Upland Gamebirds Habitat Area	2	6.00	12.0	6.00	12.0	6.00	12.0	6.00	12.0
	Loss of SoCC (Common Nighthawk and Evening Grosbeak)	2	1.00	2.0	1.00	2.0	4.00	8.0	5.00	10.0
	Loss of SAR Birds Habitat Area	5	2.00	10.0	5.00	25.0	3.00	15.0	1.00	5.0
	Loss of Wetlands	2	4.0	8.0	2.0	4.0	5.0	10.0	1.0	2.0
	Loss of Forested Area	2	1.0	2.0	2.0	4.0	3.0	6.0	5.0	10.0
	Infrastructure Disturbance - Haul Roads	2	5.0	10.0	1.0	2.0	4.0	8.0	5.0	10.0
	Sub-account score ($\sum${S *W_{ind}})			132.00		161.00		181.00		143.00
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)			**3.07**		**3.74**		**4.21**		**3.33**
Geotechnical Foundation Conditions	Surficial Geology	5	5.0	25.0	3.0	15.0	1.0	5.0	1.0	5.0
	Sub-account score ($\sum${S *W_{ind}})			25.00		15.00		5.00		5.00
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)			**5.00**		**3.00**		**1.00**		**1.00**
Hydrogeology and Seepage Risks	**Hydrogeology and seepage characteristics**	4	5.00	20.0	5.0	20.0	2.0	8.0	1.0	4.0
	Seepage to receiver	4	5.00	20.0	4.0	16.0	1.0	4.0	1.0	4.0
	Sub-account score ($\sum${S *W_{ind}})			40.00		36.00		12.00		8.00
	Sub-account rating (R_{sub} = $\sum${S*W_{ind}}/$\sum W_{ind}$)			**5.00**		**4.50**		**1.50**		**1.00**

Sub-Account	Indicator	Indicator Weight (W_{ind})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
			Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Air Quality	Potential for Dust Generation - Haul Traffic	5	5.0	25.0	3.0	15.0	1.0	5.0	3.0	15.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			25.00		15.00		5.00		15.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.00**		**3.00**		**1.00**		**3.00**
Climate Change	Greenhouse Gas Emissions	5	5.0	25.0	3.0	15.0	1.0	5.0	3.0	15.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			25.00		15.00		5.00		15.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.00**		**3.00**		**1.00**		**3.00**
MWMA Failure	Maximum Pile Height	3	6.0	18.0	4.0	12.0	2.0	6.0	5.0	15.0
	Foundation Stability	3	5.0	15.0	3.0	9.0	1.0	3.0	1.0	3.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			33.00		21.00		9.00		18.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.50**		**3.50**		**1.50**		**3.00**

5.5.2.1.2 Technical

The quantitative analysis for indicators in the Technical account is provided in Table 5-21. As the design and construction, operational, and closure philosophies are similar for the alternatives, only one sub-account was identified as differentiating in the Technical account.

MWMA-1 has a lowest maximum pile height (100 m), while MWMA-3 has a highest pile height (170 m). Therefore, MWMA-1 and MWMA-3 score the highest and lowest in the maximum pile height indicator. MWMA-3 and MWMA-4 score highest in the length of required non-contact water diversion indicator as they are located on watershed divides with little to no non-contact water diversions required. MWMA-1 and MWMA-2 are scored highest as no river/highway bridge crossing is required for these alternatives. MWMA-3 and MWMA-4 are scored lowest as river/highway bridge crossing is required for site access.

Table 5.21 Quantitative Analysis – Technical Indicators

Sub-Account	Sub-Account Rationale	Indicator	Indicator Weight (W_{ind})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
				Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Design and Operational Complexity	Alternatives with greater pile heights, or that require longer non-contact water diversions or higher number of river/highway bridge crossings may present additional complexity in design and construction.	Maximum Pile Height	5	6.0	30.0	4.0	20.0	2.0	10.0	5.0	25.0
		Length of Required Non-Contact Water Diversion	4	3.0	12.0	1.0	4.0	5.0	20.0	5.0	20.0
		River/Highway Bridge Crossings	4	6.0	24.0	6.0	24.0	1.0	4.0	4.0	16.0
		Sub-account score ($\sum\{S * W_{ind}\}$)			66.00		48.00		34.00		61.00
		Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.08**		**3.69**		**2.62**		**4.69**

5.5.2.1.3 Project Economics

The quantitative analysis for indicators in the Project Economics account is provided in Table 5.22. MWMA-4 scores the highest in the capital cost sub-account, followed by MWMA-1. While MWMA-1 has the fewest river/highway crossings and overlays the shortest distance of watercourse, it requires the construction of more fish habitat compensation (for both watercourses and waterbodies) as well as construction of a larger collection pond due to a larger catchment area (that is reporting to the internal surface water management system) and longer non-contact water diversions than those in the MWMA-3 and MWMA-4, alternatives. The capital cost associated with the construction of the perimeter ditch was similar for MWMA-1, MWMA-3 and MWMA-4 and was highest for MWMA-2. The cost associated with foundation preparation is anticipated to be lower for a more stable foundation which includes a higher portion of bedrock and a lesser of organic deposits, which is why MWMA-1 had the highest rank for that indicator.

Alternative MWMA-1 is the highest ranked in the operating costs sub-account, largely due to it having the shortest haul distance to the Open Pit. However, the cost associated with the existing land use and rights ranked MWMA-3 the highest with the lowest land use costs.

Alternative MWMA-3 and MWMA-4 are ranked highest in the closure cost sub-account with MWMA-1 and MWMA-2 having slightly smaller surface areas

Table 5.22 Quantitative Analysis – Project Economic Indicators

Sub-Account	Sub-Account Rationale	Indicator	Total Indicator Weight (W_{ind})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
				Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Capital Cost	Capital costs have a significant impact on the ability to successfully commission a mine.	CAPEX - Haul Road	4	5.0	20.0	1.0	4.0	3.0	12.0	4.0	16.0
		CAPEX – Perimeter Ditch	2	4.0	8.0	2.0	4.0	4.0	8.0	4.0	8.0
		CAPEX – Collection Pond	1	1.0	1.0	1.0	1.0	4.0	4.0	3.0	3.0
		CAPEX - Non-Contact Water Diversion Costs	3	1.0	3.0	1.0	3.0	4.0	12.0	5.0	15.0
		Fish Habitat Compensation Costs - Watercourse	5	1.0	5.0	1.0	5.0	3.0	15.0	6.0	30.0
		Fish Habitat Compensation Costs - Waterbody	5	1.0	5.0	1.0	5.0	2.0	10.0	5.0	25.0
		CAPEX - River/Highway Bridge Crossing	5	6.0	30.0	6.0	30.0	1.0	5.0	4.0	20.0
		CAPEX - Foundation Preparation	4	5.0	20.0	3.0	12.0	1.0	4.0	1.0	4.0
		Sub-account score ($\sum\{S * W_{ind}\}$)			92.00		64.00		70.00		121.00
		Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**3.17**		**2.21**		**2.41**		**4.17**
Operating Cost	Operating costs impact life of mine economics.	OPEX – Waste Rock Hauling	4	5.0	20.0	3.0	12.0	1.0	4.0	3.0	12.0
		OPEX - Land Use	2	3.0	6.0	3.0	6.0	5.0	10.0	1.0	2.0
		Sub-account score ($\sum\{S * W_{ind}\}$)			26.00		18.00		14.00		14.00
		Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**4.33**		**3.00**		**2.33**		**2.33**
Closure Cost	Closure costs can be significant and can have a significant impact on initial project economics due to requirements for financial assurance.	Cover Construction Costs	5	4.0	20.0	4.0	20.0	5.0	25.0	5.0	25.0
		Sub-account score ($\sum\{S * W_{ind}\}$)			20.00		20.00		25.00		25.00
		Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**4.00**		**4.00**		**5.00**		**5.00**

5.5.2.1.4 Socio-Economic

The quantitative analysis for indicators in the Socio-Economic account is provided in Table 5.23. Alternative MWMA-4 scores highest in LRU – animal harvesting sub-account indicators within the Socio-Economic account as it overlies the lowest amount of hunting and fishing areas (both watercourses and waterbodies), and bear management areas compared to the other three alternatives. MWMA-1 scores lowest in this sub-account as it overlies the greatest extent of hunting and fishing areas (both watercourses and waterbodies).

In the land and mineral use sub-account, MWMA-3 is ranked highest as it overlies a smaller area of unpatented crown and non-Canada Nickel owned land compared to other alternatives. MWMA-1 and MWMA-2 have received the same rating, while MWMA-4 scores lowest as it overlies a larger extent of unpatented crown and non-Canada Nickel owned land.

In the TKLU sub-account, MWMA-1 and MWMA-2 ranked highest as they overlie less unoccupied crown land and cultural continuity areas.

In the TKLU – animal harvesting and subsistence sub-account, MWMA-1 is the highest ranked alternative as it overlies the least amount of hunting and trapping, and hunting subsistence areas. MWMA-3 and MWMA-4 score lowest in this sub-account due to the larger portion of hunting and trapping, and hunting subsistence areas overlain by these alternatives.

In the TKLU – plant harvesting and subsistence sub-account, MWMA-1 is ranked highest alternative as it overlies the least amount of plant harvesting and plant subsistence areas MWMA-3 and MWMA-4 score lowest in this sub-account due to the larger portion of the plant harvesting and plant subsistence areas overlain by these alternatives.

Table 5.23 Quantitative Analysis – Socio-Economic Indicators

Sub-Account	Indicator	Total Indicator Weight (W_{ind})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
			Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)	Indicator Value (S)	Indicator Score ($S * W_{ind}$)
Land and Resource Use - Animal Harvesting	Loss of Hunting	6	2.0	12.0	3.0	18.0	4.0	24.0	5.0	30.0
	Loss of Fishing - Watercourses	6	1.0	6.0	1.0	6.0	3.0	18.0	5.0	30.0
	Loss of Fishing – Waterbodies	6	1.0	6.0	1.0	6.0	2.0	12.0	5.0	30.0
	Loss of Bear Management Areas	2	3.0	6.0	5.0	10.0	1.0	2.0	6.0	12.0
	Loss of Bear Management Areas - Number	2	5.0	10.0	4.0	8.0	5.0	10.0	6.0	12.0
	Loss of Trapline Areas	2	1.0	2.0	2.0	4.0	4.0	8.0	3.0	6.0
	Loss of Trapline Areas - Number	2	4.0	8.0	4.0	8.0	3.0	6.0	5.0	10.0
	Loss of Travel Route	3	4.0	12.0	4.0	12.0	2.0	6.0	3.0	9.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			62.00		72.00		86.00		139.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**2.14**		**2.48**		**2.97**		**4.79**
Land and Mineral Use Rights	Loss of Unpatented Crown Land	3	6.00	18.0	6.0	18.0	6.0	18.0	1.0	3.0
	Lands with Claims/Rights Owned by Others	4	4.00	16.0	4.0	16.0	5.0	20.0	3.0	12.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			34.00		34.00		38.00		15.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**4.86**		**4.86**		**5.43**		**2.14**
Traditional Knowledge and Land Use	Loss of Unoccupied Crown Land	4	5.0	20.0	5.0	20.0	4.0	16.0	1.0	4.0
	Loss of Cultural Continuity Areas	6	5.0	30.0	5.0	30.0	1.0	6.0	3.0	18.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			50.00		50.00		22.00		22.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.00**		**5.00**		**2.20**		**2.20**
Traditional Knowledge and Land Use - AnimalHarvesting and Subsistence	Loss of Hunting and Trapping Areas	6	5.0	30.0	5.0	30.0	1.0	6.0	2.0	12.0
	Loss of Hunting Subsistence Areas	4	5.0	20.0	4.0	16.0	1.0	4.0	2.0	8.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			50.00		46.00		10.00		20.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.00**		**4.60**		**1.00**		**2.00**
Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	Loss of Plant Harvesting Area	6	5.0	30.0	4.0	24.0	1.0	6.0	2.0	12.0
	Loss of Plant Harvesting Subsistence Areas	4	5.0	20.0	5.0	20.0	1.0	4.0	2.0	8.0
	Sub-account score ($\sum\{S * W_{ind}\}$)			50.00		44.00		10.00		20.00
	Sub-account rating ($R_{sub} = \sum\{S*W_{ind}\}/\sum W_{ind}$)			**5.00**		**4.40**		**1.00**		**2.00**

5.5.2.2 Sub-account Quantitative Analysis

The sub-account quantitative analysis for each of the four accounts is presented in Table 5.24. Alternative MWMA-1 is preferred in all the four accounts: Environmental, Technical, Project Economics and Socio-Economic.

Alternative MWMA-2 is ranked second highest alternative in the Socio-Economic account, third highest in the Environmental and Technical accounts and the least preferred alternative in the Project Economics accounts.

Alternative MWMA-3 is ranked the second highest alternative in the Project Economics and the least preferred alternative in the Environmental, Technical and Socio-Economic accounts.

Alternative MWMA-4 is ranked the highest in the Project Economics account. It is ranked second in the Environmental and Technical accounts and third in the Socio-Economic accounts.

Table 5.24 Quantitative Analysis – Sub-Accounts

Account	Sub-Account	Sub-Account Weight (W_{sub})	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
			Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)	Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)	Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)	Sub-Account Rating (R_{sub})	Sub-Account Score ($R_{sub} * W_{sub}$)
Environmental	Water Management	2	1.00	2.00	1.00	2.00	4.00	8.00	3.00	6.00
	Aquatic Life and Habitat	6	2.33	14.00	2.00	12.00	3.67	22.00	5.00	30.00
	Terrestrial Life and Habitat	4	3.07	12.28	3.74	14.98	4.21	16.84	3.33	13.30
	Geotechnical Foundation Conditions	3	5.00	15.00	3.00	9.00	1.50	4.50	1.00	3.00
	Hydrogeology and Seepage Risks	4	5.00	20.00	4.50	18.00	1.50	6.00	1.00	4.00
	Air Quality	3	5.00	15.00	3.00	9.00	1.00	3.00	3.00	9.00
	Climate Change	1	5.00	5.00	3.00	3.00	1.00	1.00	3.00	3.00
	MWMA Failure	2	5.50	11.00	3.50	7.00	1.50	3.00	3.00	6.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			94.3		75.0		64.3		74.3
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**3.77**		**3.00**		**2.57**		**2.97**
Technical	Design and Operational Complexity	5	5.08	25.38	3.69	18.46	2.62	13.08	4.69	23.46
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			25.4		18.5		13.1		23.5
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**5.08**		**3.69**		**2.62**		**4.69**
Project Economics	Capital Cost	6	3.17	19.03	2.21	13.24	2.41	14.48	4.17	25.03
	Operating Cost	4	4.33	17.33	3.00	12.00	2.33	9.33	2.33	9.33
	Closure Cost	2	4.00	8.00	4.00	8.00	5.00	10.00	5.00	10.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			44.4		33.2		33.8		44.4
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**3.70**		**2.77**		**2.82**		**3.70**
Socio-economic	Land and Resource Use - Animal Harvesting	5	2.14	10.69	2.28	11.38	3.17	15.86	4.38	21.90
	Land and Mineral Use Rights	2	4.86	9.71	4.86	9.71	5.43	10.86	2.14	4.29
	Traditional Knowledge and Land Use	6	5.00	30.00	5.00	30.00	2.20	13.20	2.20	13.20
	Traditional Knowledge and Land Use - Animal Harvesting and Subsistence	6	5.00	30.00	4.60	27.60	1.00	6.00	2.00	12.00
	Traditional Knowledge and Land Use – Plant Harvesting and Subsistence	6	5.00	30.00	4.40	26.40	1.00	6.00	2.00	12.00
	Account score ($\sum\{R_{sub} * W_{sub}\}$)			110.4		105.1		51.9		63.4
	Account rating ($R_a = \sum\{R_{sub} * W_{sub}\}/\sum W_{sub}$)			**4.42**		**4.20**		**2.08**		**2.54**

5.5.2.3 Account Quantitative Analysis

The account quantitative analysis is performed after completing the sub-accounts quantitative analysis. The “Base Case” account weighting factors recommended by the Guidelines were used for the account quantitative analysis. Table 5.25 presents the results of the account quantitative analysis.

The results of the account quantitative analysis indicate that MWMA-1 is rated higher than the other alternatives and thus is the preferred alternative. The result also indicates that MWMA-3 is the least preferred option among the alternatives.

To further evaluate the alternatives and the impact of the weightings applied in the analysis, sensitivity analyses were performed. These analyses are discussed in the following section.

Table 5.25 Quantitative Analysis – Accounts

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	6	3.77	22.63	3.00	17.99	2.57	15.44	2.97	17.83
Technical	3	5.08	15.23	3.69	11.08	2.62	7.85	4.69	14.08
Project Economics	1.5	3.70	5.55	2.77	4.16	2.82	4.23	3.70	5.55
Socio-Economic	3	4.42	13.25	4.20	12.61	2.08	6.23	2.54	7.61
Alternative score ($\sum\{R_a * W_a\}$)			56.65		45.84		33.74		45.06
Alternative Rating ($\sum\{R_a * W_a\}/\sum Wa$			**4.20**		**3.40**		**2.50**		**3.34**

5.6 Step 6: Sensitivity Analysis

The quantitative analyses presented in the preceding section were performed using the "Base Case" account weighting factors required by the Guidelines.

Following the completion of the quantitative analyses, a set of sensitivity analyses were performed. This process is recommended by the Guidelines as a way to test the impacts of variations in weightings on the assessment outcomes and provide stakeholders with a further understanding of the implications of the various value judgments used in the assessment process. The Guidelines describe each set of varied weightings as a "scenario". The Guidelines note that the sensitivity analyses are not prescriptive and should be project-specific and consider feedback received from stakeholders throughout the assessment process.

The following five sensitivity analyses were performed:

- **Scenario 1 – Equivalent Account Weightings –** An equivalent weighting factor (1) was applied to all accounts. This is based on a scenario recommended in the Guidelines in which all weighting factors are assigned an equal value (i.e., a weighting of 1).
- **Scenario 2 – Environmental Account Bias –** A weighting factor of (1) was applied to the Technical, Project Economic, and Socio-Economic accounts and a weighting factor of (6) was applied to the Environmental account. This scenario identifies the preferred alternative if non-environmental factors are largely removed from the evaluation.
- **Scenario 3 – Technical Account Bias –** A weighting factor of (1) was applied to the Environmental, Project Economics, and Socio-Economic accounts and a weighting factor of (6) was applied to the Technical account. This scenario identifies the preferred alternative if non-technical factors are largely removed from the evaluation.
- **Scenario 4 – Project Economics Account Bias –** A weighting factor of (1) was applied to the Environmental, Technical, and Socio-Economic accounts and a weighting factor of (6) was applied to the Project Economics account. This scenario identifies the preferred alternative if non-project economics factors are largely removed from the evaluation.
- **Scenario 5 – Socio-Economic Account Bias –** A weighting factor of (1) was applied to the Environmental, Technical, and Project Economics accounts and a weighting factor of (6) was applied to the Socio-Economic account. This scenario identifies the preferred alternative if non-socio-economic factors are largely removed from the evaluation.

5.6.1 Results

The results of the sensitivity analyses are presented in Table 5.26 through Table 5.30. A discussion of the results of the sensitivity analyses follows the sensitivity analysis results. Note that the results from the original "Base Case" analysis are presented in italicized parentheses in each table.

For Scenario 1, where all account weighting factors are equivalent (Table 5.26):

- The MWMA-1 is the preferred alternative.
- The MWMA-3 is the lowest ranked alternative.

Table 5.26 Scenario 1 – Equivalent Account Weightings

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.77	3.77	3.00	3.00	2.57	2.57	2.97	2.97
Technical	1	5.08	5.08	3.69	3.69	2.62	2.62	4.69	4.69
Project Economics	1	3.70	3.70	2.77	2.77	2.82	2.82	3.70	3.70
Socio-Economic	1	4.42	4.42	4.20	4.20	2.08	2.08	2.54	2.54
Alternative score ($\sum\{R_a * W_a\}$)			16.96		13.67		10.08		13.90
Alternative Rating ($\sum\{R_a * W_a\}/\sum Wa$			**4.24**		**3.42**		**2.52**		**3.47**

For Scenario 2, which is heavily biased towards the Environmental account (Table 5.27):

- The MWMA-1 is the preferred alternative.
- The MWMA-3 is the lowest ranked alternative.

Table 5.27 Scenario 2 – Environmental Account Bias

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	6	3.77	22.63	3.00	17.99	2.57	15.44	2.97	17.83
Technical	1	5.08	5.08	3.69	3.69	2.62	2.62	4.69	4.69
Project Economics	1	3.70	3.70	2.77	2.77	2.82	2.82	3.70	3.70
Socio-Economic	1	4.42	4.42	4.20	4.20	2.08	2.08	2.54	2.54
Alternative score ($\sum\{R_a * W_a\}$)			35.82		28.66		22.95		28.76
Alternative Rating ($\sum${Ra *Wa})/$\sum$Wa			**3.98**		**3.18**		**2.55**		**3.20**

For Scenario 3, which is heavily biased towards the Technical account (Table 5.28):

- The MWMA-1 is the preferred alternative.
- The MWMA-3 is the lowest ranked alternative.

Table 5.28 Scenario 3 – Technical Account Bias

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.77	3.77	3.00	3.00	2.57	2.57	2.97	2.97
Technical	6	5.08	30.46	3.69	22.15	2.62	15.69	4.69	28.15
Project Economics	1	3.70	3.70	2.77	2.77	2.82	2.82	3.70	3.70
Socio-Economic	1	4.42	4.42	4.20	4.20	2.08	2.08	2.54	2.54
Alternative score ($\sum\{R_a * W_a\}$)			42.35		32.13		23.16		37.36
Alternative Rating ($\sum\{R_a * W_a\}/\sum Wa$			**4.71**		**3.57**		**2.57**		**4.15**

For Scenario 4, which is heavily biased towards the Project Economics account (Table 5.29):

- The MWMA-1 is the preferred alternative.
- The MWMA-3 is the lowest ranked alternative.

Table 5.29 Scenario 4 – Project Economics Account Bias

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.77	3.77	3.00	3.00	2.57	2.57	2.97	2.97
Technical	1	5.08	5.08	3.69	3.69	2.62	2.62	4.69	4.69
Project Economics	6	3.70	22.18	2.77	16.62	2.82	16.91	3.70	22.18
Socio-Economic	1	4.42	4.42	4.20	4.20	2.08	2.08	2.54	2.54
Alternative score ($\sum\{R_a * W_a\}$)			35.45		27.52		24.17		32.38
Alternative Rating ($\sum\{R_a * W_a\}$)/$\sum$Wa			**3.94**		**3.06**		**0.68**		**1.18**

For Scenario 5, which is heavily biased towards the Socio-Economic account (Table 5.30):

- The MWMA-1 is the preferred alternative.
- The MWMA-3 is the lowest ranked alternative.

Table 5.30 Scenario 5 – Socio-Economic Account Bias

Account	Account Weight (W_a)	MWMA-1		MWMA-2		MWMA-3		MWMA-4	
		Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)	Account Rating (R_a)	Account Score ($R_a * W_a$)
Environmental	1	3.77	3.77	3.00	3.00	2.57	2.57	2.97	2.97
Technical	1	5.08	5.08	3.69	3.69	2.62	2.62	4.69	4.69
Project Economics	1	3.70	3.70	2.77	2.77	2.82	2.82	3.70	3.70
Socio-Economic	6	4.42	26.50	4.20	25.22	2.08	12.46	2.54	15.21
Alternative score ($\sum\{R_a * W_a\}$)			39.04		34.68		20.47		26.57
Alternative Rating ($\sum\{R_a * W_a\}$)/$\sum$Wa			**4.34**		**3.85**		**0.52**		**0.77**

5.6.2 Discussion

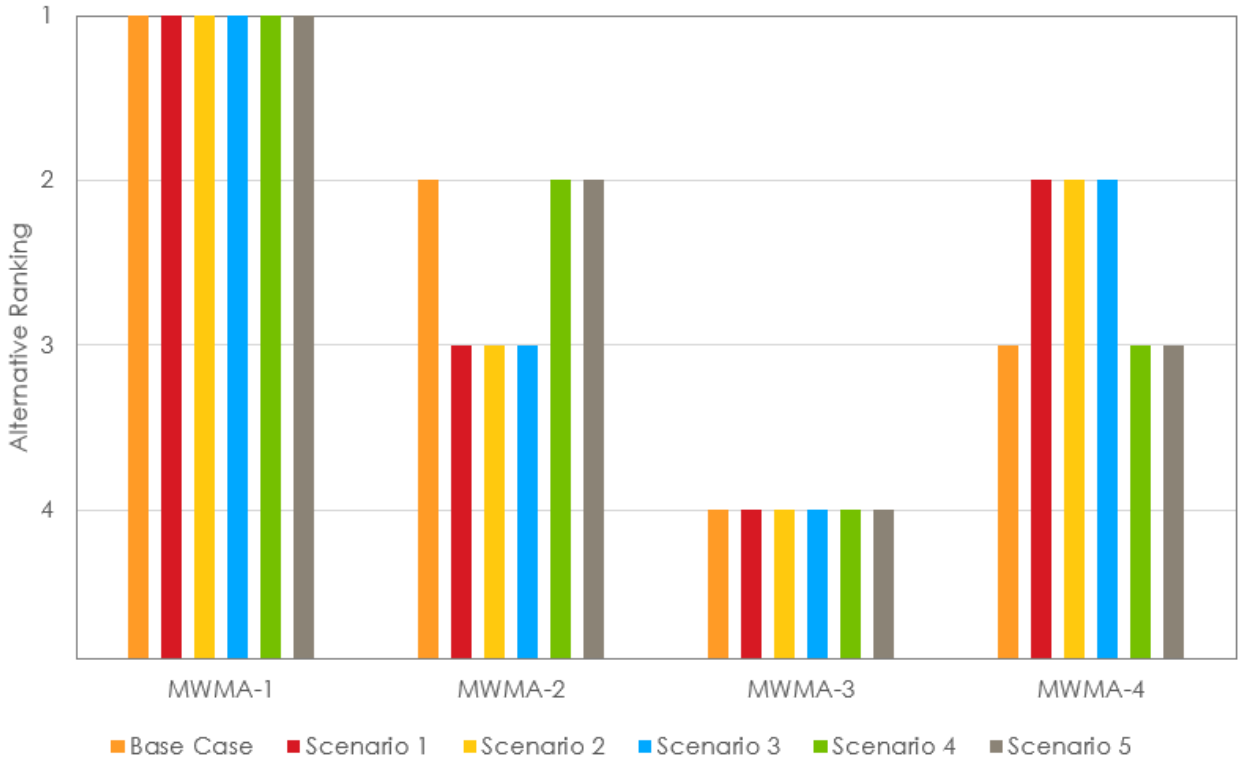
The calculated alternative ratings and rankings for the “Base Case” and the sensitivity analyses are presented numerically in Table 5.31. The ranking of each alternative as calculated in the quantitative analysis and sensitivity analysis is also presented graphically in Figure 5.6.

Varying the account weighting factors for the all accounts equal (Scenario 1), Environment bias (Scenario 2), Technical bias (Scenario 3), Project Economics bias (Scenario 4) and Socio-Economic bias (Scenario 5) indicate that significant variations in the account weightings from those recommended as “Base Case” weightings in the Guidelines do not alter the overall results of the alternative assessment with MWMA-1 alternative being preferred consistently for the five scenarios. This consistency in results provides additional confidence in the assessment results. MWMA-2 alternative is ranked second in two of the sensitivity analysis scenarios as in the “Base Case”. MWMA-4 is ranked third in two of the sensitivity analysis scenarios as is in the “Base Case”. MWMA3 alternative is ranked lowest in all sensitivity analysis scenarios as in the “Base Case”.

Table 5.31 Summary of Results of MWMA Sensitivity Analysis

Alternative	Base Case (ECCC Recommended Weightings)		Scenario 1 (All Account Weightings Equal)		Scenario 2 (Environmental Account Bias)		Scenario 3 (Technical Account Bias)		Scenario 4 (Project Economics Account Bias)		Scenario 5 (Socio-Economic Account Bias)	
	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking	Alternative Rating	Alternative Ranking
MWMA-1	4.20	1	4.24	1	3.98	1	4.71	1	3.94	1	4.34	1
MWMA-2	3.40	2	3.42	3	3.18	3	3.57	3	3.06	2	3.85	2
MWMA-3	2.50	4	2.52	4	2.55	4	2.57	4	0.68	4	0.52	4
MWMA-4	3.34	3	3.47	2	3.20	2	4.15	2	1.18	3	0.77	3

Figure 5.6 MWMA Quantitative and Sensitivity Analysis Ranking Results



6 Summary and Conclusions

An alternatives assessment was carried out to select preferred TMF and MWMA alternatives for the Project. The assessment was performed utilizing MAA methodology in general accordance with the Guidelines (ECCC 2013). The assessments included the evaluation of multiple waste storage locations and waste disposal methods.

Based on the assessment, the TMF-1 alternative is preferred TMF alternative. The conceptual design of the TMF-1 alternative is presented in Figure 4.5.

Based on the assessment, the MWMA-1 alternative is preferred MWMA alternative. The MWMA -1 conceptual design is presented in Figure 5.2.

The following presents a brief summary of the results of each assessment.

6.1 Tailings Management Facility Alternatives Assessment Summary

In the TMF assessment, six locations, six disposal methods, and three dam construction methods were considered. Following the application of pre-screening criteria (Step 2), three alternatives (TMF-1, TMF-2 and TMF-6) remained for consideration using the thickened tailings disposal method and centerline dam construction method. The alternative characterization stage developed 60 differentiating indicators within the four accounts (Environmental, Technical, Project Economics and Socio-Economic) to compare the three alternatives.

The results of the quantitative analysis identified that alternative TMF-1 with the thickened tailings disposal method and the centerline dam construction method as the preferred alternative. This is due to the relatively advantageous surficial geology for dam construction at this location, the close proximity of the location to the Open Pit resulting in shorter haul roads, lower impact on terrestrial habitat areas, and the relatively low socio-economic impacts associated with this alternative. The preferred location also has the benefit of reducing the overall Project footprint compared to the TMF-6 alternative that is located further from the mine infrastructure. The longer distance between alternative TMF-6 and the mine infrastructure would require significantly more road construction, watercourse crossings, habitat fragmentation, and extensive tailings pipelines and pumping requirements.

Overall, the TMF-1 alternative ranks highest of the three alternatives assessed in the four accounts, indicating that it represents relatively balanced environmental, technical, economic and socio-economic impacts, whereas the other alternatives are rated lowest in one or more of the accounts.

Sensitivity analyses for five scenarios were performed to evaluate the impact of variations in account weightings on the analysis results. The evaluated variations in account weightings do not alter the overall results of the alternatives assessment, with the TMF-1 alternative remaining preferred in the five

sensitivity analysis scenarios (see Figure 4.8). This demonstrates that the alternative has relatively balanced characteristics, rating relatively highly across the four accounts.

6.2 Mine Waste Management Area Alternatives Assessment Summary

In the MWMA assessment, four sets of storage areas and five disposal methods were considered. Following the application of pre-screening criteria, four alternatives with above ground storage of non-segregated waste rock remained for consideration. Further analysis of the remaining four alternatives was conducted by applying characterization criteria. A multiple accounts ledger was then developed based on a review of the characterization criteria and the understanding of the Project. Each indicator was scored, weightings were applied, and a quantitative analysis was performed to compare the remaining three alternatives.

The results of the quantitative analysis indicate that alternative MWMA-1 is the preferred alternative as this alternative is scored higher than the other alternatives in the “Base Case” assessment. This is largely due to the more stable foundation materials, lower risk of seepage to groundwater and surface water, close proximity of the location to the Open Pit, lower risk of failure of the pile, lower technical construction complexity and lower socio-economic impacts due to smallest TKLU areas for animal/plant harvesting and subsistence area overlain by the alternative.

Sensitivity analyses were then performed to evaluate the impact of variations in account weightings on the analysis results. MWMA -1 remains the preferred alternative in all of the sensitivity analyses. MWMA-1 is preferred by a relatively wide margin in all of the scenarios.

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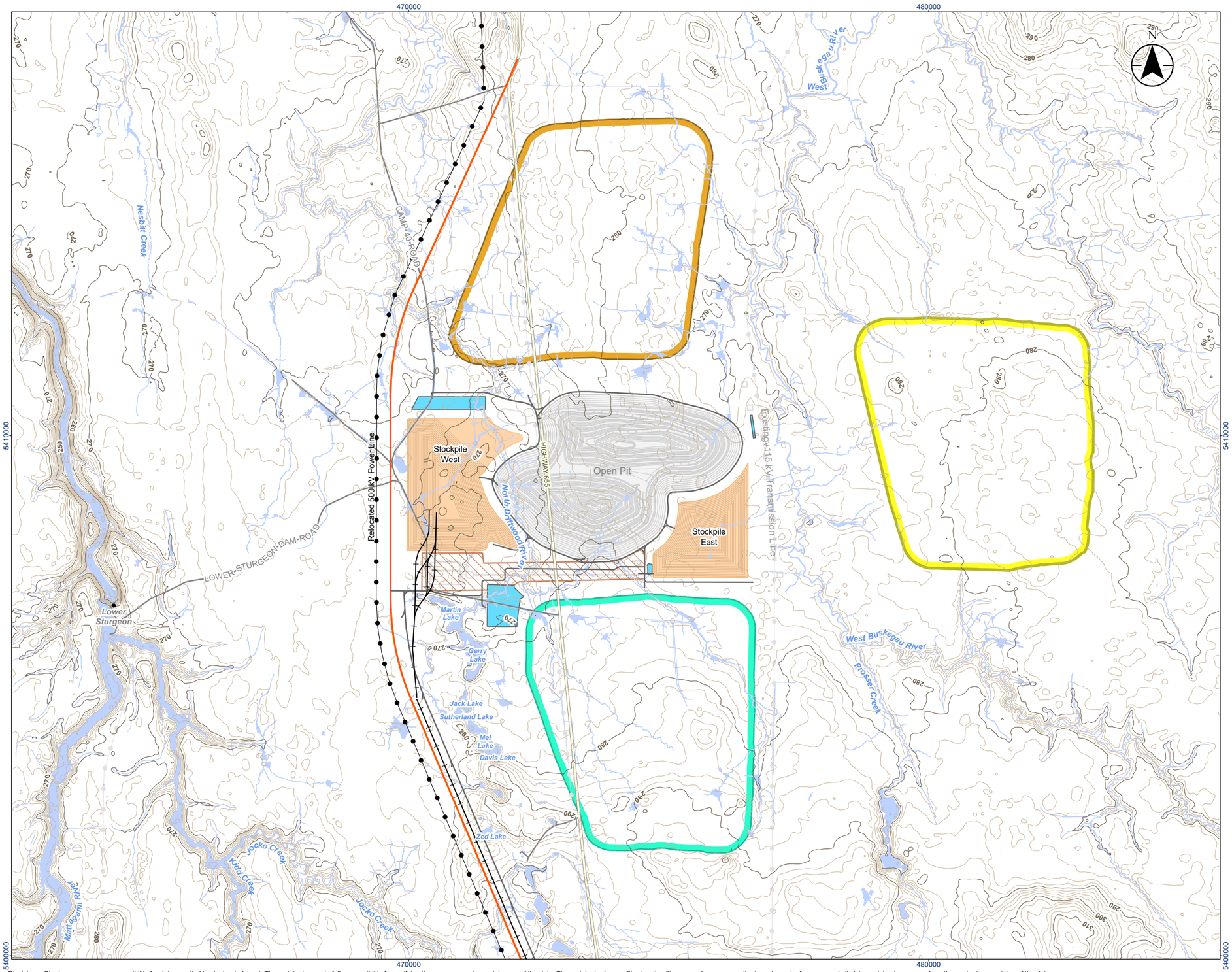
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Appendices

Appendix A TMF Baseline Information Figures



Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6

Base Features

- 2-m Contour Interval
- 10-m Contour Interval
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road
- Ore Stockpile
- Pond
- Process Plant Area

0 2 4 km

1:75,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.



Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

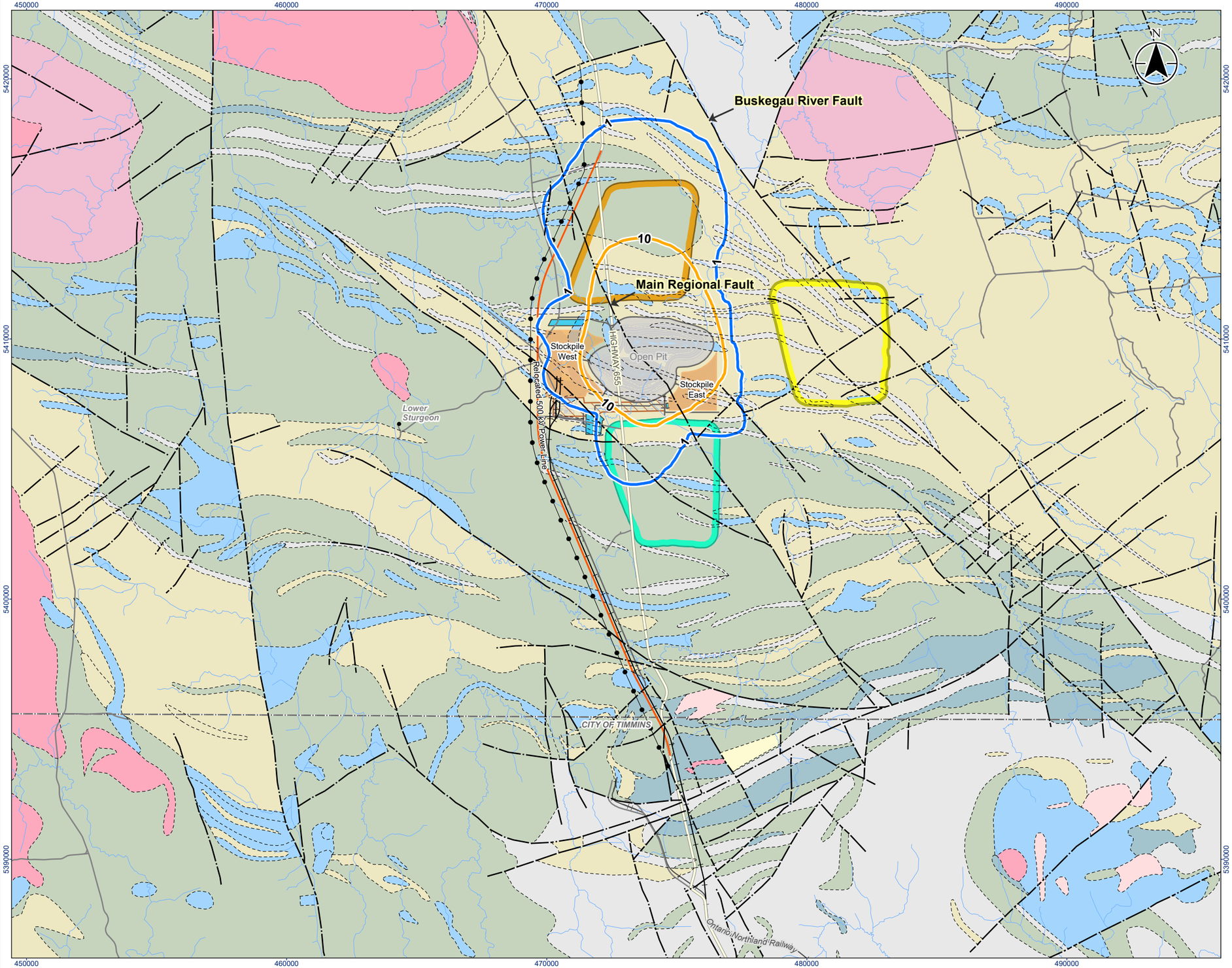
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.1

Title
Topography - TMF Alternatives

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CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- 1 m Drawdown
- 10 m Drawdown

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Watercourse
- Municipal Boundary - Lower Tier

Bedrock Geology

- Contact, Sharp, Trend
- Fault
- 4: Mafic to ultramafic metavolcanic rocksgt: mafic metavolcanic and basaltic rocks with minor komatiitic flows, metasedimentary and pyroclastic rocks
- 5: Mafic to intermediate metavolcanic rocksgt: basaltic and andesitic flows, tuffs and breccias, chert, iron formation, minor metasedimentary and intrusive rocks, related migmatites
- 6a: Dacitic and andesitic flows, tuffs and breccias
- 6b: Rhyolitic, rhyodacitic flows, tuffs and breccias
- 7: Metasedimentary rockseg: wacke, siltstone, arkose, argillite, slate, mudstone, marble, chert, iron formation, minor metavolcanic rocks, conglomerate, arenite, paragneiss, migmatites
- 7c: Marble, chert, iron formation, minor metavolcanic rocks
- 9b: Alkaline metavolcanic rocks: mafic to felsic metavolcanic flows, tuffs and breccias
- 10: Mafic and ultramafic rocksq: gabbro, anorthosite, ultramafic rocks
- 10c: Ultramafic rocks
- 12: Foliated tonalite suite: tonalite to granodiorite - foliated to massive
- 14: Diorite-monzodiorite-granodiorite suite: diorite, quartz diorite, minor tonalite, monzonite, granodiorite, syenite and hypabyssal equivalents (saturated to oversaturated suite)
- 15: Massive granodiorite to granite: massive to foliated granodiorite to granite

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.
3. Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1. ISBN 978-1-4435-5704-7 (CD) ISBN 978-1-4435-5705-4

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Prepared by malcazaren on 2024-11-19

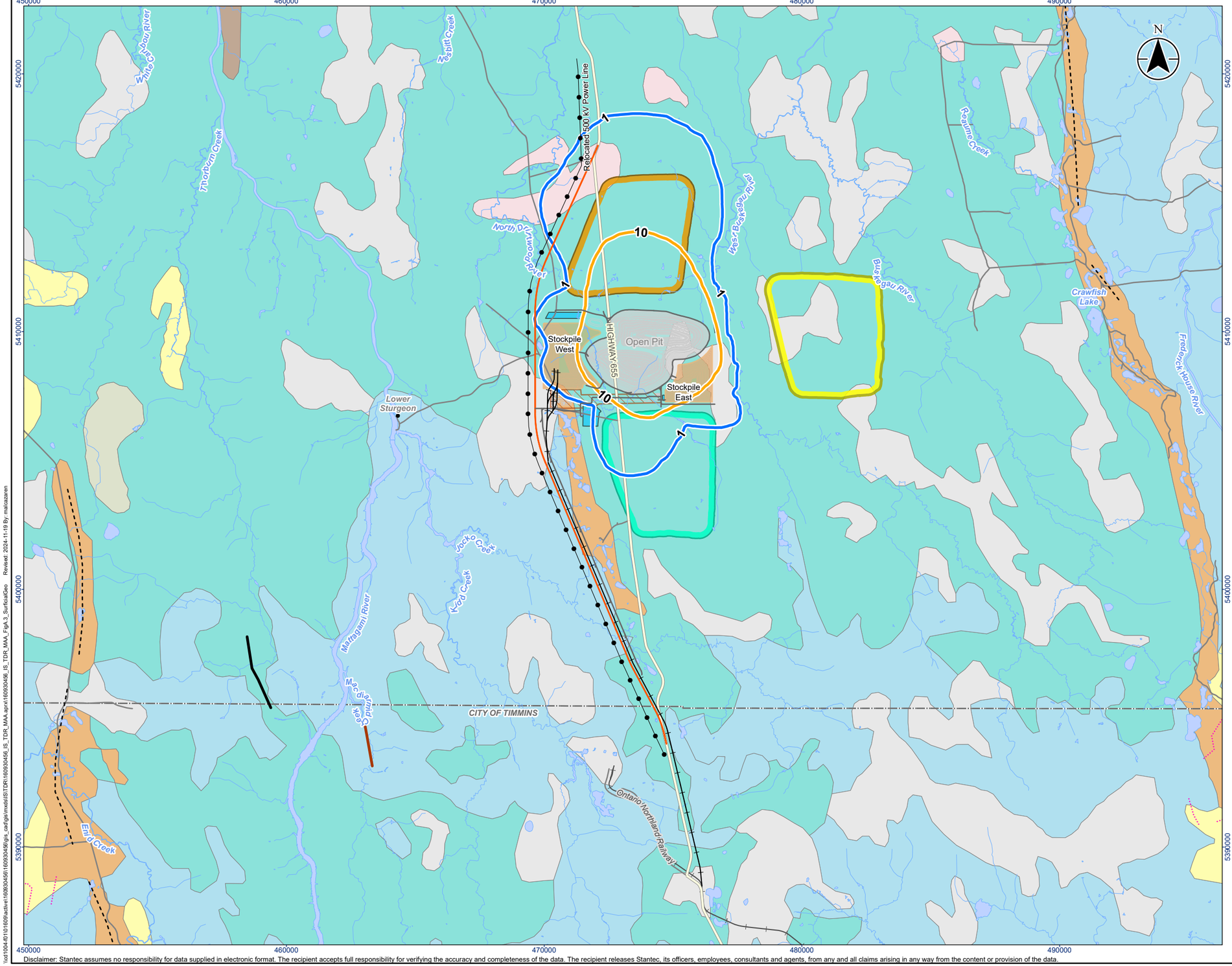
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.2

Title
Regional Bedrock Geology - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- 1 m Drawdown
- 10 m Drawdown

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road
- Ore Stockpile
- Pond
- Process Plant Area

Base Features

- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Municipal Boundary - Lower Tier

Surficial Geology

- Beach, bar or spit
- Esker or area of eskers; direction of flow know or assumed
- Terrace escarpment (abandoned shore bluff)
- Trend of end moraine crest
- 1: Bedrock
- 18: Till
- 21: Till, fine-grained
- 22: Glaciofluvial Ice
- 24: Glaciolacustrine deposits
- 25: Glaciolacustrine deposits
- 31: Fluvial deposits
- 32: Organic deposits

0 5 10 km

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Notes

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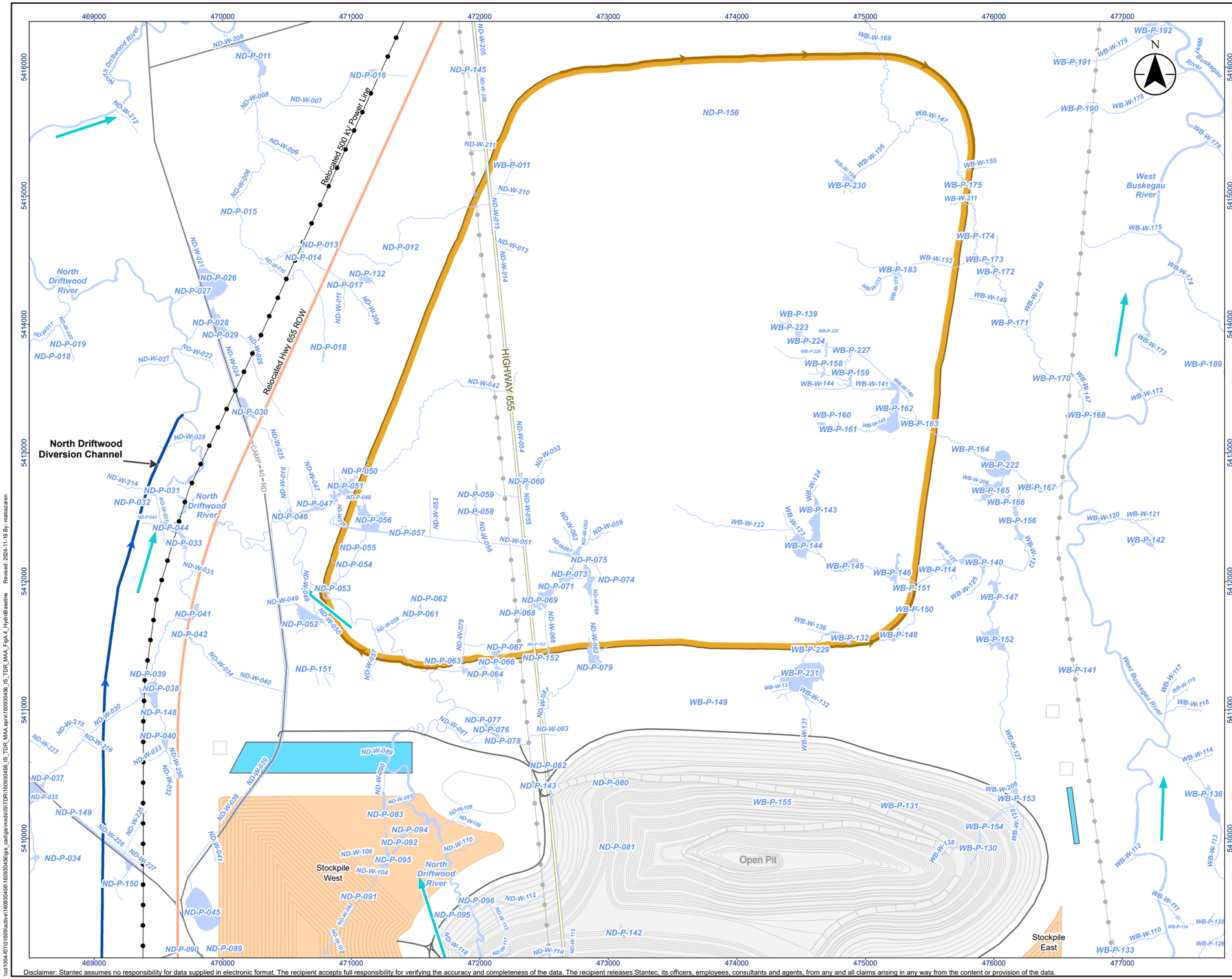
Client/Project
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Crawford Nickel Project

Figure No.
A.3

Title
Surficial Geology - TMF Alternatives

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Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- TMF-2 Non Contact Water Diversion Ditch
- Watercourse Flow Direction

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Transmission Line

Proposed Project Components

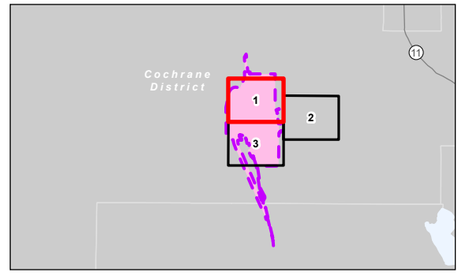
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Proposed Project Components

0 0.5 1 km

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Notes

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Timmins, Ontario

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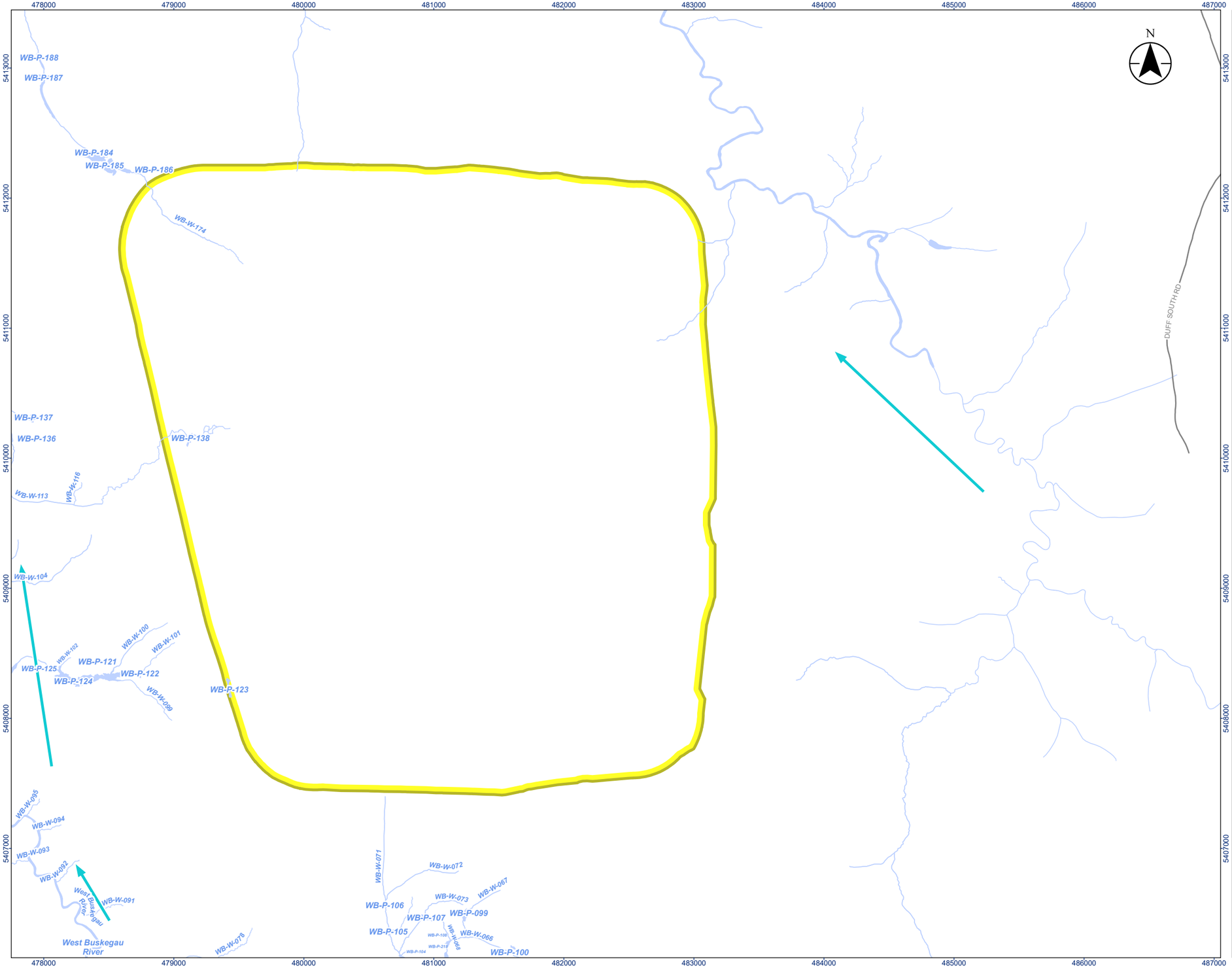
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.4.1

Title
Hydrologic Baseline Information - TMF Alternatives

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CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- Watercourse Flow Direction

Base Features

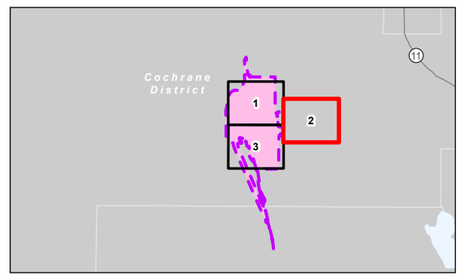
- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody

0 0.5 1 km

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Notes

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Timmins, Ontario

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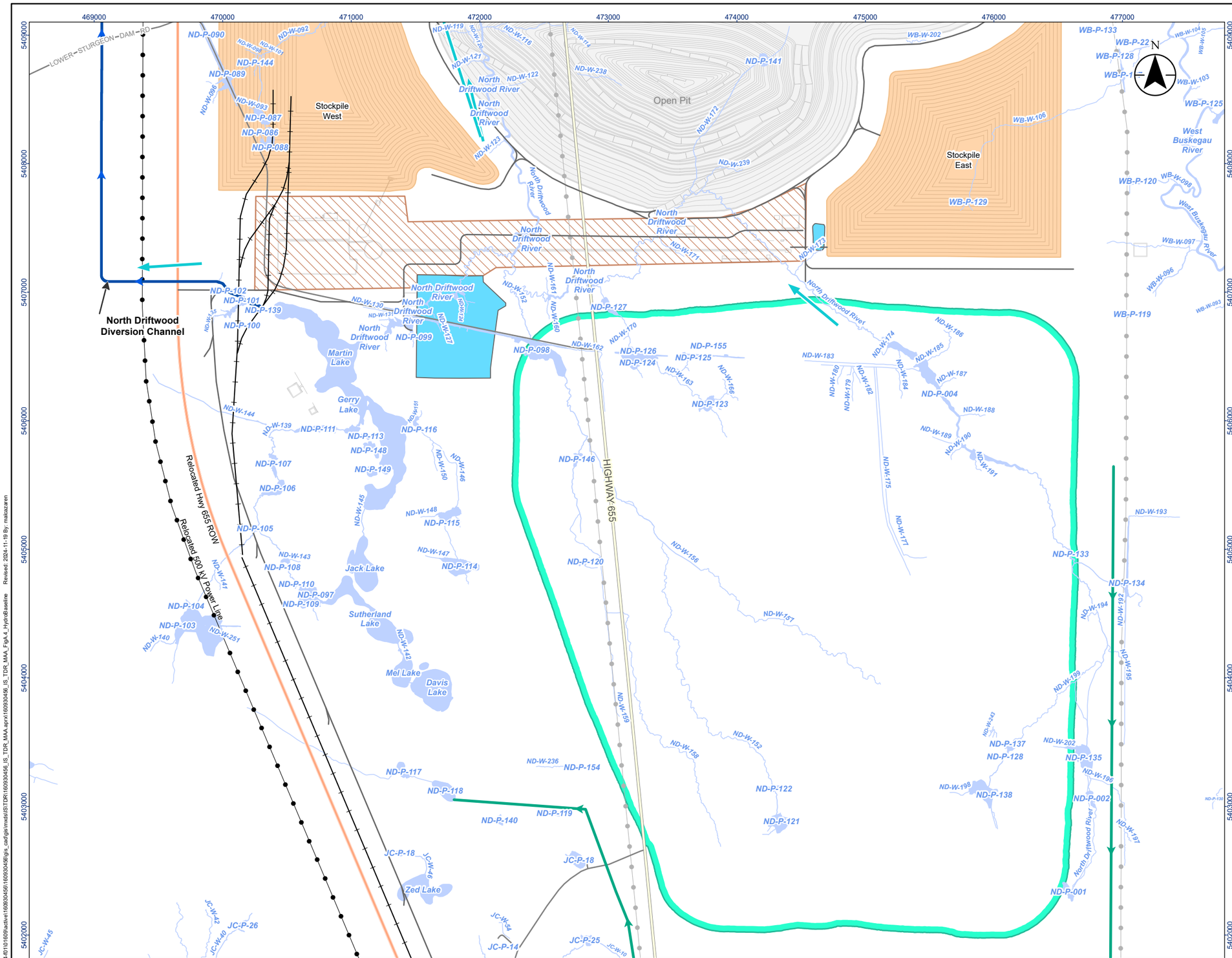
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.4.2

Title
Hydrologic Baseline Information - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- TMF-1 Non Contact Water Diversion Ditch
- Watercourse Flow Direction

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

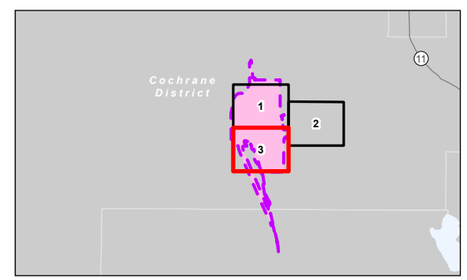
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 0.5 1 km

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Notes

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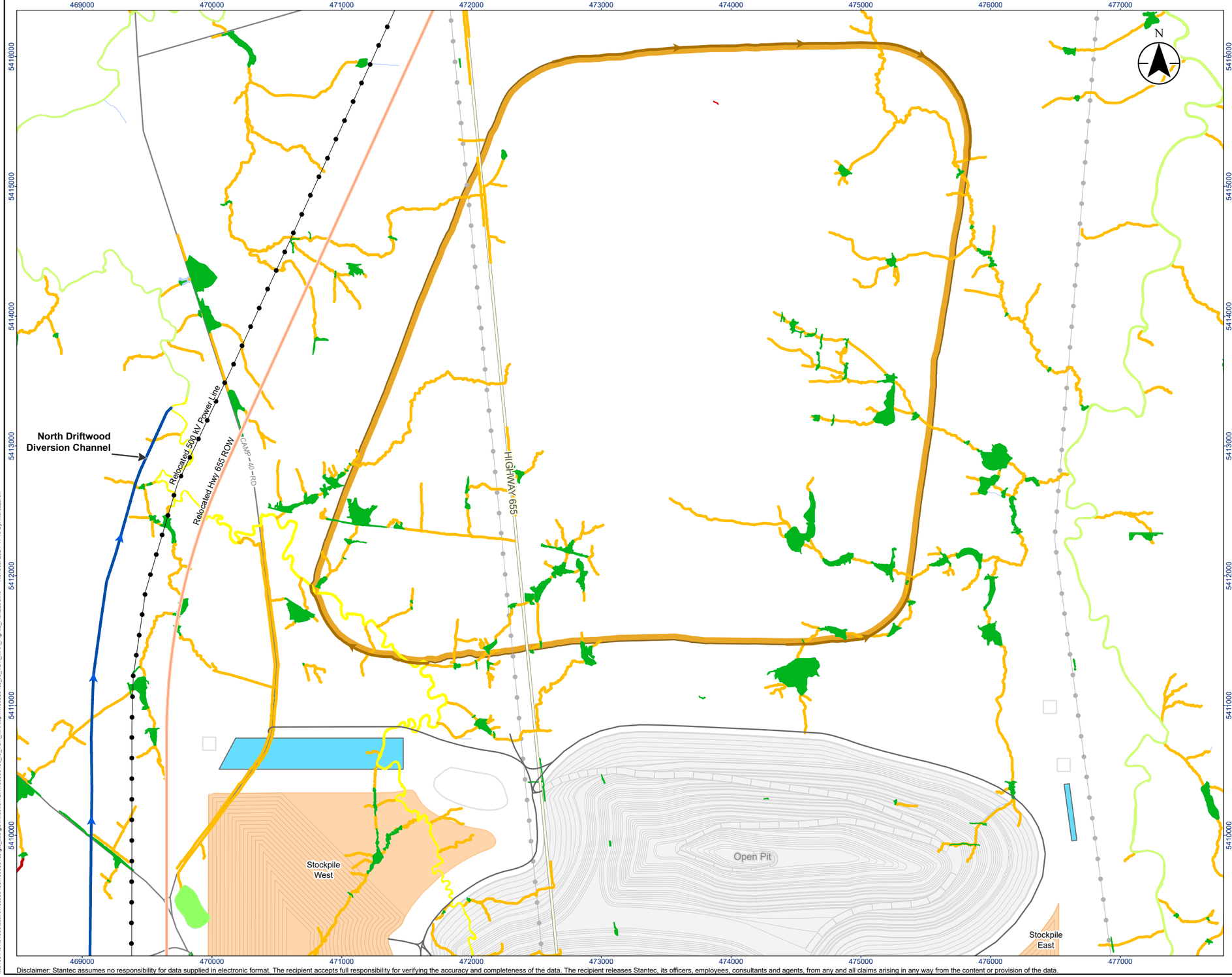
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.4.3

Title
Hydrologic Baseline Information - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- TMF-1 Non Contact Water Diversion Ditch
- TMF-2 Non Contact Water Diversion Ditch

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

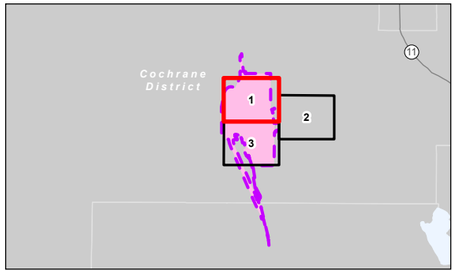
- Discharge Route
- Non-Contact Water Channel
- Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Proposed Project Components

0 0.5 1 km

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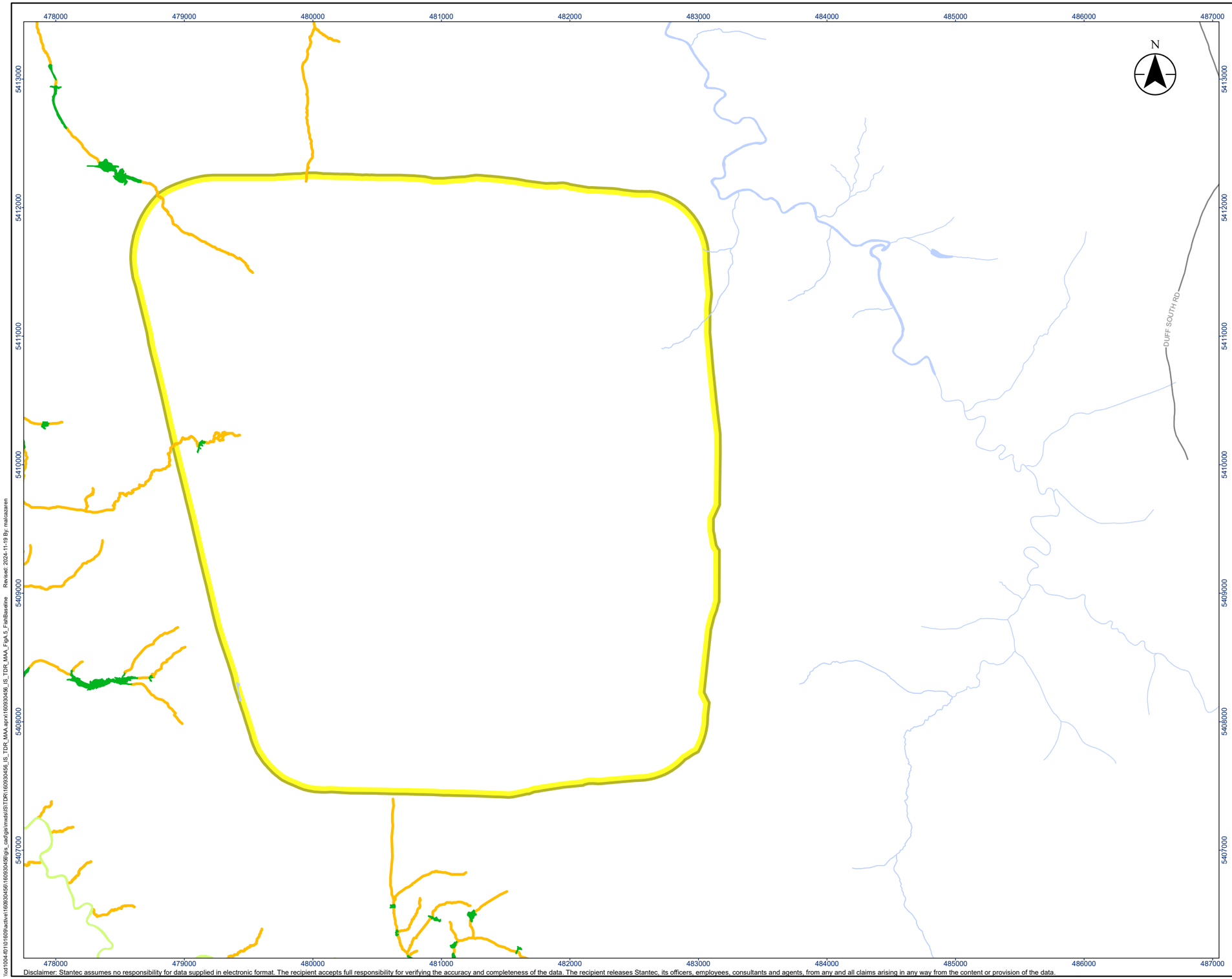
Client/Project
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Crawford Nickel Project

Figure No.
A.5.1

Title
Fish and Fish Habitat Baseline Information - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- TMF-1 Non Contact Water Diversion Ditch
- TMF-2 Non Contact Water Diversion Ditch

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

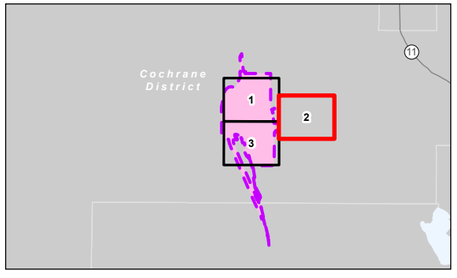
- Discharge Route
- Non-Contact Water Channel
- Contact Water Channel
- Site Road
- Proposed Project Components

0 0.5 1 km

1:30,000 (At original document size of 11x17)

Notes

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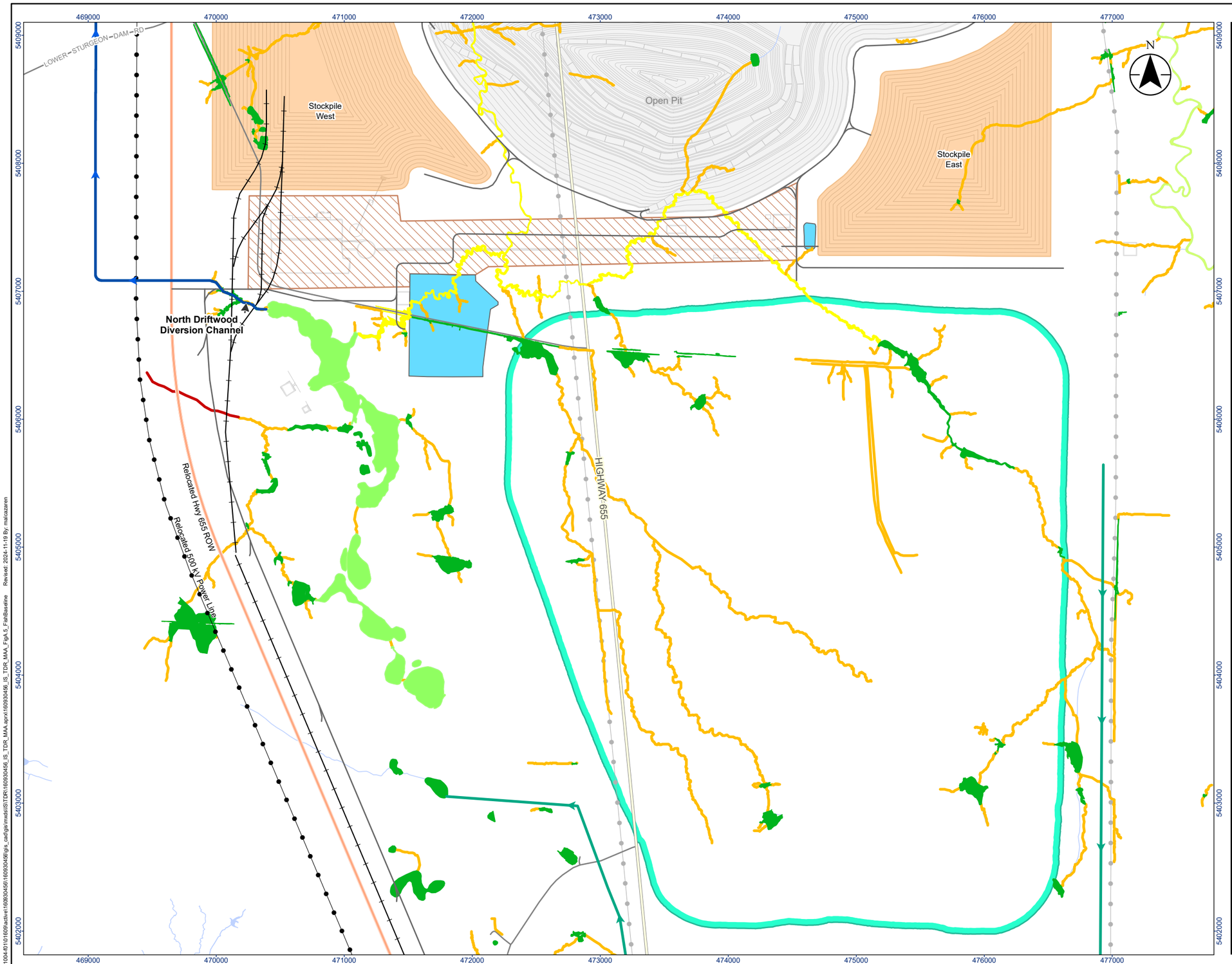
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.5.2

Title
Fish and Fish Habitat Baseline Information - TMF Alternatives

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Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- TMF-1 Non Contact Water Diversion Ditch
- TMF-2 Non Contact Water Diversion Ditch

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

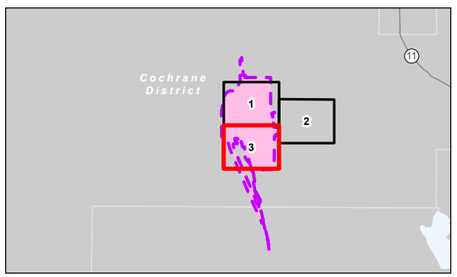
- Discharge Route
- Non-Contact Water Channel
- Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 0.5 1 km

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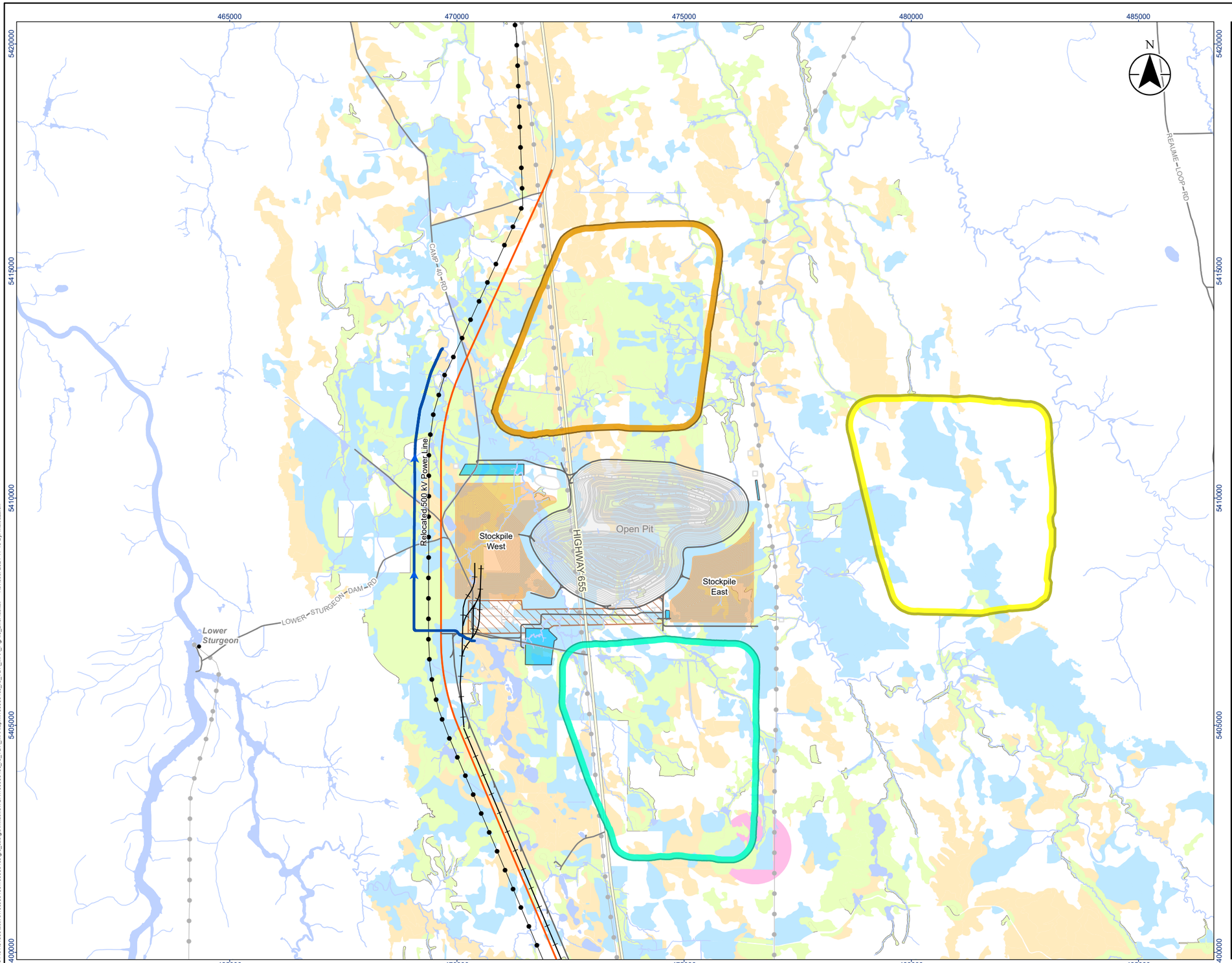
Client/Project
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Crawford Nickel Project

Figure No.
A.5.3

Title
Fish and Fish Habitat Baseline Information - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

Bird Habitat

- Candidate Waterfowl Nesting Area
- Candidate Sharptailed Grouse Habitat
- Candidate Marsh Bird Breeding Habitat
- Confirmed Bald Eagle and Osprey Nesting Habitat
- Candidate Woodland Raptor Nesting Habitat
- Candidate Shrub/Early Successional Breeding Bird Habitat

0 2 4 km

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Notes

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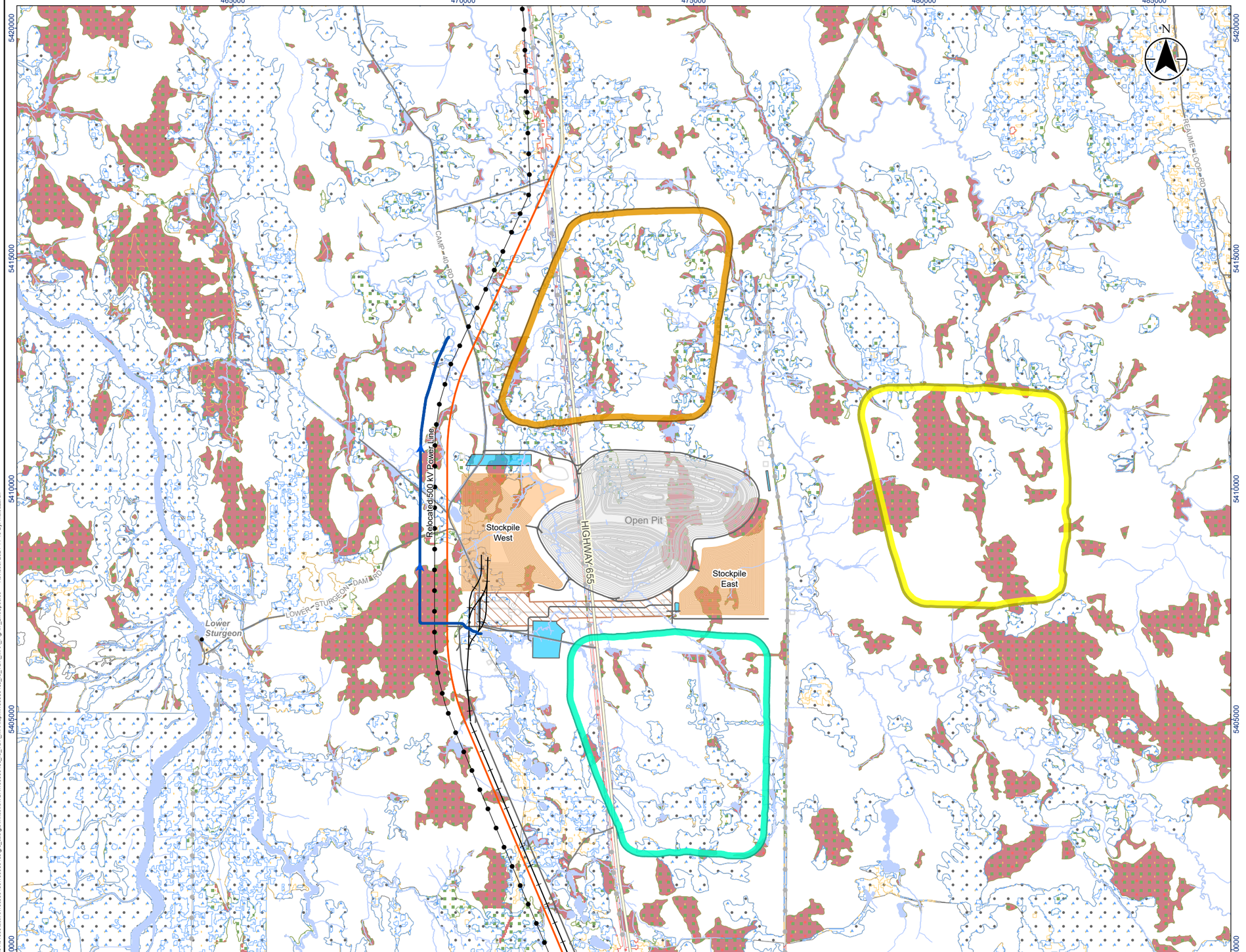
Client/Project
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Crawford Nickel Project

Figure No.
A.6

Title
Terrestial Baseline Information - Bird Habitat - TMF Alternatives

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Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6

Bird Species

- Evening Grosbeak
- Lesser Yellowlegs
- Yellow Rail
- Upland Gamebirds
- Common Nighthawk
- Short-eared Owl

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

1:85,000 (At original document size of 11x17)

Notes

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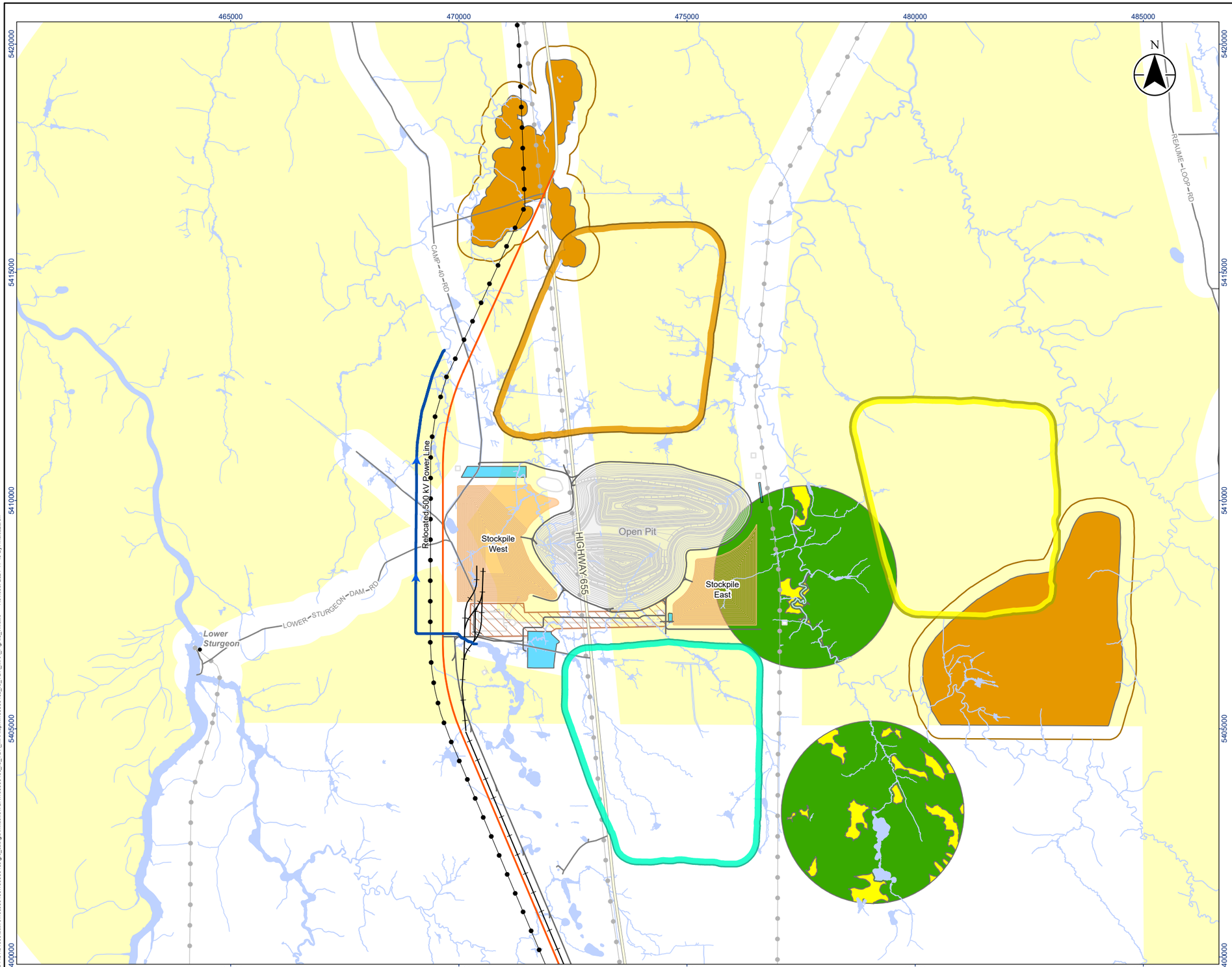
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.7

Title
Terrestial Baseline Information - Bird Species - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6

Wildlife Habitat

- Blanding's Turtle Category 1
- Blanding's Turtle Category 2
- Blanding's Turtle Category 3
- Boreal Caribou Habitat Category 3
- Moose Late Wintering Area (300 m buffer)
- Moose Late Wintering Area

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

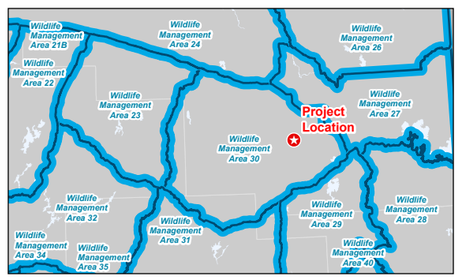
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area
- Proposed Project Components

0 2 4 km

1:85,000 (At original document size of 11x17)

Notes

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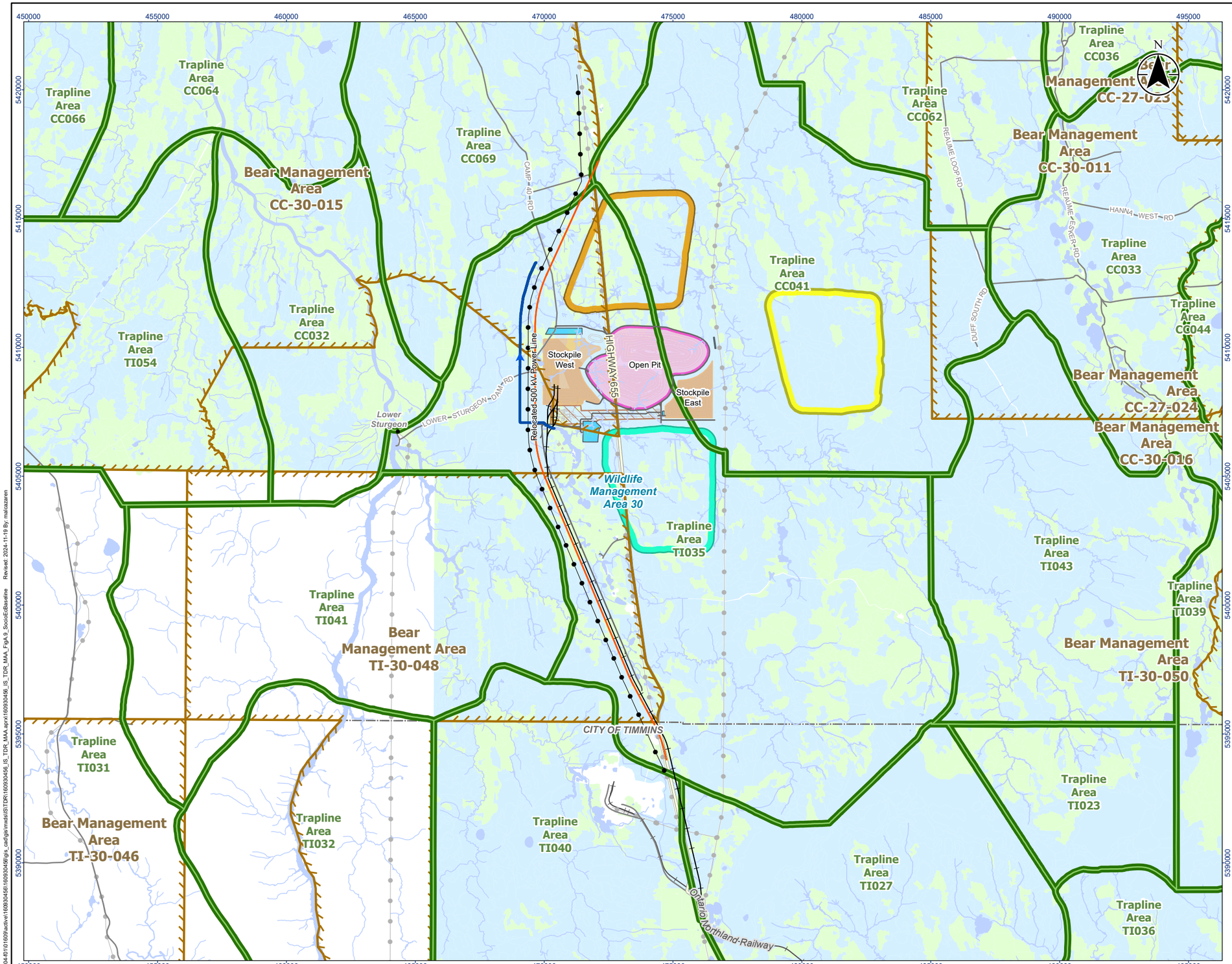
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.8

Title
Terrestial Baseline Information - Wildlife TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6
- Bear Management Area
- Trapline Area
- Wildlife Management Area
- Forest Areas
- Wetland

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Railway
- Watercourse
- Municipal Boundary - Lower Tier
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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Notes

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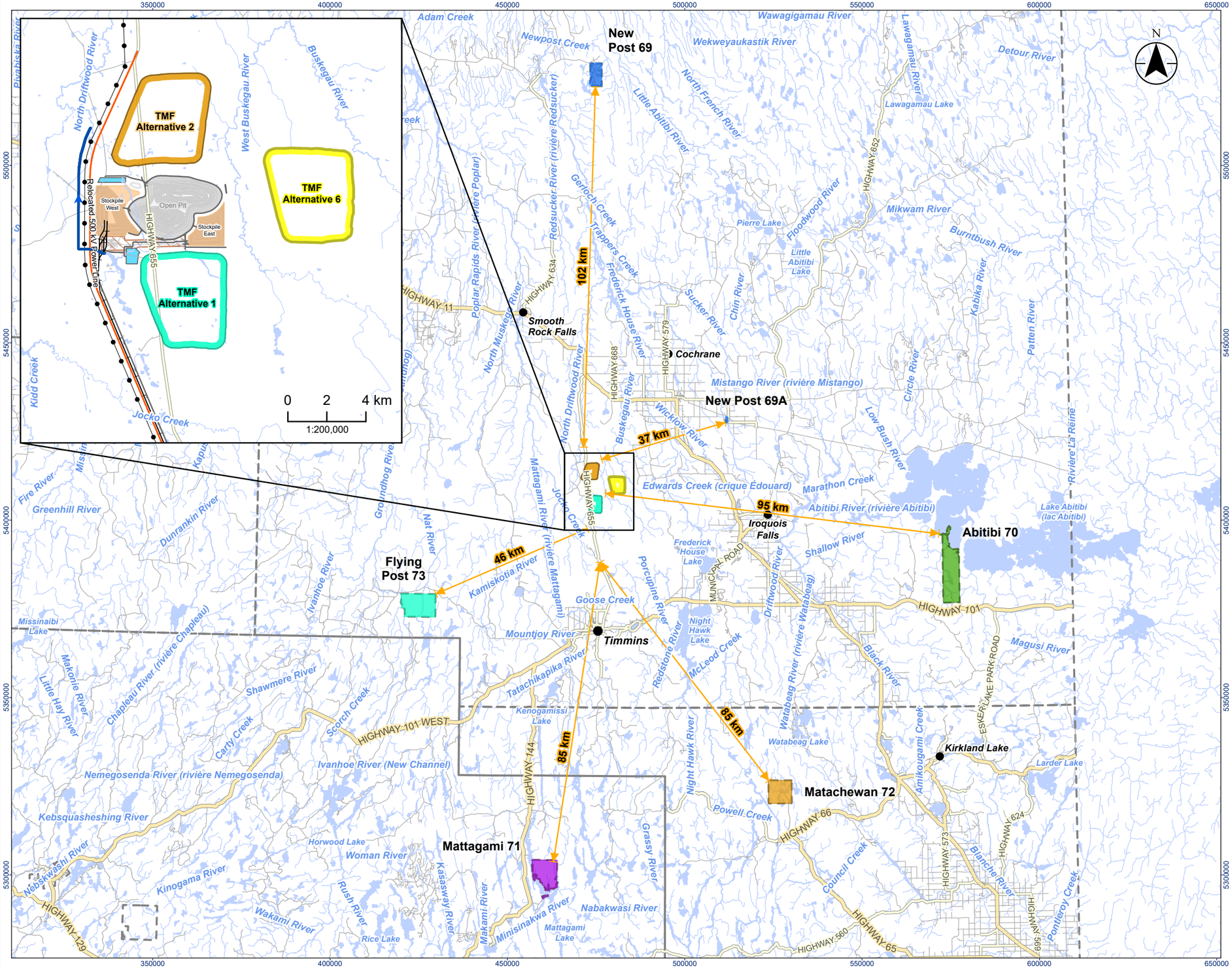
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.9

Title
Socio-Economic Baseline Information - Land and Resources Use - TMF Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- Distance from Project Area to First Nations Reserve
- TMF Alternative 1
- TMF Alternative 2
- TMF Alternative 6

Base Features

- Town
- Expressway / Highway
- Major Road
- Minor Road
- Watercourse
- Municipal Boundary
- Waterbody

First Nations Reserve

- Apitipi Anicinapek Nation Reserve
- Flying Post First Nation Reserve
- Matachewan First Nation Reserve
- Mattagami First Nation Reserve
- Taykwa Tagamou Nation Reserve

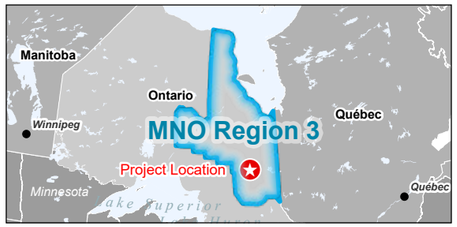
0 25 50 km

1:1,100,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.
3. Métis Nation of Ontario - Region 3 was digitized from map on https://www.metisnation.org/about-the-mno/mno-regions/. For cartographic purposes only. Not an official boundary.
4. Treaty 9 boundaries adapted from Morris 1943 (1964 reprint). For cartographic representation only.
5. Features are generalized. Not all waterbodies and watercourses are shown, due to the scale of the map.





Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

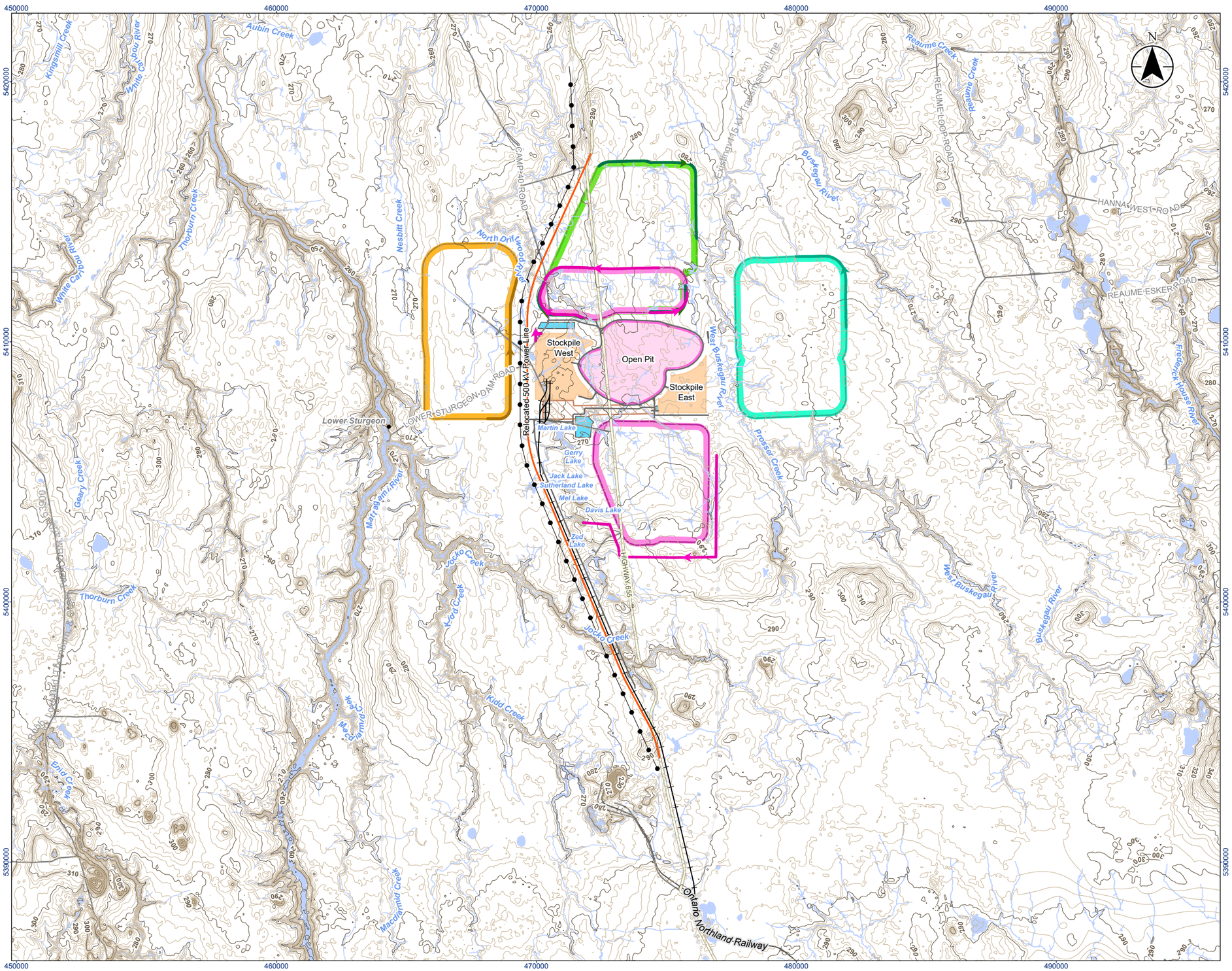
Figure No.
A.10

Title
First Nation Reserves, Treaty Lands and Consultation Areas considered in the TMF Alternatives

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Appendix B MWMA Baseline Information Figures



Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- 2-m Contour Interval
- 10-m Contour Interval
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes

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Project Location
Timmins, Ontario

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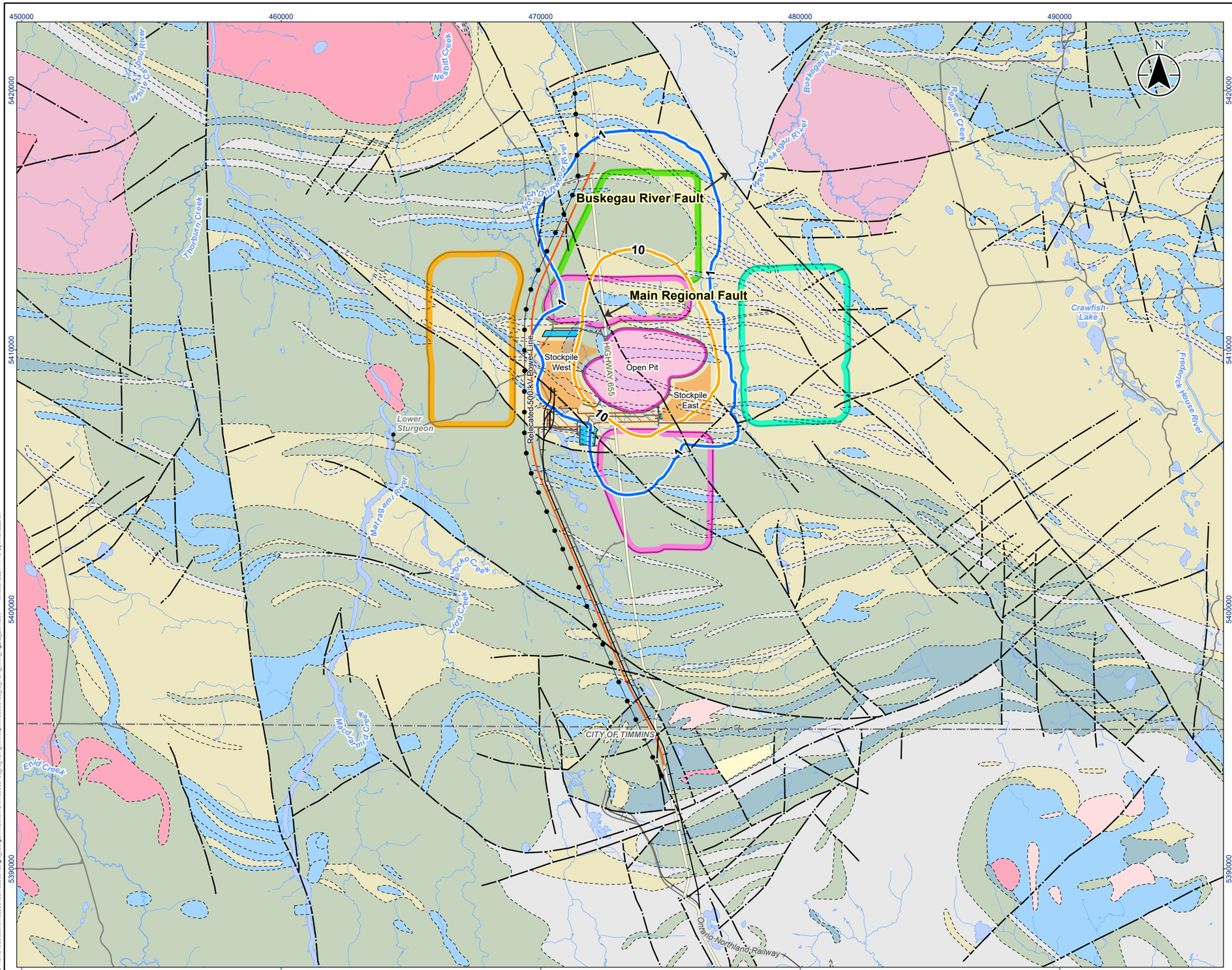
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.1

Title
Topography - MWMA Alternatives

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Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- 1 m Drawdown
- 10 m Drawdown

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

Base Features

- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody
- Municipal Boundary - Lower Tier

Bedrock Geology

- Contact, Sharp, Trend
- Fault
- 4: Mafic to ultramafic metavolcanic rocksgt: mafic metavolcanic and basaltic rocks with minor komatiitic flows, metasedimentary and pyroclastic rocks
- 5: Mafic to intermediate metavolcanic rocksgt: basaltic and andesitic flows, tuffs and breccias, chert, iron formation, minor metasedimentary and intrusive rocks, related migmatites
- 6a: Dacitic and andesitic flows, tuffs and breccias
- 6b: Rhyolitic, rhyodacitic flows, tuffs and breccias
- 7: Metasedimentary rockseg: wacke, siltstone, arkose, argillite, slate, mudstone, marble, chert, iron formation, minor metavolcanic rocks, conglomerate, arenite, paragneiss, migmatites
- 7c: Marble, chert, iron formation, minor metavolcanic rocks
- 9b: Alkaline metavolcanic rocks: mafic to felsic metavolcanic flows, tuffs and breccias
- 10: Mafic and ultramafic rocksq: gabbro, anorthosite, ultramafic rocks
- 10c: Ultramafic rocks
- 12: Foliated tonalite suite: tonalite to granodiorite - foliated to massive
- 14: Diorite-monzodiorite-granodiorite suite: diorite, quartz diorite, minor tonalite, monzonite, granodiorite, syenite and hypabyssal equivalents (saturated to oversaturated suite)
- 15: Massive granodiorite to granite: massive to foliated granodiorite to granite

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.
3. Ontario Geological Survey 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1. ISBN 978-1-4435-5704-7 (CD) ISBN 978-1-4435-5705-4

Project Location
Timmins, Ontario

160930456 REVA
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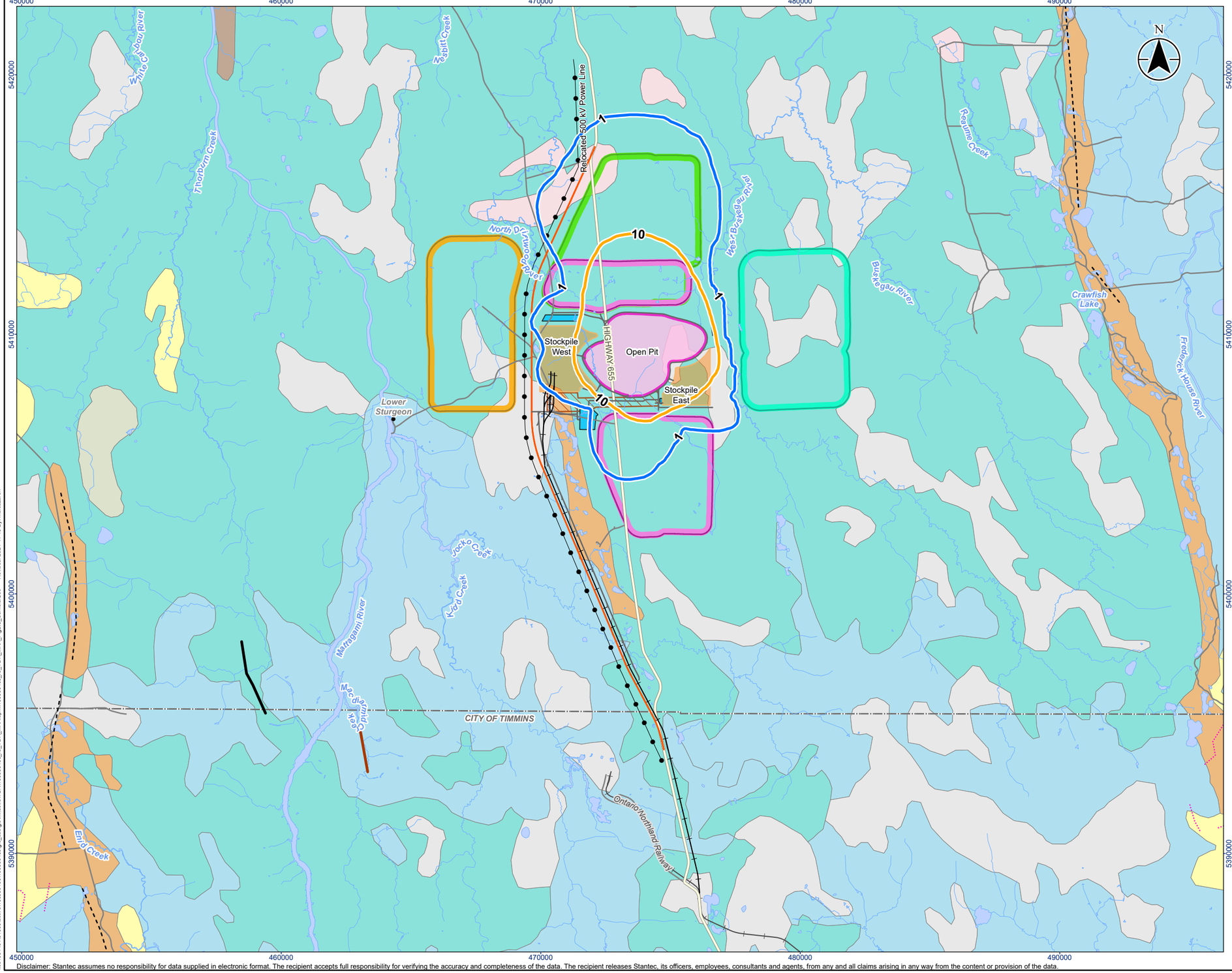
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.2

Title
Regional Bedrock Geology - MWMA Alternatives

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Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- 1 m Drawdown
- 10 m Drawdown

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Site Road

Base Features

- Major Road
- Minor Road
- Railway
- Watercourse
- Waterbody

Surficial Geology

- Beach, bar or spit
- Esker or area of eskers; direction of flow know or assumed
- Terrace escarpment (abandoned shore bluff)
- Trend of end moraine crest
- 1: Bedrock
- 18: Till
- 21: Till, fine-grained
- 22: Glaciofluvial Ice
- 24: Glaciolacustrine deposits
- 25: Glaciolacustrine deposits
- 31: Fluvial deposits
- 32: Organic deposits
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes

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Project Location
Timmins, Ontario

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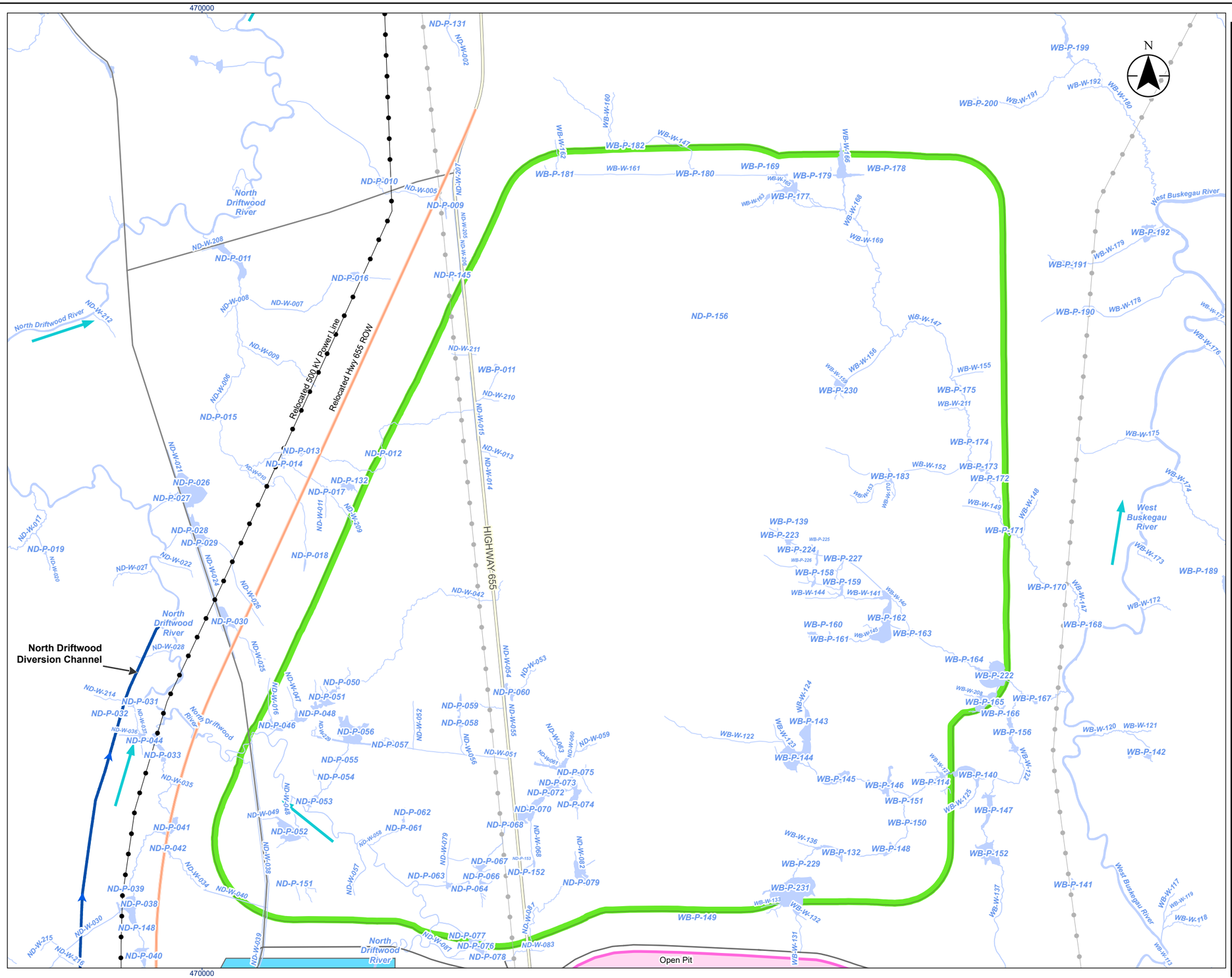
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.3

Title
Surficial Geology - MWMA Alternative

\\cn1004-f01\01609\active\160930456\160930456gis_cad\gis\mxds\ISTDR\160930456_IS_TDR_MAA.aprx\160930456_IS_TDR_MAA_FigB.3_SurficialGeo Revised: 2024-11-19 By: malcazaren

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Watercourse Flow Direction

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Transmission Line

Proposed Project Components

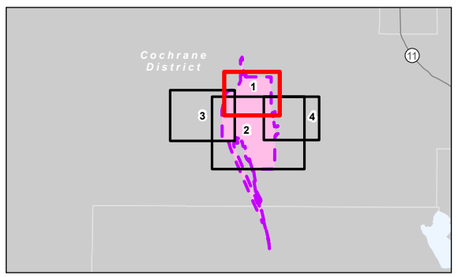
- Non-Contact Water Channel
- Site Road
- Open Pit
- Pond

0 0.5 1 km

1:30,000 (At original document size of 11x17)

Notes

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Timmins, Ontario

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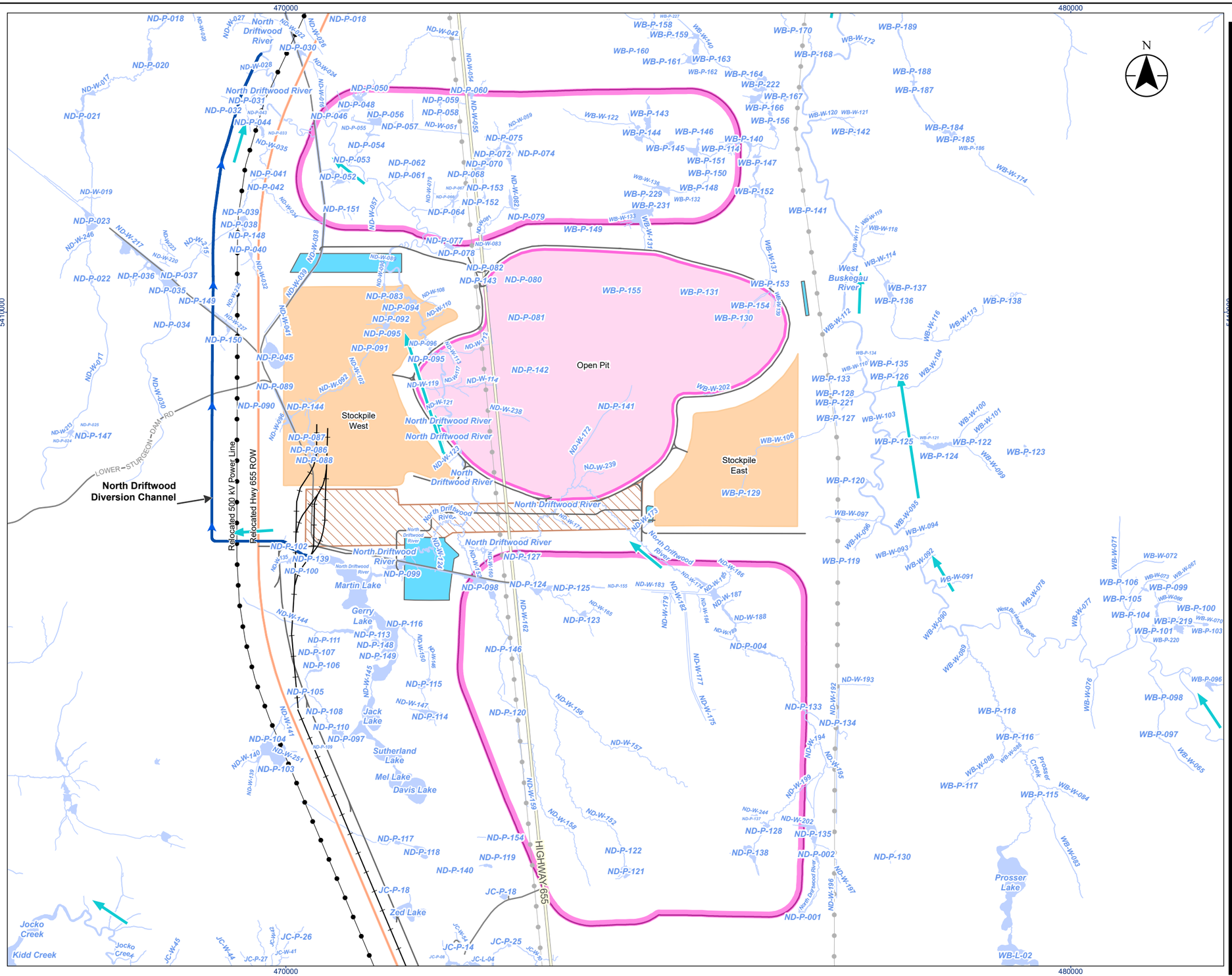
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.4.1

Title
Hydrologic Baseline Information - MWMA Alternatives

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160930456_IS_TDR_MAA_rpt\160930456_IS_TDR_MAA_rpt.aprx Revised: 2024-11-19 By: malcazaren
160930456_IS_TDR_MAA_FigB.4_HydroBaseline Revised: 2024-11-19 By: malcazaren



Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Watercourse Flow Direction

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 0.5 1 km

1:50,000 (At original document size of 11x17)

Notes

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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.4.2

Title
Hydrologic Baseline Information - MWMA Alternatives

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460000

470000

5410000

N

Mattagami River (rivière Mattagami)

Nesbitt Creek

NC-P-01

Nesbitt Creek

North Driftwood River

North Driftwood River

ND-W-247

ND-W-248

ND-P-015

ND-W-021

ND-P-026

ND-P-027

ND-P-028

ND-P-029

ND-W-022

ND-W-024

ND-P-030

ND-P-019

ND-W-027

ND-P-018

ND-P-020

ND-W-017

ND-P-021

ND-W-214

ND-P-031

ND-P-032

ND-P-043

ND-P-044

ND-P-033

ND-W-035

ND-P-041

ND-P-042

ND-W-034

ND-W-040

ND-P-039

ND-P-038

ND-P-148

ND-P-040

ND-W-033

ND-W-250

ND-W-032

ND-W-038

ND-W-019

ND-P-023

ND-W-246

ND-W-217

ND-W-223

ND-W-215

ND-W-216

ND-W-017

ND-W-227

ND-W-219

ND-P-022

ND-P-036

ND-P-037

ND-P-035

ND-P-149

ND-W-218

ND-W-226

ND-W-227

ND-P-034

ND-W-030

ND-W-039

ND-W-041

ND-P-150

ND-P-045

North Driftwood Diversion Channel

Relocated Hwy 655 ROW

Relocated 500 kV Power Line

ND-P-090

Stockpile West

ND-P-144

ND-P-089

ND-W-086

ND-W-092

ND-P-087

ND-P-086

ND-P-025

ND-W-213

ND-P-024

ND-P-147

ND-W-017

LOWER-STURGEON-DAM-RD

ND-P-102

ND-P-101

ND-P-139

ND-P-100

Lower Sturgeon

Mattagami River (rivière Mattagami)

460000

470000

Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Watercourse Flow Direction

Base Features

- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

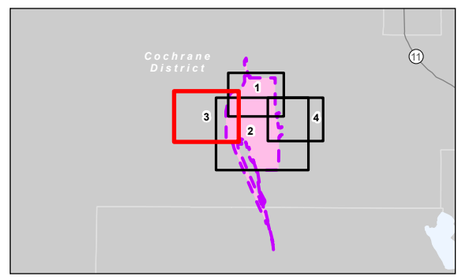
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area

0 0.5 1 km

1:35,000 (At original document size of 11x17)

Notes

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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.4.3

Title
Hydrologic Baseline Information - MWMA Alternatives

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480000

5410000

N

WB-P-189
WB-P-188
WB-P-187
WB-P-184
WB-P-185
WB-P-186
WB-W-174
WB-P-170
WB-W-147
WB-W-172
WB-P-168
WB-W-140
WB-P-162
WB-P-163
WB-P-164
WB-P-222
WB-W-208
WB-P-165
WB-P-167
WB-P-166
WB-P-156
WB-W-120
WB-W-121
WB-P-142
WB-W-127
WB-W-122
WB-P-140
WB-P-146
WB-P-114
WB-P-151
WB-W-125
WB-P-147
WB-P-150
WB-P-148
WB-P-152
WB-P-141
West Buskegau River
WB-W-119
WB-W-118
WB-W-117
WB-W-137
WB-W-114
WB-W-115
WB-P-137
WB-P-136
WB-P-138
WB-W-206
WB-P-153
WB-W-169
WB-P-131
WB-P-154
WB-W-138
WB-P-130
Open Pit
WB-W-112
WB-W-113
WB-W-116
WB-W-111
WB-P-134
WB-P-135
WB-W-110
WB-P-133
WB-P-126
WB-W-104
WB-W-202
WB-P-221
West Buskegau River
WB-P-128
WB-P-127
WB-W-103
WB-W-102
WB-W-100
WB-W-101
WB-P-121
WB-P-125
WB-P-124
WB-P-122
WB-P-123
WB-W-099
WB-W-106
Stockpile East
WB-P-120
WB-W-098
WB-P-129
WB-W-097
WB-W-095
WB-W-094
WB-W-096
WB-W-093
WB-W-092
WB-P-119
WB-W-091
ND-W-185
ND-P-004
WB-W-071
WB-W-072
WB-W-075
WB-W-073
WB-W-067
WB-P-106
WB-P-099

480000

Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Watercourse Flow Direction
- Existing Transmission Line
- Watercourse
- Waterbody

Proposed Project Components

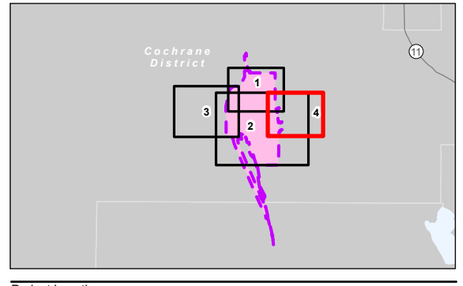
- Site Road
- Ore Stockpile
- Open Pit
- Pond

0 0.5 1 km

1:30,000 (At original document size of 11x17)

Notes

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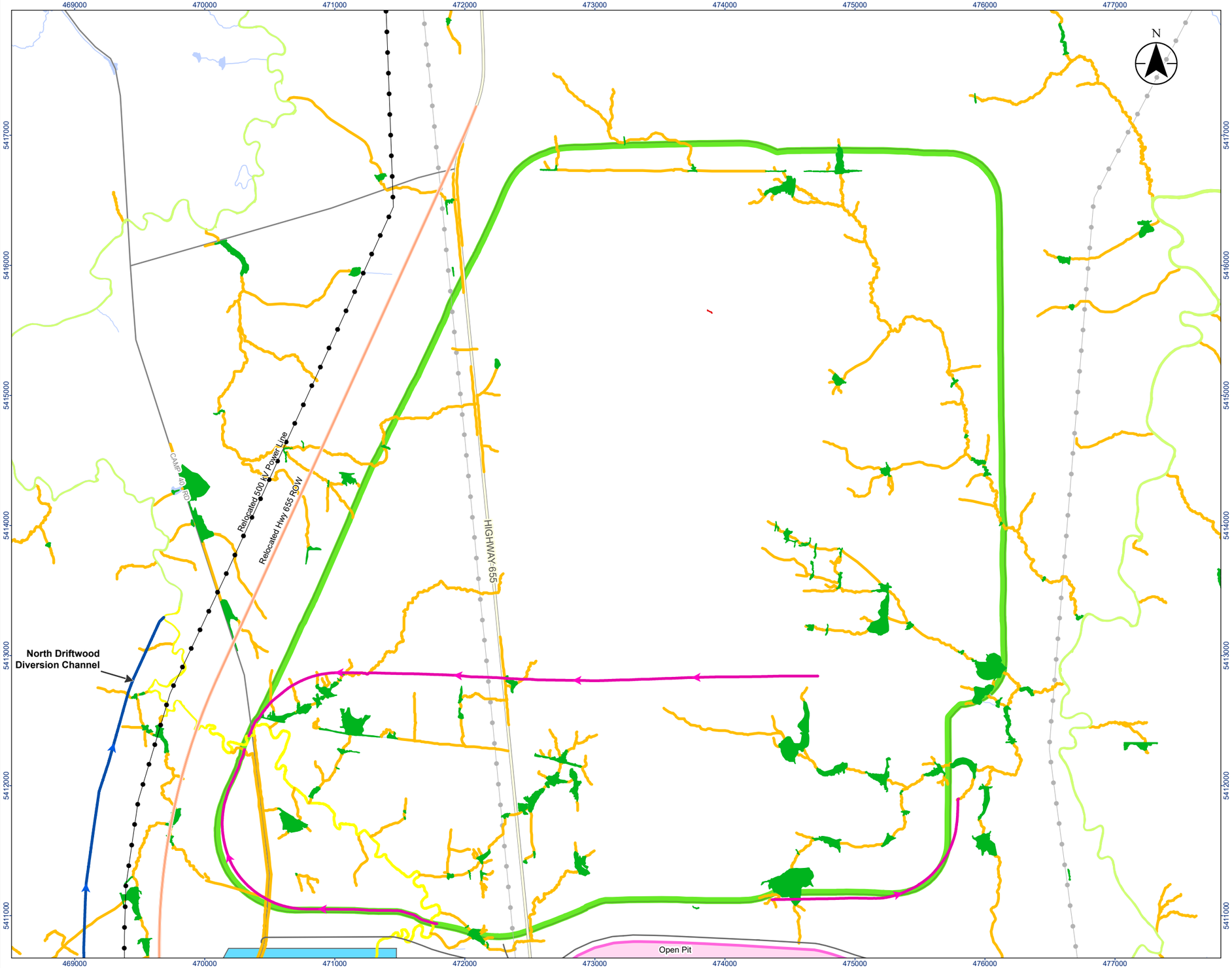
Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.4.4

Title
Hydrologic Baseline Information - MWMA Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Transmission Line

Proposed Project Components

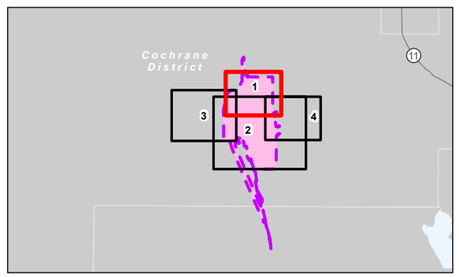
- Non-Contact Water Channel
- Site Road
- Open Pit
- Pond

0 0.5 1 km

1:30,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-11-19

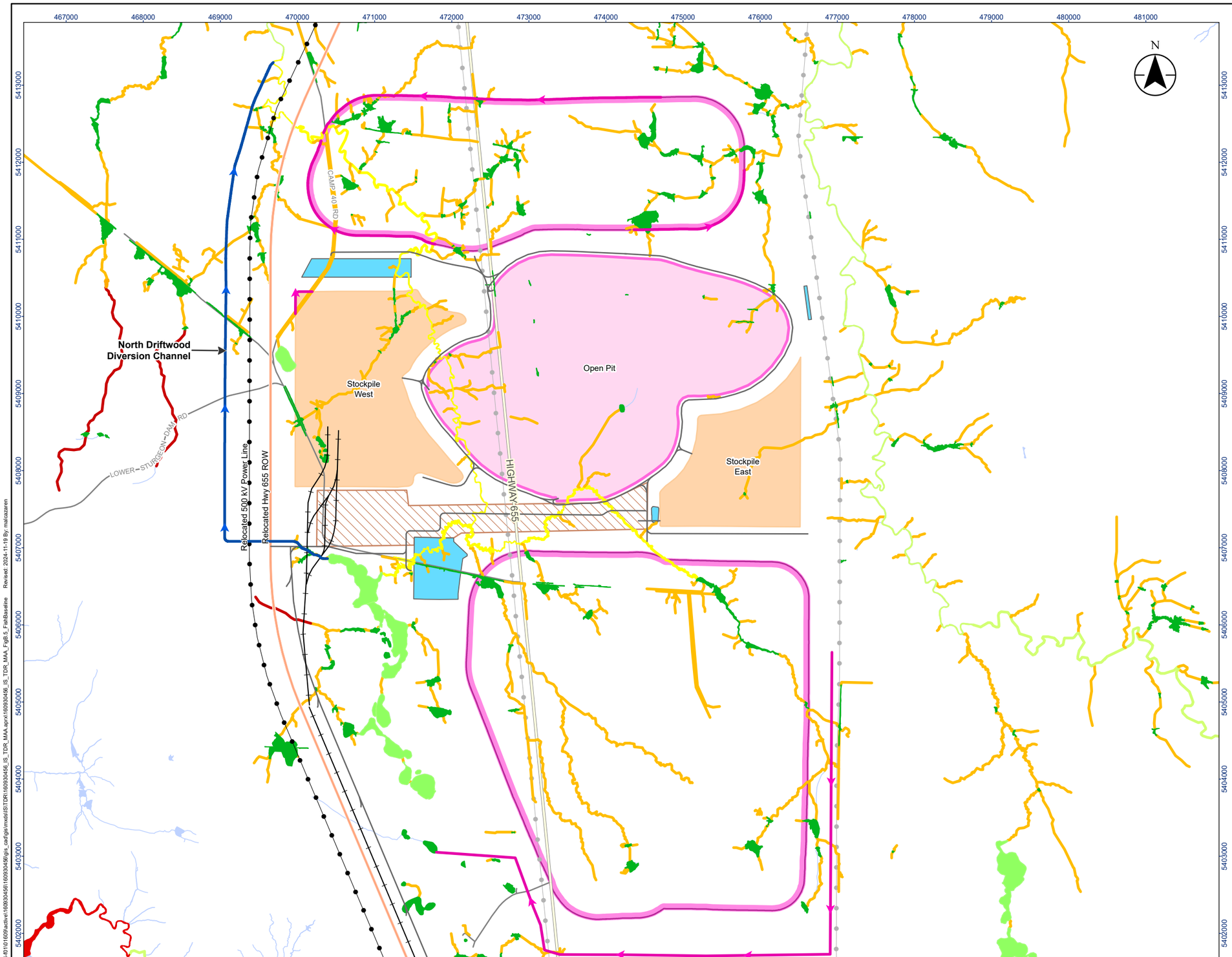
Client/Project
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Crawford Nickel Project

Figure No.
B.5.1

Title
Fish and Fish Habitat Baseline Information - MWMA Alternative

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

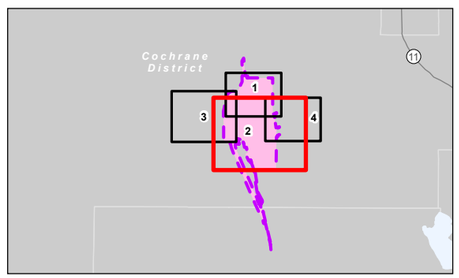
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 0.5 1 km

1:50,000 (At original document size of 11x17)

Notes

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Project Location
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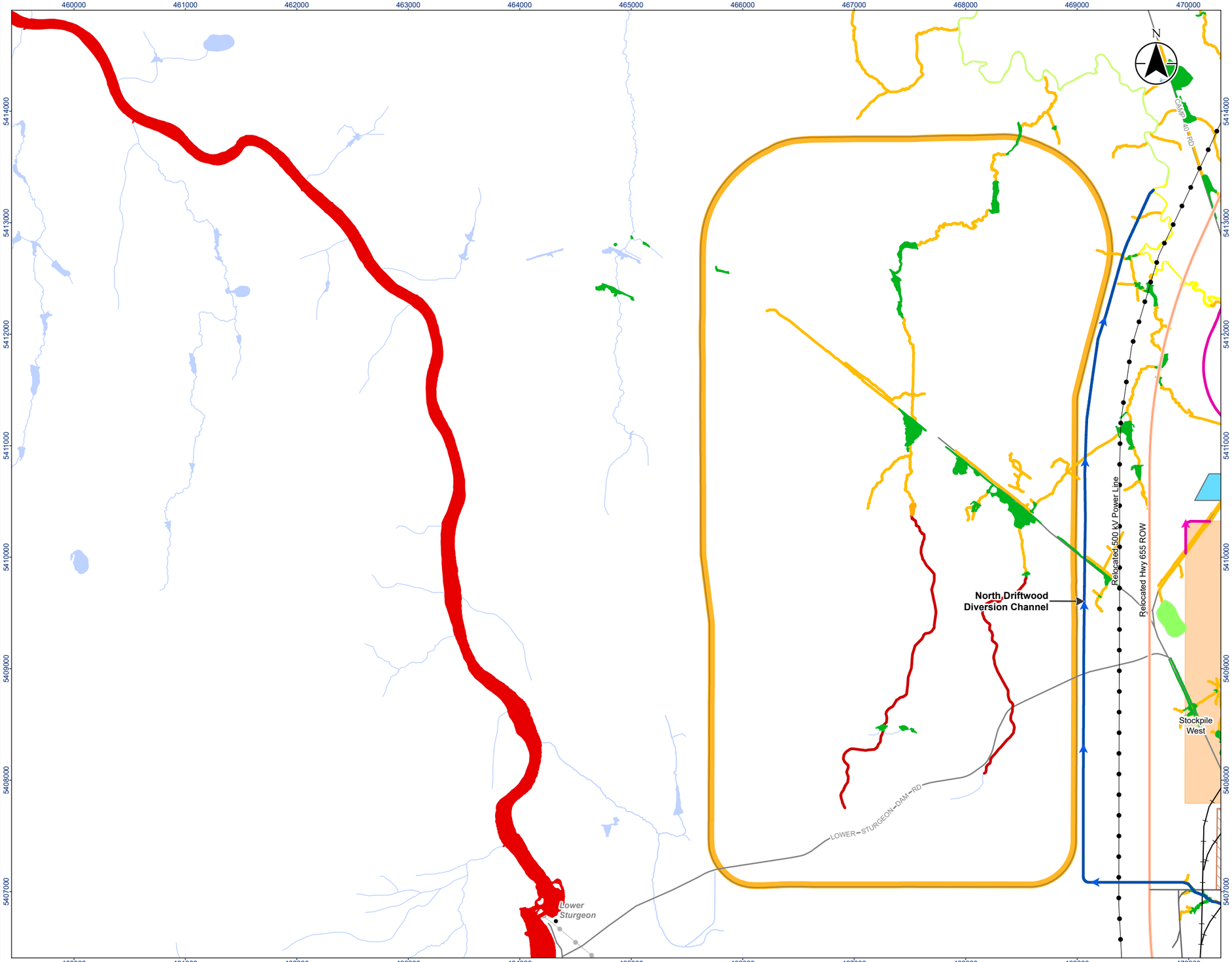
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Crawford Nickel Project

Figure No.
B.5.2

Title
Fish and Fish Habitat Baseline Information - MWMA Alternative

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

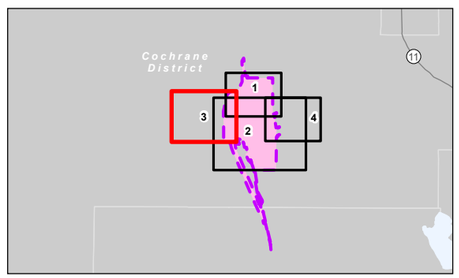
- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Pond
- Process Plant Area

0 0.5 1 km

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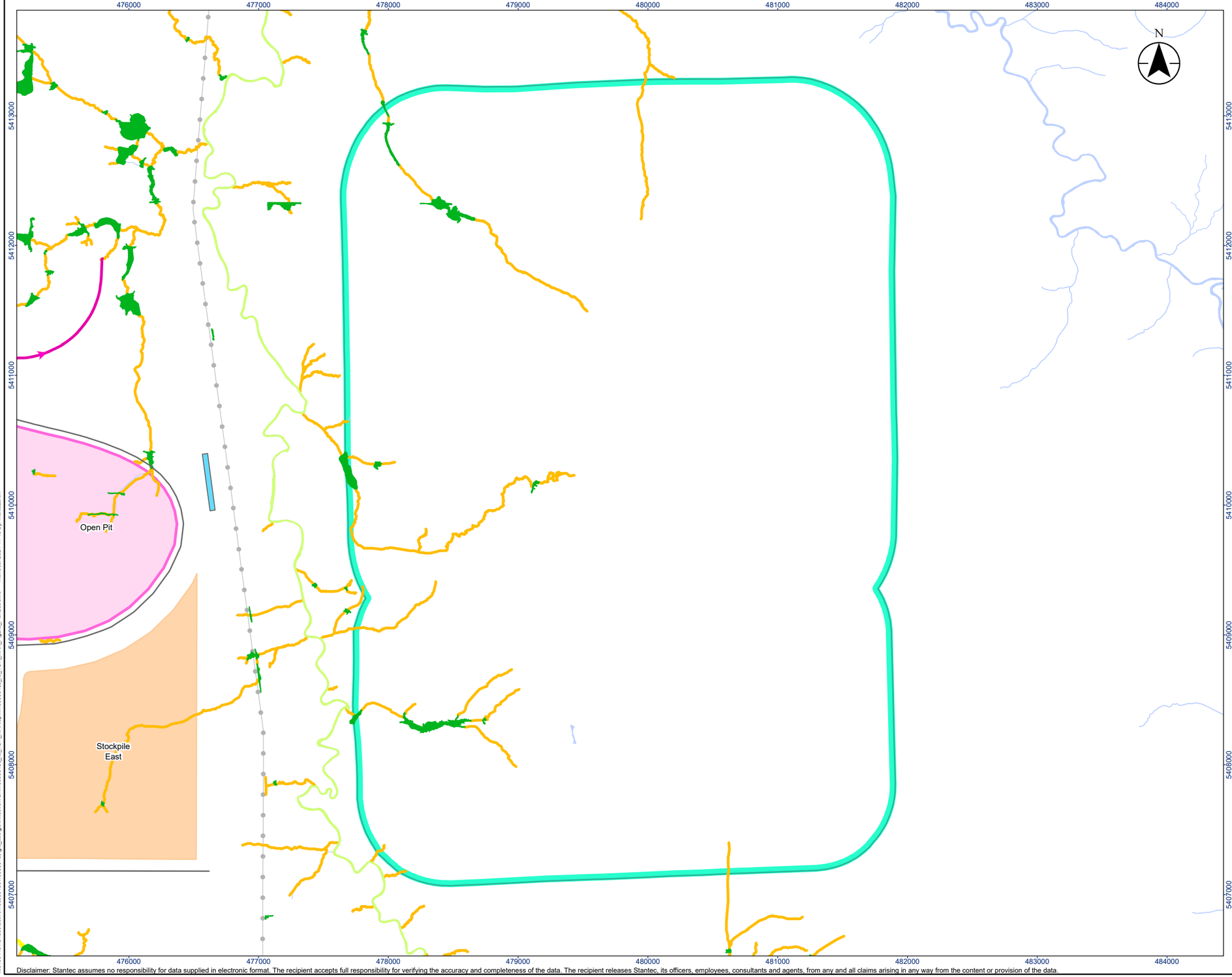
Client/Project
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Crawford Nickel Project

Figure No.
B.5.3

Title
Fish and Fish Habitat Baseline Information - MWMA Alternative

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- MWMA-1 Non-Contact Water Drainage
- MWMA-2 Non-Contact Water Drainage
- MWMA-3 Non-Contact Water Drainage
- MWMA-4 Non-Contact Water Drainage

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Fish Habitat Class

- Type A - Ponds
- Type B - Small Inland Lakes
- Type C - Entrenched Mainstem Watercourses
- Type D - Non-Entrenched Mainstem Watercourse
- Type E - Large Mainstem Rivers
- Type F - Not Fish Habitat

Proposed Project Components

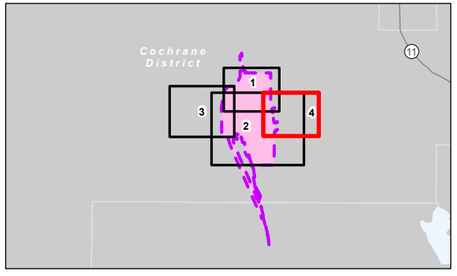
- Site Road
- Ore Stockpile
- Open Pit
- Pond

0 0.5 1 km

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Notes

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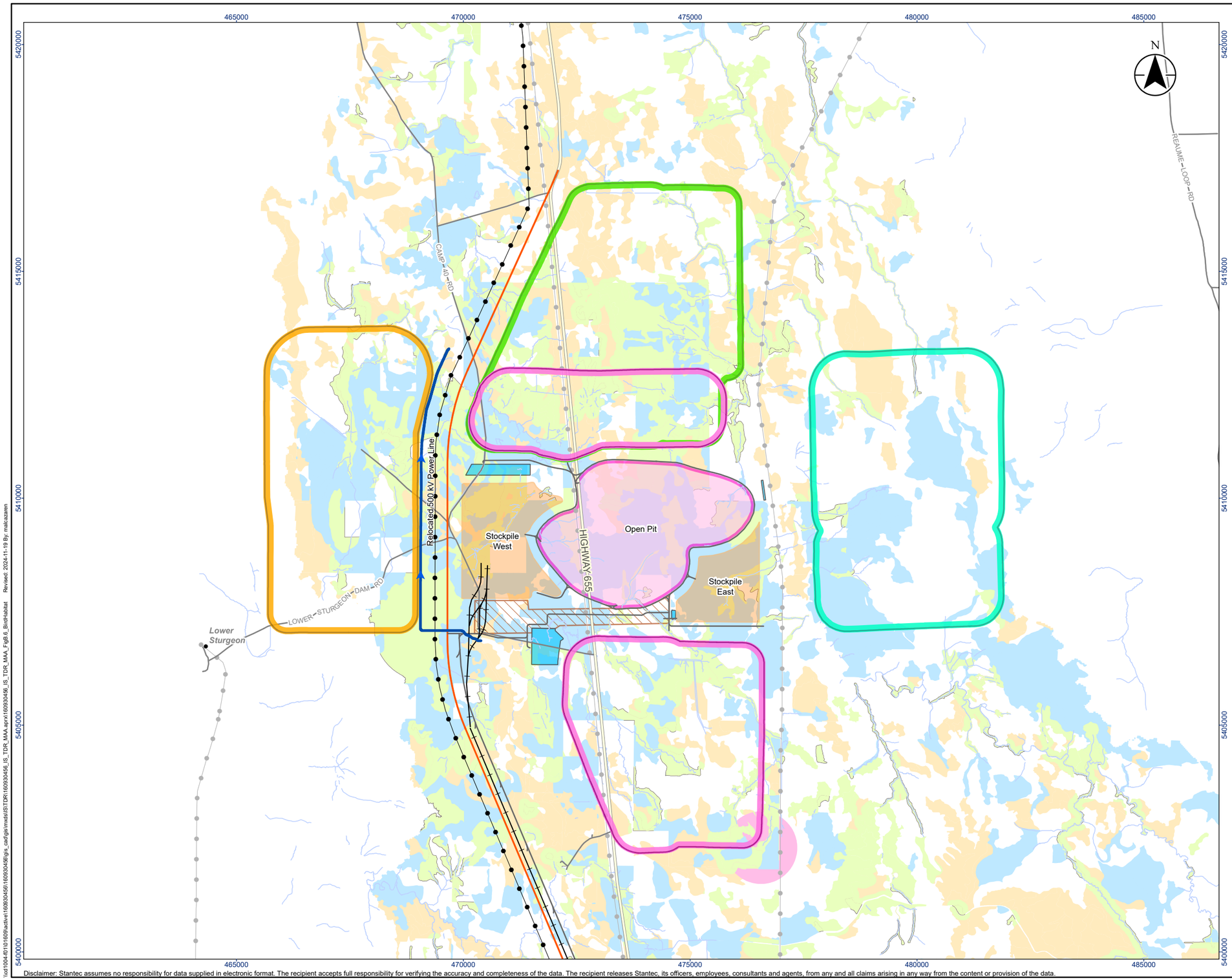
Client/Project
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Crawford Nickel Project

Figure No.
B.5.4

Title
Fish and Fish Habitat Baseline Information - MWMA Alternative

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse

Bird Habitat

- Candidate Waterfowl Nesting Area
- Candidate Sharptailed Grouse Habitat
- Candidate Marsh Bird Breeding Habitat
- Confirmed Bald Eagle and Osprey Nesting Habitat
- Candidate Woodland Raptor Nesting Habitat
- Candidate Shrub/Early Successional Breeding Bird Habitat

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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Notes

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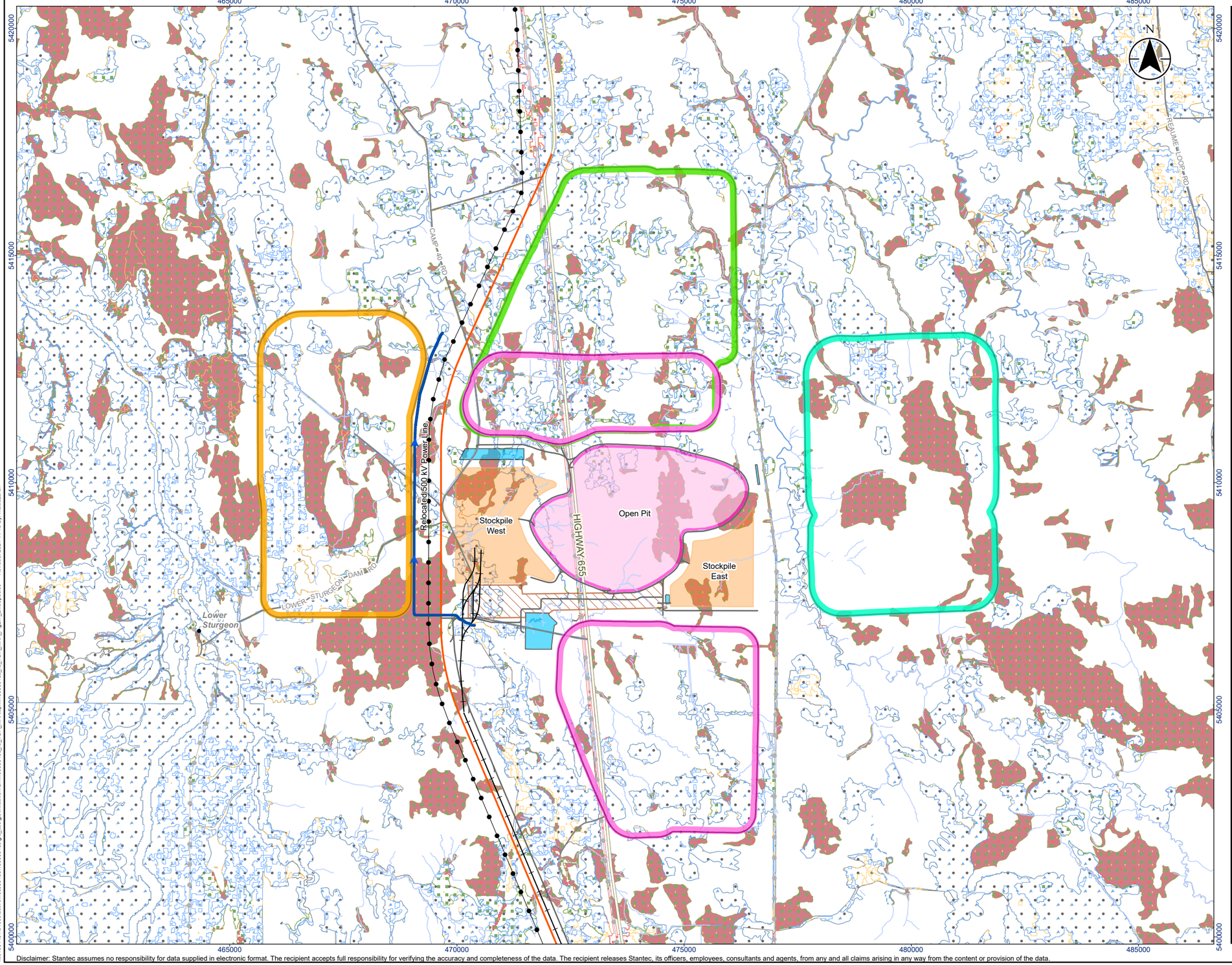
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Crawford Nickel Project

Figure No.
B.6

Title
Terrestial Baseline Information - Bird Habitat - MWMA Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4

Bird Species

- Evening Grosbeak
- Lesser Yellowlegs
- Yellow Rail
- Upland Gamebirds
- Common Nighthawk
- Short-eared Owl

Base Features

- Major Road
- Minor Road
- Existing Transmission Line

Ancillary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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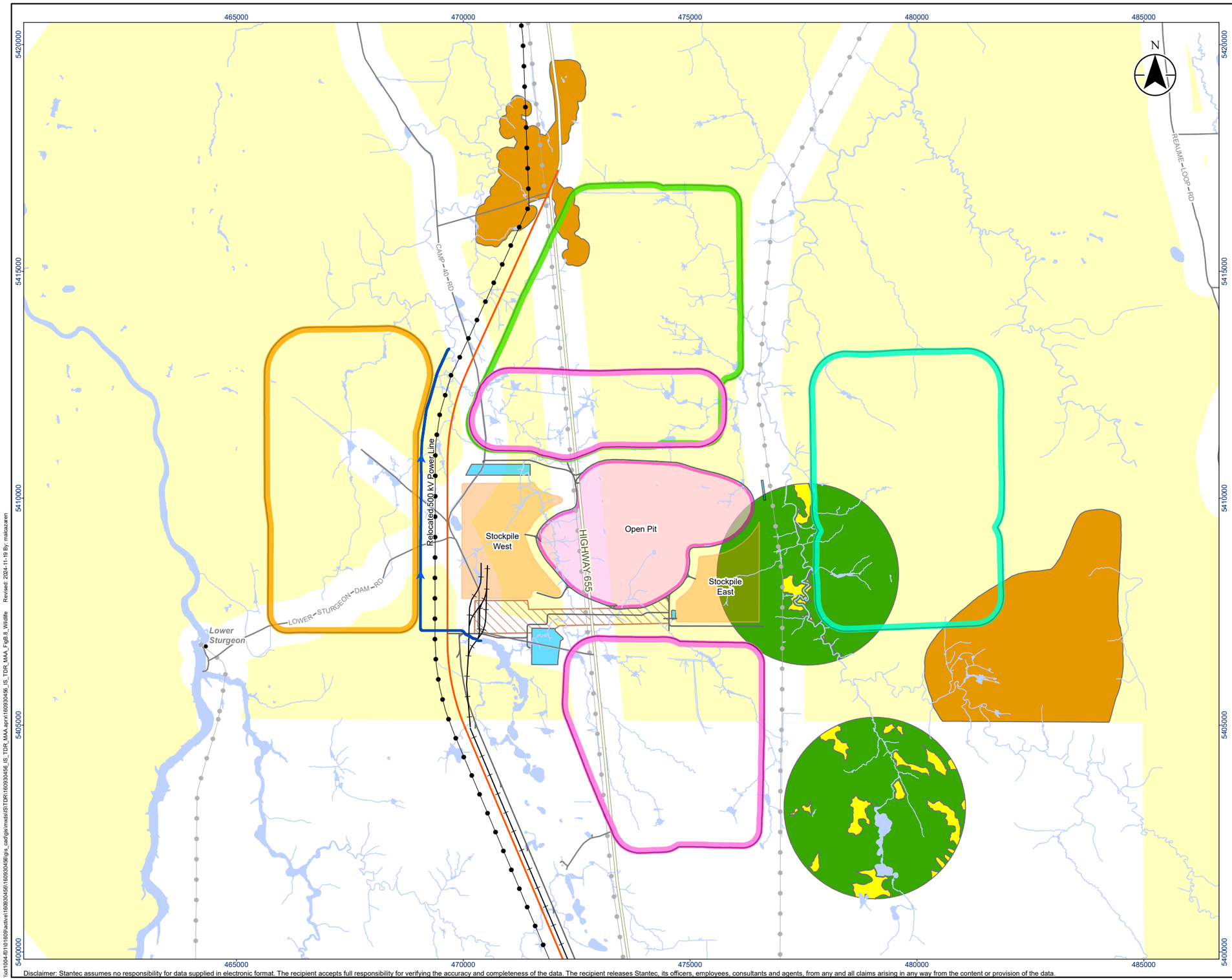
Client/Project
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Crawford Nickel Project

Figure No.
B.7

Title
Terrestial Baseline Information - Bird Species - MWMA Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4

Wildlife Habitat

- Blanding's Turtle Category 1
- Blanding's Turtle Category 2
- Blanding's Turtle Category 3
- Boreal Caribou Habitat Category 3
- Moose Late Wintering Area

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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Notes

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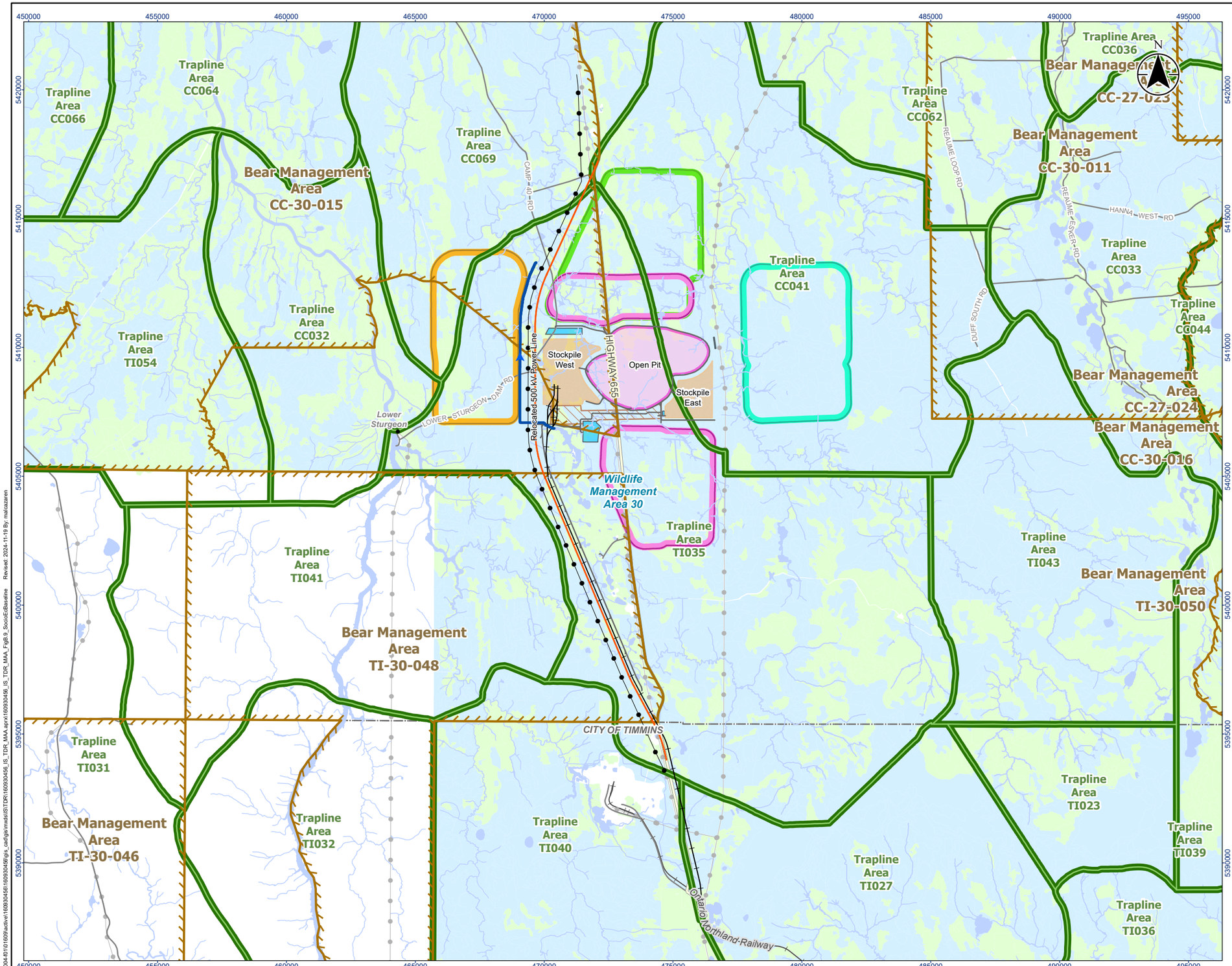
Client/Project
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Crawford Nickel Project

Figure No.
B.8

Title
Terrestial Baseline Information - Wildlife MWMA Alternatives

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Stantec

CANADA NICKEL COMPANY

Legend

- MWMA Alternative 1
- MWMA Alternative 2
- MWMA Alternative 3
- MWMA Alternative 4
- Bear Management Area
- Trapline Area
- Wildlife Management Area
- Forest Area
- Wetland

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Railway
- Watercourse
- Waterbody
- Municipal Boundary - Lower Tier

Ancilliary Infrastructure

- Relocated Hwy 655
- Rail Spur Line
- Transmission Line

Proposed Project Components

- Non-Contact Water Channel
- Site Road
- Ore Stockpile
- Open Pit
- Pond
- Process Plant Area

0 2 4 km

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Notes

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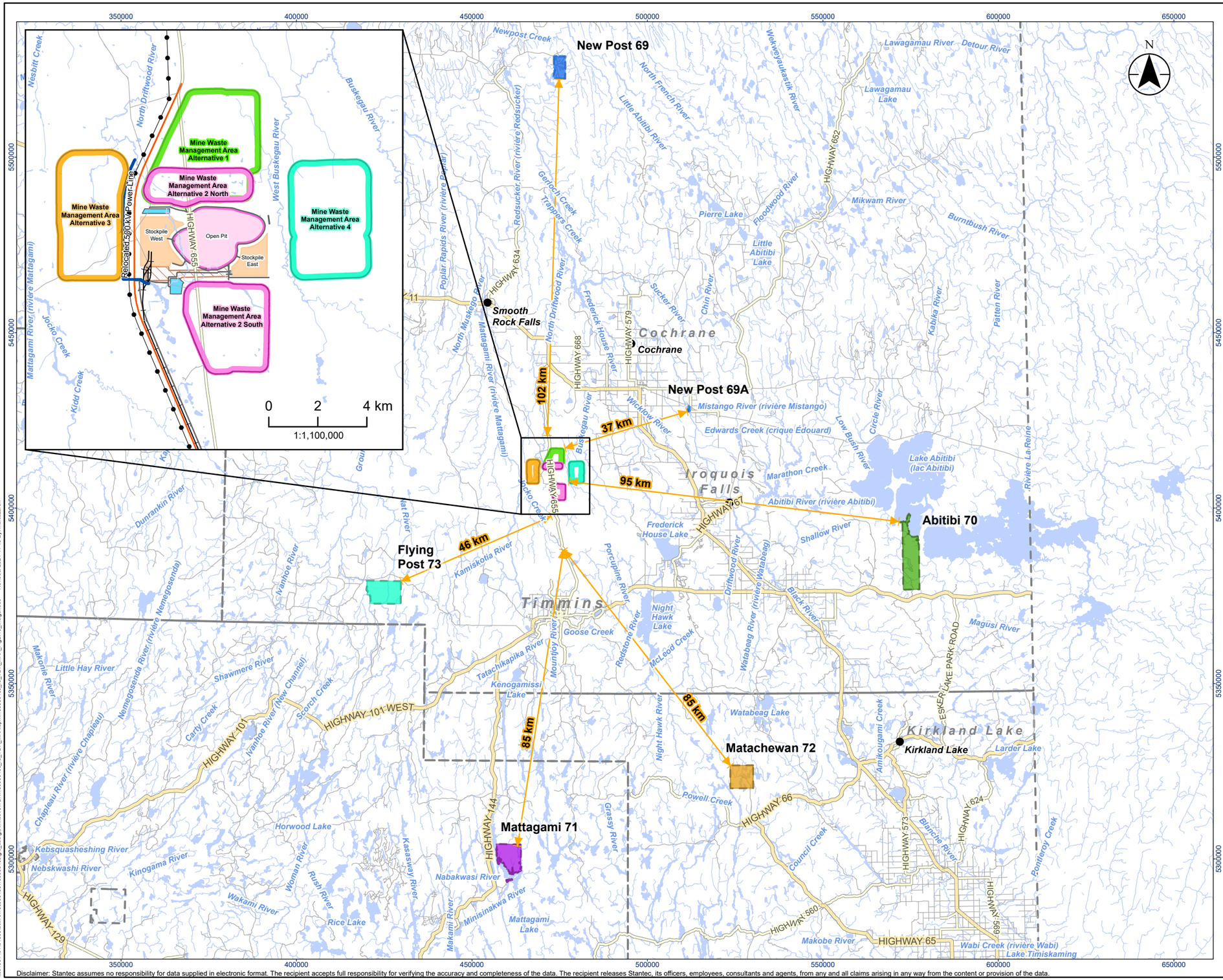
Client/Project
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Crawford Nickel Project

Figure No.
B.9

Title
Socio-Economic Baseline Information - Land and Resources Use - MWMA Alternative

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Stantec

CANADA NICKEL COMPANY

Legend

- Distance from Project Area to First Nations Reserve
- MWWA Alternative 1
- MWWA Alternative 2
- MWWA Alternative 3
- MWWA Alternative 4

Base Features

- Town
- Expressway / Highway
- Major Road
- Minor Road
- Watercourse
- Municipal Boundary
- Waterbody

First Nations Reserve

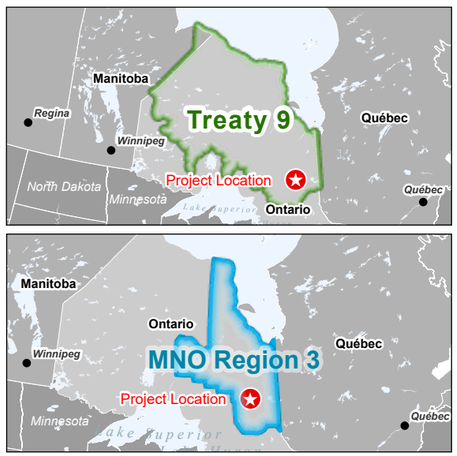
- Apitipi Anicinapek Nation Reserve
- Flying Post First Nation Reserve
- Matachewan First Nation Reserve
- Mattagami First Nation Reserve
- Taykwa Tagamou Nation Reserve

0 25 50 km

1:1,100,000 (At original document size of 11x17)

Notes

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3. Métis Nation of Ontario - Region 3 was digitized from map on https://www.metisnation.org/about-the-mno/mno-regions/. For cartographic purposes only. Not an official boundary.
4. Treaty 9 boundaries adapted from Morris 1943 (1964 reprint). For cartographic representation only.
5. Features are generalized. Not all waterbodies and watercourses are shown, due to the scale of the map.



Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
B.10

Title
First Nation Reserves, Treaty Lands and Consultation Areas considered in the MWMA Alternatives

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Appendix C TMF Alternatives Characterization Criteria

Table C.1 Characterization Criteria - Environmental Characterization – TMF

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Geochemical Characterization of Waste	In combination with mitigation measures, the geochemical characteristics of waste govern effluent water quality.	Based on preliminary geochemical characterization data, tailings are anticipated to be non-potentially acid generating as identified in the Crawford Geochemistry Characterization Report (WSP 2024)[3]. Tailings and waste rock had static test results identifying presence of potentially acid generating (PAG) or uncertain acid generating potential for the carbonate neutralization potential (CO3-NP) test[7] results with lower percentages of PAG materials or classified as non-PAG (NPAG) based on the modified Sobek NP[7] results. The kinetic humidity cell test (HCT) results for waste rock and tailings had a minimum pH of 6.7, which is classified as circumneutral and within PWQO and CCME CWQG criteria range with tests extending up to 99 weeks in length. One of the tailings HCT tests (dunite) had CO3-NP results indicating the carbonate NP of the tailings had been exhausted within 41 weeks of the test starting, but still produced neutral discharges (>6.7) to the end of the 99-week test. Thickened tailings deposited at the TMF from mine year 1 to mine year 18 of the operations phase will be rehabilitated by placing a layer of overburden and/or organic soil that is subsequently vegetated to reduce the interactions of tailings with runoff. If submergence is required to manage tailings acid generating potential, storage reductions may be required to meet freeboard requirements associated with submergence. Tailings produced in mine year 18 to the end of the operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching. Tailings would be potentially placed in the pit earlier than mine year 18 if identified as potentially acid generating to meet submergence requirements	Based on preliminary geochemical characterization data, tailings are anticipated to be non-potentially acid generating as identified in the Crawford Geochemistry Characterization Report (WSP 2024)[3]. Tailings and waste rock had static test results identifying presence of potentially acid generating (PAG) or uncertain acid generating potential for the carbonate neutralization potential (CO3-NP) test[7] results with lower percentages of PAG materials or classified as non-PAG (NPAG) based on the modified Sobek NP[7] results. The kinetic humidity cell test (HCT) results for waste rock and tailings had a minimum pH of 6.7, which is classified as circumneutral and within PWQO and CCME CWQG criteria range with tests extending up to 99 weeks in length. 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Tailings would be potentially placed in the pit earlier than mine year 18 if identified as potentially acid generating to meet submergence requirements	Based on preliminary geochemical characterization data, tailings are anticipated to be non-potentially acid generating as identified in the Crawford Geochemistry Characterization Report (WSP 2024)[3]. Tailings and waste rock had static test results identifying presence of potentially acid generating (PAG) or uncertain acid generating potential for the carbonate neutralization potential (CO3-NP) test[7] results with lower percentages of PAG materials or classified as non-PAG (NPAG) based on the modified Sobek NP[7] results. The kinetic humidity cell test (HCT) results for waste rock and tailings had a minimum pH of 6.7, which is classified as circumneutral and within PWQO and CCME CWQG criteria range with tests extending up to 99 weeks in length. One of the tailings HCT tests (dunite) had CO3-NP results indicating the carbonate NP of the tailings had been exhausted within 41 weeks of the test starting, but still produced neutral discharges (>6.7) to the end of the 99-week test. Thickened tailings deposited at the TMF from mine year 1 to mine year 18 of the operations phase will be rehabilitated by placing a layer of overburden and/or organic soil that is subsequently vegetated to reduce the interactions of tailings with runoff. If submergence is required to manage tailings acid generating potential, storage reductions may be required to meet freeboard requirements associated with submergence. Tailings produced in mine year 18 to the end of the operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching. Tailings would be potentially placed in the pit earlier than mine year 18 if identified as potentially acid generating to meet submergence requirements	Geochemical Characterization Report (WSP 2024)[3]

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Geochemical Characterization of Construction Materials and Excavation Waste	In combination with mitigation measures, the geochemical characteristics of construction materials and excavation waste govern effluent water quality.	The dam will be raised as a zoned earth fill embankment. The dam includes a low permeability clay core as the seepage control element. Filter and transition zones are provided on both the upstream and downstream sides of the clay core and serve to protect the core material from seepage migration into the upstream and downstream shells. The clay core will be covered by a layer of frost protection material (sand) to insulate the core and reduce potential for degradation from freeze-thaw action. Rip rap erosion protection will be provided over the exposed sand slopes of the frost protection and upstream shell using non-potential acid generating mine waste rock. Dam fill material (clay, sand, and waste rock) are expected to be sourced from the open pit, with the exception of material required for the wick drainage blanket. Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. Material excavated for the preparation of the dam foundation will consist of organics, frozen materials, loose overburden soils and other unsuitable materials.	The dam will be raised as a zoned earth fill embankment. The dam includes a low permeability clay core as the seepage control element. Filter and transition zones are provided on both the upstream and downstream sides of the clay core and serve to protect the core material from seepage migration into the upstream and downstream shells. The clay core will be covered by a layer of frost protection material (sand) to insulate the core and reduce potential for degradation from freeze-thaw action. Rip rap erosion protection will be provided over the exposed sand slopes of the frost protection and upstream shell using non-potential acid generating mine waste rock. Dam fill material (clay, sand, and waste rock) are expected to be sourced from the open pit, with the exception of material required for the wick drainage blanket. Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. Material excavated for the preparation of the dam foundation will consist of organics, frozen materials, loose overburden soils and other unsuitable materials.	The dam will be raised as a zoned earth fill embankment. The dam includes a low permeability clay core as the seepage control element. Filter and transition zones are provided on both the upstream and downstream sides of the clay core and serve to protect the core material from seepage migration into the upstream and downstream shells. The clay core will be covered by a layer of frost protection material (sand) to insulate the core and reduce potential for degradation from freeze-thaw action. Rip rap erosion protection will be provided over the exposed sand slopes of the frost protection and upstream shell using non-potential acid generating mine waste rock. Dam fill material (clay, sand, and waste rock) are expected to be sourced from the open pit, with the exception of material required for the wick drainage blanket. Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. Material excavated for the preparation of the dam foundation will consist of organics, frozen materials, loose overburden soils and other unsuitable materials.	TMF Feasibility Design Report (WSP 2023)[4]
Geotechnical Characterization of Construction Materials	The geotechnical characteristics of construction materials have a significant impact on the physical stability and performance of the TMF.	Waste rock will comprise the mass of the dam with lesser amounts of local borrow material used for select zones (such as low hydraulic conductivity core material and processed open pit sand and waste rock for filter and transition layer in the dam). Waste rock is anticipated to be relatively durable and strong. The main geological units in the bedrock across the SA include, from north to south, felsic to intermediate metavolcanic formations, mafic to intermediate metavolcanic flows and metasedimentary rocks.	Waste rock will comprise the mass of the dam with lesser amounts of local borrow material used for select zones (such as low hydraulic conductivity core material and processed open pit sand and waste rock for filter and transition layer in the dam). Waste rock is anticipated to be relatively durable and strong. The main geological units in the bedrock across the SA include, from north to south, felsic to intermediate metavolcanic formations, mafic to intermediate metavolcanic flows and metasedimentary rocks.	Waste rock will comprise the mass of the dam with lesser amounts of local borrow material used for select zones (such as low hydraulic conductivity core material and processed open pit sand and waste rock for filter and transition layer in the dam). Waste rock is anticipated to be relatively durable and strong. The main geological units in the bedrock across the SA include, from north to south, felsic to intermediate metavolcanic formations, mafic to intermediate metavolcanic flows and metasedimentary rocks.	Stantec technical lead input
Geographical Boundaries	The geographical location and legal status of the alternative footprint area impacts the requirements associated with permitting, construction, operation and closure of the alternative.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	Stantec technical lead input
Topography	Topography impacts the efficiency and approach used for mine waste storage.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock. Due to the limited topographic relief, the downstream toe ditch cut depth and longitudinal slope is limited in some locations. This limitation requires the containment of the ditch by the adjacent TMF downstream toe access road.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock. Due to the limited topographic relief, the downstream toe ditch cut depth and longitudinal slope is limited in some locations. This limitation requires the containment of the ditch by the adjacent TMF downstream toe access road.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock. Due to the limited topographic relief, the downstream toe ditch cut depth and longitudinal slope is limited in some locations. This limitation requires the containment of the ditch by the adjacent TMF downstream toe access road.	Stantec technical lead input

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Seismic Conditions	Higher seismicity poses a higher stability risk and requires additional mitigation to meet design criteria.	The SA is located in a stable continental region within the North American Plate and, as a consequence, has a relatively low level of seismic activity.[2]	The SA is located in a stable continental region within the North American Plate and, as a consequence, has a relatively low level of seismic activity.[2]	The SA is located in a stable continental region within the North American Plate and, as a consequence, has a relatively low level of seismic activity.[2]	Stantec technical lead input
Geotechnical Foundation Conditions	Waste facilities constructed in areas with lower strength foundations and more hydraulically conductive foundation materials pose a higher stability risk and have a higher risk of facility seepage and require additional mitigation to meet design criteria.	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex (CUC), local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the region. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-1 Bedrock: 0 ha Till and other discontinuous drifts: 1,882 ha Organic deposits: 8.8 ha	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-2 Bedrock: 18 ha Till and other discontinuous drifts: 1,873 ha Organic deposits: 0.0 ha	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-6 Bedrock: 0 ha Till and other discontinuous drifts: 1,471 ha Organic deposits: 453.5 ha	Stantec technical lead input
Hydrology	Sites with large catchment areas and reporting flows must convey larger flows of water and present a higher risk. Sites with more water bodies and water flows present a higher risk of impacts from waste.	The catchment area upstream of the facility is 1,093 ha. This catchment area represents the non-contact water drainage area diverted through non-contact water diversion. The catchment area overlain by the facility that would no longer report to downstream receiving bodies is 1,924 ha. The sum of the contact-water external catchment area of the facility (downstream face of TMF dams) and internal catchment area (tailings and upstream face of TMF dams) is 1,891 ha. The catchment area diverted to a new receiving body due to the required surface water diversion for the facility is 0 ha. Alternative does not require construction of permanent diversion. Length of watercourses within footprint is 34.4 km. Area of waterbodies within footprint is 21.0 ha.	The catchment area upstream of the facility is 983 ha. This catchment area represents the non-contact water drainage area diverted through non-contact water diversion. The catchment area overlain by the facility that would no longer report to downstream receiving bodies is 1,927 ha. The sum of the contact-water external catchment area of the facility (downstream face of TMF dams) and internal catchment area (tailings and upstream face of TMF dams) is 1,891 ha. The catchment area diverted to a new receiving body due to the required surface water diversion for the facility is 0 ha. Alternative does not require construction of permanent diversion. Length of watercourses within footprint is 35.4 km. Area of waterbodies within footprint is 32.1 ha.	The catchment area upstream of the facility is 0 ha. This catchment area represents the non-contact water drainage area diverted through non-contact water diversion. The catchment area overlain by the facility that would no longer report to downstream receiving bodies is 1,961 ha. The sum of the contact-water external catchment area of the facility (downstream face of TMF dams) and internal catchment area (tailings and upstream face of TMF dams) is 1,925 ha. The catchment area diverted to a new receiving body due to the required surface water diversion for the facility is 0 ha. Alternative does not require construction of permanent diversion. Length of watercourses within footprint is 4.7 km. Area of waterbodies within footprint is 0.8 ha.	Stantec technical lead input; Calculated by GIS/CAD

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Hydrogeology	Hydrogeology impacts seepage rates from waste facilities and the location where seepage will report to.	37% of the footprint of the alternative is within the 1 m predicted zone of influence of open pit dewatering at the end of operations. 1% of the footprint of the alternative is within the 10 m zone of influence. This may result in some level of buffer against the groundwater mounding that is predicted to occur under the alternative prior to rehabilitation, thus decreasing seepage from the alternative to groundwater. During operations, a portion of seepage from the alternative to groundwater will be collected by the open pit dewatering system for transfer to the process plant and eventual discharge via the water treatment system. Uppermost geologic unit underlaying the alternative is mostly (over 99% by footprint area) fine-grained till with some organic deposits. The surficial till is expected to limit seepage from the alternative to groundwater.	100% of the footprint of the alternative is within the 1 m predicted zone of influence of open pit dewatering at the end of operations. 41% of the footprint of the alternative is within the 10 m zone of influence. This may result in a large buffer against the groundwater mounding that is predicted to occur under the alternative prior to rehabilitation, thus decreasing seepage from the alternative to groundwater. During operations, a significant portion of seepage from the alternative to groundwater may be collected by the open pit dewatering system for transfer to the process plant and eventual and eventual discharge via the water treatment system. Uppermost geologic unit underlaying the alternative is mainly (97% by footprint area) fine-grained till with some exposed bedrock. Higher rates of seepage from the alternative to groundwater are expected in an area where bedrock is exposed at surface compared to fine-grained till.	0% of the footprint of the alternative is within the predicted zone of influence of open pit dewatering at the end of operations. Groundwater mounding under the alternative prior to rehabilitation is predicted to result in increased seepage from the alternative to groundwater. Seepage from the alternative to groundwater is unlikely to be collected by the open pit dewatering system, and will instead report to nearby surface water features including the nearby West Buskegau River. Uppermost geologic unit underlaying the alternative is mainly (76% by footprint area) fine-grained till with the remainder being organic deposits. As the organic deposits are thin and discontinuous across the SA and the till is a nearly-continuous unit, the till likely underlies the organic deposits and is the main controller of seepage rates from the alternative to groundwater. The fine-grained till is expected to limit seepage from the alternative to groundwater.	Stantec technical lead input
Climate	Climate (Temperature and rainfall) impacts the viability of waste management practices and variations in climate may impact year-round practices.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	Stantec technical lead input
Climate Change Projections	Changes in the climate may impact the waste facility performance, especially at closure. Increased haul lengths are associated with increased fuel consumption, higher carbon emissions, and higher impacts on climate change.	The tailings disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Increased variability in precipitation patterns (heavier rainfall events) which may occur due to climate change could impact thickened deposition and storage capacity. Haul distance from the center of the open pit to the center of the facility along the haul road is 5.0 km (TMF-1).	The tailings disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Increased variability in precipitation patterns (heavier rainfall events) which may occur due to climate change could impact thickened deposition and storage capacity. Haul distance from the center of the open pit to the center of the facility along the haul road is 7.0 km (TMF-2).	The tailings disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Increased variability in precipitation patterns (heavier rainfall events) which may occur due to climate change could impact thickened deposition and storage capacity. Haul distance from the center of the open pit to the center of the facility along the haul road is 10.5 km (TMF-6).	Stantec technical lead input; Ausenco

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Atmospheric Issues	Waste storage may impact the local air quality due to particulate or metals pollution associated with haulage and pile construction.	Hauling materials for TMF construction and wind-blown dust generation from exposed tailings are considered to be the primary source of dust generation related to tailings storage at the Project. Dust potential will depend on the specific characteristics of the tailings and the operational approach used. Thickened tailings deposits are generally managed to achieve drying between lifts. This may result in greater dust generation than conventional disposal. Dust impacts will depend, in part, on the distance from the source. The average dam construction material haul distance (distance from the center of the open pit to the center of the facility along the haul road) is approximately 5.0 km. The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins.	Hauling materials for TMF construction and wind-blown dust generation from exposed tailings are considered to be the primary source of dust generation related to tailings storage at the Project. Dust potential will depend on the specific characteristics of the tailings and the operational approach used. Thickened tailings deposits are generally managed to achieve drying between lifts. This may result in greater dust generation than conventional disposal. Dust impacts will depend, in part, on the distance from the source. The average dam construction material haul distance (distance from the center of the open pit to the center of the facility) is approximately 7.0 km. The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins.	Hauling materials for TMF construction and wind-blown dust generation from exposed tailings are considered to be the primary source of dust generation related to tailings storage at the Project. Dust potential will depend on the specific characteristics of the tailings and the operational approach used. Thickened tailings deposits are generally managed to achieve drying between lifts. This may result in greater dust generation than conventional disposal. Dust impacts will depend, in part, on the distance from the source. The average dam construction material haul distance (distance from the center of the open pit to the center of the facility) is approximately 10.5 km. The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins.	Stantec technical lead input; Section 4.0 Figures; Calculated by GIS/CAD
Overall Affected Land Footprint Size of TMF and Related Infrastructure	Larger footprints remove more area from the current ecological use (wildlife habitat). Longer access roads and pipeline lengths have a greater environmental impact and pose a higher risk of infrastructure disruption.	Alternative has a total (dam, tailings, and external reclaim water pond) two-dimensional area of approximately 1,924 ha. Alternative requires construction of approximately 17.8 km of new haul roads/pipeline alignments. Alternative requires 9.9 km of non-contact water diversion ditches/berms. Alternative requires 0 watercrossings due to pipeline and access road route.	Alternative has a total (dam, tailings, and external reclaim water pond) two-dimensional area of approximately 1,927 ha. Alternative requires construction of approximately 21.0 km of new haul roads/pipeline alignments. Alternative requires 6.2 km of non-contact water diversion ditches/berms. Alternative requires 0 watercrossings due to pipeline and access road route.	Alternative has a total (dam, tailings, and external reclaim water pond) two-dimensional area of approximately 1,961 ha. Alternative requires construction of approximately 24.2 km of new haul roads/pipeline alignments. Alternative requires 0.0 km of non-contact water diversion ditches/berms. Alternative requires 2 watercrossings due to pipeline and access road route.	Stantec technical lead inputSection 4.0 FiguresCalculated by GIS/CAD
Water Quality	Potential for waste storage and associated activities to affect local receiving waters	Seepage will be mitigated through engineering design. The emergency spillways would discharge flows that exceed the environmental design flood overland into water management ponds and eventually to the North Driftwood River and the West Buskegau River. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 17,479 ha. This drainage area consists of catchment areas within the West Buskegau River watershed (14,008 ha) and the North Driftwood River watershed (3,471 ha) The alternative includes 4.3 km of tailings pipelines and 12.4 km of reclaim water pipelines running along the ground outside of the TMF.	Seepage will be mitigated through engineering design. The emergency spillways would discharge flows that exceed the environmental design flood overland into water management ponds and eventually to the North Driftwood River and the West Buskegau River. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 31,565 ha. This drainage area consists of catchment areas within the West Buskegau River watershed (20,165 ha) and the North Driftwood River watershed (11,400 ha) The alternative includes 6.8 km of tailings pipelines and 18.2 km of reclaim water pipelines running along the ground outside of the TMF.	Seepage will be mitigated through engineering design. The emergency spillways would discharge flows that exceed the environmental design flood overland into water management ponds and eventually to the West Buskegau River and the Buskegau River. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 32,010 ha. This drainage area consists of catchment areas within the Buskegau River watershed (13,039 ha) and the West Buskegau River watershed (18,971 ha) The alternative includes 8.9 km of tailings pipelines and 54.0 km of reclaim water pipelines running along the ground outside of the TMF.	Stantec technical lead input
Soil Quality	Tailings storage may impact soil quality.	No significant impacts to soil quality anticipated from alternative. Soil impacts due to tailings storage anticipated to be limited to dust generated from tailings.	No significant impacts to soil quality anticipated from alternative. Soil impacts due to tailings storage anticipated to be limited to dust generated from tailings.	No significant impacts to soil quality anticipated from alternative. Soil impacts due to tailings storage anticipated to be limited to dust generated from tailings.	Stantec technical lead input

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Water Quantity and Storage Issues	Requirements to store larger quantities of water imply a higher risk of seepage and instability and require more complex water management schemes.	The conceptual water management design includes total of 33 ha external water reclaim ponds and associated seepage collection ditches. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The catchment area overlain by the facility (drainage area for contact water) that would no longer report to downstream receiving bodies is 1,924 ha. The catchment area upstream of the facility (drainage area for non-contact water) is 1,093 ha. The contact water perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam. The length of contact water perimeter ditches is 14.6 km long. The non-contact water perimeter ditching/berm is intended to divert overland flows from the outside of the tailings dam and direct towards existing receivers. The length of non-contact water perimeter berms/ditches is 9.9 km long. Thickened tailings will be deposited at solids content of 39%, which will limit the amount of supernatant water reporting to the seepage collection ditches and reclaim ponds.	The conceptual water management design includes total of 36 ha external water reclaim ponds and associated seepage collection ditches. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The catchment area overlain by the facility that would no longer report to downstream receiving bodies is 1,927 ha. The catchment area upstream of the facility (drainage area for non-contact water) is 983 ha. The contact water perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam. The length of contact water perimeter ditches is 16.8 km long. The non-contact water perimeter ditching/berm is intended to divert overland flows from the outside of the tailings dam and direct towards existing receivers. The length of non-contact water perimeter berms/ditches is 6.2 km long. Thickened tailings will be deposited at solids content of 39%, which will limit the amount of supernatant water reporting to the seepage collection ditches and reclaim ponds.	The conceptual water management design includes total of 36 ha external water reclaim ponds and associated seepage collection ditches. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The catchment area overlain by the facility that would no longer report to downstream receiving bodies is 1,961 ha. The catchment area upstream of the facility (drainage area for non-contact water) is 0 ha. The contact water perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam. The length of contact water perimeter ditches is 16.7 km long. The non-contact water perimeter ditching/berm is intended to divert overland flows from the outside of the tailings dam and direct towards existing receivers. The length of non-contact water perimeter berms/ditches is 0.0 km long. Thickened tailings will be deposited at solids content of 39%, which will limit the amount of supernatant water reporting to the seepage collection ditches and reclaim ponds.	Section 4.0 Figures Calculated by GIS/CAD
Vegetation	Facilities overlying larger amounts of vegetation or vegetation considered rare or protected pose a greater environmental impact.	Vegetation overlain by TMFs is divided into wetlands and forest area. Wetlands overlain by the alternative are 1,481.4 ha. Alternative results in loss of 375.7 ha of forest.	Vegetation overlain by TMFs is divided into wetlands and forest area. Wetlands overlain by the alternative are 1,211.7 ha. Alternative results in loss of 647.2 ha of forest.	Vegetation overlain by TMFs is divided into wetlands and forest area. Wetlands overlain by the alternative are 1,811.6 ha. Alternative results in loss of 113.1 ha of forest.	Stantec technical lead input
Aquatic Life and Habitat	Facilities overlying larger amounts of aquatic habitat or habitat considered to be rare or protected pose a greater environmental impact.	Area of watercourses within footprint is 6.9 ha. The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity. No catchment area is diverted to a new receiving body due to the required surface water diversion for the facility. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 17,479 ha. Alternative requires 0 watercrossings due to pipeline and access road route.	Area of watercourses within footprint is 9.7 ha. The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity. No catchment area is diverted to a new receiving body due to the required surface water diversion for the facility. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 31,565 ha. Alternative requires 0 watercrossings due to pipeline and access road route.	Area of watercourses within footprint is 0.3 ha.[6] The alternative overlies aquatic habitat with a "moderately low" sensitivity and spawning areas with a "moderately low" sensitivity. No catchment area is diverted to a new receiving body due to the required surface water diversion for the facility. The catchment area of the receiving body at the point of intersection of the receiving body and the two emergency spillways discharge channel is 32,010 ha. Alternative requires 2 watercrossings due to pipeline and access road route.	Stantec technical lead input;Calculated by GIS; Appendix A Figures

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Terrestrial Life and Habitat	Facilities overlying larger amounts of terrestrial (including bird) habitat considered to be rare or protected pose a greater environmental impact.	Alternative results in the loss of 1,481.4 ha of wetlands and the loss of 375.7 ha of forest. Note that mapped wetlands and forested areas do not overlap in any portions of the site area. The alternative TMF-1 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 0 ha. Blanding's turtle habitat area overlain by the alternative is 1 ha. Boreal caribou habitat area overlain by the alternative is 560 ha. Habitat areas for candidate waterfowl nesting, candidate sharp-tailed grouse lek, and candidate marsh breeding bird, which are overlain by the alternative is 755 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 71 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 376 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 94 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 477 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 426 ha. Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 154 ha. The alternative requires the construction of 28.8 km of new roads or pipelines through forested or wetland areas.	Alternative results in the loss of 1,211.7 ha of wetlands and the loss of 647.2 ha of forest. Note that mapped wetlands and forested areas do not overlap in any portions of the site area. The alternative TMF-1 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 92 ha. Blanding's turtle habitat area overlain by the alternative is 0 ha. Boreal caribou habitat area overlain by the alternative is 1,473 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 1,088 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 0 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 647 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 46 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 803 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 719 ha. Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 393 ha. The alternative requires the construction of 36.8 km of new roads or pipelines through forested or wetland areas.	Alternative results in the loss of 1,811.6 ha of wetlands and the loss of 113.1 ha of forest. Note that mapped wetlands and forested areas do not overlap in any portions of the site area. The alternative TMF-1 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 225 ha. Blanding's turtle habitat area overlain by the alternative is 39 ha. Boreal caribou habitat area overlain by the alternative is 1,925 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 452 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 0 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 82 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 0 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 570 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 113 ha. Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 478 ha. The alternative requires the construction of 77.1 km of new roads or pipelines through forested or wetland areas.	Stantec technical lead input; Calculated by GIS/CAD; Appendix A Figures
TMF Failure	There is a risk to environmental impact to environmental features (e.g., waterbodies, vegetation, and aquatic and terrestrial habitats) located within the areas which could conceivably be overlain due to a hypothetical facility failure.	The alternative will utilize thickened tailings deposition. In the case of a failure through the maximum dam section, the tailings and supernatant water runout is anticipated to flow either west and report to the North Driftwood River or east and report to the West Buskegau River.	The alternative will utilize thickened tailings deposition. In the case of a failure through the maximum dam section, the tailings and supernatant water runout is anticipated to flow either west and report to the North Driftwood River or east and report to the West Buskegau River.	The alternative will utilize thickened tailings deposition. In the case of a failure through the maximum dam section, the tailings and supernatant water runout is anticipated to flow and report to the West Buskegau River and the Buskegau River.	Stantec technical lead input; Ausenco Dam Break Assessment (2024)[5]

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Notes: 1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 through Figure 4-7. 2. Earthquakes Canada. 2024. Historical earthquakes recorded by Earthquakes Canada [digital resource]. Natural Resources Canada: Strategic Policy and Innovation Sector. Federal Geospatial Platform dataset. 3. Crawford Geochemistry Characterization Report (WSP 2024) 4. Tailings Management Facility Feasibility Design Report (WSP 2023) 5. Tailings Dam Breach Analysis Report (Ausenco 2024) 6. Area of watercourses within TMF-6 was calculated by extrapolation based on the area of waterbodies within TMF-6 divided by the average ratio of the area of waterbodies to the area of watercourses in TMF-1 and TMF-2. 7. MEND (Mine Environment Neutral Drainage Program). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1.					

Table C.2 Characterization Criteria - Technical Characterization – TMF

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Physical Characteristics of Waste	The tailing material properties may impact facility stability or seepage characteristics.	Tailings produced through crushing, floatation, magnetic separation and carbon dioxide introduction at the plant.1 Grain size distribution estimates based on analyzing composite tailing samples indicate that the produced tailings material is anticipated to be fine-grained2, which is typical of metal tailings. The target tailings discharge density is 39% solids by weight. Thickened tailing anticipated to be relatively homogeneous within the deposit.	Tailings produced through crushing, floatation, magnetic separation and carbon dioxide introduction at the plant.1 Grain size distribution estimates based on analyzing composite tailing samples indicate that the produced tailings material is anticipated to be fine-grained2, which is typical of metal tailings. The target tailings discharge density is 39% solids by weight. Thickened tailing anticipated to be relatively homogeneous within the deposit.	Tailings produced through crushing, floatation, magnetic separation and carbon dioxide introduction at the plant.1 Grain size distribution estimates based on analyzing composite tailing samples indicate that the produced tailings material is anticipated to be fine-grained2, which is typical of metal tailings. The target tailings discharge density is 39% solids by weight. Thickened tailing anticipated to be relatively homogeneous within the deposit.	(Ausenco 2023)[1] (WSP 2023)[2]
TMF Design	More complex designs may represent a higher risk of failure or upset conditions.	Design consists of a perimeter dam, external water reclaim ponds, and emergency spillways. Total footprint area of dam, tailings, and external reclaim ponds is 1,924 ha. The haul road and pipeline to the facility approach from the north.	Design consists of a perimeter dam, external water reclaim ponds, and emergency spillways. Total footprint area of dam, tailings, and external reclaim ponds is 1,927 ha. The haul road and pipeline to the facility approach from the south.	Design consists of a perimeter dam, external water reclaim ponds, and emergency spillways. Total footprint area of dam, tailings, and external reclaim ponds is 1,961 ha. The haul road and pipeline to the facility approach from the west.	Stantec technical lead input, Calculated by GIS/CAD, Section 4.0 Figures
Containment Structure Design	More complex designs may represent a higher risk of failure or upset conditions.	Maximum dam height of 40 m, volume of embankment of 124.7 Mm³, inside perimeter length of 16.6 km. Dam footprint area is (2 dimensional) of 1,891 ha. Design consists of a perimeter dam constructed. The perimeter dam extends around the entire facility. Downstream toe of embankment generally constructed along a downward sloping hillside, which is not favorable for stability or expansion. Anticipate that embankment downstream and upstream shells would be constructed of waste rock. A clay core will be constructed using materials derived from the open pit. Processed sand from the open pit will be used to construct a filter zone between the clay core and embankment shells.	Maximum dam height of 40 m, volume of embankment of 206.0 Mm³, inside perimeter length of 17.1 km. Dam footprint area is (2 dimensional) of 1,891 ha. Design consists of a perimeter dam constructed. The perimeter dam extends around the entire facility. Downstream toe of embankment generally constructed along a downward sloping hillside, which is not favorable for stability or expansion. Anticipate that embankment downstream and upstream shells would be constructed of waste rock. A clay core will be constructed using materials derived from the open pit. Processed sand from the open pit will be used to construct a filter zone between the clay core and embankment shells.	Maximum dam height of 40 m, volume of embankment of 222.0 Mm³, inside perimeter length of 16.9 km. Dam footprint area is (2 dimensional) of 1,925 ha. Design consists of a perimeter dam constructed. The perimeter dam extends around the entire facility. Downstream toe of embankment generally constructed along a downward sloping hillside, which is not favorable for stability or expansion. Anticipate that embankment downstream and upstream shells would be constructed of waste rock. A clay core will be constructed using materials derived from the open pit. Processed sand from the open pit will be used to construct a filter zone between the clay core and embankment shells.	Stantec technical lead input; Ausenco
		Seepage and runoff from the downstream shell of the dam will be collected in a perimeter contact-water channel and directed to water management ponds. The drainage blankets are required to facilitate wick drain installation. The drainage blankets will provide equipment access to support the wick drain installation, and they will also provide a permeable material to embed the wick drain tails into.	Seepage and runoff from the downstream shell of the dam will be collected in a perimeter contact-water channel and directed to water management ponds. The drainage blankets are required to facilitate wick drain installation. The drainage blankets will provide equipment access to support the wick drain installation, and they will also provide a permeable material to embed the wick drain tails into.	Seepage and runoff from the downstream shell of the dam will be collected in a perimeter contact-water channel and directed to water management ponds. The drainage blankets are required to facilitate wick drain installation. The drainage blankets will provide equipment access to support the wick drain installation, and they will also provide a permeable material to embed the wick drain tails into.	

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
		Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. TMF dam constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will likely include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint Based on available information, anticipate that a sufficient quantity and quality of low hydraulic conductivity soil is available in the pit to be used in construction. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-1 Bedrock: 0 ha Till and other discontinuous drifts: 1,882 ha Organic deposits: 8.8 ha	Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. TMF dam constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will likely include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. Based on available information, anticipate that a sufficient quantity and quality of low hydraulic conductivity soil is available in the pit to be used in construction. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-2 Bedrock: 18 ha Till and other discontinuous drifts: 1,873 ha Organic deposits: 0.0 ha	Material for wick drainage blanket is needed before the open pit is developed to the stage where fresh waste rock is extracted. The drainage blanket material could consist of sand and gravel from a borrow pit or crushed rock from a quarry. TMF dam constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will likely include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. Based on available information, anticipate that a sufficient quantity and quality of low hydraulic conductivity soil is available in the pit to be used in construction. Surficial geology underlying the entire alternative/the TMF dam is as follows: TMF-6 Bedrock: 0 ha Till and other discontinuous drifts: 1,471 ha Organic deposits: 453.5 ha	
Tailings Management System Design	More complex designs may represent a higher risk of failure or upset conditions.	Tailings deposition to be from a discharge line along the center of the facility towards the perimeter dam. Access to the discharge line expected via a gravel/waste rock access ramp that is intermittently raised. Significant precipitation can negatively impact the performance of thickened tailings, preventing the drying of deposition lifts, increasing erosion from the facility, and reducing the strength of the deposit. For the pumping system, the maximum elevation difference between the plant site and the maximum TMF dam crest elevation for the alternative is 81.5 m.	Tailings deposition to be from a discharge line along the center of the facility towards the perimeter dam. Access to the discharge line expected via a gravel/waste rock access ramp that is intermittently raised. Significant precipitation can negatively impact the performance of thickened tailings, preventing the drying of deposition lifts, increasing erosion from the facility, and reducing the strength of the deposit. For the pumping system, the maximum elevation difference between the plant site and the maximum TMF dam crest elevation for the alternative is 91.8 m.	Tailings deposition to be from a discharge line along the center of the facility towards the perimeter dam. Access to the discharge line expected via a gravel/waste rock access ramp that is intermittently raised. Significant precipitation can negatively impact the performance of thickened tailings, preventing the drying of deposition lifts, increasing erosion from the facility, and reducing the strength of the deposit. For the pumping system, the maximum elevation difference between the plant site and the maximum TMF dam crest elevation for the alternative is 89.8 m.	Stantec technical lead input; Ausenco
		The approximate tailings and reclaim pipeline lengths for the alternative are: Tailings Pipeline: 7.6 km (4.3 km along the ground surface with the remainder within the TMF along the tailings surface); Reclaim water pipeline: 13.3 km (12.4 km along the ground surface with the remainder within the TMF along the tailings surface).	The approximate tailings and reclaim pipeline lengths for the alternative are: Tailings Pipeline: 10.0 km (6.8 km along the ground surface with the remainder within the TMF along the tailings surface); Reclaim water pipeline: 18.8 km (18.2 km along the ground surface with the remainder within the TMF along the tailings surface).	The approximate tailings and reclaim pipeline lengths for the alternative are: Tailings Pipeline: 12.3 km (8.9 km along the ground surface with the remainder within the TMF along the tailings surface); Reclaim water pipeline: 55.0 km (54.0 km along the ground surface with the remainder within the TMF along the tailings surface).	
Water Management System Design	More complex designs may represent a higher risk of failure or upset conditions.	The conceptual water management design includes external water reclaim ponds and a 14.6 km long perimeter ditch. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam.	The conceptual water management design includes external water reclaim ponds and a 16.8 km long perimeter ditch. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam.	The conceptual water management design includes external water reclaim ponds and a 16.7 km long perimeter ditch. Reclaim ponds are intended to collect supernatant water from tailings discharge and contact water that falls on the tailings deposit. The perimeter ditch is intended to collect subsurface seepage flows and overland flows from the downstream face of the tailings dam.	Stantec technical lead input; Ausenco

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
		Reclaim ponds are external to the facility to mitigate storing water on the thickened tailings deposition slopes. The Project is anticipated to have a negative water balance. The alternative has a combined area of 1891.1 ha as the external contact water catchment area (the downstream dam slopes and report to the perimeter collection ditch) and internal contact water catchment area (contained by tailings and upstream face of the TMF dams) Emergency spillways would be in the northeast and northwest corners of the facility during operations, at the end of operations, and at closure. Emergency spillways discharges would flow overland and eventually report to the West Buskegau River and the North Driftwood River. No water body or watercourse diversions are anticipated.	Reclaim ponds are external to the facility to mitigate storing water on the thickened tailings deposition slopes. The Project is anticipated to have a negative water balance. The alternative has a combined area of 1891.5 ha as the external contact water catchment area (the downstream dam slopes and report to the perimeter collection ditch) and internal contact water catchment area (contained by tailings and upstream face of the TMF dams) Emergency spillways would be in the northeast and northwest corners of the facility during operations, at the end of operations, and at closure. Emergency spillways discharges would flow overland and eventually report to the West Buskegau River and the North Driftwood River. No water body or watercourse diversions are anticipated.	Reclaim ponds are external to the facility to mitigate storing water on the thickened tailings deposition slopes. The Project is anticipated to have a negative water balance. The alternative has a combined area of 1924.7 ha as the external contact water catchment area (the downstream dam slopes and report to the perimeter collection ditch) and internal contact water catchment area (contained by tailings and upstream face of the TMF dams) Emergency spillways would be in the northeast and northwest corners of the facility during operations, at the end of operations, and at closure. Emergency spillways discharges would flow overland and eventually report to the West Buskegau River and the Buskegau River. No water body or watercourse diversions are anticipated.	
Closure Design	More complex closure designs can be more difficult to implement and present higher risks.	Anticipate that dry closure will be implemented and the tailings surface would be covered and revegetated to reduce dust generation and mitigate infiltration. If ARD/ML generation is an issue that requires tailings saturation, it is anticipated that the quantity of tails in the TMF would be reduced to allow the deposit to be flooded. Thickened tailings will likely allow for relatively early safe access to the tailings surface to begin closure activities. Tailings produced in mine year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.	Anticipate that dry closure will be implemented and the tailings surface would be covered and revegetated to reduce dust generation and mitigate infiltration. If ARD/ML generation is an issue that requires tailings saturation, it is anticipated that the quantity of tails in the TMF would be reduced to allow the deposit to be flooded. Thickened tailings will likely allow for relatively early safe access to the tailings surface to begin closure activities. Tailings produced in mine year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.	Anticipate that dry closure will be implemented and the tailings surface would be covered and revegetated to reduce dust generation and mitigate infiltration. If ARD/ML generation is an issue that requires tailings saturation, it is anticipated that the quantity of tails in the TMF would be reduced to allow the deposit to be flooded. Thickened tailings will likely allow for relatively early safe access to the tailings surface to begin closure activities. Tailings produced in mine year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.	Stantec technical lead input
Operational Flexibility	The ability to handle upset conditions or be expanded to store additional quantities of waste reduces risks.	The TMF-1 alternative has an approximate 17 year tailings storage capacity. Tailings will be deposited in the open pit after the end of mine year 17. There is limited opportunity to expand the TMF with a minor dam raise due to the alternative's proximity to other mine infrastructure to the north and adjacent watercourses (the North Driftwood River and the West Buskegau River). The expansion of this TMF-1 would be a potentially limiting factor. Once the open pit is used for tailings deposition, any additional tailings could be disposed in the pit as the pit will have sufficient capacity.	The TMF-2 alternative has an approximate 17 year tailings storage capacity. Tailings will be deposited in the open pit after the end of mine year 17. There is limited opportunity to expand the TMF with a minor dam raise due to the alternative's proximity to other mine infrastructure to the north and adjacent watercourses (the North Driftwood River and the West Buskegau River). The expansion of this TMF-1 would be a potentially limiting factor. Once the open pit is used for tailings deposition, any additional tailings could be disposed in the pit as the pit will have sufficient capacity.	The TMF-6 alternative has been sized to receive tailings for approximate 17 years, consistent with other alternatives. Tailings will be deposited in the open pit after year 17. There is limited opportunity to expand the TMF with a minor dam raise due to the alternative's proximity to the West Buskegau River to the west, and the Buskegau River to the east. Once the open pit is used for tailings deposition, any additional tailings could be disposed in the pit as the pit will have sufficient capacity.	Stantec technical lead input

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Constructability and Access	Alternatives located closer to the main mine operations may be easier to oversee and present less risk. Less constructable alternatives present a greater risk of delays in schedule and impacts on construction quality.	Waste rock anticipated for use in dam construction. Waste rock placement anticipated to be relatively insensitive to weather conditions and requires less rigorous QA/QC practices. Distance to the Process plant is 5 km. Alternative is located the shortest distance from the process plant. Alternative is located approximately 5.0 km from the Main Zone open pit and the likely center of mine operations.	Waste rock anticipated for use in dam construction. Waste rock placement anticipated to be relatively insensitive to weather conditions and requires less rigorous QA/QC practices. Distance to the Process plant is 7 km. Alternative is located the shortest distance from the process plant. Alternative is located approximately 7.0 km from the Main Zone open pit and the likely center of mine operations.	Waste rock anticipated for use in dam construction. Waste rock placement anticipated to be relatively insensitive to weather conditions and requires less rigorous QA/QC practices. Distance to the Process plant is 11 km. Alternative is located approximately 10.5 km from the Main Zone open pit and the likely center of mine operations.	Stantec technical lead input

Notes:

1. Crawford Nickel Sulphide Project Nl 43-101 Technical Report and Feasibility Study (Ausenco. 2023)
2. Crawford Project Tailings Management Facility Feasibility Design (WSP 2023)

Table C.3 Characterization Criteria - Economic Characterization – TMF

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Capital Cost	Capital costs have a significant impact on the ability to successfully commission a mine.	The estimated capital cost is $911.7 M$. This includes costs associated with construction of the following. For comparative purposes, the capital cost estimate does not account for staging of construction and assumes that the entire design for the items below is constructed as part of capital: - Site preparation, foundation treatment, seepage mitigation, dam construction, and haul road and pipeline alignment construction [809.8 M$] - Pipeline and pumps [42.0 M$] - Water management and pond construction [32.0 M$] - Fish habitat compensation [27.9 M$]	The estimated capital cost is $1,374.8 M. This includes costs associated with construction of the following. For comparative purposes, the capital cost estimate does not account for staging of construction and assumes that the entire design for the items below is constructed as part of capital: - Site preparation, foundation treatment, seepage mitigation, dam construction, and haul road and pipeline alignment construction [1,248.3 M$] - Pipeline and pumps [49.8 M$] - Water management and pond construction [34.9 M$] - Fish habitat compensation [41.7 M$]	The estimated capital cost is $1,440.1 M. This includes costs associated with construction of the following. For comparative purposes, the capital cost estimate does not account for staging of construction and assumes that the entire design for the items below is constructed as part of capital: - Site preparation, foundation treatment, seepage mitigation, dam construction, and haul road and pipeline alignment construction [1,336.6 M$] - Pipeline and pumps [67.4 M$] - Water management and pond construction [34.9 M$] - Fish habitat compensation [1.1 M$]	Stantec technical lead input; Ausenco
Operating Cost	Operating costs impact life of mine economics	The estimated operating cost is $47 M. This includes the costs of TMF operation and maintenance, power, dewatering, transportation and placement associated with tailings pumping, along with dam and water management components.	The estimated operating cost is $47 M. This includes the costs of TMF operation and maintenance, power, dewatering, transportation and placement associated with tailings pumping, along with dam and water management components.	The estimated operating cost is $48 M. This includes the costs of TMF operation and maintenance, power, dewatering, transportation and placement associated with tailings pumping, along with dam and water management components.	Stantec technical lead input; Ausenco
Closure and Post-closure Cost	Closure and post-closure costs can be significant and can have a significant impact on project economics due to requirements for financial assurance.	Closure and post-closure costs include costs associated with demolition of pipelines, placement of the cover/tailings amendment and cover revegetation over the surface of the tailings deposit. Assume that embankment slopes might be remediated to mitigate erosion if locally derived materials are used for construction. Post-closure costs also include costs associated with monitoring. The estimated cover placement cost is $27.9 M.	Closure and post-closure costs include costs associated with demolition of pipelines, placement of the cover/tailings amendment and cover revegetation over the surface of the tailings deposit. Assume that embankment slopes might be remediated to mitigate erosion if locally derived materials are used for construction. The estimated cover placement cost is $27.9 M.	Closure and post-closure costs include costs associated with demolition of pipelines, placement of the cover/tailings amendment and cover revegetation over the surface of the tailings deposit. Assume that embankment slopes might be remediated to mitigate erosion if locally derived materials are used for construction. The estimated cover placement cost is $28.4 M.	Stantec technical lead input
Fish Habitat Compensation	The Guidelines recommend the inclusion of fish habitat compensation costing in alternatives assessments.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring and contingency, based on the cost of a third part completing the work. This assessment assumes that all waterbodies and watercourses are fish bearing. Approximately 6.9 ha of watercourses and 21.0 ha of waterbodies are overlain by the alternative.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring and contingency, based on the cost of a third part completing the work. This assessment assumes that all waterbodies and watercourses are fish bearing. Approximately 9.7 ha of watercourses and 32.1 ha of waterbodies are overlain by the alternative.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring and contingency, based on the cost of a third part completing the work. This assessment assumes that all waterbodies and watercourses are fish bearing. Approximately 0.3 ha of watercourses and 0.8 ha of waterbodies are overlain by the alternative.	Stantec technical lead input; GIS

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Land Use Cost Required Landuse Fees	Required land-use fees can have a negative impact on project economics.	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mines (MM).	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mines (MM).	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mines (MM).	Stantec technical lead input
Economic Risks and Benefits	Risks associated with permitting deadlines, seasonal construction, uncertainties in the design and timeline to close the waste storage facility can impact schedule and have a significant negative impact on project economics.	The alternative design has significant precedent and is relatively flexible. As such, the overall economic risk associated with the design is considered relatively low. If ARD/ML generation is an issue that requires tailings saturation, anticipate that the facility could be flooded. Based on the centre discharge method used for this alternative, it is envisioned that this would be performed by lowering the quantity of tailings placed in the TMF. Tailings produced in year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.The alternative requires construction of a fish habitat compensation areas.	The alternative design has significant precedent and is relatively flexible. As such, the overall economic risk associated with the design is considered relatively low. If ARD/ML generation is an issue that requires tailings saturation, anticipate that the facility could be flooded. Based on the centre discharge method used for this alternative, it is envisioned that this would be performed by lowering the quantity of tailings placed in the TMF. Tailings produced in year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.The alternative requires construction of a fish habitat compensation areas.	The alternative design has significant precedent and is relatively flexible. As such, the overall economic risk associated with the design is considered relatively low. If ARD/ML generation is an issue that requires tailings saturation, anticipate that the facility could be flooded. Based on the centre discharge method used for this alternative, it is envisioned that this would be performed by lowering the quantity of tailings placed in the TMF. Tailings produced in year 18 to the end of the Operations phase will be placed as backfill in the open pit and ultimately submerged in water in closure to reduce the potential for acid generation and metal leaching.The alternative requires construction of a fish habitat compensation areas.	Stantec technical lead input

Table C-4 Characterization Criteria - Socio-Economic Characterization - TMF

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Archaeology	Facilities overlying areas of archaeological importance present a higher risk of socio-economic impacts.	No known archaeological sites are overlain by the alternative as discussed in Section 3.14.	No known archaeological sites are overlain by the alternative as discussed in Section 3.14.	No known archaeological sites are overlain by the alternative as discussed in Section 3.14.	Stantec technical lead input
Land and Mineral Use Rights	Facilities overlying areas where land or mineral use rights exist present a higher risk of socio-economic impacts and may impact the ability to successfully permit and operate a mine.	Within TMF-1, there are 711 ha of mining claims owned by Canada Nickel and 1,180 ha of mining claims owned by others. The latter represents 62% of the alternative's surface area. There is no unpatented Crown land overlain by the alternative. Data provided for Land and Mineral Use Rights are based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Within TMF-2, there are 1,188 ha of mining claims owned by Canada Nickel and 704 ha of mining claims owned by others. The latter represents 37% of the alternative's surface area. There is no unpatented Crown land overlain by the alternative. There are no unpatented Crown land overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Within TMF-2, there are 225 ha of mining claims owned by Canada Nickel and 1,570 ha of mining claims owned by others. The latter represents 82% of the alternative's surface area. There are 129 ha of unpatented Crown land overlain by the alternative. This represents 7% of the alternative's surface area. There are no unpatented Crown land overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Stantec technical lead input
Land and Resource Use	Facilities overlying areas that have existing uses occurred present a higher risk of socio-economic impacts and loss of social license to operate.	The alternative lies within Wildlife Management Area 30, Bear Management Areas CC-30-015 and TI-30-048, and Trapline Areas CC041 and TI035. The alternative with footprint area of 1,891 ha overlies: 375.7 ha of forests and 1,481.4 ha of wetlands without any overlaps of forests and wetlands; 34.4 km of watercourses; 21.0 ha of waterbodies (pond, lake). Forests and wetlands are assumed to be accessible for hunting. Overlain watercourses and waterbodies within alternative area are assumed to be accessible for fishing. 96 ha of bear management areas, 2 bear management areas, 1,891 ha of trapline areas, and 2 trapline areas 7.4 km of routinely maintained access roads The baseline information used for the assessment does not indicate that the alternative overlies any planned forestry areas. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations.	The alternative lies within Wildlife Management Area 30, Bear Management Area TI-30-048, and Trapline Areas CC041 and TI035. The alternative with footprint area of 1,891 ha overlies: 647.2 ha of forests and 1,211.7 ha of wetlands without any overlaps of forests and wetlands; 35.4 km of watercourses; 32.1 ha of waterbodies (pond, lake). Forests and wetlands are assumed to be accessible for hunting. Overlain watercourses and waterbodies within alternative area are assumed to be accessible for fishing. 359 ha of bear management areas, 1 bear management areas, 1,891 ha of trapline areas, and 2 trapline areas 5.5 km of routinely maintained access roads The baseline information used for the assessment does not indicate that the alternative overlies any planned forestry areas. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations.	The alternative lies within Wildlife Management Area 30 and Trapline Area CC041. The alternative with footprint area of 1,925 ha overlies: 113.1 ha of forests and 1,811.6 ha of wetlands without any overlaps of forests and wetlands; 4.7 km of watercourses; 0.8 ha of waterbodies (pond, lake). Forests and wetlands are assumed to be accessible for hunting. Overlain watercourses and waterbodies within alternative area are assumed to be accessible for fishing. 0 ha of bear management areas, 0 bear management areas, 1,925 ha of trapline areas, and 1 trapline areas 17.5 km of routinely maintained access roads The baseline information used for the assessment does not indicate that the alternative overlies any planned forestry areas. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations.	Stantec technical lead input

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Traditional Knowledge and Resource Use	Facilities overlying areas where Indigenous-related activities are practiced represent a socio-economic impact.	For the purposes of this assessment, it has been assumed that indigenous land uses occur within the footprint of the alternative. The alternative overlies: 63 ha of unoccupied Crown land 2,634 ha of mapped hunting and trapping areas 181 ha of mapped hunting subsistence areas 1,528 ha of mapped plant harvesting areas 675 ha of plants harvesting subsistence areas 2,816 ha of cultural continuity areas 7 km of mapped travel routes.	For the purposes of this assessment, it has been assumed that indigenous land uses occur within the footprint of the alternative. The alternative overlies: 84 ha of unoccupied Crown land 2,705 ha of mapped hunting and trapping areas 135 ha of mapped hunting subsistence areas 1,254 ha of mapped plant harvesting areas 726 ha of plants harvesting subsistence areas 2,797 ha of cultural continuity areas 6 km of mapped travel routes.	For the purposes of this assessment, it has been assumed that indigenous land uses occur within the footprint of the alternative. The alternative overlies: 215 ha of unoccupied Crown land 7,218 ha of mapped hunting and trapping areas 429 ha of mapped hunting subsistence areas 3,786 ha of mapped plant harvesting areas 1,885 ha of plants harvesting subsistence areas 7,608 ha of cultural continuity areas 18 km of mapped travel routes.	Stantec technical lead input
Ecological/ Cultural Values	Local communities may value certain ecological or land features more highly than other communities or outside individuals. Facilities which overlie areas of high value to local peoples present a higher risk of socio-economic impact than facilities which overlie areas with lower values.	Ecological and cultural values were obtained from the TKLU studies (discussed in the "Traditional Knowledge and Resource Use" criteria above) and from consultation input (as listed in the "Land and Resource Use" and "Traditional Knowledge and Resource Use" criteria rows above). (Stantec 2024)	Ecological and cultural values were obtained from the TKLU studies (discussed in the "Traditional Knowledge and Resource Use" criteria above) and from consultation input (as listed in the "Land and Resource Use" and "Traditional Knowledge and Resource Use" criteria rows above). (Stantec 2024)	Ecological and cultural values were obtained from the TKLU studies (discussed in the "Traditional Knowledge and Resource Use" criteria above) and from consultation input (as listed in the "Land and Resource Use" and "Traditional Knowledge and Resource Use" criteria rows above). (Stantec 2024)	Stantec technical lead input
Interested Parties	Interested parties can impact the ability to successfully permit and operate a mine.	Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Stantec technical lead input
Aesthetics	Facilities with a lesser impact on aesthetics have a lower socio-economic impact. Closure designs which result in fewer long-term impacts to aesthetics can have a significant long-term impact.	The maximum dam height is 40.0 m. TMF-1 is located to the east of the realigned highway.	The maximum dam height is 40.0 m. TMF-2 is located to the east of the realigned highway.	The maximum dam height is 40.0 m. TMF-6 is located to the east of the Project site, further to the realigned highway compared with other alternatives.	Stantec technical lead input
Employment	Employment opportunities provide socio economic benefits and improve the ability to obtain and maintain the social license to operate.	The employment associated with the Project is not a function of the selected TMF alternative.	The employment associated with the Project is not a function of the selected TMF alternative.	The employment associated with the Project is not a function of the selected TMF alternative.	Stantec technical lead input
Capcacity Building	Training opportunities and infrastructure to support the project provide socio-economic benefits both during and after operation and improve the ability to commission and operate a mine.	The capacity building potential associated with the Project is not a function of the selected TMF alternative.	The capacity building potential associated with the Project is not a function of the selected TMF alternative.	The capacity building potential associated with the Project is not a function of the selected TMF alternative.	Stantec technical lead input
Economic Benefits	Compensation payments (e.g., leases, royalties) provide socio economic benefits and improve the ability to commission and operate a mine.	Annual payments for leased lands (once through the claims to lease process) are provided to MNDM. The level of economic benefit is not considered to be a function of the selected TMF alternative.	Annual payments for leased lands (once through the claims to lease process) are provided to MNDM. The level of economic benefit is not considered to be a function of the selected TMF alternative.	Annual payments for leased lands (once through the claims to lease process) are provided to MNDM. The level of economic benefit is not considered to be a function of the selected TMF alternative.	Stantec technical lead input

Characterization Criteria	Rationale	TMF-1	TMF-2	TMF-6	Basis
Community Safety	Facilities with a higher risk of impacts to the safety of the community are associated with a higher risk of losing the social license to operate resulting from incidents during mining.	There is a risk to public safety associated with Project development however public access to Project areas will be restricted during operation. The risks associated with tailings storage include interactions with haul trucks and the potential for TMF failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. Highway 655 realignment will be carried out due to the project but the alternative itself does not require any highway/road realignment.	There is a risk to public safety associated with Project development however public access to Project areas will be restricted during operation. The risks associated with tailings storage include interactions with haul trucks and the potential for TMF failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. Highway 655 realignment will be carried out due to the project but the alternative itself does not require any specific highway/road realignment.	There is a risk to public safety associated with Project development however public access to Project areas will be restricted during operation. The risks associated with tailings storage include interactions with haul trucks and the potential for TMF failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. Highway 655 realignment will be carried out due to the project but the alternative itself does not require any highway/road realignment.	Stantec technical lead input
TMF Failure	There is a risk of damage or loss of use to property and infrastructure (e.g., roadways, pipelines, etc.) located within the areas which could conceivably be overlain due to a hypothetical facility failure.	In the case of a hypothetical failure through the maximum dam height section, the tailings and supernatant water runout is anticipated to flow either west and report to the North Driftwood River or east and report to the West Buskegau River. Besides proposed mine infrastructure, there is no infrastructure present in hypothetical failure area. A hypothetical failure was assessed based on the Canadian Dam Association (CDA) guidelines considering four loss of life, environmental, infrastructure, and socio-economic impacts. The CDA Loss of Life classification for TMF-1 is Extreme without a deflector berm between the alternative and the mine facilities. This classification is improved to Significant if the berm is implemented. The CDA Environmental Consequence classification of TMF-1 is Low. The CDA Infrastructure and Socio-economics classification of TMF-1 is Significant. The potential overall CDA classification of TMF-1 is Significant.	In the case of a hypothetical failure through the maximum dam height section, the tailings and supernatant water runout is anticipated to flow either west and report to the North Driftwood River or east and report to the West Buskegau River. Besides proposed mine infrastructure, there is no infrastructure present in hypothetical failure area. Dam breach assessment of TMF-1 was used as an analogue for assessing the dam failure effects associated to TMF-2. If breaches occur to the north or east of the alternative, the Loss of Life classification of the alternative is low, and the environmental, infrastructure, and socio-economic classifications are Low. For breaches in the south and west of the alternative, the Loss of Life classification is Significant, and other classifications are similar to those related to breaches in the north and east. The implementation of a deflector berm between the alternative and the mine facilities will improve the CDA Loss of Life classification of the alternative for a dam breach to the south.	In the case of a hypothetical failure through the maximum dam height section, the tailings and supernatant water runout is anticipated to flow either west and report to the West Buskegau River or east and report to the Buskegau River. Besides proposed mine infrastructure, there is no infrastructure present in hypothetical failure area. Dam breach assessment of TMF-1 was used as an analogue for assessing the dam failure effects associated to TMF-6. As there are no population at risk in the vicinity of the alternative, the Loss of Life classification is Low. The Environmental Consequence classification is Low. If breaches occur to the north, east, or south of the alternative, the infrastructure classification is Low. For a breach to the west of the alternative towards the West Buskegau River and mine facilities, the infrastructure and socio-economic classification is Significant.	Stantec technical lead input

Notes:

1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 through Figure 4-7.
2. Baseline information presented in the figures included in Appendix A.
3. Chapter 25-28 of the Impact Statement (Stantec 2024)

Appendix D TMF Alternatives Characterization Criteria – Non-Differentiating Characteristics

Table D.1 Environmental Characterization - Non-differentiating Characteristics – TMF

Characterization Criteria	Discussion
Geochemical Characterization of Tailings	The alternatives would store waste with similar geochemical characteristics. The tailings placed in each alternative are anticipated to have similar geochemical characteristics and thus geochemical characteristics are considered non-differentiating.
Geochemical Characterization of Construction Materials and Excavation Waste	It is anticipated that waste rock used for dam construction would be select, non-PAG/ML material, used in the three alternatives. It is also anticipated that locally-derived materials would be non-PAG/ML. As such, the geochemical characteristics of the construction materials are considered non-differentiating between the alternatives.
Geotechnical Characterization of Construction Materials	The dam in all alternatives would be constructed using materials with similar geotechnical characteristics. As such, the geotechnical characteristics of the construction materials are considered non-differentiating between the alternatives.
Geographical Boundaries	All alternatives are located within the same geographical area.
Seismic Conditions	The alternatives all are in a similar seismic setting.
Topography	The alternatives all have similar topography.
Foundation Conditions -- Bedrock	The alternatives overlie the same types of bedrock and are not anticipated to perform differently based on bedrock conditions.
Climate	Alternatives would be subject to similar climatic conditions.
Climate Change Projections -- Carbon Sink	The loss of forest associated with TMF construction will reduce the ability of the area to serve as a carbon sink. However, this relative impact is considered sufficiently small in comparison to the amount of carbon dioxide released by haul truck traffic. Hence, the loss of carbon sink due to the construction of TMF is considered non-differentiating. The length of haul roads was considered to represent the effects on the emission of greenhouse gases, and was included as a differentiating indicator.
Climate Change Projections	The alternatives would be subject to similar climate change-related changes in precipitation and temperature patterns. As such, climate change is considered non-differentiating.
Atmospheric Issues - Dust Generation based on Deposition Method	The dust generation potential will rely on the specific tailing properties and operational practices at the site. It is anticipated that the same practices will be used in the alternatives to mitigate dusting from thickened deposition method. As such, the deposition method is considered non-differentiating. However, the length of haul roads was considered to represent dusting potential and was included as an indicator.
Water Quality	It is anticipated that water quality impacts associated with normal operations of each facility will be similar following the application of seepage mitigation measures. As such, water quality impacts are considered non-differentiating. However, there is considered to be a varying risk of seepage due to variations in the foundation materials underlying the facilities. This risk is considered differentiating between the alternatives and is included as an indicator. Additionally, water quality impacts resulting from emergency spillway discharges are considered differentiating based on the assimilative capacity of the receiving body and are considered in the assessment.

Characterization Criteria	Discussion
Water Quantity and Storage: Tailings Solids Content	Lower solids content tailings will result in greater supernatant water flows to the internal water management system. The solids content of 39% has been considered in the three alternatives. Therefore, the solids content is a non-differentiating factor.
Water Management - Internal Water Management - Supernatant Water	Length of internal ditches, as a measure of internal water management, does not vary significantly among the three alternatives. Therefore, internal supernatant water management is considered as a non-differentiating factor.
Soil Quality	The alternatives are anticipated to have limited impacts on soil quality except for variations in dust generation.
Aquatic Life and Habitat: Surface Water Diversion	Construction of surface water diversions may reroute surface water flows to new receiving bodies and result in impacts to aquatic life in the previous downstream receiving body. The North Driftwood River surface water diversion in the SA is due to the open pit, and not the TMF alternatives. Therefore, surface water diversion is considered as a non-differentiating factor. However, non-contact water within drainage areas upstream of each alternative will be managed through non-contact water perimeter ditches/berms, and is considered as a differentiating indicator in the assessment.
Aquatic Life and Habitat: Sensitivity of Spawning Areas	The environmental impact associated with tailings storage includes impacts to fish spawning areas. These impacts are a function of the sensitivity of the impacted fish to changes in environmental conditions, the dependence of the species on the spawning area, and the rarity of the spawning habitat and/or species. Quantitative evaluation of the sensitivity of fish spawning areas overlain by the alternatives indicated the same level of spawning sensitivity ('Moderately Low') for the three alternatives. Therefore, sensitivity of spawning areas is considered to be a non-differentiating factor. However, sensitivity of the impacted fish habitat is considered as a differentiating indicator in the assessment.
Aquatic Life and Habitat - Rare or Endangered Species	As noted in Section 3.0, there are no records of aquatic species at risk (SAR) or critical habitats in the areas overlain by the alternatives. As a result, impacts to SAR or critical habitats are considered non-differentiating.
Terrestrial Life and Habitat	The alternatives are assumed to have the same level of impact on moose aquatic feeding, and bat hibernacula as a Species at Risk (SAR). Therefore, these indicators are considered non-differentiating. However, a set of other SAR and Species of Conservation Concern (SOCC) have been considered in the assessment. In addition, the area of forests and wetlands overlain by the alternatives, and the perturbation of forests and wetlands due to the construction of new haul roads were considered to represent the effects on terrestrial life and habitat and were included as indicators.
TMF Failure	The deposition method (thickened tailings) is the same in the TMF alternatives, and is considered as a non-differentiating factor. The dam height is also the same in the three alternatives and is considered as a non-differentiating factor. Quantity of tailings and supernatant water that may report to the final receiving waterbody due to a hypothetical failure of the alternative are also fairly similar among the alternatives (499 Mm^3 for TMF1, and 495 Mm^3 for TMF-2 and TMF-6). However, the length of dam containment is considered as a differentiating factor in the assessment.

Notes:

1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 to 4-7.

2. Geological Survey of Canada, 2015. Seizmic Hazard Map Geological Survey of Canada. https://www.seismescanada.rncan.gc.ca/hazard-alea/zoning-zonage/images/NLsimp_NBCC2015.pdf

Table D.2 Technical Characterization - Non-differentiating Characteristics – TMF

Characterization Criteria	Discussion
Physical Characteristics of Waste	Each alternative would store the same tailings material with the same solids content (39%) using the same deposition method. As such, the type of tailings, the solids content, and the deposition approach are not considered differentiating between alternatives.
Containment Structure Design - Low Hydraulic Conductivity and Transitional Fill and Sand Construction Material	Clay needed for making the low hydraulic conductivity clay core of the dam will be sourced from the open pit for the three alternatives. As such, the quantity and quality of low hydraulic conductivity soil is considered non-differentiating between alternatives. Moreover, the overburden soil quality at the alternative sites does not indicate notable variations between the alternatives in the quantity and quality of sand and sandy soil in the general proximity to each site. As such, the quantity and quality of sandy soil is considered non-differentiating between alternatives.
Containment Structure Design - Embankment Construction Material	It is anticipated that the embankment for all alternatives would be constructed of waste rock and thus the embankment construction material is non-differentiating between alternatives.
Containment Structure Design - Dam Height	Dam height is similar in the three alternatives, therefore, dam height is considered as a non-differentiating indicator.
Technical Risks and Benefits	The conceptual design of the three alternatives is based on the same level of information regarding subsurface condition and topography. Technical risks are anticipated to be similar.
Design and Operational Complexity - Discharge Complexity	Alternatives with less complex discharge requirements require less complex designs and are associated with less operational complexity. The discharge approach is the same in the alternatives and involves a central deposition line with strategic discharge required to maintain positive drainage towards the perimeter water collection ditches. Discharge complexity is considered as a non-differentiating indicator.
Operational Flexibility - Upset Conditions	Alternatives which are more amenable to variations in the tailings deposition slope or greater submergence volumes to manage acid generating rock provide additional flexibility and reduce the risk associated with the facility. The use of methods with limited storage capacity that rely more heavily on deposition slopes to achieve tailings storage capacity pose a greater operational risk. The three alternatives have the same limitations from the perspective of raising dam height. In the three alternatives, additional volume of tailings will be deposited in the open pit. Therefore, operational flexibility is considered as a non-differentiating indicator.
Closure Design	The same dry closure design including amending/covering and revegetating the tailings surface to reduce dust generation and mitigate infiltration would be implemented in the three alternatives. If ARD/ML generation is an issue that requires tailings saturation, it is anticipated that the perimeter dam would be raised to allow the deposit to be flooded. This practice is the same in the three alternatives, and therefore, the closure design is considered as a non-differentiating factor.
Constructability	The construction of the three alternatives will be similar. Therefore, constructability is a non-differentiating criterion.

Notes:

1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 through Figure 4-7.
2. Baseline information presented in the figures included in Appendix A.

Table D.3 Economic Characterization - Non-differentiating Characteristics – TMF

Characterization Criteria	Discussion
Operating Cost	The available information does not indicate notable variations in general operating costs among the alternatives. General operating cost, including the costs of TMF operation and maintenance, power, dewatering, transportation and placement associated with tailings pumping, and dam and water management components, range between 47 M$ and 48 M$ among the three alternatives. Because the variation is not notable among the alternatives, general operating cost is considered non-differentiating. Moreover, thickened tailings will be deposited in the three alternatives. Therefore, annual operating costs associated with flocculant usage are considered non-differentiating. Water treatment is also considered to be non-differentiating as the three alternatives will release the same amount of effluent discharge with similar water quality conditions.
Post-closure Cost - Water Treatment and Monitoring	The alternatives are anticipated to have similar post-closure water treatment and monitoring costs.
Economic Risks and Benefits - Additional Volume of Dam Construction for ARD/ML Mitigation	For ARD/ML mitigation, it might be required to raise the dam of the conceptually designed facility (considering a downstream raise concept) to allow for saturation of impounded tailings. The additional volume of dam construction material can cause risks to the project. The three alternatives are constrained by adjacent watercourses/waterbodies, which limits the opportunity for dam raise with a downstream raise concept. To address the insufficiency of tailings storage capacity, tailings can be deposited in the open pit earlier than planned. Because the three alternatives are not different from this indicator point of view, the dam raise risks are considered non-differentiating.
Notes: 1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 through Figure 4-7. 2. Baseline information presented in the figures included in Appendix A.	

Table D.4 Socio-Economic Characterization - Non-differentiating Characteristics – TMF

Characterization Criteria	Discussion
Archaeology	No known archaeological sites are overlain by the proposed alternatives, and thus, the effects on archaeology are considered non-differentiating.
Land and Resource Use - Forestry	It is anticipated that all timber within the footprint of the selected alternative would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. As such, timber harvest would not be lost due to TMF construction and forestry is considered non-differentiating between alternatives.
Interested Parties	The set of interested parties, as summarized in the criteria characterization table, are considered consistent between the identified alternatives and thus are considered non-differentiating.
Aesthetics	The alternatives have similar aesthetic impacts on Timmins as they are located at the same distance to the town.
Employment	The alternatives are considered to represent similar opportunities for employment and thus this impact is considered non-differentiating.
Capacity Building	The alternatives are considered to represent similar opportunities for capacity building and thus this impact is considered non-differentiating.
Economic Benefits	The alternatives are considered to have similar economic benefits (e.g., royalties, lease payments) and thus is impact is considered non-differentiating.
Community Safety	None of the alternative is considered to represent a higher risk to community safety due to public access during normal operation. It is anticipated that public access to Project areas would be limited during construction and operation. The varied public safety risks associated with a hypothetical TMF failure are considered differentiating and are included in the assessment.
Notes: 1. Conceptual designs of TMF-1, TMF-2, and TMF-6 are presented in Figure 4-5 through 4-7. 2. Baseline information presented in the figures included in Appendix A.	

Appendix E Tailings Disposal Alternatives

For the proposed TMF locations described in Section 4, six candidate waste disposal methods were identified and considered for use, as follows:

1. Conventional slurry tailings
2. Thickened tailings
3. Pressure filtered tailings
4. Co-mixing with waste rock (conventional/thickened)
5. Co-mixing with waste rock (pressure-filtered)
6. In-pit disposal

The following are descriptions of the advantages and disadvantages for each method. The two methods of co-mixing with waste rock (conventional/thickened) and co-mixing with tailings (pressure-filtered) will be presented under the category of co-mixing with waste rock (Section E.4).

E.1 Conventional Slurry Tailings

Tailings are commonly stored in slurried form within an impoundment. This is the most common tailings storage method in use in the mining industry and has been demonstrated at very high production rates and in a variety of climates. Conventional slurry tailings typically refer to mill discharges with a solids content typically between 25% to 45% by weight, which are transported via hydraulic pumping from the plant to the impoundment storage. The deposition involves the construction of an impoundment as a surface retaining structure designed to store both tailings and mine water, with the aim of reclaiming the water for use in the processing plant as required. Embankment design varies as a function of the existing topography and may include the construction of a relatively small embankment within a valley or the construction of a ring dyke facility which fully surrounds the impoundment to provide containment in areas of flat topography.

Some of the advantages of conventional slurry tailings include:

- Widely applied in the mining industry
- Allows for large storage volumes of reclaimed water
- Lower capital cost compared to other methods

Some of the disadvantages of conventional slurry tailings include:

- Requires construction of containment embankment
- Larger storage volume is required due to the low solids/water ratio
- Deposited tailings are weaker compared to other methods, presenting additional containment embankment stability challenges
- Tailings may travel long distances in case of containment breach

- Long-term closure and reclamation present challenges related to the extent of the areas to be reclaimed and the placement of cover material over tailings

E.2 Thickened Tailings

Thickened tailings involve mechanical dewatering of the slurry tailings to a point where it will form a homogeneous non-segregated mass exhibiting a low strength post-deposition, enough to allow them to be deposited in gently sloped self-supporting stacks. (Fourie, et al., 2001; Milani, 2010). Thickened tailings typically present yield stresses between 10 Pa to 300 Pa and solids content between 50% to 70% by weight (Watson, et al., 2010). In the Project, due to the existence of clay in the tailings, solids content will be 30%, lower than the typical thickened tailings solids contents.

As thickened tailings generate more viscous tailings, they appeal to projects where water recovery is critical during operations and reduce the size of the confining embankments required. However, these methods also require additional capital and operational costs due to the need to implement thickeners. Thickened tailings have not been widely adopted in the Canadian mining industry as a preferred tailings deposition method and therefore there is limited regional experience in their implementation and performance.

Some of the advantages of thickened tailings include:

- Requires smaller confining embankments
- Less containment volume is required due to lower water content and steeper beach formation
- Dense tailings result in more stable containment embankments.
- Lower reclamation costs
- Reduced seepage
- High volumes of reclaimed water during thickening process
- Tailings are expected to have limited run-out in case of containment breach

Some of the disadvantages of thickened tailings include:

- Higher capital cost and operational costs due to the use of thickeners
- Limited application and experience in the mining industry
- Requires construction of containment embankment

E.3 Pressure-filtered Tailings

Dewatering tailings slurry to high degrees produces a filtered cake that can no longer be hydraulically transported by pipeline due to its low water content. These filtered tailings are normally transported by conveyor or trucks and are deposited and compacted to form an unsaturated tailings deposit. This type of tailings storage produces a stable deposit typically requiring no retaining structure and is also referred to as ‘dry stack tailings’ (Davies, 2001).

While there are a variety of filter types available for a variety of applications, at a basic level, all filters operate under the same general concept: filters use a porous surface to retain the solid particles from the feed (which are known as the filter cake) while driving the liquid portion of the feed through the filter cake and the porous surface. Pressure filters, as a filter category, operate by using mechanical pressure to "push" the liquid portion of the tailings feed through the filter medium and filter cake. Pressure filters can generally be divided into two types: plate and frame pressure filters (which include both chamber and membrane pressure filters) and belt pressure filters. Chamber and membrane pressure filters are typically able to produce the lowest water content material of all the filtration methods. Other miscellaneous types of pressure filters include tube press, screw press, centrifuge, dewatering sieve, and geotextile tube.

Due to the stringent regulations and the mining industry's stewardship of the natural environment, the filtered tailings option has become increasingly popular due to the following advantages:

- Reduction of catastrophic breach failure and tailings runout potential as compared with conventional storage facilities
- Reduction of environmental risks and reclamation cost as compared to conventional slurry tailings
- Reduction of potential for groundwater contamination due to seepage
- Increased water reclamation at the plant

The main disadvantages of filtered tailings are as follows:

- Equipment and operational costs of a filtration plant
- Requirement of upstream diversion systems to prevent inundation of the dry stack facility
- Need for dust suppression requirements during dry periods (other tailings types require somewhat less dust suppression)
- Heavy rainfall or snowmelt which saturates the dry stack could result in trafficability problems for haulage and compaction equipment

E.4 Co-Mixing with Waste Rock

Co-disposal is typically used as a blanket term to describe the disposal of both waste rock and tailings together in a combined facility. Co-disposal can simplify waste management by combining mine waste into one common facility and reducing the overall area of waste. Mine waste co-disposal approaches are site-specific and are developed to address certain site requirements. The co-mixing of tailings and waste rock is expected to produce material with low hydraulic conductivity, low compressibility, high water retaining capacity and high shear strength (Wilson, G., et al., 2003; Wickland, et al., 2006).

Depending upon the method selected, co-disposal can improve the characteristics of both the waste rock and tailings material by inhibiting oxygen ingress to PAG waste rock and increasing the strength of the overall waste deposit above that of the tailings itself. To achieve this, it is typically assumed that the

tailings fill the voids within the waste rock, leaving the stronger waste rock particles in contact while preventing oxygen ingress.

In-pit co-mixing of tailings with waste rock is one of the feasible methods for the Project when operations have been completed at the pit and the area is available for disposal. In-pit co mixing of tailings and waste rock, when available, presents the following advantages:

- Reduced embankment failure risks
- Lower capital and operational (e.g., monitoring) costs
- No additional impact to fish-bearing habitats and surface natural drainage
- Favorable aesthetics and public perception
- Widely used in the mining industry
- Reduced acid generation and metal leaching due to the restriction of oxygen entry and water seepage.

Some of the challenges associated with this method include:

- Mixing can be energy-consuming and expensive due to alignment of the production and sequencing of the two feed streams
- Challenging in maintaining optimal mixing ratio given the wide gradation variation of the waste rocks
- Elimination of future ore recovery from the tailings (e.g., dissolved metals)

A key technical challenge for in-pit co-mixing with waste rock in the pit is the prevention of seepage through the natural ground towards area waterbodies or aquifers. Mitigation measures to control seepage will be dependent on the local geology at the pit and may include the placement of natural or synthetic liners over permeable soils.

E.5 In-Pit Disposal

During the start of operations, it is expected that the mining pits will be under development and will not be available for storage, which results in the need for external storage areas. Once mining in any pit is completed, the available pit can be considered for disposal of tailings. In-pit tailings disposal is deemed feasible using any of the tailings deposition methods presented above. In-pit disposal is often more feasible at sites with multiple pits where waste deposition can begin after mining of a pit is completed. This avoids double handing of tailings and can significantly reduce costs.

A key technical challenge for in-pit disposal is the prevention of seepage through the natural ground (pit walls) towards area waterbodies and aquifers. Mitigation measures to control seepage will be dependent on the local geology at the pit and may include the placement of natural or synthetic liners over permeable soils. The type of tailings methodology selected for in-pit storage will also impact the amount

of water available for potential seepage and should be considered when analyzing this option. In cases where the pit is below the groundwater level and hydraulically contained (i.e., groundwater flows towards the pit), in pit storage can be an attractive option for storing PAG tailings and waste rock as it maintains saturation of the material and does not require the construction of typically more costly and higher risk embankments.

In-pit disposal of tailings, when available, presents the following advantages:

- Reduced embankment failure risks
- Lower capital and operational (e.g., monitoring) costs
- No additional impact to fish-bearing habitats and surface natural drainage
- Favorable aesthetics and public perception
- Widely used in the mining industry

References

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Appendix F MWMA Alternative Characterizations Criteria

Table F.1 Characterization Criteria - Environmental Characterization – MWMA

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Geographical Boundaries	The geographical location and legal status of the alternative footprint area impacts the requirements associated with permitting, construction, operation and closure of the alternative	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	The Project is located in northeastern Ontario, approximately 43 km north of the town of Timmins. The Crawford Project is located within an area of mining claims owned by CNC.	Stantec technical lead input
Topography	Topography impacts the efficiency and approach used for mine waste storage.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m and an overall topographic average slope of 1.7% for the SA. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m and an overall topographic average slope of 1.7% for the SA. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m and an overall topographic average slope of 1.7% for the SA. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock.	The topography of the SA is relatively flat to gently rolling with local relief up to 15 m and an overall topographic average slope of 1.7% for the SA. There are no distinct topographic features that stand out in relief. Lower lying areas are characterized as an undulating plain of glaciolacustrine clay that blankets underlying bedrock.	Stantec technical lead input
Geochemical Characterization of Waste	In combination with mitigation measures, the geochemical characteristics of waste govern effluent water quality.	It is anticipated that waste rock within each MWMA will be of similar geochemical and physical properties. A Metal Leaching (ML)/Acid Rock Drainage (ARD) assessment was conducted by WSP in the Crawford Geochemistry Characterization Report (WSP 2024) and included static and kinetic testing of waste rock samples. The waste rock Carbonate Neutralization Potential (CO3-NP) and modified Sobek NP results had a larger difference in the classification of ARD potential than the other materials. Using the CO3-NP, 22% of waste rock was classified as Potentially Acid Generating (PAG) and 7% uncertain whereas for modified Sobek NP, only 1% was classified as PAG. The Humidity Cell Test (HCT) CO3-NP and modified Sobek NP results also observed a difference in PAG and uncertain acid generating potential results with CO3-NP results being higher, which was attributed to the low concentrations of sulphides and carbonates in the waste rock, ore, and tailings, and higher concentrations of silicates. Monitoring of pH in the HCT leachate for waste rock observed a minimum pH of 6.7, which is within the circumneutral range and above the lower Provincial Water Quality Objective (PWQO) and Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines (CCME CWQG) criteria range value.	It is anticipated that waste rock within each MWMA will be of similar geochemical and physical properties. A Metal Leaching (ML)/Acid Rock Drainage (ARD) assessment was conducted by WSP in the Crawford Geochemistry Characterization Report (WSP 2024) and included static and kinetic testing of waste rock samples. The waste rock Carbonate Neutralization Potential (CO3-NP) and modified Sobek NP results had a larger difference in the classification of ARD potential than the other materials. Using the CO3-NP, 22% of waste rock was classified as Potentially Acid Generating (PAG) and 7% uncertain whereas for modified Sobek NP, only 1% was classified as PAG. The Humidity Cell Test (HCT) CO3-NP and modified Sobek NP results also observed a difference in PAG and uncertain acid generating potential results with CO3-NP results being higher, which was attributed to the low concentrations of sulphides and carbonates in the waste rock, ore, and tailings, and higher concentrations of silicates. Monitoring of pH in the HCT leachate for waste rock observed a minimum pH of 6.7, which is within the circumneutral range and above the lower Provincial Water Quality Objective (PWQO) and Canadian Council of Ministers of the Environment's Canadian Water Quality Guidelines (CCME CWQG) criteria range value.	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Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
		The majority of the waste rock is considered to be non-PAG, as per the findings of the Geochemistry Characterization Report (WSP 2024). The waste rock SFE ML results identified chloride, fluoride, aluminum (dissolved and total), total arsenic, total antimony, total boron, total chromium (VI), total copper, total iron, total selenium, total thallium, total uranium, total vanadium, and dissolved zinc as PoPCs. The waste rock HCT ML results for the dunite and metavolcanic lithologies that represent 5% and 48% of the waste rock, respectively, had several metalloid and metal parameters that exceeded PWQO and/or CCME CWQG-FAL values. For dunite, this was total chromium (VI) (long-term) and total boron (first flush), and for metavolcanics these parameters were dissolved aluminum, total aluminum, and total arsenic (WSP 2024d).	The majority of the waste rock is considered to be non-PAG, as per the findings of the Geochemistry Characterization Report (WSP 2024). The waste rock SFE ML results identified chloride, fluoride, aluminum (dissolved and total), total arsenic, total antimony, total boron, total chromium (VI), total copper, total iron, total selenium, total thallium, total uranium, total vanadium, and dissolved zinc as PoPCs. The waste rock HCT ML results for the dunite and metavolcanic lithologies that represent 5% and 48% of the waste rock, respectively, had several metalloid and metal parameters that exceeded PWQO and/or CCME CWQG-FAL values. For dunite, this was total chromium (VI) (long-term) and total boron (first flush), and for metavolcanics these parameters were dissolved aluminum, total aluminum, and total arsenic (WSP 2024d).	The majority of the waste rock is considered to be non-PAG, as per the findings of the Geochemistry Characterization Report (WSP 2024). The waste rock SFE ML results identified chloride, fluoride, aluminum (dissolved and total), total arsenic, total antimony, total boron, total chromium (VI), total copper, total iron, total selenium, total thallium, total uranium, total vanadium, and dissolved zinc as PoPCs. The waste rock HCT ML results for the dunite and metavolcanic lithologies that represent 5% and 48% of the waste rock, respectively, had several metalloid and metal parameters that exceeded PWQO and/or CCME CWQG-FAL values. For dunite, this was total chromium (VI) (long-term) and total boron (first flush), and for metavolcanics these parameters were dissolved aluminum, total aluminum, and total arsenic (WSP 2024d).	The majority of the waste rock is considered to be non-PAG, as per the findings of the Geochemistry Characterization Report (WSP 2024). The waste rock SFE ML results identified chloride, fluoride, aluminum (dissolved and total), total arsenic, total antimony, total boron, total chromium (VI), total copper, total iron, total selenium, total thallium, total uranium, total vanadium, and dissolved zinc as PoPCs. The waste rock HCT ML results for the dunite and metavolcanic lithologies that represent 5% and 48% of the waste rock, respectively, had several metalloid and metal parameters that exceeded PWQO and/or CCME CWQG-FAL values. For dunite, this was total chromium (VI) (long-term) and total boron (first flush), and for metavolcanics these parameters were dissolved aluminum, total aluminum, and total arsenic (WSP 2024d).	
Geotechnical Characterization of Waste	The geotechnical characteristics of waste have a significant impact on the physical stability and performance of the MWMA.	Waste rock is anticipated to be coarse and generally free draining. Rock anticipated to consist of five major waste rock and ore lithologies: dunite; peridotite; pyroxenite; gabbro; and metavolcanics	Waste rock is anticipated to be coarse and generally free draining. Rock anticipated to consist of five major waste rock and ore lithologies: dunite; peridotite; pyroxenite; gabbro; and metavolcanics	Waste rock is anticipated to be coarse and generally free draining. Rock anticipated to consist of five major waste rock and ore lithologies: dunite; peridotite; pyroxenite; gabbro; and metavolcanics	Waste rock is anticipated to be coarse and generally free draining. Rock anticipated to consist of five major waste rock and ore lithologies: dunite; peridotite; pyroxenite; gabbro; and metavolcanics	Stantec technical lead input
Geochemical Characterization of Construction Materials and Excavation Waste	In combination with mitigation measures, the geochemical characteristics of waste govern water quality	The construction materials used in MWMA, ore stockpiles, sand/till pile and clay pile with waste rock ribs for stability are expected to consist of select waste rock for use in impoundment construction based on implementation of an acid rock and metal leaching mitigation program. Excavated materials will consist of surficial unsuitable soils and soils removed during construction.	The construction materials used in MWMA, ore stockpiles, sand/till pile and clay pile with waste rock ribs for stability are expected to consist of select waste rock for use in impoundment construction based on implementation of an acid rock and metal leaching mitigation program. Excavated materials will consist of surficial unsuitable soils and soils removed during construction.	The construction materials used in MWMA, ore stockpiles, sand/till pile and clay pile with waste rock ribs for stability are expected to consist of select waste rock for use in impoundment construction based on implementation of an acid rock and metal leaching mitigation program. Excavated materials will consist of surficial unsuitable soils and soils removed during construction.	The construction materials used in MWMA, ore stockpiles, sand/till pile and clay pile with waste rock ribs for stability are expected to consist of select waste rock for use in impoundment construction based on implementation of an acid rock and metal leaching mitigation program. Excavated materials will consist of surficial unsuitable soils and soils removed during construction.	Stantec technical lead input
Seismic Conditions	Higher seismicity poses a higher stability risk and requires additional mitigation to meet design criteria.	The site is classified as "low" relative seismic hazard by the Geological Survey of Canada [2]	The site is classified as "low" relative seismic hazard by the Geological Survey of Canada [2]	The site is classified as "low" relative seismic hazard by the Geological Survey of Canada [2]	The site is classified as "low" relative seismic hazard by the Geological Survey of Canada [2]	-

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Geotechnical Foundation Conditions	Waste facilities constructed in areas with lower strength foundations and more hydraulically conductive foundation materials pose a higher stability risk and have a higher risk of facility seepage and require additional mitigation to meet design criteria.	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the alternative is as follows: MWMA-1 Bedrock: 110 ha MWMA-1 Till: 2,763 ha MWMA-1 Organic deposits: 0 ha	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the alternative is as follows: MWMA-2 Bedrock: 0 ha MWMA-2 Till: 2,783 ha MWMA-2 Organic deposits: 6.5 ha	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the alternative is as follows: MWMA-3 Bedrock: 0 ha MWMA-3 Till: 1,914 ha MWMA-3 Organic deposits: 339 ha	The bedrock in the region is comprised of a felsic to mafic volcanic assemblage hosting the Crawford Ultramafic Complex, local metasediments (i.e. iron formation, minor metavolcanic rocks), and other local ultramafic sills. Overburden is predominantly glacial till consisting of sand, clay, loose gravel and boulders, with an average thickness of about 50 m. A major fraction of the overburden is clay-dominated. Several regional faults are found in the LSA/RSA. The major regional faults are the Mattagami River Fault, the Buskegau River Fault and the main regional fault (also referred to as CUC fault). The fault lines cross every major structure of the Project. Surficial geology underlying the alternative is as follows: MWMA-4 Bedrock: 0 ha MWMA-4 Till: 1,976 ha MWMA-4 Organic deposits: 554 ha	Stantec technical lead input
Hydrology	Sites with large catchment areas and reporting flows must convey larger flows of water and present a higher risk. Sites with more water bodies and water flows present a higher risk of impacts from waste.	Area of watercourses within footprint: MWMA-1: 14.9 ha Area of waterbodies within footprint: MWMA-1: 47.8 ha	Area of watercourses within footprint: MWMA-1: 15.2 ha Area of waterbodies within footprint: MWMA-2: 54.3 ha	Area of watercourses within footprint: MWMA-1: 9.5 ha Area of waterbodies within footprint: [3] MWMA-3: 31.4 ha	Area of watercourses within footprint: MWMA-4: 1.1 ha Area of waterbodies within footprint: [3] MWMA-4: 3.6 ha	Stantec technical lead input
Hydrogeology	Hydrogeology impacts seepage rates from waste facilities and the location where seepage will report to.	Uppermost geologic unit underlaying the alternative is mostly (96% by footprint area) fine-grained till with some exposed bedrock. Higher rates of seepage from the alternative to groundwater are expected in an area where bedrock is exposed at surface compared to fine-grained till.	Uppermost geologic unit underlaying the alternative is fine-grained till which is expected to limit the seepage from the alternative to groundwater.	Uppermost geologic unit underlaying the alternative is mainly (85% by footprint area) fine-grained till with the remainder being organic deposits. As the organic deposits are thin and discontinuous across the SA and the till is a nearly-continuous unit, the till likely underlies the organic deposits and is the main controller of seepage rates from the alternative to groundwater. The fine-grained till is expected to limit seepage from the alternative to groundwater.	Uppermost geologic unit underlaying the alternative is mainly (76% by footprint area) fine-grained till with the remainder being organic deposits. As the organic deposits are thin and discontinuous across the SA and the till is a nearly-continuous unit, the till likely underlies the organic deposits and is the main controller of seepage rates from the alternative to groundwater. The fine-grained till is expected to limit seepage from the alternative to groundwater.	Stantec technical lead input
		97% of the footprint of the alternative is within the 1 m predicted zone of influence of open pit dewatering at the end of operations. 34% of the footprint of the alternative is within the 10 m zone of influence. This may result in a significant portion of seepage from the alternative to groundwater during operations being collected by the open pit dewatering system for transfer to the process	58% of the footprint of the alternative is within the 1 m predicted zone of influence of open pit dewatering at the end of operations. 26% of the footprint of the alternative is within the 10 m zone of influence. This may result in a portion of seepage from the alternative to groundwater during operations being collected by the open pit dewatering system for transfer to the process plant and	0% of the footprint of the alternative is within the predicted zone of influence of open pit dewatering at the end of operations. This may result in the majority of the seepage from the alternative to groundwater during operations ultimately being discharged to surface water.	0% of the footprint of the alternative is within the predicted zone of influence of open pit dewatering at the end of operations. This may result in the majority of the seepage from the alternative to groundwater during operations ultimately being discharged to surface water.	

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
		plant and eventual and eventual discharge via the water treatment system.	eventual and eventual discharge via the water treatment system.			
Climate	Climate (Temperature and rainfall) impacts the viability of waste management practices and variations in climate may impact year-round practices.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	The SA has a climate typical for northern Ontario. Weather statistics from 1991 to 2020 indicates a mean daily temperature of 2ºC. Climate normal temperatures range between a minimum of -16.4ºC in January to a high of 17.6ºC in July. The climate normal rainfall for SA is 801.8 mm/year with ~40% as snowfall.	Stantec technical lead input
Climate Change Projections	Changes in the climate may impact the waste facility performance, especially at closure. Increased haul lengths are associated with increased fuel consumption, higher carbon emissions, and higher impacts on climate change.	The waste rock disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-1: 6.1 km Longer haul distances will require greater fuel consumption and would result in greater emission of greenhouse gases, which contribute to climate change.	The waste rock disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-2: 9.2 km Longer haul distances will require greater fuel consumption and would result in greater emission of greenhouse gases, which contribute to climate change.	The waste rock disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-3: 12.0 km Longer haul distances will require greater fuel consumption and would result in greater emission of greenhouse gases, which contribute to climate change.	The waste rock disposal method does not rely on maintenance of temperature conditions (such as permafrost). Variations in climate could alter rainfall behaviour and impact the performance of the water management systems during operation and closure. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-4: 9.4 km Longer haul distances will require greater fuel consumption and would result in greater emission of greenhouse gases, which contribute to climate change.	Stantec technical lead input Section 5.0 Figures Ausenco
Atmospheric Issues	Waste storage may impact the local air quality due to particulate or metals pollution associated with haulage and pile construction.	Haul distances are considered to be the primary source of dust generation due to waste rock storage. The exposed waste rock surface area is not anticipated to significantly impact air quality due to the relatively coarse-grained nature of the waste rock. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-1: 6.1 km Longer haul distances will result in larger quantities of dust generated which will have impacts on terrestrial and aquatic life as well as human life.	Haul distances are considered to be the primary source of dust generation due to waste rock storage. The exposed waste rock surface area is not anticipated to significantly impact air quality due to the relatively coarse-grained nature of the waste rock. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-2: 9.2 km Longer haul distances will result in larger quantities of dust generated which will have impacts on terrestrial and aquatic life as well as human life.	Haul distances are considered to be the primary source of dust generation due to waste rock storage. The exposed waste rock surface area is not anticipated to significantly impact air quality due to the relatively coarse-grained nature of the waste rock. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-3: 12.0 km Longer haul distances will result in larger quantities of dust generated which will have impacts on terrestrial and aquatic life as well as human life.	Haul distances are considered to be the primary source of dust generation due to waste rock storage. The exposed waste rock surface area is not anticipated to significantly impact air quality due to the relatively coarse-grained nature of the waste rock. Haul distance from the center of the open pit to the center of the pile along the anticipated haul route is: MWMA-4: 9.4 km Longer haul distances will result in larger quantities of dust generated which will have impacts on terrestrial and aquatic life as well as human life.	Stantec technical lead input Section 5.0 Figures Calculated by GIS/CAD
Overall Affected Land Footprint Size of MWMA and Related Infrastructure	Larger footprints remove more area from the current ecological use (wildlife habitat). Longer access roads and pipeline lengths have a greater environmental impact and pose a higher risk of infrastructure disruption.	Footprint area (2-dimensional): MWMA-1: 2,940 ha Length of new haul roads required: MWMA-1: 22.4 km	Footprint area (2-dimensional): MWMA-1: 2,880 ha Length of new haul roads required: MWMA-2: 32.5 km	Footprint area (2-dimensional): MWMA-1: 2,320 ha Length of new haul roads required: MWMA-3: 26.3 km	Footprint area (2-dimensional): MWMA-1: 2,590 ha Length of new haul roads required: MWMA-4: 23.9 km	Stantec technical lead input Section 5.0 Figures Calculated by GIS/CAD

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Water Quality	Potential for waste storage and associated activities to effect local receiving waters	MWMA-1 is located near the open pit, which will capture groundwater seepage from the waste rock pile and be subsequently managed by the dewatering system and mine water treatment systems during construction and operation.	MWMA-2 is located near the open pit, which will capture groundwater seepage from the waste rock pile and be subsequently managed by the dewatering system and mine water treatment systems during construction and operation. The waste rock pile will be surrounded by a seepage collection ditch that will convey flows to a sedimentation pond with further water treatment prior to discharge via a final discharge point.	MWMA-3 will be surrounded by a seepage collection ditch that will convey flows to a sedimentation pond with further water treatment prior to discharge via a final discharge point.	MWMA-4 will be surrounded by a seepage collection ditch that will convey flows to a sedimentation pond with further water treatment prior to discharge via a final discharge point.	Stantec technical lead input
Soil Quality	Waste storage may impact soil quality.	No significant impacts to soil quality anticipated from alternative. Soil impacts due to storage anticipated to be limited to dust generated from tailings.	Based on characterization data, waste rock is anticipated to be non-PAG and acid rock drainage is not likely to occur during the life of the mine. The waste rock has a low metal leaching potential (Appendix H of the Impact Statement). Mitigation measures will be implemented via a acid rock drainage/metal leaching plan if confirmatory samples identify PAG and metal leaching potential. No significant impacts to soil quality anticipated from alternative.	Based on characterization data, waste rock is anticipated to be non-PAG and acid rock drainage is not likely to occur during the life of the mine. The waste rock has a low metal leaching potential (Appendix H of the Impact Statement). Mitigation measures will be implemented via a acid rock drainage/metal leaching plan if confirmatory samples identify PAG and metal leaching potential. No significant impacts to soil quality anticipated from alternative.	Based on characterization data, waste rock is anticipated to be non-PAG and acid rock drainage is not likely to occur during the life of the mine. The waste rock has a low metal leaching potential (Appendix H of the Impact Statement). Mitigation measures will be implemented via a acid rock drainage/metal leaching plan if confirmatory samples identify PAG and metal leaching potential. No significant impacts to soil quality anticipated from alternative.	Stantec technical lead input
Water Quantity and Storage Issues	Requirements to store larger quantities of water imply a higher risk of seepage and instability and require more complex water management schemes.	Conceptual design includes perimeter collection ditches constructed around individual piles which convey flows to ponds. Length of perimeter ditches: MWMA-1: 21.3 km The non-contact water catchment area anticipated to be diverted around the alternative via ditches/berms: MWMA-1: 552 ha The contact water catchment area anticipated to report to MWMA-1: MWMA-1: 2,940 ha	Conceptual design includes perimeter collection ditches constructed around individual piles which convey flows to ponds. Length of perimeter ditches: MWMA-2: 30.4 km The non-contact water catchment area anticipated to be diverted around the alternative via ditches/berms: MWMA-2: 1,709 ha The contact water catchment area anticipated to report to MWMA-2: MWMA-2: 2,880 ha	Conceptual design includes perimeter collection ditches constructed around individual piles which convey flows to ponds. Length of perimeter ditches: MWMA-3: 19.5 km The non-contact water catchment area anticipated to be diverted around the alternative via ditches/berms: MWMA-3: 021 ha The contact water catchment area anticipated to report to MWMA-3: MWMA-3: 2,320 ha	Conceptual design includes perimeter collection ditches constructed around individual piles which convey flows to ponds. Length of perimeter ditches: MWMA-4: 19.7 km The non-contact water catchment area anticipated to be diverted around the alternative via ditches/berms: MWMA-4: 0,085 ha The contact water catchment area anticipated to report to MWMA-4: MWMA-4: 2,590 ha	Section 5.0 Figures c
Vegetation	Facilities overlying larger amounts of vegetation or vegetation considered rare or protected pose a greater environmental impact.	Vegetation overlain by MWMA is divided into wetlands and forested area. Wetlands overlain: MWMA-1: 1,831 ha Forested areas overlain: MWMA-1: 995 ha Combined forested and wetland areas: MWMA-1: 2,826 ha The baseline information used in the assessment does not indicate the	Vegetation overlain by MWMA is divided into wetlands and forested area. Wetlands overlain: MWMA-2: 2,041 ha Forested areas overlain: MWMA-2: 701 ha Combined forested and wetland areas: MWMA-2: 2,742 ha The baseline information used in the assessment does not indicate the	Vegetation overlain by MWMA is divided into wetlands and forested area. Wetlands overlain: MWMA-3: 1,652 ha Forested areas overlain: MWMA-3: 587 ha Combined forested and wetland areas: MWMA-3: 2,238 ha The baseline information used in the assessment does not indicate the	Vegetation overlain by MWMA is divided into wetlands and forested area. Wetlands overlain: MWMA-4: 2,296 ha Forested areas overlain: MWMA-4: 231 ha Combined forested and wetland areas: MWMA-4: 2,528 ha The baseline information used in the assessment does not indicate the	Stantec technical lead input; Calculated by GIS/CAD; Appendix B Figures

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
		presence of any rare or protected vegetation in the alternative footprint.	presence of any rare or protected vegetation in the alternative footprint.	presence of any rare or protected vegetation in the alternative footprint.	presence of any rare or protected vegetation in the alternative footprint.	
Aquatic Life and Habitat	Facilities overlying larger amounts of aquatic habitat or habitat considered to be rare or protected pose a greater environmental impact.	Area of watercourses within MWMA footprint: MWMA-1: 14.9 ha Area of waterbodies within MWMA footprint: MWMA-1: 47.8 ha The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity.	Area of watercourses within MWMA footprint: MWMA-3: 15.2 ha Area of waterbodies within MWMA footprint: MWMA-2: 54.3 ha The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity.	Area of watercourses within MWMA footprint: MWMA-2: 9.5 ha Area of waterbodies within MWMA footprint: 4 MWMA-3: 31.4 ha The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity.	Area of watercourses within MWMA footprint: 3 MWMA-4: 1.1 ha Area of waterbodies within MWMA footprint: 4 MWMA-4: 3.6 ha The alternative overlies aquatic habitat with "moderately low" and "moderate" sensitivities. The alternative overlies spawning areas with a "moderately low" sensitivity.	WSP technical lead input; Calculated by GIS; Appendix B Figures
Terrestrial Life and Habitat	Facilities overlying larger amounts of terrestrial habitat considered to be rare or protected pose a greater environmental impact.	The alternative MWMA-1 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 171 ha. Blanding's turtle habitat area overlain by the alternative is 0 ha. Boreal caribou habitat area overlain by the alternative is 2,186 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 1,467 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 0 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 995 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 66 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 1,127 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 1,933 ha.	The alternative MWMA-2 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 0 ha. Blanding's turtle habitat area overlain by the alternative is 0 ha. Boreal caribou habitat area overlain by the alternative is 1,194 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 1,373 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 48 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 701 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 124 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 865 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 1,686 ha.	The alternative MWMA-3 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 0 ha. Blanding's turtle habitat area overlain by the alternative is 0 ha. Boreal caribou habitat area overlain by the alternative is 1,694 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 1,035 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 0 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 327 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 257 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 964 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 612 ha.	The alternative MWMA-4 does not overlie any high density moose population areas, or moose aquatic feeding areas. There are records of eight Species at Risk (SAR), six SAR birds, two Species of Conservation Concern (SoCC), and seven SoCC birds in the assessment areas where the alternative is located. Moose late winter cover area overlain by the alternative is 119 ha. Blanding's turtle habitat area overlain by the alternative is 490 ha. Boreal caribou habitat area overlain by the alternative is 2,529 ha. Habitat areas for waterfowl nesting, sharp-tailed grouse lek, marsh breeding bird, which are overlain by the alternative is 840 ha. Confirmed bald eagle and osprey nesting habitat, which is overlain by the alternative is 0 ha. Woodland raptor nesting habitat, which is overlain by the alternative is 204 ha. Shrub/early successional breeding bird habitat, which is overlain by the alternative is 22 ha. Habitat areas for upland gamebirds, which are overlain by the alternative is 739 ha. Habitat areas for common nighthawk and evening grosbeak, which are overlain by the alternative is 232 ha.	Stantec technical lead input; Calculated by GIS/CAD; Appendix B Figures

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
		Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 536 ha. Wetlands overlain: MWMA-1: 1,831 ha Forested areas overlain: MWMA-1: 995 ha Combined forested and wetland areas: MWMA-1: 2,826 ha Length of new haul roads required: MWMA-1: 22.4 km	Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 374 ha. Wetlands overlain: MWMA-2: 2,041 ha Forested areas overlain: MWMA-2: 701 ha Combined forested and wetland areas: MWMA-2: 2,742 ha Length of new haul roads required: MWMA-2: 32.5 km	Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 461 ha. Wetlands overlain: MWMA-3: 1,652 ha Forested areas overlain: MWMA-3: 587 ha Combined forested and wetland areas: MWMA-3: 2,238 ha Length of new haul roads required: MWMA-3: 26.3 km	Habitat areas for SAR and SoCC birds, which are overlain by the alternative is 567 ha. Wetlands overlain: MWMA-4: 2,296 ha Forested areas overlain: MWMA-4: 231 ha Combined forested and wetland areas: MWMA-4: 2,528 ha Length of new haul roads required: MWMA-4: 23.9 km	
MWMA Failure	MWMA failure could result in environmental impacts due to loss of containment.	The likely extents of failure are considered to be limited considering the granular and relatively undrained nature of waste rock and the relatively flat topography in the area.	The likely extents of failure are considered to be limited considering the granular and relatively undrained nature of waste rock and the relatively flat topography in the area.	The likely extents of failure are considered to be limited considering the granular and relatively undrained nature of waste rock and the relatively flat topography in the area.	The likely extents of failure are considered to be limited considering the granular and relatively undrained nature of waste rock and the relatively flat topography in the area.	

Notes:
1. Conceptual designs of MWMA-1, MWMA-2, MWMA-3 and MWMA-4 are presented in Figure 5.2, 5.3, 5.4 and 5.5, respectively.
2. Geological Survey of Canada, 2015. Seismic Hazard Map Geological Survey of Canada. https://www.seismescanada.rncan.gc.ca/hazard-alea/zoning-zonage/images/NLsimp_NBCC2015.pdf
3. Calculated based on average ratio of length of field identified watercourses providing aquatic habitat to length of mapped watercourses for MWMA-1 and MWMA-2
4. Calculated based on average ratio of area of field identified waterbodies providing aquatic habitat to area of mapped waterbodies for MWMA-1 and MWMA-2

Table F.2 Characterization Criteria - Technical Characterization – MWMA

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Physical Characteristics of Waste	Waste rock materials with higher fractions of fines and lower hydraulic conductivities may present a higher risk of instability and greater failure runout lengths. Waste permeability and consolidation/settlement characteristics impact seepage and deformation characteristics during operation and closure.	Blasted waste rock from the open pit. Waste rock is anticipated to be relatively coarse and free-draining.	Blasted waste rock from the open pit. Waste rock is anticipated to be relatively coarse and free-draining.	Blasted waste rock from the open pit. Waste rock is anticipated to be relatively coarse and free-draining.	Blasted waste rock from the open pit. Waste rock is anticipated to be relatively coarse and free-draining.	Stantec technical lead input
MWMA Design	More complex designs may represent a higher risk of failure or upset conditions	Footprint Area (2-dimensional): MWMA-1: 2,940 ha Maximum pile height: MWMA-1: 100 m Piles will be constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. If required, mitigation measures such as toe berms or shear keys could be incorporated. Piles constructed by end-dump placement of rockfill in horizontal lifts with benches. The clay storage component of the waste rock area will be surrounded by a perimeter berm of waste rock. A series of waste rock ribs will be construed spaced 200 m apart within the clay storage area for containment and haulage access. Surface water management by perimeter collection ditches and collection ponds. Length of pile perimeter: MWMA-1: 21.3 km Number of River/Highway Bridge Crossing MWMA-1: 0	Footprint Area (2-dimensional): MWMA-2: 2,880 ha Maximum pile height: MWMA-2: 130 m Piles will be constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. If required, mitigation measures such as toe berms or shear keys could be incorporated. Piles constructed by end-dump placement of rockfill in horizontal lifts with benches. The clay storage component of the waste rock area will be surrounded by a perimeter berm of waste rock. A series of waste rock ribs will be construed spaced 200 m apart within the clay storage area for containment and haulage access. Surface water management by perimeter collection ditches and collection ponds. Length of pile perimeter: MWMA-2: 30.4 km Number of River/Highway Bridge Crossing MWMA-2: 0	Footprint Area (2-dimensional): MWMA-3: 2,320 ha Maximum pile height: MWMA-3: 170 m Piles will be constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. If required, mitigation measures such as toe berms or shear keys could be incorporated. Piles constructed by end-dump placement of rockfill in horizontal lifts with benches. The clay storage component of the waste rock area will be surrounded by a perimeter berm of waste rock. A series of waste rock ribs will be construed spaced 200 m apart within the clay storage area for containment and haulage access. Surface water management by perimeter collection ditches and collection ponds. Length of pile perimeter: MWMA-3: 19.5 km Number of River/Highway Bridge Crossing MWMA-3: 2	Footprint Area (2-dimensional): MWMA-4: 2,590 ha Maximum pile height: MWMA-4: 120 m Piles will be constructed on a prepared foundation. Foundation preparation varies based on foundation conditions and will include clearing, grubbing and stripping of footprint to remove unsuitable materials from the footprint. If required, mitigation measures such as toe berms or shear keys could be incorporated. Piles constructed by end-dump placement of rockfill in horizontal lifts with benches. The clay storage component of the waste rock area will be surrounded by a perimeter berm of waste rock. A series of waste rock ribs will be construed spaced 200 m apart within the clay storage area for containment and haulage access. Surface water management by perimeter collection ditches and collection ponds. Length of pile perimeter: MWMA-4: 19.7 km Number of River/Highway Bridge Crossing MWMA-4: 1	Stantec technical lead input Calculated by GIS/CAD Section 5.0 Figures
Closure Design	More complex closure designs can be more difficult to implement and present higher risks.	The closure design would include covering the top platform and benches of waste rock, sand and till, and clay storage piles with a store and release cover to reduce amount of infiltration into the pile. The ore piles will be removed and sites will be landscaped and revegetated Two-dimensional pile area (approximates cover area): MWMA-1: 2,874 ha	The closure design would include covering the top platform and benches of waste rock, sand and till, and clay storage piles with a store and release cover to reduce amount of infiltration into the pile. The ore piles will be removed and sites will be landscaped and revegetated Two-dimensional pile area (approximates cover area): MWMA-1: 2,790 ha	The closure design would include covering the top platform and benches of waste rock, sand and till, and clay storage piles with a store and release cover to reduce amount of infiltration into the pile. The ore piles will be removed and sites will be landscaped and revegetated Two-dimensional pile area (approximates cover area): MWMA-1: 2,253 ha	The closure design would include covering the top platform and benches of waste rock, sand and till, and clay storage piles with a store and release cover to reduce amount of infiltration into the pile. The ore piles will be removed and sites will be landscaped and revegetated Two-dimensional pile area (approximates cover area): MWMA-1: 2,529 ha	Stantec technical lead input

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Precedent	Deposition/disposal methods that are relatively new or have limited precedent present a higher risk of failure and impact to mine operation.	End-dumping of waste rock in piles with benches used to define overall slope angle is a well-established method for waste rock storage.	End-dumping of waste rock in piles with benches used to define overall slope angle is a well-established method for waste rock storage.	End-dumping of waste rock in piles with benches used to define overall slope angle is a well-established method for waste rock storage.	End-dumping of waste rock in piles with benches used to define overall slope angle is a well-established method for waste rock storage.	Stantec technical lead input
Technical Risks and Benefits	Higher risks in technical characteristics result in higher overall project risks.	Construction, operation, and closure approach has a long precedent and is considered to have relatively low technical risks and complexities.	Construction, operation, and closure approach has a long precedent and is considered to have relatively low technical risks and complexities.	Construction, operation, and closure approach has a long precedent and is considered to have relatively low technical risks and complexities.	Construction, operation, and closure approach has a long precedent and is considered to have relatively low technical risks and complexities.	Stantec technical lead input
Constructability	Less constructible alternatives present a greater risk of delays in schedule and impacts on construction quality.	Presence of groundwater, stream crossings, wetlands, and unsuitable materials may complicate construction. Construction of shear keys may be more difficult depending on required depth and groundwater conditions (if required)	Presence of groundwater, stream crossings, wetlands, and unsuitable materials may complicate construction. Construction of shear keys may be more difficult depending on required depth and groundwater conditions (if required)	Presence of groundwater, stream crossings, wetlands, and unsuitable materials may complicate construction. Construction of shear keys may be more difficult depending on required depth and groundwater conditions (if required)	Presence of groundwater, stream crossings, wetlands, and unsuitable materials may complicate construction. Construction of shear keys may be more difficult depending on required depth and groundwater conditions (if required)	Stantec technical lead input; Section 5.0 Figures
Flexibility	Ability to handle upset conditions or be expanded to store additional quantities of waste reduces risks.	Slope angles and foundation preparation can be varied to address changes in waste rock and foundation characteristics.	Slope angles and foundation preparation can be varied to address changes in waste rock and foundation characteristics.	Slope angles and foundation preparation can be varied to address changes in waste rock and foundation characteristics.	Slope angles and foundation preparation can be varied to address changes in waste rock and foundation characteristics.	Stantec technical lead input
Notes: 1. Conceptual designs of MWMA-1, MWMA-2, MWMA-3 and MWMA-4 are presented in Figure 5.2, 5.3, 5.4 and 5.5, respectively						

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Table F.3 Characterization Criteria - Economic Characterization – MWMA

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Capital Cost	Capital costs have a significant impact on the ability to successfully commission a mine.	Capital costs are anticipated to largely consist of costs associated with construction of haul roads, foundation preparation (clearing, grubbing, stripping and unsuitable soil removal), stability mitigation measures (e.g., waste rock ribs in clay storage pile, waste rock toe berms), construction of contact water collection systems (perimeter ditches and collection ponds), and fish habitat compensation areas. Capital costs have not been estimated for the alternative but are considered to be a function of the footprint area (foundation preparation cost), distance from the open pit (length of haul road), facility perimeter (perimeter ditch), number of river/highway bridge crossings and length of overlain watercourses and waterbodies (required fish habitat compensation).	Capital costs are anticipated to largely consist of costs associated with construction of haul roads, foundation preparation (clearing, grubbing, stripping and unsuitable soil removal), stability mitigation measures (e.g., waste rock ribs in clay storage pile, waste rock toe berms), construction of contact water collection systems (perimeter ditches and collection ponds), and fish habitat compensation areas. Capital costs have not been estimated for the alternative but are considered to be a function of the footprint area (foundation preparation cost), distance from the open pit (length of haul road), facility perimeter (perimeter ditch), number of river/highway bridge crossings and length of overlain watercourses and waterbodies (required fish habitat compensation).	Capital costs are anticipated to largely consist of costs associated with construction of haul roads, foundation preparation (clearing, grubbing, stripping and unsuitable soil removal), stability mitigation measures (e.g., waste rock ribs in clay storage pile, waste rock toe berms), construction of contact water collection systems (perimeter ditches and collection ponds), and fish habitat compensation areas. Capital costs have not been estimated for the alternative but are considered to be a function of the footprint area (foundation preparation cost), distance from the open pit (length of haul road), facility perimeter (perimeter ditch), number of river/highway bridge crossings and length of overlain watercourses and waterbodies (required fish habitat compensation).	Capital costs are anticipated to largely consist of costs associated with construction of haul roads, foundation preparation (clearing, grubbing, stripping and unsuitable soil removal), stability mitigation measures (e.g., waste rock ribs in clay storage pile, waste rock toe berms), construction of contact water collection systems (perimeter ditches and collection ponds), and fish habitat compensation areas. Capital costs have not been estimated for the alternative but are considered to be a function of the footprint area (foundation preparation cost), distance from the open pit (length of haul road), facility perimeter (perimeter ditch), number of river/highway bridge crossings and length of overlain watercourses and waterbodies (required fish habitat compensation).	Stantec technical lead input; Calculated by GIA/CAD
Operating Cost	Operating costs impact life of mine economics	Operating costs for MWMA-1 are anticipated to largely consist of costs associated with waste rock hauling. Operating costs also include costs for waste rock pile maintenance (e.g., grading).	Operating costs for MWMA-2 are anticipated to largely consist of costs associated with waste rock hauling. Operating costs also include costs for waste rock pile maintenance (e.g., grading).	Operating costs for MWMA-3 are anticipated to largely consist of costs associated with waste rock hauling. Operating costs also include costs for waste rock pile maintenance (e.g., grading).	Operating costs for MWMA-4 are anticipated to largely consist of costs associated with waste rock hauling. Operating costs also include costs for waste rock pile maintenance (e.g., grading).	Stantec technical lead input
Closure and Post-closure Cost	Closure and post-closure costs can be significant and can have a significant impact on project economics due to requirements for financial assurance.	Closure and post-closure costs for MWMA-1 include costs associated with placement of the MWMA-1 cover and cover revegetation over the surface of the pile benches and top of pile. Post-closure costs include costs associated with water treatment and monitoring.	Closure and post-closure costs for MWMA-2 include costs associated with placement of the MWMA-2 cover and cover revegetation over the surface of the pile benches and top of pile. Post-closure costs include costs associated with water treatment and monitoring.	Closure and post-closure costs for MWMA-3 include costs associated with placement of the MWMA-3 cover and cover revegetation over the surface of the pile benches and top of pile. Post-closure costs include costs associated with water treatment and monitoring.	Closure and post-closure costs for MWMA-4 include costs associated with placement of the MWMA-4 cover and cover revegetation over the surface of the pile benches and top of pile. Post-closure costs include costs associated with water treatment and monitoring.	Stantec technical lead input
Fish Habitat Compensation	The Guidelines recommend the inclusion of fish habitat compensation costing in alternatives assessments.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring, and contingency, based on the cost of a third party completing the work. It is assumed that the costs associated with fish habitat compensation are a function of the length of overlain watercourses and waterbodies.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring, and contingency, based on the cost of a third party completing the work. It is assumed that the costs associated with fish habitat compensation are a function of the length of overlain watercourses and waterbodies.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring, and contingency, based on the cost of a third party completing the work. It is assumed that the costs associated with fish habitat compensation are a function of the length of overlain watercourses and waterbodies.	Fish habitat compensation requires a letter of credit for the total estimated cost of offsetting, monitoring, and contingency, based on the cost of a third party completing the work. It is assumed that the costs associated with fish habitat compensation are a function of the length of overlain watercourses and waterbodies.	Stantec technical lead input Calculated by GIA/CAD
Land Use Cost	Required land-use fees can have a negative impact on project economics.	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mining and Mineral Development (MMMD).	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mining and Mineral Development (MMMD).	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mining and Mineral Development (MMMD).	Annual payments for leased lands (once through the claims to lease process) are provided to the Ministry of Mining and Mineral Development (MMMD).	Stantec technical lead input

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Economic Risks and Benefits	Risks associated with permitting deadlines, seasonal construction, uncertainties in the design and timeline to close the waste storage facility can impact schedule and have a significant negative impact on project economics.	The MWMA design has significant precedent and is relatively flexible. As such, the overall design risk is considered low. Anticipate foundation preparation and stormwater management construction could be performed during warm weather (non-winter) seasons. Waste rock placement not significantly impacted by cold weather	The MWMA design has significant precedent and is relatively flexible. As such, the overall design risk is considered low. Anticipate foundation preparation and stormwater management construction could be performed during warm weather (non-winter) seasons. Waste rock placement not significantly impacted by cold weather	The MWMA design has significant precedent and is relatively flexible. As such, the overall design risk is considered low. Anticipate foundation preparation and stormwater management construction could be performed during warm weather (non-winter) seasons. Waste rock placement not significantly impacted by cold weather	The MWMA design has significant precedent and is relatively flexible. As such, the overall design risk is considered low. Anticipate foundation preparation and stormwater management construction could be performed during warm weather (non-winter) seasons. Waste rock placement not significantly impacted by cold weather	Stantec technical lead input
Notes: 1. Conceptual designs of MWMA-1, MWMA-2, MWMA-3 and MWMA-4 are presented in Figure 5.2, 5.3, 5.4 and 5.5, respectively.						

Table F.4 Characterization Criteria - Socio-Economic Characterization - MWMA

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Archaeology	Facilities overlying areas of archaeological importance present a higher risk of socio-economic impacts.	As discussed in Section 3.14, no known archaeological sites are overlain by the alternative.	As discussed in section 3.14, no known archaeological sites are overlain by the alternative.	As discussed in section 3.14, no known archaeological sites are overlain by the alternative.	As discussed in section 3.14, no known archaeological sites are overlain by the alternative.	Stantec technical lead input
Community/Indigenous Land/Mineral Use Rights	Facilities overlying areas where formal/informal agreements exist regarding community/indigenous land use rights present a higher risk of socio-economic impacts and loss of social license to operate.	Within MWMA-1, there are 1549 ha (54%) of the tola land with claims and right owned by Canada Nickel Company and 1325 ha (46%) of the tola land with claims and rights owned by others. This information is based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines. There are no unpatented Crown land overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Within MWMA-2, there are 1458 ha (52%) of the tola land with claims and right owned by Canada Nickel Company and 1332 ha (48%) of the tola land with claims and rights owned by others. This information is based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines. There are no unpatented Crown land overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Within MWMA-3, there are 1684 ha (75%) of the tola land with claims and right owned by Canada Nickel Company and 569 ha (25%) of the tola land with claims and rights owned by others. This information is based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines. There are no unpatented Crown land overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Within MWMA-4, there are 687 ha (27%) of the tola land with claims and right owned by Canada Nickel Company and 1590 ha (63%) of the tola land with claims and rights owned by others. This information is based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines There are 252 ha (10%) of the total land as unpatented Crown lands overlain by the alternative based on mapping information from the Ministry of Natural Resources and Forestry and the Ministry of Northern Development and Mines.	Stantec technical lead input
Land and Resource Use	Local LRU may be impacted by mining activities.	The alternative overlies mapped Wildlife Management Area 30, Bear Management Area CC-30-015 and TI-30-048 and Trapline Area CC04, CC069, TI 035 and TI041. Area of overlain bear management and other wildlife: MWMA-1: 672 ha Area of overlain trapline areas: MWMA-1: 2,874 ha Overlain watercourses within alternative area are assumed to be accessible for fishing. The length of overlain mapped watercourses is: MWMA-1: 50.9 km Area of overlain waterbodies within the alternative area are assumed to be accessible for fishing. The area length of overlain mapped waterbodies is: MWMA-1: 47.8 ha Forests and wetlands are assumed to be accessible for hunting. The area of forests or wetlands (excluding double counting of overlapping areas) are: MWMA-1: 2,826 ha The alternative overlies mapped travel routes areas:	The alternative overlies mapped Wildlife Management Area 30, Bear Management Area CC-30-015 and Trapline Area CC041 Area of overlain bear management and other wildlife: MWMA-2: 498 ha Area of overlain trapline areas: MWMA-2: 2,790 ha Overlain watercourses within alternative area are assumed to be accessible for fishing. The length of overlain mapped watercourses is: MWMA-2: 48.9 km Area of overlain waterbodies within the alternative area are assumed to be accessible for fishing. The area length of overlain mapped waterbodies is: MWMA-2: 54.3 ha Forests and wetlands are assumed to be accessible for hunting. The area of forests or wetlands (excluding double counting of overlapping areas) are: MWMA-2: 2,742 ha The alternative overlies mapped travel routes areas:	The alternative overlies mapped Wildlife Management Area 30, Bear Management Area CC-30-015 and Trapline Area CC041 Area of overlain bear management and other wildlife: MWMA-3: 808 ha Area of overlain trapline areas: MWMA-3: 2,253 ha Overlain watercourses within alternative area are assumed to be accessible for fishing. The length of overlain mapped watercourses is: MWMA-3: 26.6 km Area of overlain waterbodies within the alternative area are assumed to be accessible for fishing. The area length of overlain mapped waterbodies is: MWMA-3: 31.4 ha Forests and wetlands are assumed to be accessible for hunting. The area of forests or wetlands (excluding double counting of overlapping areas) are: MWMA-3: 2,238 ha The alternative overlies mapped travel routes areas:	The alternative overlies mapped Wildlife Management Area 30, Bear Management Area CC-30-015 and Trapline Area CC041 Area of overlain bear management and other wildlife: MWMA-4: 000 ha Area of overlain trapline areas: MWMA-4: 2,529 ha Overlain watercourses within alternative area are assumed to be accessible for fishing. The length of overlain mapped watercourses is: MWMA-1: 17.7 km Area of overlain waterbodies within the alternative area are assumed to be accessible for fishing. The area length of overlain mapped waterbodies is: MWMA-4: 3.6 ha Forests and wetlands are assumed to be accessible for hunting. The area of forests or wetlands (excluding double counting of overlapping areas) are: MWMA-4: 2,528 ha The alternative overlies mapped travel routes areas:	Stantec technical lead input

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
		MWMA-1: 13.0 ha The baseline information used for the assessment indicates that all crown land in the SA is part of a managed forest area. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. A portion of the footprint is located on unoccupied Crown Land. The overlain unoccupied Crown Land by each pile: MWMA-1: 119.4 ha	MWMA-2: 15.3 ha The baseline information used for the assessment indicates that all crown land in the SA is part of a managed forest area. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. A portion of the footprint is located on unoccupied Crown Land. The overlain unoccupied Crown Land by each pile: MWMA-2: 62.9 ha	MWMA-3: 27.9 ha The baseline information used for the assessment indicates that all crown land in the SA is part of a managed forest area. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. A portion of the footprint is located on unoccupied Crown Land. The overlain unoccupied Crown Land by each pile: MWMA-3: 128.1 ha	MWMA-4: 23.1 ha The baseline information used for the assessment indicates that all crown land in the SA is part of a managed forest area. It is anticipated that all timber within the facility footprint would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. A portion of the footprint is located on unoccupied Crown Land. The overlain unoccupied Crown Land by each pile: MWMA-4: 345.4 ha	
Traditional Knowledge and Resource Use	Facilities overlying areas where Indigenous-related activities are practiced represent a socio-economic impact.	Overlain animal hunting and trapping areas: MWMA-1: 3,763 ha Overlain hunting subsistence areas: MWMA-1: 162 ha Overlain plant harvesting areas: MWMA-1: 1,796 ha Overlain plants harvesting subsistence areas: MWMA-1: 984 ha Overlain Cultural Continuity Areas MWMA-1: 4,196 ha Ecological and cultural values were obtained from the TKLU studies (discussed in the “Traditional Knowledge and Resource Use” criteria above) and from consultation input (as listed in the “Land and Resource Use” and “Traditional Knowledge and Resource Use” criteria rows above). (Stantec 2024) Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Overlain animal hunting and trapping areas: MWMA-2: 4,099 ha Overlain hunting subsistence areas: MWMA-1: 198 ha Overlain plant harvesting areas: MWMA-2: 2,270 ha Overlain plants harvesting subsistence areas: MWMA-2: 1,066 ha Overlain Cultural Continuity Areas MWMA-2: 4,292 ha Ecological and cultural values were obtained from the TKLU studies (discussed in the “Traditional Knowledge and Resource Use” criteria above) and from consultation input (as listed in the “Land and Resource Use” and “Traditional Knowledge and Resource Use” criteria rows above). (Stantec 2024) Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Overlain animal hunting and trapping areas: MWMA-3: 9285 ha Overlain hunting subsistence areas: MWMA-1: 348 ha Overlain plant harvesting areas: MWMA-3: 3,983 ha Overlain plants harvesting subsistence areas: MWMA-3: 2033 ha Overlain Cultural Continuity Areas: MWMA-3: 8,412 ha Ecological and cultural values were obtained from the TKLU studies (discussed in the “Traditional Knowledge and Resource Use” criteria above) and from consultation input (as listed in the “Land and Resource Use” and “Traditional Knowledge and Resource Use” criteria rows above). (Stantec 2024) Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Overlain animal hunting and trapping areas: MWMA-4: 7712 ha Overlain hunting subsistence areas: MWMA-1: 289 ha Overlain plant harvesting areas: MWMA-4: 3308 ha Overlain plants harvesting subsistence areas: MWMA-4: 1689 ha Overlain Cultural Continuity Areas: MWMA-4: 6,987 ha Ecological and cultural values were obtained from the TKLU studies (discussed in the “Traditional Knowledge and Resource Use” criteria above) and from consultation input (as listed in the “Land and Resource Use” and “Traditional Knowledge and Resource Use” criteria rows above). (Stantec 2024) Interested parties include stakeholders, government, and Indigenous communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives.	Stantec technical lead input

Characterization Criteria	Rationale	MWMA-1	MWMA-2	MWMA-3	MWMA-4	Basis
Ecological/ Cultural Values	Local communities may value certain ecological or land features more highly than other communities or outside individuals. Facilities which overlie areas of high value to local peoples present a higher risk of socio-economic impact than facilities which overlie areas with lower values.	The MWMA stockpiles will be visible on the landscape and have the following maximum pile height:	The MWMA stockpiles will be visible on the landscape and have the following maximum pile height:	The MWMA stockpiles will be visible on the landscape and have the following maximum pile height:	The MWMA stockpiles will be visible on the landscape and have the following maximum pile height:	Stantec technical lead input
Interested Parties	Interested parties can impact the ability to successfully permit and operate a mine.	MWMA-1: 100.0 m	MWMA-2: 130.0 m	MWMA-3: 170.0 m	MWMA-4: 120.0 m	Stantec technical lead input
Aesthetics	Facilities with a lesser impact on aesthetics have a lower socio-economic impact. Closure designs which result in fewer long-term impacts to aesthetics can have a significant long-term impact.	The employment associated with the Project is not a function of the selected MWMA alternative. The capacity building potential associated with the Project is not a function of the selected MWMA alternative.	The employment associated with the Project is not a function of the selected MWMA alternative. The capacity building potential associated with the Project is not a function of the selected MWMA alternative.	The employment associated with the Project is not a function of the selected MWMA alternative. The capacity building potential associated with the Project is not a function of the selected MWMA alternative.	The employment associated with the Project is not a function of the selected MWMA alternative. The capacity building potential associated with the Project is not a function of the selected MWMA alternative.	Stantec technical lead input
Employment	Employment opportunities provide socio-economic benefits and improve the ability to obtain and maintain the social license to operate.	Annual payments for leased lands (once through the claims to lease process) are provided to the MMMD. The level of economic benefits associated with the Project are not considered to be a function of the selected MWMA alternative.	Annual payments for leased lands (once through the claims to lease process) are provided to the MMMD. The level of economic benefits associated with the Project are not considered to be a function of the selected MWMA alternative.	Annual payments for leased lands (once through the claims to lease process) are provided to the MMMD. The level of economic benefits associated with the Project are not considered to be a function of the selected MWMA alternative.	Annual payments for leased lands (once through the claims to lease process) are provided to the MMMD. The level of economic benefits associated with the Project are not considered to be a function of the selected MWMA alternative.	Stantec technical lead input
Capacity Building	Training opportunities and infrastructure to support the project provide socio-economic benefits both during and after operation and improve the ability to obtain and maintain the social license to operate.	Public access to SA will be restricted during construction and operation. The risks associated with the waste rock storage include interactions with haul trucks and the potential for waste rock pile failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. The Highway 655 realignment will be carried out due to the open pit shell but the alternative itself does not require any highway/road realignment.	Public access to SA will be restricted during construction and operation. The risks associated with the waste rock storage include interactions with haul trucks and the potential for waste rock pile failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. The Highway 655 realignment will be carried out due to the open pit shell but the alternative itself does not require any highway/road realignment.	Public access to SA will be restricted during construction and operation. The risks associated with the waste rock storage include interactions with haul trucks and the potential for waste rock pile failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. The Highway 655 realignment will be carried out due to the open pit shell but the alternative itself does not require any highway/road realignment. The MWMA-3 haul road will cross the Highway 655 realignment, requiring mitigation measures such as bridge or controlled crossing to manage potential community safety issues	Public access to SA will be restricted during construction and operation. The risks associated with the waste rock storage include interactions with haul trucks and the potential for waste rock pile failure. Haul truck interactions are expected to be minimal due to restricting public access to active operational areas. The Highway 655 realignment will be carried out due to the open pit shell but the alternative itself does not require any highway/road realignment.	Stantec technical lead input
Economic Benefits	Compensation payments (e.g., leases, royalties) provide socio-economic benefits and improve the ability to maintain the social license to operate.					Stantec technical lead input
Community Safety	Facilities with a higher risk of impacts to the safety of the community are associated with a higher risk of losing the social license to operate resulting from incidents during mining.					Stantec technical lead input

Appendix G MWMA Alternatives Characterization Criteria – Non-Differentiating Characteristics

Table G.1 Environmental Characterization - Non-differentiating Characteristics – MWMA

Non-differentiating Items	Discussion
Geographical Boundaries	All alternatives are located within the same geographical area (Figure 5-1).
Topography	The topography of the alternatives is similar (Figure B.1).
Geochemical Characterization of Waste	Alternatives would store waste with similar geochemical characteristics.
Geotechnical Characterization of Waste	Alternatives would store waste rock with similar geotechnical characteristics.
Geochemical Characterization of Construction Materials and Excavation Waste	The geochemical characteristics of construction materials (waste rock for toe berm/shear key construction) and excavated materials would be similar for all alternatives and is not considered differentiating.
Seismic Conditions	The alternatives are in a similar seismic setting.
Climate	Alternatives would be subject to similar climatic conditions.
Climate Change Projections	Climate change is not expected to have varied impacts on the MWMA alternatives as all use the same type of operational and closure approach. Climate change may impact rainfall patterns which could increase the risk associated with water management. Water management risks are included as an indicator in the assessment. The loss of forest associated with MWMA construction will reduce the ability of the SA to serve as a carbon sink. However, this relative impact is considered sufficiently small in comparison to the amount of carbon dioxide released by haul truck traffic to be effectively non-differentiating.
Atmospheric Issues - Dust Impacts on Timmins	The distance to the closest community, Timmins, is similar for the MWMA alternatives (approximately 42 km). The variations in dust impacts on Timmins are considered to be non-differentiating and were not included in the assessment. Note that air quality impacts were included in the assessment based on the variations in haul distance between the alternatives
Water Quality	The MWMA alternatives are considered to have similar impacts on water quality following the implementation of mitigation measures. As such, water quality impacts are considered non-differentiating. However, the risk of water quality impacts is considered to vary between alternatives and was considered in the assessment through the “Water Management” sub-account.
Soil Quality	None of the alternatives are anticipated to have varying impacts on soil quality.
Aquatic Life and Habitat - Rare or Endangered Species	As noted in Section 3.0, there are no records of aquatic species at risk (SAR) or critical habitats in the areas overlain by the alternatives. As a result, impacts to SAR or critical habitats are considered non-differentiating.

Non-differentiating Items	Discussion
Aquatic Life and Habitat - Sensitivity of Spawning Areas	The environmental impact associated with waste rock storage includes impacts to fish spawning areas. These impacts are a function of the sensitivity of the impacted fish to changes in environmental conditions, the dependence of the species on the spawning area, and the rarity of the spawning habitat and/or species. Quantitative evaluation of the sensitivity of fish spawning areas overlain by the alternatives indicated the same level of spawning sensitivity ('Moderately Low') for the four alternatives. Therefore, sensitivity of spawning areas is considered to be a non-differentiating factor. However, sensitivity of the impacted fish habitat is considered as a differentiating indicator in the assessment.
Terrestrial Life and Habitat	The alternatives are assumed to have the same level of impact on moose aquatic feeding, and bat hibernacula as a Species at Risk (SAR). Therefore, these indicators are considered non-differentiating. However, a set of other SAR and Species of Conservation Concern (SOCC) have been considered in the assessment. In addition, the area of forests and wetlands overlain by the alternatives, and the perturbation of forests and wetlands due to the construction of new haul roads were considered to represent the effects on terrestrial life and habitat, and were included as indicators.

Table G.2 Technical Criteria - Non-differentiating Characteristics – MWMA

Non-Differentiating Items	Discussion
Physical Characteristics of Waste	Alternatives would store waste with similar physical characteristics and thus share similar technical complexity.
MWMA Design	Alternatives use a similar design concept and would be constructed, operated, and closed in a similar manner. Variations in MWMA design characteristics (such as size and capacity) are not considered to have a technical impact. The limited variations in the area and perimeters of the piles are not considered to represent a notable technical impact and thus are considered non-differentiating from a technical standpoint. The available surficial geologic mapping does not indicate a notable variation in foundation preparation requirements between the three alternatives and accordingly, technical complexity associated with foundation design is considered non-differentiating between the alternatives. The alternatives are located in similar areas with similar catchments and thus the technical complexity associated with surface and seepage water management designs are considered be non-differentiating. However, the increased risk of seepage associated with larger catchment areas was considered in the assessment through the “Water Management” sub-account.
Closure Design	Alternatives use a similar closure concept and are considered to require a similar degree of closure design and implementation complexity. The minor variations in closure cover area are not considered material from a technical standpoint.
Precedent	Alternatives use the same storage approach which is well established and is considered non-differentiating between alternatives.
Technical Risks and Benefits	The conceptual design of the alternatives is based on the same level of information regarding subsurface conditions, waste rock characteristics, and topography. Technical risks are anticipated to be similar.
Flexibility	Alternatives have a similar ability to be expanded based on topography and limitations based on adjacent major watercourses (North Driftwood River, West Buskegau River). The alternatives have a similar ability for variation of slope angles and foundation preparation to address variations in conditions. Thus, technical flexibility is considered non-differentiating.

Table G.3 Project Economic Characterization - Non-differentiating Characteristics – MWMA

Non-Differentiating Items	Discussion
Post-Closure Costs	Alternatives are anticipated to have similar post-closure water treatment and monitoring costs based on the similar design and closure concept and waste rock characteristics of each alternative. As such, the alternatives are not anticipated to vary greatly in terms of closure costs except for the closure cover area for each, which varies slightly.
Economic Risks and Benefits	Alternatives are considered to have similar risks associated with permitting deadlines, construction schedule, and uncertainties in the design.

Table G.4: Socio-Economic Characterization - Non-differentiating Characteristics – MWMA

Non-Differentiating Items	Discussion
Archaeology	No known archaeological sites are overlain by the proposed alternatives (Section 3.16) and thus impacts to archaeology are considered non-differentiating.
Land and Resource Use – Loss of Routinely & Non-Routinely Maintained Access Roads	It is anticipated that the same set of roads in the vicinity of piles would be closed to public access for safety reasons due to construction of any of the MWMA alternatives. As such, the impacts associated with the loss of routinely and non-routinely maintained access roads is considered non-differentiating.
Land and resource use – Forestry	It is anticipated that all timber within the footprint of the selected alternative would be harvested by the relevant forestry license holder prior to facility construction per Crown timber regulations. As such, timber harvest would not be lost due to MWMA construction and forestry is considered non-differentiating between alternatives.
Interested Parties	Interested parties include stakeholders, government, and Aboriginal Communities. A variety of interested parties have been identified and consulted, as summarized in Chapter 6 of this report. The set of interested parties are considered consistent between the identified alternatives and thus are considered non-differentiating.
Aesthetics	The alternatives are located in similar locations and will be constructed, operated, and closed in a similar manner. The relatively minor variations in pile height are not considered sufficient to have a varied impact on aesthetics. They are also similar distances from the City of Timmins.
Employment	All alternatives are considered to represent similar opportunities for employment.
Capacity Building	All alternatives are considered to represent similar opportunities for capacity building.
Economic Benefits	None of the alternatives are considered to have varied impacts on economic benefits (e.g., royalties, lease payments)
Community Safety – Public Access	None of the alternatives are considered to represent a higher risk to community safety due to public access.