APPENDIX E

REVISED MINE WASTE ALTERNATIVES ASSESSMENT

Revised Mine Waste Management Alternatives Assessment

Springpole Gold Project

First Mining Gold Corp.

ONS2104

Prepared by:
WSP Canada Inc.

October 2024

Revised Mine Waste Management Alternatives Assessment
Springpole Gold Project

Red Lake District, Northwest Ontario
Project #ONS2104

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EXECUTIVE SUMMARY

First Mining Gold Corp. proposes to develop, operate and eventually decommission and close an open pit gold and silver mine and ore process plant with supporting facilities known as the Springpole Gold Project (Project). The Project is located in a remote area of northwestern Ontario, approximately 110 kilometres (km) northeast of the Municipality of Red Lake and 145 km north of the Municipality of Sioux Lookout.

The Metal and Diamond Mining Effluent Regulations (MDMER; SOR/2002-222) requires that for mine waste to be deposited in, or overprint, a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the MDMER, designating it as a tailings impoundment area. A project proponent seeking to use or overprint a natural waterbody for mine waste storage must conduct an assessment of alternatives, in accordance with the Environment and Climate Change Canada (ECCC 2016) *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*.

This Mine Waste Management Alternatives Assessment report outlines the potential disposal methods, candidate storage locations, selection criteria and methods used to identify preferred alternatives for mine waste and contact water management. A multiple accounts analysis (MAA) following the method outlined in the ECCC (2016) Guidelines was used to rigorously examine and compare different mine waste and contact water storage alternatives and provides a transparent and defensible decision-making approach.

A total of four alternatives were brought through the analysis for the selection of a mine waste management facility, as well as for the siting of the central water storage pond (CWSP).

Additional scenarios were considered in a sensitivity analysis to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. In addition to the Base Case analysis for both the co-disposal facility (CDF) and the CWSP, five additional scenarios were given consideration. The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence the analyses.

Under the Base Case scenario for the CDF, Alternative B is the preferred alternative. In assessing the alternatives under various weighting scenarios, Alternative B is the preferred alternative while Alternative C is the least favoured. The development of a CDF to the west of the open pit, with an adjoining slurry cell for potentially acid generating tailings, represents the preferred waste storage method for the Project.

Under the Base Case scenario for the CWSP, Site W1 is the preferred alternative. In assessing the alternatives under various weighting scenarios, Site W1 is the preferred alternative under all scenarios, while Site W3 is the least favoured.

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$	dollar(s)
%	percent
ABA	acid base accounting
ARD	acid rock drainage
$CaCO_3$/t	calcium carbonate per tonne
CDF	co-disposal facility
CWSP	central water storage pond
dBA	A-weighted decibels
ECCC	Environment and Climate Change Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	*Endangered Species Act*
FMG	First Mining Gold Corp.
GHG	greenhouse gas
ha	hectare
K	conductivity
k	thousand
km	kilometre
m	metre(s)
M	million
m/s	metres per second
Mm^3	million cubic metres
MAA	multiple accounts analysis
MDMER	Metal and Diamond Mining Effluent Regulations
MINES	Ministry of Mines
ML	metal leaching
ML/ARD	metal leaching and acid rock drainage
Mt	million tonnes
NAG	non-acid generating
NP	neutralization potential
NPR	neutralization potential to acid potential ratio
PAG	potentially acid generating
Project	Springpole Gold Project
PWQO	Provincial Water Quality Objectives
SAR	Species at Risk
SARA	*Species at Risk Act*
TK/TLRU	Traditional Knowledge / Traditional Land and Resource Use
UTM	Universal Transverse Mercator
WSP	WSP Canada Inc.
wt.%	weight percent

1.0 INTRODUCTION

First Mining Gold Corp. (FMG) proposes to develop, operate and eventually decommission and close an open pit gold and silver mine and ore process plant with supporting infrastructure known as the Springpole Gold Project (Project). The Project is located in a remote area of northwestern Ontario, approximately 110 kilometres (km) northeast of the Municipality of Red Lake and 145 km north of the Municipality of Sioux Lookout (Figure 1-1).

An environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act, 2012* (SC 2012, c. 19, s. 52) and the Ontario *Environmental Assessment Act* (RSO 1990, c. E.18) is required to be completed for the Project. This document is one of a series of appendices to the Environmental Impact Statement (EIS)/EA prepared by WSP Canada Inc. (WSP).

The Project is a greenfield site wholly owned by FMG. The main Project site is centred at Universal Transverse Mercator (UTM) coordinates 549183E 5693578N (NAD83, Zone 15U).

Ore from the open pit will be processed in an onsite process plant at a typical throughput rate of approximately 30,000 tonnes per day. A total of 101 million tonnes (Mt) of ore will be processed over an approximate 10-year mine life. The process plant will include a conventional crushing and grinding circuit, followed by a flotation and carbon-in-pulp circuit to produce gold and silver doré bars. The Project will require sufficient area to securely store mine waste, including tailings (approximately 78 million cubic metres [Mm^3]) and mine rock (approximately 112 Mm^3).

The Metal and Diamond Mining Effluent Regulations (MDMER; SOR/2002-222) requires that for mine waste to be deposited in, or overprint, a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the MDMER, designating it as a tailings impoundment area. A project proponent seeking to use or overprint a natural waterbody for mine waste storage must conduct an assessment of alternatives, in accordance with the Environment and Climate Change Canada (ECCC) *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (ECCC 2016).

This Mine Waste Management Alternatives Assessment report outlines the potential disposal methods, candidate storage locations, selection criteria and methods used to identify preferred alternatives for mine waste management. A multiple accounts analysis (MAA) following the method outlined by ECCC (2016; MAA Guidelines) was used to rigorously examine and compare different mine waste storage alternatives and provides a transparent and defensible decision-making approach. Sensitivity analyses are presented to allow different weightings of key MAA components and to evaluate potential technical, economic, environmental and social impacts.

A diagram illustrating the MAA process is shown below and is reproduced throughout this report to help guide the reader through the stepwise assessment process required by the MAA Guidelines.

1.1 Influence of Consultation with Indigenous Communities, Government and the Public

Consultation has been ongoing for several years prior to and throughout the EA process and will continue with Indigenous communities, government agencies and the public through the life of the Project. Throughout the planning and preparation of the EIS/EA for the Project, FMG has provided opportunities for engagement with Indigenous communities, government reviewers and the public in order to share information on the baseline environment and receive preliminary feedback on the proposed mine waste management approach. The Record of Consultation (Appendix C of the final EIS/EA) includes detailed comments received during the development of the final EIS/EA. Consultation feedback has been addressed through direct responses (in writing and during follow-up meetings, where applicable) and in the final EIS/EA and this report, as appropriate. An overview of the key comments that influenced the design of the Project and the Project Description (Section 5 of the final EIS/EA) between the draft and final EIS/EA is provided below.

Conceptual methods and locations were presented at community and public meetings in 2021. Consultation continued through the draft EIS/EA review process where feedback was considered and further refinements to designs made. To date, key comments have related to the types of mine waste and geochemistry, location of the mine waste facility or facilities, the approach to management and the inclusion of the central water storage pond (CWSP) for assessment. The primary comment received from multiple groups is regarding the importance of managing seepage and protecting long-term groundwater and surface water quality in the area of the Project. In response to this, the approach to mine waste management has been optimized, and the current approach includes the following key design measures taking into consideration the feedback received to date:

- The co-disposal facility (CDF) will be a two-cell facility that effectively uses non-acid generating (NAG) mine rock for construction purposes, and permanently secures potentially acid generating (PAG) mine rock.
- The perimeter embankment of the south cell will be lined with a low permeability material such as clay or a geomembrane for seepage mitigation.
- Mine rock will be used to construct the embankments to provide stability to the facility.
- The south cell embankment will be designed using a robust downstream raise construction method.
- The NAG tailings will be co-disposed to effectively encapsulate the PAG mine rock, thereby isolating the mine rock from atmospheric oxygen, which will mitigate potential acid generation and metal leaching (ML).
- The south cell will be operated to keep the PAG tailings in a saturated condition to similarly isolate the PAG tailings from atmospheric oxygen and restrict the potential for acid generation.
- An Independent Geotechnical and Tailings Review Board, consisting of an independent three-person panel of experts, has been established to review both the detailed permitting designs and the construction, ongoing operations and closure design of the CDF.
- At closure, a low permeability cover will be placed on the surface of the south cell. Both cells will be re-vegetated with a commercially available native seed mix, with follow-up maintenance to confirm a robust self-sustaining vegetative cover is developed.

This revised MAA is provided with the intent of further review and discussion with Indigenous communities, government agencies and the public before finalization. The review will be facilitated through the review of the final EIS/EA document submission for the Project during the environmental assessment process and allow the currently proposed mine waste management measures to be consulted on by way of community consultations to be facilitated by ECCC. Any additional document revisions leading to a final submission will consider comments and recommendations received through these consultations. The results of these consultation and engagement efforts will be documented and included as an Appendix to this document.

1.1.1 Draft Multiple Accounts Analysis Comments: Co-disposal Facility

The Ministry of Mines (MINES) provided comments regarding the use of filtered tailings in a CDF being a non-industry standard design. MINES also commented that because the north cell is not lined, groundwater may be affected. More clarification or detail was requested regarding the co-disposal of tailings and PAG mine rock, and how ML and acid rock drainage (ARD) would be minimized. The Impact Assessment Agency of Canada also commented regarding the design of the CDF and encapsulating the PAG rock with NAG tailings and how the material would be co-disposed.

In consideration of the comments received and completion of additional engineering trade-off assessments, the CDF has been optimized. Optimizations include the production of a thickened pumpable NAG tailings in place of the filtered tailings proposed in the draft EIS/EA. Thickened tailings provide a more robust operation for co-mingling with mine rock, reduced energy consumption and reduced air emissions, including greenhouse gases (GHGs).

The original draft MAA determined a CDF including filtered NAG tailings to be preferred, therefore, this alternative has been carried forward in this revised report for comparison with the optimized Project design.

1.1.2 Draft Multiple Accounts Analysis Comments: Location of Co-disposal Facility and Central Water Storage Pond

MINES commented on the draft EIS/EA, requesting clarification and additional discussion on alternatives to the design and placement of the CDF. This report presents a detailed and comprehensive assessment of tailings alternatives following ECCC (2016) MAA Guidelines.

ECCC determined that the CWSP would also be subject to Schedule 2 of the MDMER and require assessment using the MAA Guidelines. Accordingly, an assessment and analysis of contact water storage alternatives has been included in this report.

1.2 Mine Waste Generated by the Project

Approximately 101 Mt of tailings will be produced by the process plant, which will require permanent storage. Two tailings streams will be produced to best manage the potential for acid generation from the tailings in the long term: a thickened NAG tailings (80 percent [%] by mass) and a conventional slurry PAG tailings (20% by mass).

The Project will also produce approximately 292 Mt (133 Mm^3) of mine rock that will either be used in construction or will require permanent storage. Tailings embankments and other infrastructure on site such as roads and building pads will be constructed using NAG mine rock and overburden, thereby reducing the volume of mine rock which requires storage. A small portion of the NAG mine rock may also be used in aquatic habitat construction and restoration in the pit.

Overburden removed during site preparation and open pit stripping activities that is not needed directly at other site locations for construction or progressive reclamation is proposed to be stored primarily in a surficial soil stockpile located east of the open pit. This location is not situated in an area that overprints waters frequented by fish, and as a result, this mine waste type is not discussed further in this report.

The Project will also require storage for minewater, runoff and other waters that have come into contact with Project components. Site plan designs recommended the use of unnamed lake L-2 for a CWSP, given the central location and proximity to the open pit, process plant and piping to the CDF. As unnamed lake L-2 is considered to be fish bearing and mine effluent falls under the purview of Schedule 2, an analysis of alternative locations is also carried out for this aspect. This analysis is documented separately in Section 7.0.

1.3 Geochemical Characteristics of the Mine Waste Materials

Rigorous geochemistry studies were conducted for the Project as part of baseline investigations and continue as part of an ongoing geochemistry program for the current Project mine plan. This section provides a summary of the investigations completed to date.

1.3.1 Mine Rock

Mine rock is rock that will be mined as part of development of the open pit that does not have sufficient economic value in terms of gold content to be processed. A total of 716 mine rock samples were collected from all three ore body zones in the open pit: the Portage, East Extension and Camp zones (Figure 1-2). The samples were tested in a laboratory for their ARD potential and elemental content, along with short-term leachate tests and mineralogical tests. Key findings regarding ML/ARD for the mine rock samples are summarized below.

Mine rock samples had variable sulphur contents, ranging from 0.005% to 10%, with a median sulphur content of 0.9%. No strong patterns were apparent in sulphur content among different rock types from the open pit. Sulphide represented the dominant sulphur species in the samples. Available information and data indicated that pyrite is generally the only observed sulphide mineral.

Overall, the neutralization potential (NP) content of the samples was variable, ranging from -1 to approximately 550 kg calcium carbonate per tonne ($CaCO_3$/t). The mine rock samples formed two distinct groups based on their NP content. The low NP content group of samples were exclusively from the Portage zone, whereas the higher NP content group included samples from the Portage zone, the East Extension zone and the Camp zone.

Acid base accounting (ABA) results for mine rock were screened to assess the potential for neutral and acidic ML in the future. For Project planning purposes, ABA results with a neutralization potential ratio (NPR; NP to acid potential ratio) less than 2 were assumed to be PAG in accordance with industry standard guidance (MEND 2009). On the order of 46% of the mine rock samples from the Portage zone, which represents the most volumetrically significant zone of the open pit, were classified as PAG. Most samples from the East Extension zone and Camp zone were classified as NAG with NPR greater than 2 owing to the generally higher NP and relatively lower sulphur content of rock from these zones.

Without considering the mitigation measures included in the Project design, preliminary estimates based on currently available kinetic testing suggest that 15% to 20% of the Portage zone mine rock samples could become net acid generating within 1 year of exposure, while up to 25% to 30% of the samples could become net acid generating over approximately 10 years. Approximately 50% of the Portage zone mine rock samples were found to only become net acid generating after several decades of unmitigated exposure. The lag time to acid onset for PAG samples from the East Extension and Camp zones was estimated to be on the order of several decades of exposure, with approximately 15% of the mine rock samples from these zones eventually becoming net acid generating. This lag time is notably longer than samples from the Portage zone owing to the higher NP content of these samples. Based on the currently available data, no samples from these zones showed the potential for rapid acid onset.

When conservatively compared to Provincial Water Quality Objectives (PWQO) or interim PWQO to identify parameters for further assessment consideration, shake flask extraction testing indicates that only 10% to 20% of the samples show antimony, cadmium, cobalt, copper and lead have concentrations greater than their respective PWQO, while between 4% and 40% of samples have arsenic concentrations greater than PWQO and the more conservative interim PWQO.

Humidity cell test results for mine rock indicate that arsenic, antimony, cadmium, molybdenum, selenium and tungsten may be of interest for neutral ML in some samples (Appendix K-2 of the EIS/EA). Among the neutral-leaching humidity cell tests, higher release rates for a given element were typically related to a higher elemental content for that element.

NAG leachate results indicated that aluminum, cadmium, chromium, cobalt, copper, iron, lead, nickel, silver, thallium, uranium, vanadium and zinc may be of potential interest under acidic leaching conditions.

1.3.2 Tailings

Synthetic tailings were produced and then tested in an accredited laboratory as part of geochemistry investigations. This included five tailings samples generated as part of previous metallurgical studies undertaken from 2019 to 2020. The tailings samples were representative of a single tailings stream from the process plant proposed at that time. The design of the CDF has been optimized based on comments received from technical reviewers on the draft EIS/EA, as well as additional engineering, and field investigations. The optimized strategy includes the production of two types of tailings: a thickened NAG tailings (a flotation tailing with a low sulphide content), which provide a more robust operation for co-mingling with mine rock, reduced energy consumption and reduced air and GHG emissions; and a conventional PAG tailings slurry (sulphide concentrate tailing). The thickened NAG tailings are expected to represent approximate 80% by mass of the tailings generated over life of mine while the conventional PAG portion represents 20% by mass.

Tailings samples and other tailings products representative of these two tailings streams are part of ongoing metallurgical and geochemical studies, including static and kinetic testing to provide specific information on the ML/ARD characteristics of the tailings. Completed studies to assess the static geochemistry of the two tailings streams included a total of 18 synthetic tailings samples produced as a part of two metallurgical programs (2021 and 2022). This included nine samples of NAG tailings and nine samples of PAG tailings. Some samples represent life of mine milling conditions and other samples were generated as part of variability testing.

The sample from a flotation circuit, which represents thickened tailings, had a low concentration of total sulphur, ranging from 0.08% to 0.26% (median 0.15%). The flotation samples (PAG tailings) had total sulphur content ranging from 10% to 25% (median 18%). Sulphur was primarily present as sulphide sulphur in both samples. Mineralogical testing identified pyrite as the only sulphide mineral in the conventional slurry tailings sample at approximately 40 weight percent (wt.%). Sulphide minerals were only detected in one NAG tailings sample (including 0.6 wt.% barite). The NP content of the NAG tailing sample ranged from approximately 30 to 240 kg $CaCO_3$/t (median of 145 kg $CaCO_3$/t), whereas the NP content of the concentrate sample ranged from approximately 20 to 150 kg $CaCO_3$/t (median of 49 kg $CaCO_3$/t). In both samples, carbonate NP was similar to the NP content, indicating that NP was present as carbonate minerals; however, some samples contained some non-carbonate NP. Mineralogical testing identified the presence of calcite along with ankerite-dolomite in both samples along with other trace minerals.

Tailings sample ABA results were assessed for the potential for neutral and acidic ML in the future. For Project planning purposes, ABA results with a ratio of NPR less than 2 were assumed to be PAG in accordance with industry standard guidance (MEND 2009). Based on this threshold, the sample representative of the thickened flotation tailings was classified as NAG (NPR greater than 2) and the sample representative of the conventional slurry tailings was classified as PAG (NPR less than 2).

1.4 Report Structure

This report is intended to support requirements for listing of subject waterbodies on Schedule 2 of the MDMER. The report is structured as follows.

- Section 2.0 provides an assessment of mine waste storage candidate alternatives;
- Section 3.0 provides a characterization of the alternatives carried for analysis;
- Section 4.0 describes the sub-accounts and indicators to be used to evaluate the various alternatives and provides a rationale for their inclusion;
- Section 5.0 provides the weighting, scoring and analytical results of the MAA process;
- Section 6.0 presents a sensitivity analysis of the analytical process; and
- Section 7.0 provides an assessment of mine contact water storage candidate alternatives.

Figure 1-1: Project Location

Figure 1-2: Ore Body Zones

2.0 MINE WASTE STORAGE ALTERNATIVES

This section outlines the screening process followed to identify the mine waste storage alternatives to be considered for a detailed analysis. The structure of this section follows that used in the Alternatives Assessment (Section 4) of the final EIS/EA for the Project:

1. Mine rock storage locations;
2. Tailings storage locations;
3. Mine rock and tailings storage methods;
4. Tailings storage methods; and
5. Mine rock and tailings storage strategy.

2.1 Identification of Mine Waste Storage Candidate Alternatives

2.1.1 Identification of Location Candidate Alternatives for Mine Rock

The first step in the MAA process is identification of candidate locations for mine waste storage:

For the Project, approximately 46% of the mine rock is considered to be PAG while 54% is NAG. As indicated in Section 1.2, some of the NAG mine rock will be used for construction of various Project facilities, including embankments, roads and building pads. Residual NAG mine rock and the PAG mine rock will need to be stored in a location where the potential for acid generation can be effectively managed.

The MAA Guidelines (ECCC 2016) recommend the use of threshold criteria to "establish the regional boundaries for selecting candidate alternatives." The regional area for candidate locations for the Project is largely defined by the natural drainage network and waterbodies in the immediate area of the Project site, which places some operational constraints on the placement of a mine waste storage facility. The Project site and local area are bounded to the north by Birch Lake and to the west by Springpole Lake, both of which are very large lakes relative to other waterbodies in the area (Figure 1-1). The southeast arm of Springpole Lake provides another geographic constraint south of the Project site, as it has a minimum crossing span of approximately 150 metres (m) closer to the site. A bridge over this waterbody would be technically challenging and is not economically feasible for the Project. As such, all preliminary candidate sites for mine rock storage are located south of Birch Lake, east of Springpole Lake and north of the southeast arm of Springpole Lake. Presence of habitat for Caribou (Boreal population), along with distance and associated Project economics for haulage, constrain locations east of the Project site for a potential mine rock storage area.

Six preliminary alternative sites were identified as candidates for mine waste storage locations for the MAA process in a workshop with a technical working group consisting of experts in engineering, aquatic resources, environmental approvals and other related disciplines, and with due consideration of archaeological potential and available land use information. The locations of these alternative sites are presented in Figure 2-1.

Apart from environmental siting constraints, the most critical aspect when selecting a suitable surface storage location for mine rock is haul distance from the open pit. Even small haulage distance differentials can amount to substantive cost differentials between alternatives for mine rock storage and result in an alternative that cannot be financially supported by the Project. The cost to transport mine rock is much higher than for the transportation of tailings for the Project, primarily due to the higher tonnage / volume of mine rock requiring management and associated haulage requirements.

A brief overview of each candidate site is presented in Table 2–1.

The Project area is tectonically stable, with low-magnitude, shallow events recorded on the order of magnitude 2.0 to 3.9. There are no known localized, site-specific tectonic factors that would affect the storage of mine rock at any of the identified locations.

None of the identified locations overprint or are near any parks or other environmentally protected areas, although the Project site is within Caribou habitat (Boreal population; Figure 2-2).

Note that only candidate locations have been considered in this analysis for mine rock storage, as there are no candidate technologies available beyond stockpiling.

2.1.2 Pre-screening Candidate Mine Rock Storage Locations

Step 2 is where pre-screening criteria are used to assess the candidate mine rock storage locations. As described in the MAA Guidelines (ECCC 2016), this is a fatal flaws analysis that would result in the Project not being executed. The candidate mine rock storage locations are evaluated based on these criteria only.

By not meeting these pre-screening criteria, the alternative is so unfavourable or severe that it eliminates the potential candidate mine rock storage location from further assessment. Pre-screening criteria are formulated such that a “yes” or “no” response is possible. There must be no reasonable mitigation strategy that would convert a “yes” response into a “no” response.

The criteria for pre-screening assessment of candidate mine rock storage locations are as follows:

- **Does the mine rock storage location provide sufficient storage capacity? (Yes/No):** The proposed sites must accommodate the storage of approximately 102 Mm^3 of mine rock.
- **Is the mine rock storage location reasonably accessible? (Yes/No):** For the purposes of this assessment, a 7 km radius from the proposed mine site is used as a maximum cutoff distance. In the case of mine rock storage, haulage costs are directly proportional to the haulage distance. The economics of open pit mines are generally such that haul distances for mine rock ideally must be kept to within approximately 4 to 5 km to maintain operating costs at a level to keep the Project viable. For the Springpole Project, distances greater than 7 km (straight-line distance), which would need to navigate varying topography and the local drainage network, would be considered unfeasible for the Project.

The pre-screening assessment for preliminary candidate mine rock storage locations is presented in Table 2–2. A “no” indicates a fatal flaw with the storage location, resulting in removal from further analysis.

Candidate Site 1

Candidate Site 1 meets both criteria and is retained for detailed analysis.

Candidate Site 2

Candidate Site 2 meets both criteria and is retained for detailed analysis.

Candidate Site 3

Candidate Site 3 was considered as an alternative that does not overprint waters frequented by fish. While this location satisfies criterion 2, the density of watercourses and waterbodies in the area would require the impoundment to be a very high and technically challenged facility and would still have insufficient capacity to store the required quantity of mine rock. As a result, additional facilities would be required to contain the total amount of mine rock, thereby increasing the overall Project footprint and operational complexity. These additional facilities would also require the overprinting of aquatic habitat and increase the associated environmental impacts, risks and costs. As such, this candidate location fails the first criterion and is not carried forward for further analysis.

Candidate Site 4

Candidate Site 4 fails the criterion of distance from the Project as it is outside of the 7 km cutoff distance. As a result, it has been screened out of further analysis.

Candidate Site 5

Candidate Site 5 fails the criterion of distance from the Project as it is outside of the 7 km cutoff distance. As a result, it has been screened out of further analysis.

Candidate Site 6

Candidate Site 6 fails the criterion of distance from the Project as it is outside of the 7 km cutoff distance. As a result, it has been screened out of further analysis.

2.1.3 Identification of Location Candidate Alternatives for Tailings

Eight candidate locations were identified for tailings storage. The locations of these candidate storage locations are presented in Figure 2-3.

As indicated in Section 2.1.1, the Project site and local area are bounded to the north by Birch Lake and to the west by Springpole Lake, both of which are very large lakes (Figure 1-1). The boundary for preliminary candidate locations was approximately 15 km southwest to east of the process plant, recognizing that required infrastructure elements could be considerably longer due to the complex natural drainage network.

A brief overview of each candidate tailings storage location is presented in Table 2–3.

The Project area is tectonically stable, with low magnitude, shallow events recorded on the order of magnitude 2.0 to 3.9. There are no known localized, site-specific tectonic factors that would affect the storage of tailings at any of the identified locations.

None of the identified locations overprint or are near any parks or other environmentally protected areas, although the Project site is within a sensitive habitat area for Caribou (Boreal population; Figure 2-2).

Based on the geological, topographical and biological features of the area, extending the distance from site farther than shown in Figure 2-3 (or west of Springpole Lake or north of Birch Lake) to identify additional potential alternative locations would not provide an additional range of candidate sites. These locations would require significantly longer infrastructure elements, resulting in an incremental increase in disturbance, as well as increased capital and operating costs.

2.1.4 Pre-screening Tailings Storage Locations

The criteria for pre-screening assessment of candidate tailings storage locations are as follows:

- **Does the tailings storage location provide sufficient tailings storage capacity? (Yes/No):** The proposed site must accommodate the storage of up to 101 Mt of tailings.
- **Does the tailings storage location avoid prohibitive water crossings? (Yes/No):** Springpole Lake bisects the landscape to the south of the Project area, with a minimum crossing distance of approximately 150 m. Development and maintenance of both a tailings pipeline and access road across the southeast arm of Springpole Lake represents an unacceptable environmental and safety risk for the Project and would not be economically feasible for the Project.
- **Is the tailings storage location reasonably close to the Project site? (Yes/No):** For the purposes of this assessment, a 10 km radius is used as a reasonable cutoff distance. Given the northern location of the Project with the presence of several waterbodies in the area, routing around water features beyond 10 km would not be a practical solution for the Project considering the supporting infrastructure needs associated with a tailings management facility including roads, bridges, potential pipelines, power and winter driving conditions with large trucks on a 20 km round trip.

The pre-screening assessment for candidate tailings storage locations is presented in Table 2–4 A "no" indicates a fatal flaw with the tailings storage location, resulting in removal from further analysis.

Candidate Site 1

Candidate Site 1 meets all three criteria and is retained for detailed analysis.

Candidate Site 2

Candidate Site 2 meets all three criteria and is retained for detailed analysis.

Candidate Site 3

Candidate Site 3 was considered as an alternative that does not overprint waters frequented by fish. While this location satisfies criteria 2 and 3, the density of watercourses and waterbodies in the Project area would require that the geometry of the impoundment at this location be highly irregular and very high. As the dams are raised over the life of mine, the storage capacity would be greatly reduced (or eliminated in some parts of the facility). A proper storage facility would need to be shaped such that some portion of it would overprint waters frequented by fish, negating the intent of carrying out this option. In order to maintain non-overprinting options, additional facilities would be required, which would increase the Project footprint and overall operational complexity and still require overprinting of aquatic habitat, creating associated environmental impacts, risks and costs. As such, this candidate location fails the first criterion and is not carried forward for further analysis.

Candidate Site 4

Candidate Site 4 fails the criterion of reasonable distance from the Project site, at approximately 13 km away. As a result, it has been screened out of further analysis.

Candidate Site 5

Candidate Site 5 fails the criterion of reasonable distance from the Project site, at approximately 13 km away. As a result, it has been screened out of further analysis.

Candidate Site 6

Candidate Site 6 fails the criterion of not requiring a prohibitive water crossing, as it is located on the south side of the southeast arm of Springpole Lake. It is also outside of the 10 km cutoff distance. As a result, this candidate location has been screened out of further analysis.

Candidate Site 7

Candidate Site 7 fails the criterion of not requiring a prohibitive water crossing, as it is located on the south side of the southeast arm of Springpole Lake. As a result, it has been screened out of further analysis.

Candidate Site 8

Candidate Site 8 fails the criterion of reasonable distance from the Project site, at approximately 12 km away. As a result, it has been screened out of further analysis.

2.1.5 Identification of Candidate Mine Waste Storage Methods

Three candidate mine waste storage methods / strategies for tailings and mine rock were identified:

- Method 1 – in-pit storage;
- Method 2 – co-disposal of tailings and mine rock; and
- Method 3 – discrete tailings and mine rock storage facilities.

Method 1: In-Pit Storage

In-pit storage involves transferring tailings and/or mine rock to an existing open pit capable of storing the material. Tailings can be transported by pump for slurry, thickened, or paste tailings or by truck or conveyor for filtered tailings. Mine rock would be transferred to the final storage location (within the same pit or a separate pit) by truck.

In the context of the Project, there is only one open pit that will operate for 10 years (thereafter, processing continues by reclaiming ore from stockpiles). For this method to be feasible, the components of the tailings storage facility would require the following:

- Construction, operation and closure of a secondary tailings impoundment facility, external to the open pit while mining is occurring and able to contain approximately 85 Mt (most of the full storage requirement of 101 Mt);
- Pump station and slurry pipelines to the temporary impoundment facility;
- Associated seepage and water management; and
- Re-routing of the tailings pipelines to the mine pit at the end of mine life for the storage of tailings in the mine pit for the remainder of the Project life (about two years).

Method 2: Co-disposal of Tailings and Mine Rock

Co-disposal is the mixing of fine-grained mine waste material (i.e., tailings) with coarse-grained mine waste material (i.e., mine rock) into a single waste management facility. Mixing of the tailings with mine rock promotes filling of voids to maximize density of the material. Several different terms for co-disposal are considered based on the point at which mixing occurs, or how the independent waste streams are placed:

- ***Co-mingling:*** Co-mingling involves mixing and subsequent placement of tailings and mine rock together in a single waste management facility. Tailings and coarse mine rock material are transported independently and mixed together, usually by mechanical means, within a waste management facility, or combined into a single discharge stream when pumped or conveyed.
- ***Co-placement:*** Tailings and coarse mine rock materials are transported independently but not mixed to form a single discharge stream. Examples of co-placement may include mine rock end-dumped into a tailings storage facility or mine rock used to construct perimeter embankments for tailings storage.
- ***Co-deposition:*** Co-deposition is similar to co-placement, but the waste streams are generally placed in independent layers allowing the deposited tailings to naturally enter the voids in the underlying mine rock layers.

Method 3: Discrete Mine Waste Storage Areas

Many open pit gold mining operations opt for the development of separate tailings and mine rock facilities. The decision to develop separate facilities may be influenced by a variety of factors for each project, including quantity of material to be handled, handling methods (truck, conveyors or pipelines), distance of potential facilities from the process plant and/or mine, management of wastes and potential environmental risks (e.g., ARD, seepage), land tenure and environmental constraints, among others. Discrete facilities for tailings and mine rock may offer an opportunity to tailor runoff and seepage management to the site-specific conditions and requirements of the Project, while coming at the expense of a more compact Project footprint and an associated increase in potential impacts on aquatic and/or terrestrial habitats.

2.1.6 Pre-screening of Candidate Mine Waste Storage Methods

Pre-screening is applied to determine if any of the candidate mine waste storage methods have an inherent fatal flaw that warrants elimination of the candidate from further consideration in the mine waste alternative analysis.

The pre-screening criteria developed for the assessment of candidate mine waste storage methods are:

- **Is the method proven effective at the necessary scale for mine waste storage? (Yes/No):** It is essential that the storage method be demonstrated effective on a large scale in order to reduce operational risks and Project uncertainty.
- **Is the method feasible with the Project mine plan? (Yes/No):** The storage method must be applicable and usable at the start of operation to avoid the need for additional mine waste storage facilities.
- **Does the mine waste storage method offer environmental advantages, considering the characteristics of the Project? (Yes/No):** The storage method must offer a comparative environmental benefit while minimizing environmental risks, considering the characteristics of the mine waste and geographic constraints at the Project site.

The result of the pre-screening assessment for candidate mine waste storage methods is presented in Table 2–5. A “no” indicates a fatal flaw with the candidate mine waste storage method, resulting in removal from further analysis.

Method 1: In-Pit Storage

The development plans for the Project consider 10 years of operations (including a 10-year pit life). During mining, tailings that are produced would have to be disposed of on the surface since the open pit will be actively mined. As with any mine, in-pit storage during operations could condemn future resources and create safety challenges. As a result, implementing in-pit storage would limit required operational flexibility should economic conditions change, including mine plan optimizations, changes to the cutoff grade or the discovery of additional resources. In-pit storage would also limit opportunities for planned habitat compensation construction and reconnecting the pit lake to Springpole Lake.

Further, additional storage would be required on surface until such time as a suitable storage area is available in the pit, resulting in surface impacts to aquatic and/or terrestrial habitat during operations (which in-pit storage would be intended to avoid), as well as prohibitive costs associated with re-handling the material at closure. The Project cannot financially support development of a temporary surface facility and double handling the material after operations cease. Therefore, this candidate is not considered feasible as a primary tailings or primary mine rock storage method for the Project and has been eliminated from further consideration in this analysis.

As operations of the Project progress, opportunities for placement of some portion of mine wastes in the pit may be considered contingent on feasibility and the evolution of the mine plan.

Method 2: Co-disposal Facility

Co-disposal of tailings and mine rock (e.g., co-mingling) or co-placement of tailings and mine rock (e.g., use of mine rock for embankment construction,) could also be considered with any of the tailings storage technologies. It is a proven method at the scale needed (i.e., it is a combination of stockpiling mine rock and tailings) and is compatible with the Project mine plan (i.e., a facility on surface will not interfere with mining activity).

For the Project, the tailings are predominately NAG (approximately 80% by weight) and mine rock is both PAG and NAG. A combination of co-disposal techniques such as the use of NAG mine rock as embankment construction material and co-mingling of PAG mine rock with tailings will minimize the overall footprint for mine waste storage and the overall Project footprint. Further, the co-mingling of NAG tailings with PAG mine rock can provide buffering capacity to help inhibit the onset of acid generation, and strategic placement of tailings can help to effectively encapsulate PAG mine rock and reduce potential acid generation and ML. Finally, co-mingling of tailings into the void spaces of mine rock can also enhance the physical stability of the facility. As a result, this method is considered to provide an environmental advantage.

This method meets all three criteria and is carried forward in the analysis.

Method 3: Individual Storage Facilities for Tailings and Mine Rock

Development of separate facilities for storage of tailings and mine rock is implemented at many mine sites in Canada. There are several factors that may affect the decision to develop discrete facilities, including the geochemical characteristics of tailings and mine rock streams, management of runoff and seepage, and suitability of the surrounding land for facility development (e.g., presence / absence of lakes). This method meets the first two above but fails on the third for the following reasons:

- Discrete storage facilities for each of tailings and mine rock would increase the overall footprint of mine wastes for the Project area, increasing the associated potential effects on terrestrial habitat including habitat for Species at Risk (SAR), such as Woodland Caribou (Boreal population), which is contrary to the objective in the MAA Guidelines (ECCC 2016) of minimizing the environmental footprint of the storage area.
- This method does not offer potential for in situ mitigation of ML/ARD utilizing the inherent characteristics of Project mine wastes to restrict atmospheric oxygen within the facility (i.e., infilling of void spaces and encapsulation of PAG mine rock with tailings to reduce oxygen infiltration and ARD onset).

Therefore, physical separation of the mine rock storage area and tailings storage area does not offer a significant environmental advantage for the Project, and in fact will unnecessarily expand the Project footprint, and the candidate method is not considered for further analysis.

2.1.7 Identification of Candidate Mine Waste Storage Technologies

Modern gold mining projects have a variety of alternative technologies to consider for tailings production, with the options of:

- Slurry tailings;
- Thickened tailings;
- High-density tailings / paste tailings; and
- Filtered tailings.

Slurry and thickened tailings are typically delivered to the tailings facility via pipeline and consist of a material which is 20-40% solids (slurry) and up to 60% solids (thickened) by weight. These tailings are deposited hydraulically within a containment area which typically consists of engineered dams. The tailings will form a beach as the material is deposited and spreads out, and as water comes out from the pore spaces.

High-density tailings / paste tailings are also typically delivered via pipeline, and consist of a materials which is approximately 60-75% solids by weight. As such, they are still hydraulically deposited, but can form slopes at a steeper angle of repose. Engineered dams are normally still required for containment of solids, though ponds are often minimal or not present. Paste technology is also often used as backfill for stopes in underground mining operations when mining sequencing allows.

Filtered tailings are dewatered to a state of over 80% solids by weight, and are most commonly delivered to the tailings storage area by truck or conveyor. Costs associated with this technology are generally high in temperate environments, owing to both the energy required to dewater the tailings as well as the ongoing operating costs for trucks (if used in lieu of a conveyor).

2.1.8 Pre-screening of Candidate Tailings Storage Technologies

Pre-screening is applied to determine if any of the candidate mine waste storage methods have an inherent fatal flaw that warrants elimination of the candidate from further consideration in the mine waste alternative analysis.

The pre-screening criteria developed for the assessment of candidate mine waste storage technologies are:

- **Is the method suitable for use at a low-grade / high-tonnage open pit operation? (Yes/No):** It is important that the technology be appropriate for an operation as proposed for the Springpole Project to reduce technical risks/uncertainties, and avoid unnecessary negative cost impacts.

The result of the pre-screening assessment for candidate mine waste storage methods is presented in Table 2–6. A “no” indicates a fatal flaw with the candidate mine waste storage method, resulting in removal from further analysis.

Slurry Tailings

Conventional slurry tailings deposition is a widely used technology for open pit gold mining operations and has been demonstrated to be viable across a wide variety of conditions. This technology is considered appropriate for the Project.

Thickened Tailings

Thickened tailings are similar to conventional slurry but are dewatered to a greater degree (typically to about 45% to 65% solids by weight), resulting in a reduced amount of water in the tailings storage area. The main advantage of using thickened tailings slurry over conventional slurry tailings is the somewhat reduced storage area and a reduction in water management requirements within the storage area. This technology is considered appropriate for the Project.

Filtered Tailings

Filtered tailings require greater energy inputs at the plant site for dewatering, as well as energy inputs and associated emissions with vehicle / equipment transport and placement of the tailings within the storage area. Nevertheless, this technology is considered appropriate for the Project.

High-Density Tailings / Paste Tailings

Paste tailings management is best used to backfill underground workings where transport and placement are aided by gravity and is not recommended for moderate to high production mines or with coarse tailing materials. As such, it is not a widely accepted, proven technology for use in a low-grade, bulk-tonnage open pit mining operation and is not suitable for the Project.

2.2 Summary of Mine Waste Alternatives to be Analyzed

2.2.1 Avoiding Fish-Frequented Waters

The MAA Guidelines (ECCC 2016) state that at least three alternatives should remain worthy of detailed assessment after completing the pre-screening process. At least one of these alternatives should not impact a waterbody frequented by fish, unless it can be demonstrated that this possibility does not reasonably exist based on site-specific circumstances. In the case of the Project, the available land base at the site is constrained by extensive surface water features, which precludes the potential for an option that does not impact a waterbody frequented by fish. To provide sufficient capacity for storage of the anticipated volume of mine rock and tailings, multiple smaller facilities would be required, which would unnecessarily increase the environmental risks and operational complexity. Further, the multiple facilities would expand the Project's footprint, resulting in habitat fragmentation and associated effects on wildlife species. These overall drawbacks would also lead to an unfavourable economic effect on the Project.

Taking the above constraints into consideration, a reasonable option does not exist to avoid fish-frequented waters for mine rock and tailings storage.

2.2.2 Tailings Technologies

Filtered tailings was originally considered for the NAG portion of the Project tailings. In response to comments on the draft EIS/EA, an engineering review was conducted to consider technical optimizations for management of the tailings and mine rock (WSP 2023). This review concluded that hydraulic delivery of thickened tailings, when compared with the original filtered tailings method, would provide benefits to the Project over the use of filtered tailings in terms of the following:

- Reduced energy consumption and demand for power generation;
- Reduced fuel consumption for trucking of filtered tailings to the storage area;

- Reduced GHG, dust and noise emissions associated with vehicle travel to the storage area;
- Reduced Project emissions associated with raw material production for construction of the filter plant; and
- Reduced use of consumables for the filter plant.

For NAG material, both filtered and thickened tailings have an advantage over conventional slurry tailings as the tailings are dewatered at the process plant site and therefore do not require a large tailings pond. Physical stability of the tailings is also increased as a result of the lower water content. When compared with each other, the moisture content of thickened tailings vs. filtered tailings will allow more effective settling and filling of void spaces amongst the deposited mine rock.

Based on the above benefits for the Project, thickened tailings provides an advantage over both conventional slurry and filtered tailings for NAG material and is considered the preferred technology. The previous draft MAA, developed prior to the engineering optimization, determined filtered tailings deposited within the CDF to be the preferred alternative; this alternative is carried forward in this revised draft for comparison against the thickened tailings alternatives.

A technology resulting in a reduced tailings water content is less advantageous for management of PAG material as the tailings remain unsaturated, and therefore it is generally more suitable for NAG tailings. Conventional slurry tailings storage is a dependable and cost-effective technology for storage of tailings, and the ratio of water to solids provides an advantage for mitigating PAG materials in that they can be maintained in a saturated state to mitigate ARD.

2.2.3 Retained Alternatives

Based on the screening applied in the previous sections, co-disposal of tailings and mine rock is retained as the preferred mine waste storage method for the Project. The key factors for retaining this method include:

- Maintenance of a smaller overall footprint by combining storage of the two mine waste streams in one facility;
- Reducing the amount of surficial waterbodies that may be impacted by multiple waste facilities; and
- Optimizing water management requirements for the different mine waste material characteristics.

Through the pre-screening described above, the candidate locations and methods include five possible alternatives to be considered in the MAA:

- **Alternative A:** development of a CDF for the storage of thickened tailings (both PAG and NAG) and mine rock; Candidate Site 1 location.
- **Alternative B:** development of a CDF for the storage of NAG thickened tailings and mine rock, and adjacent cell for conventional slurry tailings (PAG); Candidate Site 1 location.
- **Alternative C:** development of a CDF for the storage of NAG thickened tailings and mine rock; Candidate Site 1 location. Development of a separate facility at the Candidate Site 2 location for PAG conventional slurry tailings.
- **Alternative D:** development of a CDF for the storage of PAG and NAG conventional slurry tailings, and mine rock; Candidate Site 1 location.
- **Alternative E:** development of a CDF with filtered NAG tailings and mine rock, and a lined slurry cell for PAG tailings; Candidate Site 1 location.

A combined CDF for either 100% thickened tailings and mine rock (such as described for Alternative A), or 100% conventional slurry tailings and mine rock (such as described for Alternative D) at Candidate Site 2 was not considered, as it would have similar characteristics as Candidate Site 1, but with a resulting increase in the overall Project footprint (e.g., longer roads, pipelines and increased GHG emissions).

Table 2–1: Summary of Candidate Mine Rock Storage Locations

Candidate Site	Description	Capacity	Overprints Fish-Frequented Waters
1	Rectangular storage location adjacent to the west side of the open pit. Geographically constrained by Birch Lake, Springpole Lake, open pit. Overprints small ponds and streams.	Available footprint has sufficient capacity for 66 Mm^3 of mine rock	Yes
2	Storage location southeast of the open pit, constrained on south and west by Springpole Lake. Overprints small streams and wetlands.	Available footprint has sufficient capacity for 66 Mm^3 of mine rock	Yes
3	Irregularly shaped storage location to the southwest of the open pit; requires a haul road along the narrow isthmus separating Birch Lake and Springpole Lake.	Small, irregular lobes due to geometry required to avoid fish-frequented waters do not allow efficient storage or sufficient capacity for 66 Mm^3 of mine rock	No
4	Oblong / rectangular storage location adjacent to the north shore of Springpole Lake. Overprints small ponds and streams.	Available footprint has sufficient capacity for 66 Mm^3 of mine rock	Yes
5	Oblong / rectangular storage location to the west of Durkin Lake. Overprints small ponds and streams.	Available footprint has sufficient capacity for 66 Mm^3 of mine rock	Yes
6	Slightly irregular rectangular storage location, north Springpole Lake. Overprints small ponds and streams.	Available footprint has sufficient capacity for 66 Mm^3 of mine rock	Yes

Table 2–2: Pre-screening of Candidate Mine Rock Sites Storage Locations

Candidate Site	1	2	3	4	5	6
Does the mine rock storage location provide sufficient storage capacity?	**YES**	**YES**	NO	**YES**	**YES**	**YES**
Is the mine rock storage location within 7 km of the Project site?	**YES**	**YES**	NO	NO	NO	NO

Table 2–3: Summary of Candidate Tailings Storage Locations

Candidate Site	Description	Capacity	Overprints Fish-Frequented Waters
1	Rectangular tailings storage facility adjacent to the west side of the open pit. Geographically constrained by Birch Lake, Springpole Lake and the open pit. Overprints small ponds and streams.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
2	Facility located to the southeast of the open pit, constrained on south and west by Springpole Lake. Overprints small streams and wetlands.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
3	Irregularly shaped tailings storage facility to the southwest of the open pit; requires a haul road along the narrow isthmus separating Birch Lake and Springpole Lake.	Small, irregular lobes due to geometry required to avoid fish-frequented waters do not allow sufficient capacity for 78 Mm^3 of tailings	No
4	Oblong / rectangular tailings storage facility adjacent to the north shore of Springpole Lake. Overprints small ponds and streams.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
5	Oblong / rectangular tailings storage facility to the west of Durkin Lake. Overprints small ponds and streams.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
6	Slightly rounded tailings storage facility south of the southeast arm of Springpole Lake. Overprints small ponds and streams. Requires a complex alignment of tailings pipeline and access road due to the distance from process plant (approximately 15 km straight-line). Requires the crossing of the southeast arm of Springpole Lake and numerous local drainage features.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
7	Slightly rounded tailings storage facility, south of the southeast arm of Springpole Lake. Overprints several ponds and streams.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes
8	Slightly rounded tailings storage facility, northwest of Bertha Lake. Overprints small ponds and streams. Requires a complex alignment of tailings pipeline and access road due to distance from process plant (approximately 12 km straight-line) and numerous local drainage features.	Available footprint has sufficient capacity for up to 78 Mm^3 of tailings	Yes

Table 2–4: Pre-screening of Candidate Tailings Storage Locations

Candidate Site	1	2	3	4	5	6	7	8
Does the tailings storage location provide sufficient tailings storage capacity?	**YES**	**YES**	NO	**YES**	**YES**	**YES**	**YES**	**YES**
Does the tailings storage location avoid prohibitive water crossings?	**YES**	**YES**	**YES**	**YES**	**YES**	NO	NO	**YES**
Is the tailings storage location within 10 km of the Project site?	**YES**	**YES**	NO	NO	NO	NO	NO	NO

Table 2–5: Pre-screening of Candidate Mine Waste Storage Methods

Pre-screening Criteria	Method 1 In-Pit Storage	Method 2 Co-disposal	Method 3 Discrete Facilities
Is the method proven effective at the necessary scale for mine waste storage?	NO	**YES**	**YES**
Is the method feasible with the Project mine plan?	NO	**YES**	**YES**
Does the mine waste storage method offer environmental advantages, considering the characteristics of the Project?	**YES**	**YES**	NO

Table 2–6: Pre-screening of Candidate Mine Waste Storage Technologies

Pre-screening Criteria	Slurry Tailings	Thickened Tailings	High-density Tailings / Paste Tailings	Filtered Tailings
Is the method suitable for use at a low-grade / high-tonnage open pit operation?	**YES**	**YES**	NO	**YES**

Figure 2-1: Mine Rock Storage Location Alternatives

Figure 2-2: Tailings Storage Location Alternatives and Sensitive Wildlife Area

Figure 2-3: Tailings Storage Location Alternatives

3.0 CHARACTERIZATION OF ALTERNATIVES

The alternatives characterization provides detailed information on the alternatives presented. The alternatives are characterized from an environmental, technical, economic and socioeconomic perspective.

As a result of the number of combinations possible for mine rock and tailings storage for the Project and the significant site and environmental constraints, the pre-screening process in the previous section identified the five candidate alternatives (two candidate locations and three candidate mine waste storage methods).

A summary of the environmental conditions at Candidate Sites 1 and 2 is provided in Section 3.1. The major attributes or characteristics differentiating the five alternatives are presented in Sections 3.2 to 3.6 and tabulated in Table 3–1.

Operation and closure considerations for the alternatives are summarized in Table 3–2.

To date, some Traditional Knowledge and Traditional Land and Resource Use (TK/TLRU) information is available for the Project area. The following Indigenous communities were contacted to participate in Indigenous engagement for the Project and to gather available TK/TLRU information:

- Cat Lake First Nation;
- Lac Seul First Nation;
- Mishkeegogamang Ojibway Nation;
- Ojibway Nation of Saugeen;
- Pikangikum First Nation;
- Slate Falls Nation;
- Wabauskang First Nation; and
- Northwestern Ontario Métis Community.

To date, seven Indigenous communities (Cat Lake First Nation, Slate Falls Nation, Lac Seul First Nation, Pikangikum First Nation, Wabauskang First Nation, Mishkeegogamang Ojibway Nation and Northwestern Ontario Métis Community) have produced either TK/TLRU studies or community land use planning documents. FMG is continuing to work with Indigenous communities to gather additional TK/TLRU information and consider the data as made available. In addition, FMG will continue to document and address comments related to TK/TLRU activities identified by Indigenous communities during the engagement activities for the Project.

An archaeology and cultural heritage baseline program has been carried out for the mine site, and to date there have not been any significant cultural sites identified which would be overprinted by either Candidate Site 1 or Candidate Site 2 (Northwest Archaeological Assessments, 2021a,b).

3.1 Environmental Conditions

3.1.1 Candidate Site 1

The surface rights within Candidate Site 1 are owned by FMG. A large portion of Site 1 is a mining lease or patented by FMG, with the rest of the area pending a mining lease (Figure 2-3).

Between 2011 and 2023, a number of surveys were conducted for the terrestrial baseline including the Site 1 location. At Site 1, the following observations of Species of Conservation Concern (including SAR) were noted adjacent or near to the site location:

- Alpine Woodsia (vegetation), provincially rare ranked S2;
- Floating Marsh Marigold (vegetation), provincially rare ranked S2; and
- Bald Eagle (bird), Special Concern (*Endangered Species Act* [ESA; S.O. 2007, c. 6]).

Candidate Site 1 is located within habitat for Caribou (Figure 2-2). Caribou are classified as Threatened under both the ESA and *Species at Risk Act* (SARA; SC 2002, c. 29). This location also overprints approximately 3 ha of Wolverine habitat, and a combined approximately 2 ha of avian SAR habitat (Eastern Whip-poor-will, Lesser Yellowlegs and Short-eared Owl).

The overburden of Candidate Site 1 predominantly consists of a large sandy layer with an underlying layer of clay or gravel over bedrock. Test pits have shown a peat, organic layer above the sandy layer. Overall, test pits at the Project show an overburden thickness ranging from 0.31 to 4.95 m.

Groundwater conductivity in overburden within the Project area has a K value on the order of 10^{-4} to 10^{-6} metres per second (m/s). The groundwater table is generally 3 m below ground surface even in the winter months. Groundwater discharges into both Birch Lake and Springpole Lake from Candidate Site 1, with comparatively low flows having an insignificant contribution in maintaining water levels within these lakes. The underlying bedrock fracture network has limited flow.

Candidate Site 1 is on the boundary between the watershed of Springpole Lake and Birch Lake. Roughly half of the area reports to Birch Lake, while the other half reports to Springpole Lake. The footprint of Candidate Site 1 contains small unnamed ponds—L-3, 15.8 hectares (ha); L-4, 0.7 ha; L-5, 4.6 ha; L-6, 2.3 ha; L-17, 0.9 ha; and L-18, 4.9 ha—and unnamed creeks.

Candidate Site 1 includes parts of two licensed trapline areas (SL-200 and SL-197).

3.1.2 Candidate Site 2

The surface rights within Candidate Site 2 are owned by FMG. A portion of Site 2 is a mining lease or patented by FMG, with the rest of the area pending a mining lease (Figure 2-3).

Between 2011 and 2023, a number of surveys have been conducted for the terrestrial baseline including the Site 2 location.

At Candidate Site 2, the following observations of Species of Conservation Concern (including SAR) were noted within the Candidate Site 2 boundary:

- Little Brown Myotis (bat), Endangered (ESA, SARA); and
- Northern Marsh Violet (vegetation), provincially rare ranked S2, S3.

Candidate Site 2 is located within the habitat range for Caribou (Figure 2-2). Caribou are classified as Threatened under both the ESA and SARA. This location also overprints approximately 4.7 ha of Wolverine habitat, and a combined approximately 2.9 ha of avian SAR habitat ((Eastern Whip-poor-will, Lesser Yellowlegs and Short-eared Owl).

The overburden at Candidate Site 2 has not been directly characterized. Overall, test pits at the Project site show an overburden thickness ranging from 0.31 to 4.95 m, with overburden consisting of glacial till and glaciolacustrine clay/silt overlain by a thin layer of peat/organic material.

Groundwater conductivity in overburden within the Project area has a K value on the order of 10^{-4} to 10^{-6} m/s. The groundwater table is generally 3 m below ground surface even in the winter months. Groundwater discharges into Springpole Lake from Candidate Site 2. The underlying bedrock fracture network has limited flow.

Candidate Site 2 is entirely within the Springpole Lake subwatershed. The footprint of Site 2 contains a few small unnamed lakes / ponds—L-11, 16.3 ha; L-12, 0.7 ha; and L-13, 1.9 ha—and unnamed creeks.

Candidate Site 2 includes parts of two licensed trapline areas (SL-194 and SL-197).

3.2 Alternative A

Development of a CDF with combined thickened tailings and mine rock at Candidate Site 1

Alternative A requires the development of an embankment with a final height of approximately 78 m and will provide containment for an estimated 152 Mm^3 of tailings and mine rock, requiring approximately 57 Mm^3 of fill and a footprint of 373 ha. The embankment will be constructed with a combination of local borrow material and NAG mine rock from the open pit. The storage to embankment fill ratio is approximately 2.67, meaning the embankment will contain twice as much mine waste as it would take to construct. The higher this number is, the more efficient the facility is with regard to storage vs. construction requirements and costs.

The CDF will consist of one general storage area that houses both thickened tailings and mine rock along with seepage collection for transfer to the internal pond. A contact water reclaim pipeline of approximately 3 km will be constructed, and no tailings pipeline will be required.

3.3 Alternative B

Development of a CDF with thickened NAG tailings and mine rock, and a slurry cell for PAG tailings at Candidate Site 1

Alternative B requires the development of an embankment with a final height of approximately 77 m requiring approximately 76 Mm^3 of fill, which will provide containment for an estimated 152 Mm^3 of tailings and mine rock. The embankment will be constructed with a combination of local borrow material and NAG mine rock from the open pit. The storage to embankment fill ratio is approximately 1.98.

The CDF will consist of two cells: one that houses thickened NAG tailings and mine rock and a smaller cell to the south that contains a conventional slurry PAG tailings and an internal pond. The combined footprint is 372 ha. The conventional slurry cell will contain the PAG slurry tailings, which make up roughly 20% of the tailings by weight. The slurry cell will be lined with either clay or a geomembrane material. The northern cell will have contact water and seepage collection for transfer to the south cell internal pond.

The internal pond in the south cell will collect water from both the north and south cells, as well as receiving water from perimeter runoff and seepage collection ditching. This water will be recycled to the mill. A water reclaim pipeline and tailings pipeline of 3 km in length will be required.

3.4 Alternative C

Development of a CDF for thickened NAG tailings and mine rock at Candidate Site 1 and a separate conventional slurry cell for PAG tailings at Candidate Site 2

Alternative C will require the development of an embankment on Candidate Site 1 with a final height of approximately 73 m and an embankment fill volume of 47 Mm^3. The embankment will be constructed with a combination of local borrow material and NAG mine rock from the open pit. A separate facility will be constructed at Candidate Site 2 that will hold the PAG slurry tailings, which makes up approximately 20% of the tailings by weight. The embankment for this facility will have a maximum height of 46 m and a total embankment fill volume of 12 Mm^3. Water from the conventional slurry cell will be reclaimed for use in the milling process using a submersible pump. The storage to embankment fill ratio for the main cell is approximately 2.67, while the secondary cell has a storage ratio of 2.33. The two areas have a combined storage ratio of 2.60 and a combined footprint of 450 ha.

The CDF will consist of one cell that contains the thickened NAG tailings and mine rock, with a contact water and seepage collection system for transfer to the internal pond. A water reclaim pipeline of approximately 8 km in length and tailings pipeline of 5 km in length will be required.

3.5 Alternative D

Development of a CDF combined conventional slurry tailings and mine rock at Candidate Site 1

Alternative D will require the development of an embankment with a final height of approximately 73 m and a total fill volume of approximately 51.6 Mm^3. The embankment will be constructed with a combination of local borrow material and NAG mine rock from the open pit. The embankment fill to tailings storage ratio is estimated at 2.98. This alternative has a footprint of 391 ha.

The CDF will consist of one general storage area that houses conventional slurry tailings (NAG and PAG), as well as both NAG and PAG mine rock. The tailings internal pond would form on the southern end of the cell for reclaim water to be recycled to the process plant. A water reclaim and tailings pipeline of 3 km in length will be required.

3.6 Alternative E

Development of a CDF with filtered NAG tailings and mine rock, and a slurry cell for PAG tailings at Candidate Site 1

Alternative E requires the development of an embankment with a final height of approximately 65 m requiring approximately 52 Mm^3 of fill, which will provide containment for an estimated 117 Mm^3 of tailings and mine rock, with a footprint of approximately 379 ha. The embankment will be constructed with a combination of local borrow material and NAG mine rock from the open pit. The storage to embankment fill ratio is approximately 2.31.

The CDF will consist of two cells: one that houses filtered NAG tailings and mine rock and a smaller cell to the south that contains a conventional slurry PAG tailings and an internal pond. The conventional slurry cell will contain the PAG slurry tailings, which make up roughly 20% of the tailings by weight. The slurry cell will be lined with either clay or a geomembrane material. The northern cell will have contact water and seepage collection for transfer to the south cell internal pond.

The internal pond in the south cell will collect water from both the north and south cells as well as receiving water from perimeter runoff and seepage collection ditching. This water will be recycled to the mill. A water reclaim pipeline and tailings pipeline of 3 km in length will be required.

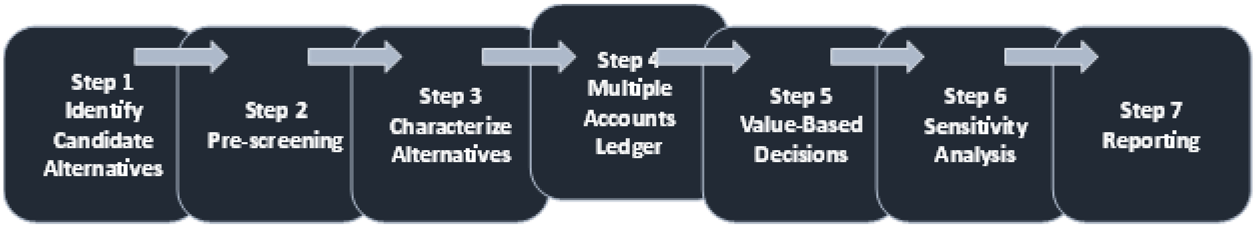
Table 3–1: Characterization of Alternatives

Account	Subaccount	Indicator	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Environmental	Water Resources	Flexibility for Water Treatment and Recycle	Low	Mid-high	Mid-high	High	Mid-high
	Fisheries Resources	Loss of Fish Habitat (Waterbodies; ha)	27.9	30.0	27.7	23.3	30.0
		Loss of Fish Habitat (Watercourses; m)	3100	2200	4400	3400	2200
	Terrestrial Resources	Loss of Wetlands (ha)	1.8	2.0	4.1	0.9	2.0
		CDF Footprint (ha)	373	372	450	391	379
		Incremental Haul / Access Road Corridor Footprint (ha)	0	0	10	0	0
	Species at Risk	Loss of Caribou Habitat (ha)	373	372	450	391	379
		Loss of Wolverine Habitat	3.1	3.1	7.8	3.1	3.1
		Loss of Avian Habitat	2.0	2.0	5.0	2.0	2.0
		Loss of Bat Habitat	4.2	4.2	9.5	4.2	4.2
	Atmospheric Emissions	Potential for Fugitive Dust	Mid-low	Mid-low	Mid	Mid-low	High
		Greenhouse Gases Emissions	Low	Mid	Mid-high	Low	High
		Noise Emissions	Mid	Mid	High	Mid	High
Technical	Design Factors	Storage to Dam Volume Ratio	2.67	2.00	2.60	2.98	2.30
		Maximum Distance to Mill (m)	3200	3200	4100	3200	3200
		Chemical and Physical Stability	Mid	High	High	Mid	Mid-low
	Safety Factors	Dam Height (m)	78	77	47	73	65
	Water Management	Volume of Reclaim Water	Mid	Mid-low	Mid-low	High	Low
		Complexity of Seepage Management	Mid-low	Mid-low	High	High	Mid-low
		Water Treatment requirements	Mid-high	Mid	Mid	High	Low
	Progressive Reclamation	Opportunity for Progressive Reclamation	Low	High	Mid	Low	Mid-low
	Monitoring and Maintenance	Dam Monitoring and Maintenance Requirements	Mid	Mid	High	Mid	Mid
Economics	Capital Costs	Site Preparation and Starter Dam Costs	$86,504,000	$223,848,000	$152,459,000	$69,127,000	$153,159,000
		Sustaining Capital Costs	$281,089,000	$306,305,000	$508,079,000	$199,316,000	$209,577,000
		Tailings Dewatering Infrastructure Costs	Mid	Mid	Mid	Low	High
		Haul / Access Road Construction Costs	Mid	Mid	High	Low	Mid
		Pipeline and Pumping Infrastructure Costs	Mid-high	Mid-high	High	Mid-high	Mid-high
		Seepage Collection Infrastructure Costs	Low	Mid	High	Mid-high	Mid
	Operating Cost	Tailings Transportation and Deposition Costs	Low	Low	Mid	Low	High
	Closure Cost	CDF Cover and Reclamation Costs	Mid	Mid	Mid-high	Mid	High
		Road Reclamation Costs	Mid-low	Mid-low	High	Mid-low	Mid-low
		Water Management Infrastructure Reclamation Costs	Low	Mid-low	Mid-high	Mid-low	Mid-low
	Post-Closure Costs	Inspection / Maintenance / Monitoring Costs	Mid-low	Mid	Mid-high	High	Mid
		Post-Closure Water Treatment Costs	Mid	Mid	Mid-high	High	Mid-Low
	Ancillary Costs	SAR Compensation	Mid-low	Mid	Mid-high	Mid-low	Mid
Socio-economics	Indigenous Land Use and Heritage Value	Loss of Undisturbed Habitat for Traditional Uses	507	504	526	563	504
		Loss of Trapping Opportunities	Mid-high	Mid-high	High	Mid-high	Mid-high
	Operational Impact (Aesthetics)	Aesthetics (dam height)	78	77	47	73	65

Table 3–2: Summary Table of Candidate Alternatives

Alternative	Construction Approach	Operational Approach	Closure Approach
Alternative A	• Construction of perimeter hydraulic structures to establish a single cell for containment of mine rock and tailings. • Establishment of seepage collection system for recycling of contact water to the CWSP. • Development of site roads and pipelines to access CDF for deposition of mine rock, and inspections and maintenance.	• Mine rock deposition by mine fleet. • Tailings conveyed hydraulically by pipeline for co-deposition with mine rock. • Water cover maintained to inhibit oxidation of PAG material and for reclaim to plant for processing. • Berm separating NAG and PAG cells to be permeable, allowing water from NAG tailings to drain to PAG cell for inhibition of oxidation of PAG material and for reclaim to plant for processing. • Excess water transferred to CWSP for reuse/ treatment & discharge.	• Placement of thick layer of NAG tailings over CDF to isolate mine rock and PAG tailings from oxidation. • Regrading to promote drainage to a central location; placement of a vegetative cover to inhibit erosion.
Alternative B	• Construction of perimeter hydraulic structures to establish two cells – one for containment of mine rock and NAG tailings and a second for containment of PAG tailings. • Establishment of seepage collection system for recycling of contact water to the CWSP. • Development of site roads and pipelines to access CDF for deposition of mine rock, and inspections and maintenance.	• Mine rock deposition by mine fleet. • Tailings conveyed hydraulically by pipeline for co-deposition with mine rock. • Berm separating NAG and PAG cells to be permeable, allowing water from NAG tailings to drain to PAG cell for inhibition of oxidation of PAG material and for reclaim to plant for processing. • Excess water transferred to CWSP for reuse/ treatment & discharge.	• Placement of thick layer of NAG tailings over main cell to isolate mine rock from oxidation. • Regrading main cell to promote drainage to a central location; place a vegetative cover to inhibit erosion. • Draining water cover from south cell (for treatment and discharge); placement of low permeability cover, growth medium and vegetative cover.
Alternative C	• Construction of perimeter hydraulic structures to establish two discrete cells for containment of mine rock and tailings. • Establishment of seepage collection system for recycling of contact water to the CWSP. • Development of site roads and pipelines to access CDF for deposition of mine rock, and inspections and maintenance.	• Mine rock deposition by mine fleet. • NAG tailings conveyed hydraulically by pipeline for co-deposition with mine rock; PAG tailings also transported hydraulically by pipeline for deposition in separate facility. • Water cover in PAG facility maintained to inhibit oxidation of PAG material. • Excess water transferred to CWSP for reuse/ treatment & discharge.	• Placement of thick layer of NAG tailings over main cell to isolate mine rock from oxidation. • Regrading main cell to promote drainage to a central location; placement of a vegetative cover to inhibit erosion. • Draining water cover from PAG cell (for treatment and discharge); placement of low permeability cover, growth medium and vegetative cover.
Alternative D	• Construction of perimeter hydraulic structures to establish a single cell for containment of mine rock and tailings. • Establishment of seepage collection system for recycling of contact water to the CWSP. • Development of site roads and pipelines to access CDF for deposition of mine rock, and inspections and maintenance.	• Mine rock deposition by mine fleet. • Tailings conveyed hydraulically by pipeline for co-deposition with mine rock. • Water cover maintained to inhibit oxidation of PAG material and for reclaim to plant for processing. • Excess water transferred to CWSP for reuse/ treatment & discharge.	• Draining water cover (for treatment and discharge). • Placement of thick layer of NAG tailings over CDF to isolate mine rock and PAG tailings from oxidation. • Regrading to promote drainage to a central location; placement of a vegetative cover to inhibit erosion.
Alternative E	• Construction of perimeter hydraulic structures to establish two cells: one for containment of mine rock and NAG tailings and a second for containment of PAG tailings. • Establishment of seepage collection system for recycling of contact water to the CWSP. • Development of haul roads and pipelines to access CDF for deposition of tailings and mine rock, and inspections and maintenance.	• Mine rock and NAG tailings deposition by mine fleet; PAG tailings via hydraulic transfer and deposition. • Berm separating NAG and PAG cells to be permeable, allowing water from NAG tailings to drain to PAG cell for inhibition of oxidation of PAG material and for reclaim to plant for processing. • Development and maintenance of haul roads to access CDF for deposition of tailings. • Excess water transferred to CWSP for treatment / discharge.	• Placement of thick layer of NAG tailings over main cell to isolate mine rock from oxidation. • Regrading main cell to promote drainage to a central location; placement of a vegetative cover to inhibit erosion. • Draining water cover from south cell (for treatment and discharge); placement of low permeability cover, growth medium and vegetative cover.

4.0 MULTIPLE ACCOUNTS LEDGER



Step 4 focuses on impact evaluations of the assessment process. A thorough characterization of each alternative is done. Sub-accounts and indicators are determined with appropriate explanations, and the alternatives are evaluated in terms of the indicators.

Evaluation criteria used in the MAA consider the material impact, such as benefit or loss, associated with each alternative. The multiple accounts ledger includes a three-level hierarchy composed of accounts, sub-accounts and indicators. Four broad categories, or accounts, are considered for the entire Project life cycle:

- Environmental;
- Technical;
- Project Economics; and
- Socioeconomic.

Each account is divided into evaluation criteria, or sub-accounts, that are used to evaluate the level of impact of the account. As stated in the MAA Guidelines (ECCC 2016), sub-accounts should conform to the following criteria:

- Sub-accounts need to be impact driven;
- Sub-accounts must differentiate one alternative from another;
- Sub-accounts must be relevant to the account;
- Sub-accounts must be understandable, and unambiguously defined for clarity;
- Sub-accounts must not be redundant; and
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

Sub-accounts measure impacts between alternatives and are often not easily quantified and ranked in a transparent manner. Measurement criteria (i.e., indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

The accounts, sub-accounts and indicators retained for the MAA analysis and the rationale for their selection are presented in Table 4–1.

Table 4–1: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
Environmental	**Water Resources**	Localized hydrology can be altered by the CDF alternatives through direct overprinting of drainage channels or by changes to the flows and water levels in nearby waters. Further, changes to water quality could harm aquatic species and other animals using the water.	**Flexibility for Water Treatment and Recycle**	Alternatives that could pump excess water amongst multiple ponds to allow extra aging and water treatment before discharge to the environment are preferred. Conversely, alternatives that have minimal capacity to handle excess water will have rigid discharge requirements that are less able to manage changes to the water balance.
	Fisheries Resources	All the alternatives have been sited to avoid lakes and large rivers to the extent possible. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER.	**Loss of Fish Habitat (waterbodies)**	There are numerous waterbodies surrounding the Project site that are fish bearing. Although large waterbodies have been avoided by all of the alternatives carried forward to the MAA, some of the alternatives would overprint smaller ponds. These alternatives would require that new fish habitat be constructed under the *Fisheries Act* to avoid adverse impacts to fish and fish habitat. Alternatives that overprint waterbodies should be avoided.
			Loss of Fish Habitat (watercourses)	There are watercourses (intermittent, and/or permanently flowing) around the Project site that flow throughout the year. Baseline studies determined these creeks to be fish bearing, and overprinting would affect fish and fish habitat, which would require new habitat to be constructed under the *Fisheries Act*. Alternatives that overprint main stem watercourses should be avoided.
	Terrestrial Resources	Overprinting of land for the CDF and ancillary infrastructure results in direct habitat loss, although some habitat can be restored at closure. Terrestrial ecosystems vary within the Project site from dense forests to cleared land and can be assigned an ecological value. Alternatives that allow a more compact site footprint and overprint areas that avoid higher value habitat would have less of an impact on the terrestrial ecosystem.	**Loss of Wetlands**	Wetlands have a high ecological value due to their productivity and large fauna and flora diversity. Alternatives that overprint wetlands should be avoided.
			CDF Footprint	Total footprint is a reasonable metric for estimating impacts to terrestrial resources. In general, smaller facilities can be expected to have fewer and/or reduced effects on flora and fauna.
			Haul / Access Road Corridor Footprint	Alternatives that are located farther from the process plant increase the segregation of habitat corridors and increase the likelihood of vehicle collisions with wildlife through increased access / haul road distances and physical barriers. Alternatives that are located closer to the process plant are preferred to reduce these effects.
	Species at Risk	Some species are sensitive or at risk from disappearing in Ontario or in Canada and have been afforded special protections. Alternatives that have greater potential to harm these species should be avoided.	**Loss of Caribou Habitat**	Caribou from the Churchill Caribou Range have the potential to be affected by the direct loss of land. Caribou require large contiguous "intact" conifer-dominated stands, islands and peninsulas. The Project area contains known wintering areas, calving/nursery areas and seasonal range habitat, and potential corridors or travel routes leading from wintering areas.
			Loss of Wolverine Habitat	Wolverine are present in the Project area. Alternatives which affect lower amounts of Wolverine habitat are preferred.
			Loss of Avian Habitat	Habitat for three avian SAR species (Eastern Whip-poor-will, Lesser Yellowlegs and Short-eared Owl) has been identified on site. Alternatives which affect lower amounts of avian SAR habitat are preferred.
			Loss of Bat Habitat	Northern Myotis and Little Brown Myotis have been detected on site. Some of the ecosites at the Project site are suitable habitat for foraging, roosting and maternity. Hibernacula have not been observed at the Project site to date.
	Atmospheric Emissions	Development of a CDF will result in air and noise emissions that could affect the ambient air, noise and light environments.	**Potential for Fugitive Dust**	Alternatives have the potential to result in fugitive dust emissions when tailings are mechanically disturbed by air currents, or by ground disturbance during hauling of materials or construction activities. In addition to reducing air quality, fugitive dust could be deposited in nearby lakes and rivers, affecting aquatic species, as well as on nearby vegetation. Alternatives that generate less fugitive dust or contain fugitive dust emissions to near the affected Project area, will result in less disturbance to the atmosphere and are preferred from an air quality perspective.
			GHG Emissions	FMG recognizes that GHG emissions are a global problem partially resulting from the burning of fossil fuels. Although emissions from the Project will not affect the immediate surrounding area, they add to global GHG emissions and ultimately contribute to climate change. Alternatives with reduced hauling requirements will emit less GHGs and are therefore preferred.
			Noise Emissions	Construction / operation of the CDF will result in noise emissions that increase ambient sound levels. Published literature has identified that sound emissions levels from 50 to 60 A-weighted decibels (dBA) can mask important communication signals in wildlife (Dooling and Popper 2007). The ECCC guidelines to avoid harm to migratory birds (ECCC 2023) suggests sound levels exceeding 50 dBA are disruptive to wildlife, especially migratory birds. Alternatives with a compact footprint and limited construction windows will reduce noise emissions and are preferred.
Technical	**Design Factors**	Design factors include some of the key factors that contribute to technical complexity of the CDF alternatives. Alternatives that are less technically challenging are generally preferred.	**Storage to Dam Volume Ratio**	Reducing the storage volume to dam volume ratio can increase the efficiency of the CDF. Further, alternatives with high storage volume to dam volume ratios are generally easier to construct and require less material to build and are preferred.
			Distance to Mill	Alternatives that are located farther from the process plant have greater transportation infrastructure requirements such as longer haul roads, reclaim pipelines and tailings pipelines. Greater transportation infrastructure requirements increase the likelihood of technical challenges with the surrounding terrain (e.g., river crossings, steep hills). Additionally, distance from the process plant is the primary considerations for filtered stack tailings as they need to be hauled or conveyed to the CDF. Alternatives that are located close to the process plant are preferred.
			Chemical and Physical Stability	Alternatives which provide an advantage for management of chemical properties of waste material and/or provide greater stability to the stockpiled material are preferred.
	Safety Factors	Safety is a primary concern when designing the CDF, and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore be avoided.	**Dam Height**	There is generally a proportional increase in potential consequence of dam failure with an increase in CDF height. In the unlikely event of failure, taller facilities have greater potential energy to move materials. Shorter dam heights are therefore considered to incur less risk and are the preferred alternative.
	Water Management	Water management is a primary consideration when designing the CDF. Reclaim water is an integral part of processing, and there	**Volume of Reclaim Water**	Each alternative will require that the seepage and runoff collected in the seepage collection ponds and/or the internal pond be pumped back to the water storage pond for use in the process plant to maintain the closed-loop water management approach. There will be technical challenges associated with the

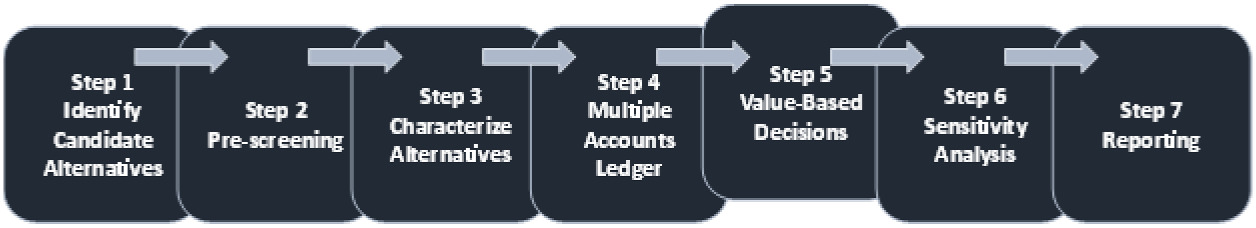
Table 4–1: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
		needs to be sufficient storage or water on site at all times. However, excess water on site will require treatment prior to discharge to ensure environmental protection.		distance reclaim water is required to be pumped back to the water storage pond for use such as line inspections, maintenance and operating in winter conditions. Alternatives that have a less reclaim water are preferred from a technical perspective.
			Complexity of Seepage Management	As required by the MDMER, each alternative will be equipped with seepage collection infrastructure, including ditching and seepage collection ponds to prevent contact water from leaving the site. Alternatives with a less complex system will allow easier compliance with the MDMER and are preferred.
			Water Treatment Requirements	Alternatives with larger catchment areas will result in additional water requiring treatment and management. Additional water management infrastructure could be required such as a larger treatment plant. Alternatives with increased quantities of water requiring treatment should be avoided.
	Progressive Reclamation	It is advantageous, from a technical perspective, to have the ability to progressively reclaim the CDF during operations, which will reduce reclamation requirements in the closure phase. Alternatives that allow progressive reclamation are preferred.	**Opportunity for Progressive Reclamation**	It is advantageous, from a technical perspective, to have the ability to progressively reclaim the CDF during operations, which will reduce reclaim requirements in the closure phase, allow testing of reclamation approaches, and provide enhanced stability of the CDF during the operations phase. Alternatives that allow progressive reclamation are preferred.
	Monitoring and Maintenance	FMG will be required to monitor and maintain the CDF following closure until MINES has deemed the site remediated and no further monitoring is required.	**Dam Monitoring and Maintenance Requirements**	FMG will be required to monitor and maintain the CDF during operations and following closure until the regulatory authority has deemed the site remediated and no further monitoring is required. Alternatives with more dams will increase the safety risk, thereby requiring additional monitoring during operation and potentially additional maintenance and are therefore less preferred.
Project Economics	**Capital Costs**	Capital costs required for the CDF are a key consideration when designing the structure. CDFs often require extensive dam construction and earthworks or costly dewatering plants. Other capital costs include site clearing, infrastructure for water management and treatment, access roads, pipelines and seepage collection infrastructure.	**Site Preparation and Starter Dam Costs**	Site preparation can be a notable capital cost and is generally proportional to the area the alternative overprints. Alternatives that have a smaller footprint are preferred from a capital cost perspective. Starter dams for the CDF are generally the most expensive capital costs of the Project for alternatives that require surface impoundment dams. The cost of constructing these dams cannot be deferred to revenue and is entirely funded by Project capital. Alternatives that require less starter dam fill are generally less expensive and are therefore preferred.
			Sustaining Capital Costs	CDF dam raises (including associated support structures) are generally one of the largest costs associated with mines that require surface impoundment dams. Typically, impoundment dams are constructed over the operating life of the mine in raises as part of sustaining capital cost, which allows tailings deposition prior to the dams being fully constructed. Alternatives that require less dam fill will typically be less expensive and are therefore preferred.
			Tailings Dewatering Infrastructure Costs	The infrastructure required for dewatering and thickening tailings is a significant capital cost which has an influence on the approach.
			Haul / Access Road Construction Costs	During the construction phase, haul roads will need to be constructed to the CDF location prior to hauling fill material for dam construction. The cost of these roads cannot be deferred to revenue and is entirely funded by Project capital. Alternatives that are located closer to the open pit are preferred.
			Pipeline and Pumping Infrastructure Costs	Pipelines will include tailings and reclaim pipelines, lines between sumps and the CDF or holding pond, lines from the filtration plant to the holding pond and lines to the water treatment plant. These pipelines will require pumphouses and are up-front capital costs.
			Seepage Collection Infrastructure Costs	Seepage collection infrastructure includes both the perimeter ditching around the CDF and the seepage collection ponds. The cost of constructing the seepage collection infrastructure would be incurred as a capital cost and cannot be paid by revenue. Alternatives that require less seepage collection infrastructure are therefore preferred.
	Operating Cost	Operational costs associated with tailings deposition and water management directly affect Project economics as these expenses occur at regular intervals throughout the life of the mine.	**Tailings Transportation and Deposition Costs**	There is a large variation in the cost of transporting tailings from the process plant to the CDF between the alternatives and this cost is dependent foremost on the tailings deposition technology, as well as the distance from the process plant. The different tailings deposition technologies require varying levels of effort and resources to transport the tailings and fall on a spectrum from pumping conventional tailings via pipeline (>50% water content) to filtered stack tailings via trucking or conveying (<30% water content). Tailings transportation can be the most significant cost during operations for filtered stack tailings deposition. Alternatives that utilize a less expensive tailings transportation method and are located in close proximity to the process plant are preferred.
	Closure Cost	The closure costs associated with the CDF include the cost of decommissioning and rehabilitating the site to a stable and more ecologically productive state, in accordance with regulatory requirements. Extensive closure costs will increase the requirement for closure bonding and will ultimately affect overall project financial performance.	**CDF Cover and Reclamation Costs**	At closure, the CDF footprint will be contoured and vegetated, where possible. Alternatives that utilize filtered stack tailings deposition technology will require an overburden cover or rock placement to mitigate erosion of the stockpile in the long term, which will add to the closure costs compared to conventional slurry deposition alternatives. Alternatives with a smaller overall footprint and minimal cover requirements lessen associated closure costs (e.g., covering and vegetation) and are therefore preferred.
			Road Reclamation Costs	Haul / access road infrastructure will need to be closed and reclaimed at closure.
			Water Management Infrastructure Reclamation Costs	Water management infrastructure will need to be closed and reclaimed at closure. Infrastructure could include spillways, water treatment plants, filtration plants, holding ponds and pipelines.
	Post-closure Costs	Post-closure costs generally include long-term dam monitoring and maintenance or water treatment if needed.	**Inspection / Maintenance / Monitoring Costs**	FMG will be required to monitor and maintain the CDF following closure until MINES has deemed the site remediated and no further monitoring is required. FMG expects the monitoring and maintenance requirements for the CDF to be proportional to the length and the height of the impoundment dams. Alternatives with shorter dam lengths and heights are preferred from a post-closure cost perspective.
			Post-closure Water Treatment Costs	During the closure phase of the Project, the site will be graded to drain all water captured within the operations area to the open pit into post-closure. Alternatives that are downgradient of the open pit or are unable to be graded towards the open pit may require additional treatment facilities to be built in order for discharge to meet PWQO, should the CDF cover not perform as expected. The construction and operation of an additional treatment facility would significantly impact the Project economics into post-closure.

Table 4–1: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
Socioeconomic	**Indigenous Land Use and Heritage Value**	Indigenous engagement is recognized as an integral part of the EA process and the Project design is influenced by Indigenous values and Traditional Knowledge. FMG has engaged with Indigenous communities to better understand what these Indigenous values are in order to design a Project that avoids or minimizes Project-related effects on Indigenous communities.	**Loss of Undisturbed Habitat for Traditional Uses**	Indigenous communities have expressed that undisturbed habitat, such as wetlands and forests, is culturally and spiritually valuable and that the Project footprint should be minimized in these areas. Alternatives that overprint more undisturbed habitat, which could include plant harvest areas or be used for hunting, should be avoided.
			Loss of Trapping Opportunities	The Project is located within licensed traplines in the area that have the potential to be affected by the Project. Alternatives with a larger CDF area and a greater spatial Project extent will affect these traplines and the livelihood of the licensed trappers. Alternatives that overprint fewer traplines are preferred.
	Operational Impact (aesthetics)	The Project is located in an area that is sparsely populated with infrequent land use. As a result of the CDF, there could be effects on these local people that could affect their enjoyment of the area.	**Aesthetics**	During the EA process, Indigenous peoples and other local members of the public identified the importance of the visual aesthetics of the natural landscape. The maximum elevation of the CDF was assessed as being proportional to the visibility of the alternatives. Alternatives with a lower maximum elevation are preferred from an aesthetics perspective as surrounding terrain would conceal more of the CDF.

5.0 VALUE-BASED DECISIONS



5.1 Scoring

A multiple accounts ledger was developed for the four alternatives retained after pre-screening of the candidate locations, methods and technologies. The scoring criteria for indicators are presented in Table 5–1. For each indicator and sub-account, the scoring criteria present of range of values for the CDF alternatives. Scoring of the CDF alternatives against this scale is also provided in Table 5–1. This process enables a comparison of the CDF alternatives relative to one another.

For the purpose of the MAA, each alternative is assigned a score with respect to each indicator ranging from 1 to 6. A score of 6 is assigned when the alternative meets the best criteria on the qualitative value scale for the indicator, and a score of 1 is assigned when the alternative meets the worst criteria.

5.2 Weighting

Project personnel led a team of experienced professionals consisting of engineers, geoscientists and environmental specialists in determining the appropriate weighting of mine waste alternatives. A weighting was applied to each sub-account and indicator on a scale of 1 to 6 based on the relative importance of each sub-account and indicator. As per the MAA Guidelines (ECCC 2016), a weight of 2 is considered twice as important as a weight of 1, and a weight of 4 is twice as important as a weight of 2. By design of the scale, no sub-account or indicator can be valued more than six times more important than another sub-account or indicator. These weighting factors assigned to each sub-account and indicators by FMG's team of professionals are presented in Table 5–2.

5.2.1 Accounts, Sub-accounts and Indicators

The MAA Guidelines propose the following Base Case account weightings:

- Environmental – 6
- Technical – 3
- Project Economics – 1.5
- Socioeconomic – 3

The weight of indicators is comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of 1 is applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

5.3 Calculations and Results

Table 5–3 through Table 5–6 present the results of the quantitative analysis for the individual indicators with regard to each of the sub-accounts and accounts (i.e., Environment, Technical, Project Economics and Socioeconomic). Table 5–7 summarizes the MAA for each of the sub-accounts with regard to each of the accounts. The overall results of this analysis are summarized in Table 5–8.

Based on the approach taken, the preferred alternative for mine waste management for the Project is Alternative B: co-disposal of PAG mine rock and thickened NAG tailings, with conventional slurry PAG tailings placed in an adjoining smaller cell.

Table 5–1: Scoring Criteria and Alternative Scores

Account	Sub-account	Indicator	Criteria						Score				
			6 (Best)	5	4	3	2	1 (worst)	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Environment	Water Resources	Flexibility for Water Treatment and Recycle	High	Mid-high	Mid	Mid-low	Low	None	2	5	5	6	5
	Fisheries Resources	Loss of Fish Habitat (waterbodies; ha)	0	0.1–8.0	8.1–16.0	16.1–24.0	24.1–32.0	>32.0	2	2	2	3	2
		Loss of Fish Habitat (watercourses; m)	0	1–1,000	1,001–2,000	2,001–3,000	3,001–4,000	>4,000	2	3	1	2	3
	Terrestrial Resources	Loss of Wetlands (ha)	0	0.1–1.0	1.1–2.0	2.1–3.0	3.1–4.0	>4.0	4	4	1	5	4
		CDF Footprint (ha)	<350	350–375	376–400	401–425	426–450	>450	5	5	2	4	4
		Incremental Haul / Access Road Corridor Footprint (ha)	0	1-2	3-4	5-6	7-8	>8	6	6	1	6	6
	Species at Risk	Loss of Caribou Habitat (ha)	0	0.1 - 5.0	5.1 - 10.0	10.1 - 15.0	15.1 - 20.0	> 20.0	5	5	2	4	4
		Loss of Wolverine Habitat (ha)	0	0.1 - 2.0	2.1 - 4.0	4.1 - 6.0	6.1 - 8.0	> 8.0	4	4	2	4	4
		Loss of Avian Habitat (ha)	0	0.1 - 2.0	2.1 - 4.0	4.1 - 6.0	6.1 - 8.0	> 8.0	5	5	3	5	5
		Loss of Bat Habitat (ha)	0	0.1 - 2.0	2.1 - 4.0	4.1 - 6.0	6.1 - 8.0	> 8.0	3	3	1	3	3
	Atmospheric Emissions	Potential for Fugitive Dust	None	Low	Mid-low	Mid	Mid-high	High	4	4	3	4	1
		GHG Emissions	None	Low	Mid-low	Mid	Mid-high	High	5	3	2	5	1
		Noise Emissions	None	Low	Mid-low	Mid	Mid-high	High	3	3	1	3	1
Technical	Design Factors	Storage to Dam Volume Ratio	>2	1.76–2	1.51–1.75	1.26–1.5	1.0–1.25	<1.0	6	5	6	6	6
		Maximum Distance to Mill (m)	<500	501–1,500	1,501–2,500	2,501–3,500	3,501–4,500	>4,500	3	3	2	3	3
		ARD Management Potential	High	Mid-high	Mid	Mid-low	Low	None	4	6	6	4	3
	Safety Factors	Dam Height (m)	<41	41 - 50	51 - 60	61 - 70	71 - 80	>80	2	2	5	2	3
	Water Management	Volume of Reclaim Water	None	Low	Mid-low	Mid	Mid-high	High	3	4	4	1	5
		Complexity of Seepage Management	None	Low	Mid-low	Mid	Mid-high	High	4	4	1	1	4
		Water Treatment Requirements	None	Low	Mid-low	Mid	Mid-high	High	2	3	3	1	5
	Progressive Reclamation	Opportunity for Progressive Reclamation	High	Mid-high	Mid	Mid-low	Low	None	2	6	4	2	4
	Monitoring and Maintenance	Dam Monitoring and Maintenance Requirements	None	Low	Mid-low	Mid	Mid-high	High	3	3	1	3	3
Project Economics	Capital Costs	Site Preparation and Starter Dam Costs ($)	<101M	101M–110M	111M–120M	121M–130M	131M–140M	>140M	6	1	1	6	1
		Sustaining Capital Costs ($)	<200M	201M–250M	251M–300M	301M–350M	351M–400M	>400M	4	3	1	6	5
		Tailings Dewatering Infrastructure Costs	None	Low	Mid-low	Mid	Mid-high	High	3	3	3	5	1
		Haul / Access Road Construction Costs	None	Low	Mid-low	Mid	Mid-high	High	2	3	1	5	3
		Pipeline and Pumping Infrastructure Costs	None	Low	Mid-low	Mid	Mid-high	High	5	2	1	2	2
		Seepage Collection Infrastructure Costs	None	Low	Mid-low	Mid	Mid-high	High	5	3	1	2	3
	Operating Cost	Tailings Transportation and Deposition Costs	None	Low	Mid-low	Mid	Mid-high	High	5	5	1	5	1
	Closure Cost	CDF Cover and Reclamation Costs	None	Low	Mid-low	Mid	Mid-high	High	3	3	2	3	1
		Road Reclamation Costs	None	Low	Mid-low	Mid	Mid-high	High	4	4	1	4	4
		Water Management Infrastructure Reclamation Costs	None	Low	Mid-low	Mid	Mid-high	High	5	4	2	4	4
	Post-closure Costs	Inspection / Maintenance / Monitoring Costs	None	Low	Mid-low	Mid	Mid-high	High	4	3	2	1	3
		Post-closure Water Treatment Costs	None	Low	Mid-low	Mid	Mid-high	High	3	3	2	1	4
	Ancillary Costs	SAR Compensation	None	Low	Mid-low	Mid	Mid-high	High	4	3	2	4	3
Socioeconomic	Indigenous Land Use and Heritage Value	Loss of Undisturbed Habitat for Traditional Uses (ha)	<501	501–525	526–550	551–575	576–600	>600	5	5	4	3	5
		Loss of Trapping Opportunities	None	Low	Mid-low	Mid	Mid-high	High	2	2	1	2	2
	Operational Impact	Aesthetics (dam height; m)	<51	51–55	56–60	61–65	66–70	>70	2	3	3	1	3

Table 5–2: Weighting of Accounts, Sub-accounts and Indicators

Account	Weight	Sub-account	Weight	Indicator	Weight
Environment	6	Water Resources	4	Flexibility for Water Treatment and Recycle	5
		Fisheries Resources	6	Loss of Fish Habitat (waterbodies)	5
				Loss of Fish Habitat (watercourses)	5
		Terrestrial Resources	3	Loss of Wetlands	5
				CDF Footprint	3
				Incremental Haul / Access Road Corridor Footprint	3
		Species at Risk	6	Loss of Caribou Habitat (ha)	6
				Loss of Wolverine Habitat	6
				Loss of Avian Habitat	4
				Loss of Bat Habitat	4
		Atmospheric Emissions	3	Potential for Fugitive Dust	2
				GHG Emissions	5
				Noise Emissions	3
Technical	3	Design Factors	3	Storage to Dam Volume Ratio	4
				Maximum Distance to Mill	3
				Chemical and Physical Stability	5
		Safety Factors	5	Dam Height	5
		Water Management	5	Volume of Reclaim Water	4
				Complexity of Seepage Management	6
				Water Treatment Requirements	5
		Progressive Reclamation	5	Opportunity for Progressive Reclamation	6
		Monitoring and Maintenance	1	Dam Monitoring and Maintenance Requirements	3
Project Economics	1.5	Capital Costs	6	Site Preparation and Starter Dam Costs	4
				Sustaining Capital Costs	6
				Tailings Dewatering Infrastructure Costs	5
				Haul / Access Road Construction Costs	4
				Pipeline and Pumping Infrastructure Costs	4
				Seepage Collection Infrastructure Costs	4
		Operating Cost	5	Tailings Transportation and Deposition Costs	5
		Closure Cost	4	CDF Cover and Reclamation Costs	5
				Road Reclamation Costs	2
				Water Management Infrastructure Reclamation Costs	3
		Post-closure Costs	2	Inspection / Maintenance / Monitoring Costs	2
				Post-closure Water Treatment Costs	5
		Ancillary Costs	3	SAR Compensation	3
Socioeconomic	3	Indigenous Land Use and Heritage Value	5	Loss of Undisturbed Habitat for Traditional Uses	4
				Loss of Trapping Opportunities	3
		Operational Impact (air, noise and aesthetics)	3	Aesthetics (dam height)	4

Table 5–3: Quantitative Analysis – Environmental Indicators

Sub-account	Indicator	Weight	Indicator Score					Merit Score				
			Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Water Resources	Flexibility for Water Treatment and Recycle	5	2.0	5.0	5.0	6.0	5.0	10.0	25.0	25.0	30.0	25.0
ΣW		5										
Sub-account Merit Score (Σ{S × W})								10.0	25.0	25.0	30.0	25.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**2.0**	**5.0**	**5.0**	**6.0**	**5.0**
Fisheries Resources	Loss of Fish Habitat (waterbodies)	5	2.0	2.0	2.0	3.0	2.0	10.0	10.0	10.0	15.0	10.0
	Loss of Fish Habitat (watercourses)	5	2.0	3.0	1.0	2.0	3.0	10.0	15.0	5.0	10.0	15.0
ΣW		10										
Sub-account Merit Score (Σ{S × W})								20.0	25.0	15.0	25.0	25.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**2.0**	**2.5**	**1.5**	**2.5**	**2.5**
Terrestrial Resources	Loss of Wetlands	5	4.0	4.0	1.0	5.0	4.0	20.0	20.0	5.0	25.0	20.0
	CDF Footprint	3	5.0	5.0	2.0	4.0	4.0	15.0	15.0	6.0	12.0	12.0
	Incremental Haul / Access Road Corridor Footprint	3	6.0	6.0	1.0	6.0	6.0	18.0	18.0	3.0	18.0	18.0
ΣW		11										
Sub-account Merit Score (Σ{S × W})								53.0	53.0	14.0	55.0	50.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**4.8**	**4.8**	**1.3**	**5.0**	**4.5**
Species at Risk	Loss of Caribou Habitat (ha)	6	5.0	5.0	2.0	4.0	4.0	30.0	30.0	12.0	24.0	24.0
	Loss of Wolverine Habitat (ha)	6	4.0	4.0	2.0	4.0	4.0	24.0	24.0	12.0	24.0	24.0
	Loss of Avian Habitat (ha)	4	5.0	5.0	3.0	5.0	5.0	20.0	20.0	12.0	20.0	20.0
	Loss of Bat Habitat (ha)	4	3.0	3.0	1.0	3.0	3.0	12.0	12.0	4.0	12.0	12.0
ΣW		20										
Sub-account Merit Score (Σ{S × W})								86.0	86.0	40.0	80.0	80.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**4.3**	**4.3**	**2.0**	**4.0**	**4.0**
Atmospheric Emissions	Potential for Fugitive Dust	2	4.0	4.0	3.0	4.0	1.0	8.0	8.0	6.0	8.0	2.0
	GHG Emissions	5	5.0	5.0	2.0	5.0	1.0	25.0	25.0	10.0	25.0	5.0
	Noise Emissions	3	3.0	3.0	1.0	3.0	1.0	9.0	9.0	3.0	9.0	3.0
ΣW		10										
Sub-account Merit Score (Σ{S × W})								42.0	42.0	19.0	42.0	10.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**4.2**	**4.2**	**1.9**	**4.2**	**1.0**

Table 5–4: Quantitative Analysis – Technical Indicators

Sub-account	Indicator	Weight	Indicator Score					Merit Score				
			Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Design Factors	Storage to Dam Volume Ratio	4	6.0	5.0	6.0	6.0	6.0	24.0	20.0	24.0	24.0	24.0
	Maximum Distance to Mill	3	3.0	3.0	2.0	3.0	3.0	9.0	9.0	6.0	9.0	9.0
	ARD Management Potential	5	4.0	6.0	6.0	4.0	3.0	20.0	30.0	30.0	20.0	15.0
ΣW		12										
Sub-account Merit Score (Σ{S × W})								53.0	59.0	60.0	53.0	48.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**4.4**	**4.9**	**5.0**	**4.4**	**4.0**
Safety Factors	Dam Height	5	2.0	2.0	5.0	2.0	3.0	10.0	10.0	25.0	10.0	15.0
ΣW		5										
Sub-account Merit Score (Σ{S × W})								10.0	10.0	25.0	10.0	15.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**2.0**	**2.0**	**5.0**	**2.0**	**3.0**
Water Management	Volume of Reclaim Water	4	3.0	4.0	4.0	1.0	5.0	12.0	16.0	16.0	4.0	20.0
	Complexity of Seepage Management	6	4.0	4.0	1.0	1.0	4.0	24.0	24.0	6.0	6.0	24.0
	Water Treatment Requirements	5	2.0	3.0	3.0	1.0	5.0	10.0	15.0	15.0	5.0	25.0
ΣW		15										
Sub-account Merit Score (Σ{S × W})								46.0	55.0	37.0	15.0	69.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**3.1**	**3.7**	**2.5**	**1.0**	**4.6**
Progressive Reclamation	Opportunity for Progressive Reclamation	6	2.0	6.0	4.0	2.0	4.0	12.0	36.0	24.0	12.0	24.0
ΣW		6										
Sub-account Merit Score (Σ{S × W})								12.0	36.0	24.0	12.0	24.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**2.0**	**6.0**	**4.0**	**2.0**	**4.0**
Monitoring and Maintenance	Dam Monitoring and Maintenance Requirements	3	3.0	3.0	1.0	3.0	3.0	9.0	9.0	3.0	9.0	9.0
ΣW		3										
Sub-account Merit Score (Σ{S × W})								9.0	9.0	3.0	9.0	9.0
Sub-account Merit Rating (Rs = Σ{S×W}/ ΣW)								**3.0**	**3.0**	**1.0**	**3.0**	**3.0**

Table 5–5: Quantitative Analysis – Project Economics Indicators

Sub-account	Indicator	Weight	Indicator Score					Merit Score				
			Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Capital Costs	Site Preparation and Starter Dam Costs	4	6.0	1.0	1.0	6.0	1.0	24.0	4.0	4.0	24.0	4.0
	Sustaining Capital Costs	6	4.0	3.0	1.0	6.0	5.0	24.0	18.0	6.0	36.0	30.0
	Tailings Dewatering Infrastructure Costs	5	3.0	3.0	3.0	5.0	1.0	15.0	15.0	15.0	25.0	5.0
	Haul / Access Road Construction Costs	4	2.0	3.0	1.0	5.0	3.0	8.0	12.0	4.0	20.0	12.0
	Pipeline and Pumping Infrastructure Costs	4	5.0	2.0	1.0	2.0	2.0	20.0	8.0	4.0	8.0	8.0
	Seepage Collection Infrastructure Costs	4	5.0	3.0	1.0	2.0	3.0	20.0	12.0	4.0	8.0	12.0
ΣW		27										
Sub-account Merit Score (Σ(S × W))								111.0	69.0	37.0	121.0	71.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**4.1**	**2.6**	**1.4**	**4.5**	**2.6**
Operating Cost	Tailings Transportation and Deposition Costs	5	5.0	5.0	1.0	5.0	1.0	25.0	25.0	5.0	25.0	5.0
ΣW		5										
Sub-account Merit Score (Σ(S × W))								25.0	25.0	5.0	25.0	5.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**5.0**	**5.0**	**1.0**	**5.0**	**1.0**
Closure Cost	CDF Cover and Reclamation Costs	5	3.0	3.0	2.0	3.0	1.0	15.0	15.0	10.0	15.0	5.0
	Road Reclamation Costs	2	4.0	4.0	1.0	4.0	4.0	8.0	8.0	2.0	8.0	8.0
	Water Management Infrastructure Reclamation Costs	3	5.0	4.0	2.0	4.0	4.0	15.0	12.0	6.0	12.0	12.0
ΣW		10										
Sub-account Merit Score (Σ(S × W))								38.0	35.0	18.0	35.0	25.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**3.8**	**3.5**	**1.8**	**3.5**	**2.5**
Post-closure Costs	Inspection / Maintenance / Monitoring Costs	2	4.0	3.0	2.0	1.0	3.0	8.0	6.0	4.0	2.0	6.0
	Post-closure Water Treatment Costs	5	3.0	3.0	2.0	1.0	4.0	15.0	15.0	10.0	5.0	20.0
ΣW		7										
Sub-account Merit Score (Σ(S × W))								23.0	21.0	14.0	7.0	26.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**3.3**	**3.0**	**2.0**	**1.0**	**3.7**
Ancillary Costs	SAR Compensation	3	4.0	3.0	2.0	4.0	3.0	12.0	9.0	6.0	12.0	9.0
ΣW		3										
Sub-account Merit Score (Σ(S × W))								12.0	9.0	6.0	12.0	9.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**4.0**	**3.0**	**2.0**	**4.0**	**3.0**

Table 5–6: Quantitative Analysis – Socioeconomic Indicators

Sub-account	Indicator	Weight	Indicator Score					Merit Score				
			Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Indigenous Land Use and Heritage Value	Loss of Undisturbed Habitat for Traditional Uses	4	5.0	5.0	4.0	3.0	5.0	20.0	20.0	16.0	12.0	20.0
	Loss of Trapping Opportunities	3	2.0	2.0	1.0	2.0	2.0	6.0	6.0	3.0	6.0	6.0
ΣW		7										
Sub-account Merit Score (Σ(S × W))								26.0	26.0	19.0	18.0	26.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**3.7**	**3.7**	**2.7**	**2.6**	**3.7**
Operational Impact (aesthetics)	Aesthetics (dam height)	4	2.0	3.0	3.0	1.0	3.0	8.0	12.0	12.0	4.0	12.0
ΣW		4										
Sub-account Merit Score (Σ(S × W))								8.0	12.0	12.0	4.0	12.0
Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)								**2.0**	**3.0**	**3.0**	**1.0**	**3.0**

Table 5‒7: Quantitative Analysis – Sub-accounts

ENVIRONMENTAL SUB-ACCOUNT

Sub-account	Weight	Sub-account Score					Merit Score				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Water Resources	4	2.0	5.0	5.0	5.0	5.0	8.0	20.0	20.0	20.0	20.0
Fisheries Resources	6	2.0	2.5	1.5	2.5	2.5	12.0	15.0	9.0	15.0	15.0
Terrestrial Resources	3	4.8	4.8	1.3	5.0	4.5	14.5	14.5	3.8	15.0	13.6
Species at Risk	6	4.3	4.3	2.0	4.0	4.0	25.8	25.8	12.0	24.0	24.0
Atmospheric Emissions	3	4.2	4.2	1.9	4.2	1.0	12.6	12.6	5.7	12.6	3.0
ΣW	22										
Account Merit Score (Σ{S × W})							72.9	87.9	50.5	86.6	75.6
Account Merit Rating (Rs = Σ{S×W}/ΣW)							**3.3**	**4.0**	**2.3**	**3.9**	**3.4**

TECHNICAL SUB-ACCOUNT

Sub-account	Weight	Sub-account Score					Merit Score				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Design Factors	3	4.4	4.9	5.0	4.4	4.0	13.3	14.8	15.0	13.3	12.0
Safety Factors	5	2.0	2.0	5.0	2.0	3.0	10.0	10.0	25.0	10.0	15.0
Water Management	5	3.1	3.7	2.5	1.0	4.6	15.3	18.3	12.3	5.0	23.0
Progressive Reclamation	5	2.0	6.0	4.0	2.0	4.0	10.0	30.0	20.0	10.0	20.0
Monitoring and Maintenance	1	3.0	3.0	1.0	3.0	3.0	3.0	3.0	1.0	3.0	3.0
ΣW	19										
Account Merit Score (Σ{S × W})							51.6	76.1	73.3	41.3	73.0
Account Merit Rating (Rs = Σ{S×W}/ΣW)							**2.7**	**4.0**	**3.9**	**2.2**	**3.8**

PROJECT ECONOMICS SUB-ACCOUNT

Sub-account	Weight	Sub-account Score					Merit Score				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Capital Costs	6	4.1	2.6	1.4	4.5	2.6	24.7	15.3	8.2	26.9	15.8
Operating Cost	5	5.0	5.0	1.0	5.0	1.0	25.0	25.0	5.0	25.0	5.0
Closure Cost	4	3.8	3.5	1.8	3.5	2.5	15.2	14.0	7.2	14.0	10.0
Post-closure Costs	2	3.3	3.0	2.0	1.0	3.7	6.6	6.0	4.0	2.0	7.4
Ancillary Costs	3	4.0	3.0	2.0	4.0	3.0	12.0	9.0	6.0	12.0	9.0
ΣW	20										
Account Merit Score (Σ{S × W})							83.4	69.3	30.4	79.9	47.2
Account Merit Rating (Rs = Σ{S×W}/ΣW)							**4.2**	**3.5**	**1.5**	**4.0**	**2.4**

SOCIOECONOMIC SUB-ACCOUNT

Sub-account	Weight	Sub-account Score					Merit Score				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Indigenous Land Use and Heritage Value	5	3.7	3.7	2.7	2.6	3.7	18.6	18.6	13.6	12.9	18.6
Operational Impact (air, noise and aesthetics)	3	2.0	3.0	3.0	1.0	3.0	6.0	9.0	9.0	3.0	9.0
ΣW	8										
Account Merit Score (Σ{S × W})							24.6	27.6	22.6	15.9	27.6
Account Merit Rating (Rs = Σ{S×W}/ΣW)							**3.1**	**3.4**	**2.8**	**2.0**	**3.4**

Table 5–8: Quantitative Analysis – Final Assessment

Account	Weight	Account Score					Merit Score				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Environmental	6	3.3	4.0	2.3	3.9	3.4	19.9	24.0	13.8	23.6	20.6
Technical	3	2.7	4.0	3.9	2.2	3.8	8.1	12.0	11.6	6.5	11.5
Project Economics	1.5	4.2	3.5	1.5	4.0	2.4	6.3	5.2	2.3	6.0	3.5
Socioeconomic	3	3.1	3.4	2.8	2.0	3.4	9.2	10.3	8.5	5.9	10.3
ΣW	13.5										
Alternative Merit Score (Σ{S × W})							43.5	51.5	36.1	42.1	46.0
Alternative Merit Rating (Rs = Σ{S×W}/ ΣW)							**3.2**	**3.8**	**2.7**	**3.1**	**3.4**

6.0 SENSITIVITY ANALYSIS

Additional scenarios are considered to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. Five sensitivity analysis scenarios were given consideration in addition to the Base Case:

- Case 1: Base Case;
- Case 2: All accounts weighted equally;
- Case 3: Environment account weighted twice as important as technical and socioeconomic accounts, cost account has no weight;
- Case 4: Environment and technical accounts weighted twice as important as socioeconomic and cost accounts;
- Case 5: Environment and socioeconomic accounts weighted twice as important as technical and cost accounts; and
- Case 6: All accounts, sub-accounts and indicators weighted equally.

The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence selection of the CDF alternative. The results of the sensitivity analysis are presented in Table 6–1 and Figure 6-1, with supporting tables provided in Appendix A.

Under the Base Case scenario, Alternative B is the preferred alternative. In assessing the alternatives under various weighting scenarios, Alternative B is the preferred alternative under all scenarios. Alternative C is the least favoured.

Taken on balance, the development of a CDF for mine rock and thickened NAG tailings to the west of the open pit, with an adjoining slurry cell for PAG tailings, represents the preferred waste storage method for the Project.

Table 6–1: Sensitivity Analysis Results

Scenario	Scenario Description	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Case 1	Base Case	3.2	3.8	2.7	3.1	3.4
Case 2	All accounts weighted equally	3.3	3.7	2.6	3.0	3.3
Case 3	Environment account (6) weighted twice as important as technical (3) and socioeconomic accounts (3), cost account has no weight (0)	3.1	3.9	2.8	3.0	3.5
Case 4	Environment (6) and technical (6) accounts weighted twice as important as socioeconomic (3) and cost accounts (3)	3.2	3.8	2.8	3.0	3.4
Case 5	Environment (6) and socioeconomic (6) accounts weighted twice as important as technical (3) and cost (3) accounts	3.3	3.7	2.6	3.0	3.3
Case 6	All accounts, sub-accounts and indicators weighted equally	3.3	3.7	2.5	3.0	3.3

Note: Blue shaded cells indicate the highest scores.

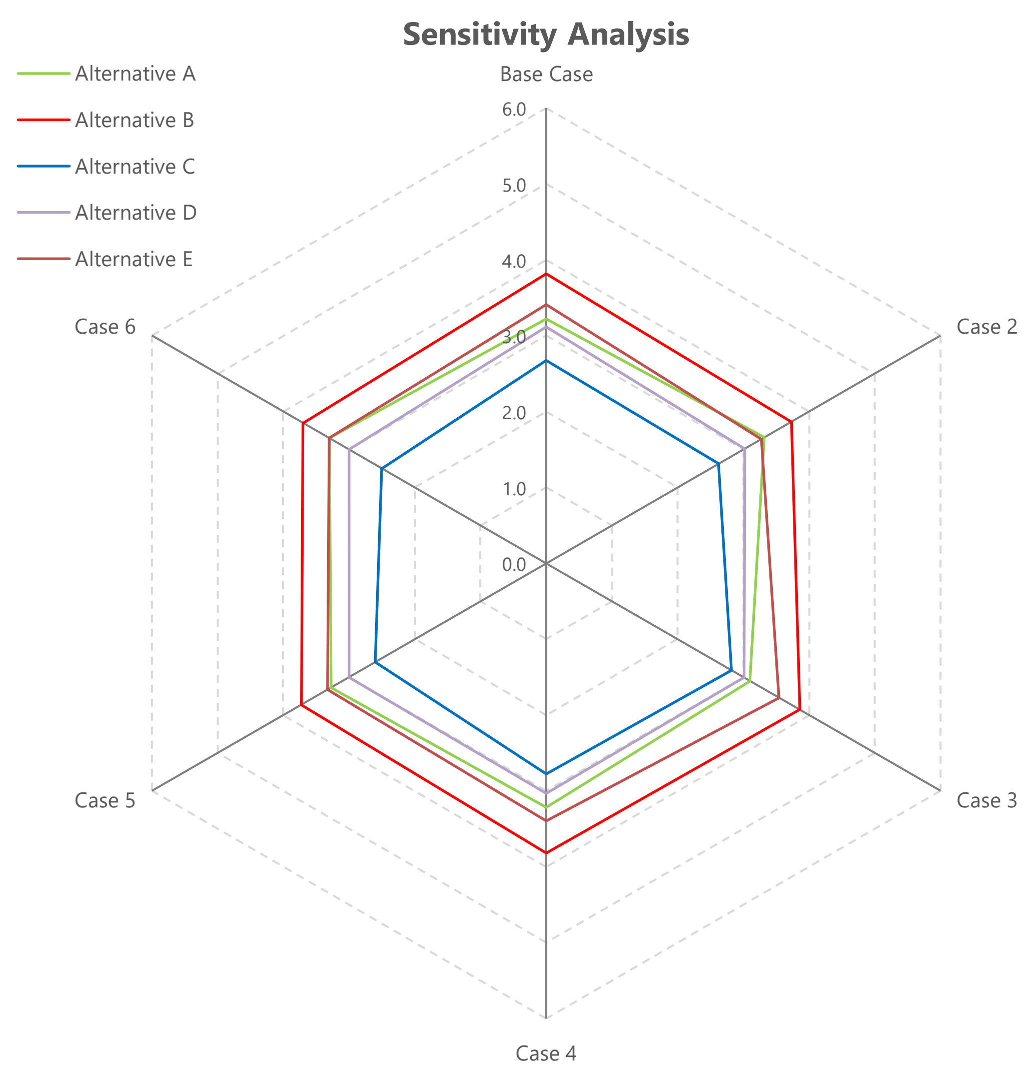


Figure 6-1: Co-disposal Facility Sensitivity Analysis

7.0 CENTRAL WATER STORAGE POND ANALYSIS

This section outlines the process followed to identify and evaluate the CWSP alternatives for the Project. The structure of this section follows the same process as that for the alternatives for mine waste documented above.

7.1 Central Water Storage Pond Candidate Alternatives

7.1.1 Alternative Locations and Threshold Criteria

The first step in the MAA process is identification of candidate locations for the CWSP.

The MAA Guidelines (ECCC 2016) recommend the use of threshold criteria to "establish the regional boundaries for selecting candidate alternatives." The location of the CWSP is largely constrained by the placement of other critical Project features, such as the open pit, process plant site, CDF and stockpiles. Placement is further constrained by Birch Lake and Springpole Lake, which are immediately adjacent to the Project site. Finally, for practical purposes, the CWSP must be within a reasonable distance of the facilities which it serves for collection of contact water (e.g., to allow gravity drainage where possible, minimize pumping distance and head). For this purpose, a cutoff distance of 2 km from the plant site has been selected as a feasible distance associated with operating a water management system in a cold climate.

With these criteria, six preliminary candidate sites were identified for CWSP locations. The locations of these alternative sites are presented in Figure 7-2.

A brief overview of each candidate site is presented in Table 7–1.

None of the identified locations overprint or are near any parks or other environmentally protected areas, although the Project site is within Caribou habitat (Boreal population; Figure 2-2).

7.1.2 Pre-screening Alternative Locations

Step 2 is where pre-screening criteria are used to assess the candidate locations. As described by the MAA Guidelines (ECCC 2016), this is a fatal flaws analysis for the alternative that, if selected, would result in the Project not being executed. By not meeting the pre-screening criteria, the alternative is so unfavourable or severe that it eliminates the candidate location from further assessment. Pre-screening criteria are formulated such that a "yes" or "no" response is possible. There must be no reasonable mitigation strategy that would convert a "yes" response into a "no" response.

The criteria for pre-screening assessment of candidate CWSP locations are as follows:

- **Does the location provide sufficient storage capacity? (Yes/No):** The proposed sites must accommodate the storage of approximately 700,000 m^3 of contact water.
- **Does use of the location work with the scheduling of construction and mine operations? (Yes/No):** Should the Project move into the construction phase, water will need to be managed from a variety of work locations, including the open pit, foundation excavations, runoff sumps, and dewatering of a portion of Springpole Lake (once clean upper waters have been discharged to the environment). The location must be available to accommodate inflows from a variety of locations.

The pre-screening assessment is presented in Table 7–2. A "no" indicates a fatal flaw with the storage location, resulting in removal from further analysis.

Candidate Site W1

Candidate Site 1 meets both criteria and is retained for detailed analysis.

Candidate Site W2

Candidate Site 2 meets both criteria and is retained for detailed analysis.

Candidate Site W3

Candidate Site 2 meets both criteria and is retained for detailed analysis.

Candidate Site W4

Candidate Site 2 meets both criteria and is retained for detailed analysis.

Candidate Site W5

Candidate Site W5 fails the second criterion as it will not be available early in the construction phase for use in management of contact waters from the Project. As such, it has been removed from further consideration.

Candidate Site W6

Candidate Site W6 fails the first criterion, as it will not have sufficient capacity to hold the required volume of water. It is located within a limited area, constrained by the process plant, haul road and stockpiles, that would result in dam heights too high to safely contain the volume adjacent to those facilities, and the interior volume (considering dam slopes) is not expected to be sufficient regardless. As such, it has been removed from further consideration.

7.1.3 Summary of Alternatives to be Analyzed

Through the pre-screening described above, the candidate locations include four possible alternatives to be considered in the MAA:

- **Site W1:** Unnamed lake L-2;
- **Site W2:** Unnamed lake L-19;
- **Site W3:** Storage location adjacent to the low grade ore stockpile; and
- **Site W4:** Storage location adjacent to the mine access road and surficial soil stockpile.

7.2 Characterization of Alternatives

The alternatives characterization provides detailed information on the alternatives presented. The alternatives are characterized from an environmental, technical, cost and socioeconomic perspective.

A summary of the major attributes or characteristics differentiating the four alternatives is presented below and tabulated in Table 7–3.

Operation and closure considerations for the alternatives are summarized in Table 7–4.

7.2.1 Site W1

The surface rights within Site W1 are owned by FMG. Site W1 is unnamed lake L-2 under existing conditions. This waterbody has a surface area of approximately 11.6 ha, with a maximum measured depth of 22 m. This depth indicates that hydraulic containment structures will not be required to meet the storage requirements for the CWSP. With no fill requirements, this site has the most efficient storage ratio, which has been indicated as 100 for the purposes of this assessment.

The unnamed lake L-2 fish community was assessed during surveys undertaken in spring and summer of 2022. Northern Pike, Yellow Perch, Golden Shiner, Common Shiner and Blacknose Shiner were observed.

As unnamed lake L-2 represents aquatic habitat, it is not considered terrestrial Caribou habitat.

7.2.2 Site W2

The surface rights within Site W2 are owned by FMG. Site W2 is Waterbody L-19 under existing conditions. This waterbody has a surface area of approximately 16.8 ha, with a maximum measured depth of 1.5 m. Assuming an average depth of 1 m, hydraulic containment structures (perimeter dam) will be required to meet the storage requirements for the CWSP. A dam of approximately 4 m in height is estimated, which will result in a terrestrial footprint of approximately 3.8 ha and a relatively efficient storage ratio (storage to dam fill) of 11.4.

The Waterbody L-19 fish community was assessed during surveys undertaken in spring and summer of 2022. Bluntnose Minnow, Brook Stickleback, Fathead Minnow, Iowa Darter and Northern Redbelly Dace were observed.

As a portion of Site W2 would require dam construction, a portion of it would be considered terrestrial Caribou habitat.

7.2.3 Site W3

The surface rights within Site W3 are owned by FMG. This site does not overprint any waterbodies or watercourses. It does lie within the area identified as sensitive Caribou habitat.

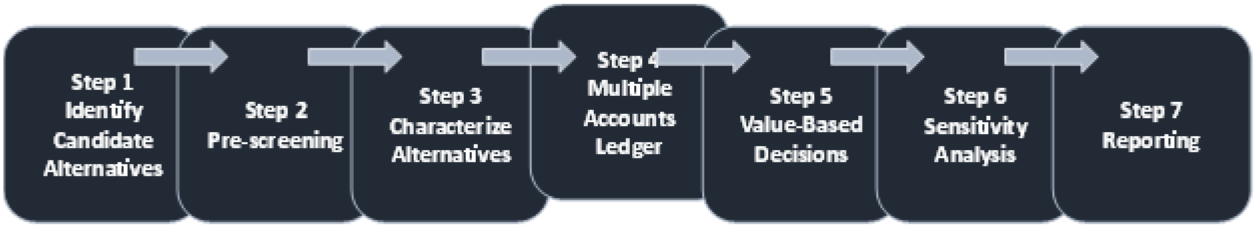
A hydraulic containment structure would be required to meet the storage requirements at this location, with a dam height estimated at approximately 7.3 m. The footprint of the facility would be approximately 10.9 ha. With the available area at this location, the facility would be a narrow rectangle, resulting in a relatively low efficiency ratio (storage to dam fill) of 3.7.

7.2.4 Site W4

The surface rights within Site W4 are owned by FMG. This site does not overprint any waterbodies or watercourses. It does lie within the area identified as sensitive Caribou habitat.

A hydraulic containment structure would be required to meet the storage requirements at this location, with an estimated dam height of approximately 5 m. The footprint of the facility would be approximately 21.1 ha. There is sufficient space in this area to optimize the facility, with a roughly rectangular shape. The somewhat wider rectangle for this facility results in an efficiency ratio of 4.7, slightly better than that of Site W3.

7.3 Multiple Accounts Ledger



Step 4 focuses on impact evaluations of the assessment process. A thorough characterization of each alternative is done. Sub-accounts and indicators are determined with appropriate explanations, and the alternatives are evaluated in terms of the indicators.

Evaluation criteria used in the MAA consider the material impact, such as benefit or loss, associated with each alternative. The multiple accounts ledger includes a three-level hierarchy composed of accounts, sub-accounts and indicators. Four broad categories, or accounts, are considered for the entire Project life cycle:

- Environmental;
- Technical;
- Project Economics; and
- Socioeconomic.

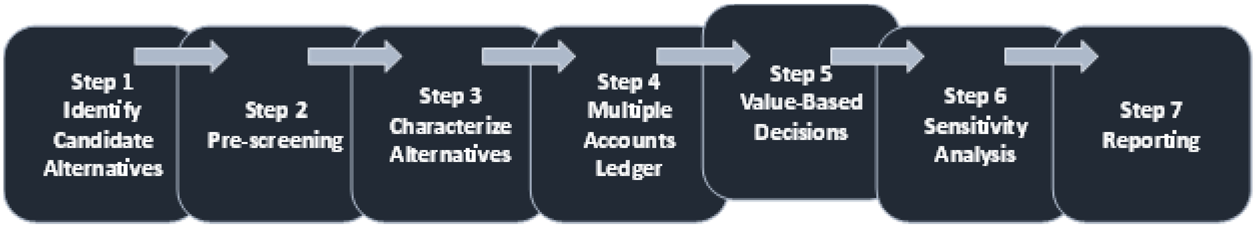
Each account is divided into evaluation criteria, or sub-accounts, that are used to evaluate the level of impact of the account. As stated in the MAA Guidelines (ECCC 2016), sub-accounts should conform to the following criteria:

- Sub-accounts need to be impact driven;
- Sub-accounts must differentiate one alternative from another;
- Sub-accounts must be relevant to the account;
- Sub-accounts must be understandable, and unambiguously defined for clarity;
- Sub-accounts must not be redundant; and
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

Sub-accounts measure impacts between alternatives and are often not easily quantified and ranked in a transparent manner. Measurement criteria (i.e., indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

The accounts, sub-accounts and indicators retained for the MAA analysis and the rationale for their selection are presented in Table 7–5.

7.4 Value-Based Decisions



7.4.1 Scoring

A multiple accounts ledger was developed for the four alternatives retained after pre-screening of the candidate locations. The scoring criteria for indicators are presented in Table 7–6. For each indicator and sub-account, the scoring criteria present of range of values for the CWSP alternatives. Scoring of the CWSP alternatives against this scale is also provided in Table 7–6. This process enables a comparison of the alternatives relative to one another.

For the purpose of the MAA, each alternative is assigned a score with respect to each indicator ranging from 1 to 6. A score of 6 is assigned when the alternative meets the best criteria on the qualitative value scale for the indicator, and a score of 1 is assigned when the alternative meets the worst criteria.

7.4.2 Weighting

A weighting was applied to each sub-account and indicator on a scale of 1 to 6 based on the relative importance of each sub-account and indicator. As per the MAA Guidelines (ECCC 2016), a weight of 2 is considered twice as important as a weight of 1, and a weight of 4 is twice as important as a weight of 2. By design of the scale, no sub-account or indicator can be valued more than six times more important than another sub-account or indicator. These weighting factors are presented in Table 7–7.

Accounts, Sub-accounts and Indicators

The MAA Guidelines propose the following Base Case account weightings:

- Environmental – 6
- Technical – 3
- Project Economics – 1.5
- Socioeconomic – 3

The weight of indicators is comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of 1 is applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

7.4.3 Calculations and Results

Table 7–8 through Table 7–11 present the results of the quantitative analysis for the individual indicators with regard to each of the sub-accounts and accounts (i.e., Environment, Technical, Project Economics and Socioeconomic). Table 7–12 summarizes the MAA for each of the sub-accounts with regard to each of the accounts. The overall results of this analysis are summarized in
Table 7–13.

Based on the approach taken, the preferred alternative for the CWSP for the Project is Site W1.

7.5 Sensitivity Analysis

Additional scenarios are considered to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. Five additional sensitivity analysis scenarios were given consideration, in addition to the Base Case. These are the same scenarios presented in Section 6.0

- Case 1: Base Case;
- Case 2: All accounts weighted equally;
- Case 3: Environment account weighted twice as important as technical and socioeconomic accounts, cost account has no weight;
- Case 4: Environment and technical accounts weighted twice as important as socioeconomic and cost accounts;
- Case 5: Environment and socioeconomic accounts weighted twice as important as technical and cost accounts; and
- Case 6: All accounts, sub-accounts and indicators weighted equally.

The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence selection of the CWSP alternative. The results of the sensitivity analysis are presented in Table 7–14 and Figure 7-1, with supporting tables provided in Appendix B.

Under the Base Case scenario, Site W1 is the preferred alternative. In assessing the alternatives under various weighting scenarios, Site W1 is the preferred alternative, while Site W4 is the least favoured. In the single scenario where all accounts, subaccounts, and indicators are weighted equally, Site W1 and W3 are preferred equally. Taken on balance, the analysis confirms Site W1 as the preferred location.

Table 7–1: Summary of Central Water Storage Pond Locations

Candidate Site	Description	Capacity	Overprints Fish-Frequented Waters
W1	Unnamed waterbody L-2	Available footprint has sufficient capacity for >0.7 Mm^3 of water	Yes
W2	Unnamed waterbody L-19	Available footprint has sufficient capacity for >0.7 Mm^3 of water	Yes
W3	Oblong / sub-rectangular storage location adjacent to the low grade ore stockpile. Does not overprint fish-frequented waters.	Available footprint has sufficient capacity for >0.7 Mm^3 of water	No
W4	Oblong / sub-rectangular storage location adjacent to the mine access road and surficial soil stockpile. Does not overprint fish-frequented waters.	Available footprint has sufficient capacity for >0.7 Mm^3 of water	No
W5	Flexibility for shape of CWSP to accommodate required volume within the dewatered basin next to the open pit.	Available footprint has sufficient capacity for >0.7 Mm^3 of water	No
W6	Situated adjacent to the Process Plant.	Available footprint has insufficient capacity for >0.7 Mm^3 of water	No

Table 7–2: Pre-screening of Candidate Central Water Storage Pond Locations

Candidate Site	W1	W2	W3	W4	W5	W6
Does the location provide sufficient storage capacity?	**YES**	**YES**	**YES**	**YES**	**YES**	NO
Does use of the location work with the scheduling of construction and mine operations?	**YES**	**YES**	**YES**	**YES**	NO	**YES**

Table 7–3: Characterization of Alternatives

Account	Sub-account	Indicator	Site W1	Site W2	Site W3	Site W4
Environment	Fisheries Resources	Loss of Fish Habitat (waterbodies; ha)	11.6	16.8	0	0
	Terrestrial Resources	CWSP Footprint (ha)	0	3.8	10.9	21.1
	Species at Risk	Direct Loss of Caribou Habitat (ha)	0	3.8	10.9	21.1
Technical	Design Factors	Storage to Dam Volume Ratio	100	11.4	3.7	4.7
	Safety Factors	Dam Height (m)	0	4	7.3	5
	Water Management	Complexity of Seepage Management (sumps)	0	2	2	1
Project Economics	Capital Costs	Site Preparation and Dam Costs ($)	500,000	604,000	1,866,209	1,475,473
		Seepage Collection Infrastructure Costs ($)	0	154,500	225,200	187,600
	Ancillary Costs	Fish Habitat Compensation Costs (ratio)	1.0	1.4	0	0
Socioeconomic	Indigenous Land Use and Heritage Value	Loss of Indigenous Fishing Areas (ha)	11.6	16.8	0	0
		Changes in Plant and Wildlife Harvesting (ha)	0	3.8	10.9	21.1

Table 7–4: Summary Table of Candidate Alternatives

Alternative	Construction Approach	Operational Approach	Closure Approach
Site W1	Reduction of natural water level by means of pumping clean water for discharge to environment.	Contact water transferred to CWSP for storage and reclaim to process plant. Excess water treated if necessary to meet environmental criteria and discharged to the environment.	Collected contact water monitored for quality, processed through treatment system if needed for discharge to environment. Basin allowed to fill naturally by groundwater inflow and runoff.
Site W2	Reduction of natural water level by means of pumping clean water for discharge to environment.	Contact water transferred to CWSP for storage and reclaim to process plant. Excess water treated if necessary to meet environmental criteria and discharged to the environment.	Collected contact water monitored for quality, processed through treatment system if needed for discharge to the environment. Basin allowed to fill naturally by groundwater inflow and runoff. The embankment and interior of the CWSP graded to promote drainage and to allow runoff to exit.
Site W3	Construction of perimeter hydraulic structures to establish the CWSP. Establishment of seepage collection ditching systems and collection sumps. Access developed as part of site road network to the low grade ore stockpile.	Contact water transferred to CWSP for storage and reclaim to process plant. Excess water treated if necessary to meet environmental criteria and discharged to the environment.	Collected contact water monitored for quality, processed through treatment system if needed for discharge to environment. The embankments and interior of the CWSP graded to promote drainage and to allow runoff to exit.
Site W4	Construction of perimeter hydraulic structures to establish the CWSP. Establishment of seepage collection ditching systems and collection sump. Access available by means of mine access road.	Contact water transferred to CWSP for storage and reclaim to process plant. Excess water treated if necessary to meet environmental criteria and discharged to the environment.	Collected contact water monitored for quality, processed through treatment system if needed for discharge to environment. The embankments and interior of the CWSP graded to promote drainage and to allow runoff to exit.

Table 7–5: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
Environmental	**Fisheries Resources**	Alternatives that would overprint waters frequented by fish would result in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER.	**Loss of Fish Habitat (waterbodies)**	There are numerous waterbodies surrounding the Project site that are fish bearing. Although large waterbodies have been avoided by all of the alternatives carried forward to the MAA, some of the alternatives would overprint smaller ponds. These alternatives would require that new fish habitat be constructed under the *Fisheries Act* to avoid adverse impacts to fish and fish habitat. Alternatives that overprint waterbodies should be avoided.
	Terrestrial Resources	Overprinting of land results in direct habitat loss, although some habitat can be restored at closure. Terrestrial ecosystems vary within the Project site from dense forests to cleared land and can be assigned an ecological value. Alternatives that allow a more compact site footprint and overprint areas that avoid higher value habitat would have less of an impact on the terrestrial ecosystem.	**CDF Footprint**	Total footprint is a reasonable metric for estimating impacts to terrestrial resources. In general, smaller facilities can be expected to have fewer and/or reduced effects on flora and fauna.
	Species at Risk	Some species are sensitive or at risk from disappearing in Ontario or in Canada and have been afforded special protections. Alternatives that have greater potential to harm these species should be avoided.	**Direct Loss of Caribou Habitat**	Caribou from the Churchill Caribou Range have the potential to be affected by the direct loss of land. Caribou require large contiguous "intact" conifer-dominated stands, islands and peninsulas. The Project area contains known wintering areas, calving/nursery areas and seasonal range habitat, and potential corridors or travel routes leading from wintering areas.
Technical	**Design Factors**	Design factors include some of the key factors that contribute to technical complexity of the water storage facility alternatives. Alternatives that are less technically challenging are generally preferred.	**Storage to Dam Volume Ratio**	Reducing the storage volume to dam volume ratio can increase the efficiency of the facility. Such facilities are generally easier to construct and require less material to build and are preferred.
	Safety Factors	Safety is a primary concern, and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore be avoided.	**Dam Height**	There is generally a proportional increase in potential consequence of dam failure with an increase in height. In the unlikely event of failure, taller facilities have greater potential energy to move materials. Shorter dam heights are therefore considered to incur less risk and are the preferred alternative.
	Water Management	Water management is a significant design consideration for the site. Reclaim water is an integral part of processing and there needs to be sufficient storage or water on site at all times. However, excess water on site will require treatment prior to discharge to ensure environmental protection.	**Complexity of Seepage Management**	As required by the MDMER, each alternative will be equipped with seepage collection infrastructure where needed, including ditching and seepage collection ponds to prevent contact water from leaving the site. Alternatives with a less complex system will allow easier compliance with the MDMER and are preferred.
Project Economics	**Capital Costs**	Capital costs required for the CWSP are a key consideration when designing the structure. Extensive earthworks and excavations result in large capital expenditures during the construction phase of the Project. Other capital costs include site clearing, infrastructure for water management and treatment, access roads, pipelines and seepage collection infrastructure.	**Site Preparation and Starter Dam Costs**	Site preparation can be a notable capital cost and is generally proportional to the area the alternative overprints. Alternatives that have a smaller footprint are preferred from a capital cost perspective. Dams are generally the most expensive capital costs of the Project for alternatives that require surface impoundment dams. The cost of constructing these dams cannot be deferred to revenue and is entirely funded by Project capital. Alternatives requiring less starter dam fill are generally less expensive and are therefore preferred.
			Seepage Collection Infrastructure Costs	Seepage collection infrastructure includes both the perimeter ditching and the seepage collection ponds. The cost of constructing the seepage collection infrastructure would be incurred as a capital cost and could not be paid by revenue. Alternatives that require less seepage collection infrastructure are therefore preferred.
	Ancillary Costs	Some of the alternatives will result in ancillary costs that will impact project economics, such as fish habitat offsetting. Alternatives with lower ancillary costs are preferred.	**Fish Habitat Compensation**	Under the *Fisheries Act*, alternatives that overprint watercourses frequented by fish will require fish habitat offsetting / compensation, which is generally proportional to the amount of habitat overprinted. Alternatives that avoid overprinting watercourses frequented by fish are therefore preferred from a Project economics perspective. This metric has been developed as a ratio, using Site W1 as the baseline (i.e., ratio of 1).
Socioeconomic	**Indigenous Land Use and Heritage Value**	Indigenous engagement is recognized as an integral part of the EA process, and the Project design is influenced by Indigenous values and Traditional Knowledge. FMG has engaged with Indigenous communities to better understand what these Indigenous values are in order to design a Project that avoids or minimizes Project-related effects on Indigenous communities.	**Loss of Indigenous Fishing Areas**	Alternatives that avoid overprinting watercourses or waterbodies will have less of an effect on Indigenous fishing opportunities and are therefore preferred.
			Changes in Plant and Wildlife Harvesting	Alternatives that impact (directly through habitat loss or indirectly through dust, noise and light) plants and wildlife will result in changes in distribution and abundance and potential quality due to real or perceived contamination. Alternatives located adjacent or within preferred plant and wildlife harvesting areas are to be avoided.

Table 7–6: Scoring Criteria and Alternative Scores

Account	Sub-account	Indicator	Criteria						Score			
			6 (Best)	5	4	3	2	1 (worst)	Site W1	Site W2	Site W3	Site W4
Environment	Fisheries Resources	Loss of Fish Habitat (waterbodies; ha)	0	0.1–3.0	3.1–6.0	6.1–9.0	9.1–12.0	>12.0	2	1	6	6
	Terrestrial Resources	CWSP Footprint (ha)	0	0.1–5.0	5.1–10.0	10.1–15.0	15.1–20.0	>20.0	6	5	3	1
	Species at Risk	Direct Loss of Caribou Habitat (ha)	0	0.1–5.0	5.1–10.0	10.1–15.0	15.1–20.0	>20.0	6	5	3	1
Technical	Design Factors	Storage to Dam Volume Ratio	>10	10.0–8.0	6.0–7.9	4.0–5.9	2.0–3.9	<2.0	6	6	2	3
	Safety Factors	Dam Height (m)	0	0.1–2.0	2.1–4.0	4.1–6.0	6.1–8.0	>8.0	6	4	2	3
	Water Management	Complexity of Seepage Management (sumps)	0	1	2	3	4	>4	6	4	4	5
Project Economics	Capital Costs	Site Preparation and Dam Costs ($)	<0.3M	0.3M–0.6M	0.61M–0.9M	0.91M–1.2M	1.21M–1.5M	>1.5M	5	5	1	2
		Seepage Collection Infrastructure Costs ($)	<40k	41k - 80k	81k–120k	121k–160k	161k–200k	>200k	6	3	1	2
	Ancillary Costs	Fish Habitat Compensation Costs (ratio)	0	0-0.25	0.26–0.5	0.51–0.75	0.76–1.0	>1.0	2	1	6	6
Socioeconomic	Indigenous Land Use and Heritage Value	Loss of Indigenous Fishing Areas (ha)	0	0.1–3.0	3.1–6.0	6.1–9.0	9.1–12.0	>12.0	2	1	6	6
		Changes in Plant and Wildlife Harvesting (ha)	0	0.1–5.0	5.1–10.0	10.1–15.0	15.1–20.0	>20.0	6	5	3	1

Table 7–7: Weighting of Accounts, Sub-accounts and Indicators

Account	Weight	Sub-account	Weight	Indicator	Weight
Environment	6	Fisheries Resources	6	Loss of Fish Habitat (waterbodies)	6
		Terrestrial Resources	3	CWSP Footprint	3
		Species at Risk	6	Direct Loss of Caribou Habitat	3
Technical	3	Design Factors	5	Storage to Dam Volume Ratio	5
		Safety Factors	3	Dam Height	3
		Water Management	2	Complexity of Seepage Management (sumps)	2
Project Economics	1.5	Capital Costs	6	Site Preparation and Dam Costs	6
				Seepage Collection Infrastructure Costs	3
		Ancillary Costs	5	Fish Habitat Compensation Costs	5
Socioeconomic	3	Indigenous Land Use and Heritage Value	5	Loss of Indigenous Fishing Areas	5
				Changes in Plant and Wildlife Harvesting	5

Table 7–8: Quantitative Analysis – Environmental Indicators

Sub-account	Indicator	Weight	Indicator Score				Merit Score			
			Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Fisheries Resources	Loss of Fish Habitat (waterbodies)	6	2.0	1.0	6.0	6.0	12.0	6.0	36.0	36.0
	ΣW	6								
	Sub-account Merit Score (Σ(S × W))						12.0	6.0	36.0	36.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**2.0**	**1.0**	**6.0**	**6.0**
Terrestrial Resources	CWSP Footprint	3	6.0	5.0	3.0	1.0	18.0	15.0	9.0	3.0
	ΣW	3								
	Sub-account Merit Score (Σ(S × W))						18.0	15.0	9.0	3.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**6.0**	**5.0**	**3.0**	**1.0**
Species at Risk	Direct Loss of Caribou Habitat	3	6.0	5.0	3.0	1.0	18.0	15.0	9.0	3.0
	ΣW	3								
	Sub-account Merit Score (Σ(S × W))						18.0	15.0	9.0	3.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**6.0**	**5.0**	**3.0**	**1.0**

Table 7–9: Quantitative Analysis – Technical Indicators

Sub-account	Indicator	Weight	Indicator Score				Merit Score			
			Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Design Factors	Storage to Dam Volume Ratio	5	6.0	6.0	2.0	3.0	30.0	30.0	10.0	15.0
	ΣW	5								
	Sub-account Merit Score (Σ(S × W))						30.0	30.0	10.0	15.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**6.0**	**6.0**	**2.0**	**3.0**
Safety Factors	Dam Height	3	6.0	4.0	2.0	3.0	18.0	12.0	6.0	9.0
	ΣW	3								
	Sub-account Merit Score (Σ(S × W))						18.0	12.0	6.0	9.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**6.0**	**4.0**	**2.0**	**3.0**
Water Management	Complexity of Seepage Management (sumps)	2	6.0	4.0	4.0	5.0	12.0	8.0	8.0	10.0
	ΣW	2								
	Sub-account Merit Score (Σ(S × W))						12.0	8.0	8.0	10.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**6.0**	**4.0**	**4.0**	**5.0**

Table 7–10: Quantitative Analysis – Project Economics Indicators

Sub-account	Indicator	Weight	Indicator Score				Merit Score			
			Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Capital Costs	Site Preparation and Dam Costs	6	5.0	5.0	1.0	2.0	30.0	30.0	6.0	12.0
	Seepage Collection Infrastructure Costs	3	6.0	3.0	1.0	2.0	18.0	9.0	3.0	6.0
	ΣW	9								
	Sub-account Merit Score (Σ(S × W))						48.0	39.0	9.0	18.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**5.3**	**4.3**	**1.0**	**2.0**
Ancillary Costs	Fish Habitat Compensation Costs	5	2.0	1.0	6.0	6.0	10.0	5.0	30.0	30.0
	ΣW	5								
	Sub-account Merit Score (Σ(S × W))						10.0	5.0	30.0	30.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**2.0**	**1.0**	**6.0**	**6.0**

Table 7–11: Quantitative Analysis – Socioeconomic Indicators

Sub-account	Indicator	Weight	Indicator Score				Merit Score			
			Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Indigenous Land Use and Heritage Value	Loss of Indigenous Fishing Areas	5	2.0	1.0	6.0	6.0	10.0	5.0	30.0	30.0
	Changes in Plant and Wildlife Harvesting	5	6.0	5.0	3.0	1.0	30.0	25.0	15.0	5.0
	ΣW	10								
	Sub-account Merit Score (Σ(S × W))						40.0	30.0	45.0	35.0
	Sub-account Merit Rating (Rs = Σ(S×W)/ ΣW)						**4.0**	**3.0**	**4.5**	**3.5**

Table 7–12: Quantitative Analysis – Sub-accounts

CWSP ALTERNATIVE -ENVIRONMENTAL SUBACCOUNT

Sub-Account	Weight	Sub-Account Score				Merit Score			
		Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Fisheries Resources	6	2.0	1.0	6.0	6.0	12.0	6.0	36.0	36.0
Terrestrial Resources	3	6.0	5.0	3.0	1.0	18.0	15.0	9.0	3.0
Species at Risk	6	6.0	5.0	3.0	1.0	36.0	30.0	18.0	6.0
ΣW	15								
Account Merit Score (Σ(S × W))						65.9	51.0	63.0	45.0
Account Merit Rating (Rs = Σ{S×W}/ ΣW)						**4.4**	**3.4**	**4.2**	**3.0**

CWSP ALTERNATIVE -TECHNICAL SUBACCOUNT

Sub-Account	Weight	Sub-Account Score				Merit Score			
		Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Design Factors	5	6.0	6.0	2.0	3.0	30.0	30.0	10.0	15.0
Safety Factors	3	6.0	4.0	2.0	3.0	18.0	12.0	6.0	9.0
Water Management	2	6.0	4.0	4.0	5.0	12.0	8.0	8.0	10.0
ΣW	10								
Account Merit Score (Σ(S × W))						59.9	50.0	24.0	34.0
Account Merit Rating (Rs = Σ{S×W}/ ΣW)						**6.0**	**5.0**	**2.4**	**3.4**

CWSP ALTERNATIVE -PROJECT ECONOMICS SUBACCOUNT

Sub-Account	Weight	Sub-Account Score				Merit Score			
		Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Capital Costs	6	5.3	4.3	1.0	2.0	32.0	26.0	6.0	12.0
Ancillary Costs	5	2.0	1.0	6.0	6.0	10.0	5.0	30.0	30.0
ΣW	11								
Account Merit Score (Σ(S × W))						42.0	31.0	36.0	42.0
Account Merit Rating (Rs = Σ{S×W}/ ΣW)						**3.8**	**2.8**	**3.3**	**3.8**

CWSP ALTERNATIVE -SOCIOECONOMIC SUBACCOUNT

Sub-Account	Weight	Sub-Account Score				Merit Score			
		Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Indigenous Land Use and Heritage Value	5	4.0	3.0	4.5	3.5	20.0	15.0	22.5	17.5
ΣW	5								
Account Merit Score (Σ(S × W))						20.0	15.0	22.5	17.5
Account Merit Rating (Rs = Σ{S×W}/ ΣW)						**4.0**	**3.0**	**4.5**	**3.5**

Table 7–13: Quantitative Analysis – Final Assessment

Account	Weight	Account Score				Merit Score			
		Site W1	Site W2	Site W3	Site W4	Site W1	Site W2	Site W3	Site W4
Environmental	6	4.4	3.4	4.2	3.0	26.4	20.4	25.2	18.0
Technical	3	6.0	5.0	2.4	3.4	18.0	15.0	7.2	10.2
Project Economics	1.5	3.8	2.8	3.3	3.8	5.7	4.2	4.9	5.7
Socioeconomic	3	4.0	3.0	4.5	3.5	12.0	9.0	13.5	10.5
ΣW	13.5								
Alternative Merit Score (Σ(S × W))						62.1	48.6	50.8	44.4
Alternative Merit Rating (Rs = Σ{S×W}/ ΣW)						**4.6**	**3.6**	**3.8**	**3.3**

Table 7–14: Sensitivity Analysis Results

Scenario	Scenario Description	Site W1	Site W2	Site W3	Site W4
Case 1	Base Case	4.6	3.6	3.8	3.3
Case 2	All accounts weighted equally	4.6	3.6	3.6	3.4
Case 3	Environment account (6) weighted twice as important as technical (3) and socioeconomic accounts (3), cost account has no weight (0)	4.7	3.7	3.8	3.2
Case 4	Environment (6) and technical (6) accounts weighted twice as important as socioeconomic (3) and cost accounts (3)	4.8	3.8	3.5	3.4
Case 5	Environment (6) and socioeconomic (6) accounts weighted twice as important as technical (3) and cost (3) accounts	4.4	3.4	3.8	3.4
Case 6	All accounts, Sub-accounts and indicators weighted equally	1.0	0.8	1.0	0.8

Note: Blue shaded cells indicate the highest scores.

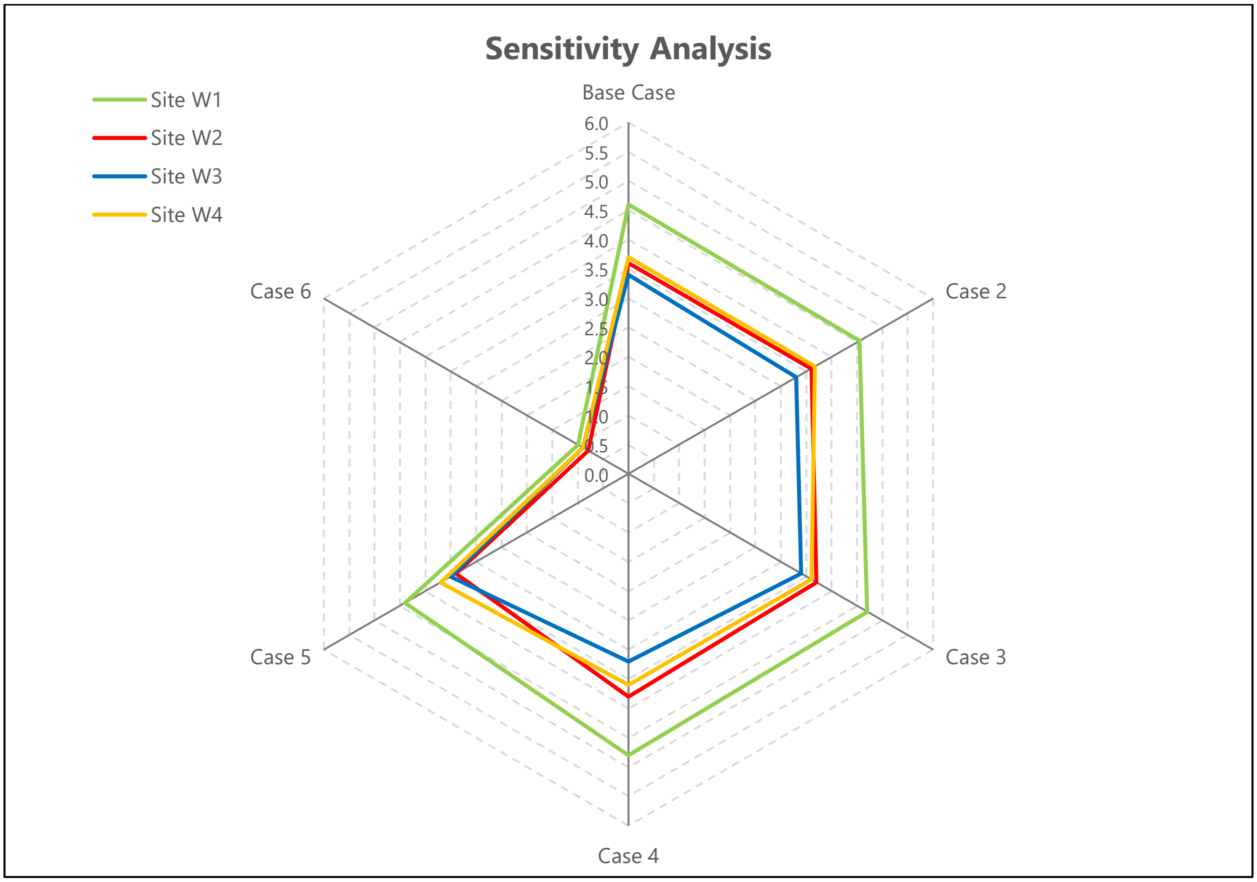


Figure 7-1: Central Water Storage Pond Sensitivity Analysis

Figure 7-2: Central Water Storage Pond Locations

8.0 CONCLUSIONS

Using the MAA method, the preferred alternative for mine waste management at the Project is co-disposal of tailings and mine rock within a surficial impoundment adjacent to the open pit. Owing to the geochemical characteristics of the ore, two separate tailings streams will be produced: thickened NAG tailings (representing approximately 80% of the tailings) and slurry PAG tailings (approximately 20%). The preferred location and configuration allows ease of integration into the overall site-wide water management plan.

NAG mine rock will be used throughout the site for construction, including in construction of the CDF dams. Mine rock to be used for these purposes will be tested to confirm it is NAG prior to use. Up to 66 Mm^3 of PAG mine rock will be deposited in the CDF with NAG tailings. The NAG tailings will be used to reduce the potential for ML/ARD generation within the CDF and will be used as a cover in the final years of mine life to inhibit the movement of oxygen through the waste pile following closure.

The use of the unnamed lake L-2 basin is the preferred alternative for the CWSP for management of contact water.

Although some fish habitat will be overprinted by the deposition of mine waste, the development of the preferred alternative for the CDF will enable the Project to be developed in a manner that minimizes overall adverse effects on the receiving environment and provides for optimal management of PAG materials and the potential for ML/ARD generation. Mitigation measures for the loss of fish habitat are described in the Draft Fish Habitat Compensation and Offset Plan for the Project (Appendix F of final EIS/EA).

Figure 8-1 presents the Project site layout along with associated runoff and seepage water management infrastructure.

Figure 8-1: Site Plan

9.0 REFERENCES

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10.0 CLOSING

This Mine Waste Management Alternatives Assessment report was prepared for FMG by WSP. The quality of information, conclusions and scheduling estimates contained here is consistent with the level of effort involved in WSP's services and based on 1) information available at the time of preparation, 2) data supplied by outside sources, and 3) the assumptions, conditions and qualifications set forth in this report.

Yours truly,

WSP Canada Inc.

Prepared by:	**Reviewed by:**
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Attachment A

Co-disposal Facility Sensitivity Analysis Tables

Attachment B

Central Water Storage Pond Sensitivity Analysis Tables