



Great Bear

Great Bear Gold Project Impact Statement

Section 4: Alternatives Assessment

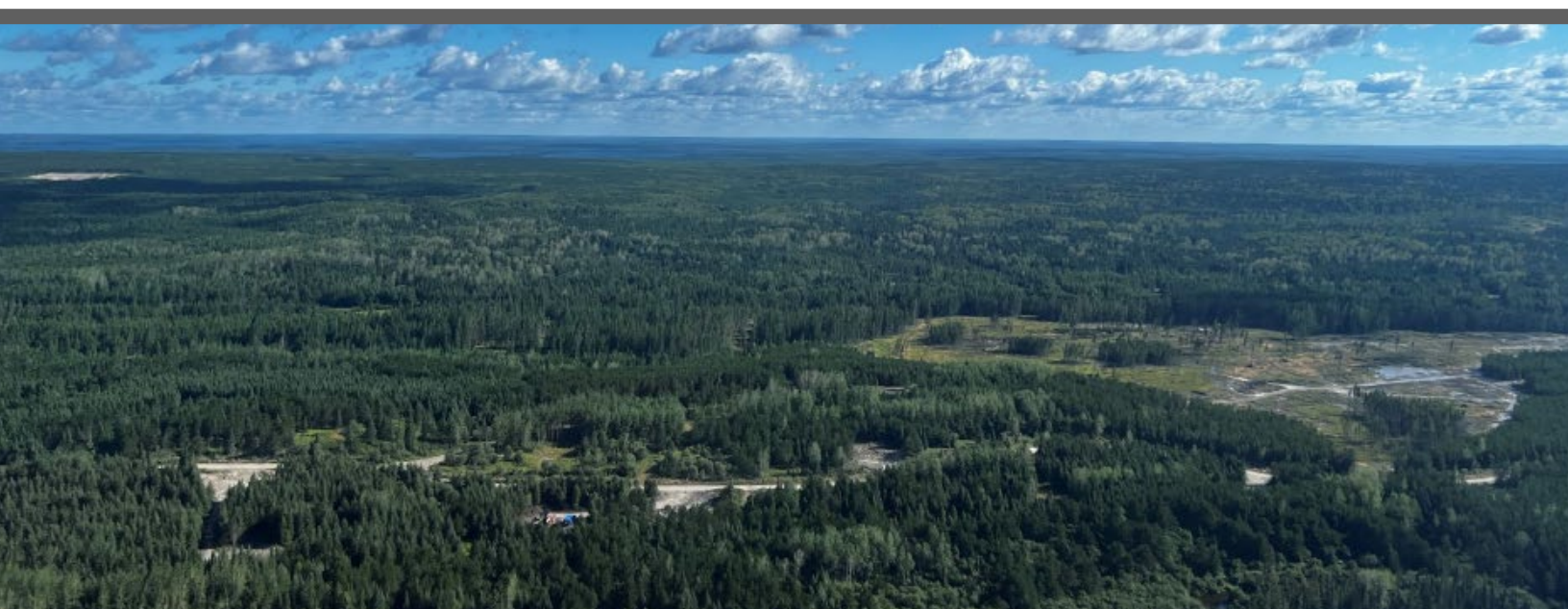


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Acronyms and Abbreviations

AEX	Advanced exploration
ANA	Asubpeeschoseewagong Netum Anishinabek
ARD	Acid rock drainage
asl	Above sea level
ECCC	Environment and Climate Change Canada
EMS	Environmental management system
GHG	Greenhouse gases
Great Bear Resources	Great Bear Resources Ltd.
H:V	Horizontal to vertical
LGO	Low grade ore stockpile
LSFN	Lac Seul First Nation
MDMER	Metal and Diamond Mining Effluent Regulation
MECP	Ministry of the Environment, Conservation and Parks
ML	Metal leaching
MNR	Ministry of Natural Resources
MRS	Mine rock stockpile
MWP	Mine water pond
NPAG	Non-potentially acid generating
NWOMC	Northwestern Ontario Métis Community
O. Reg.	Ontario Regulation
OVB	Overburden stockpile
PA	Project Area
PAG	Potentially acid generating
Project	Great Bear Project
Property	Great Bear Property
SAR	Species at risk
TISG	Tailored Impact Statement Guidelines
TMF	Tailings management facility
VMF	Viggo management facility
WFN	Wabauskang First Nation

4.0 Alternatives Assessment

4.1 Purpose of the Project

The purpose of the Great Bear Project (Project) is to extract ore by underground and open pit mining for processing on site to produce bars of gold and silver (doré bars). The doré bars will be transported off site and sold to provide a reasonable rate of return on investment while providing employment and supporting the Canadian economy.

4.2 Need for the Project

4.2.1 Demand for Project

Mining is an important industry and a major job creator in Canada. In 2022, mining and related industries made up 7.8% of the Canadian gross domestic product. Customers buying mining products from Canada can have confidence that they were mined responsibly with fewer greenhouse gas (GHG) emissions than anywhere else in the world (MAC 2024).

Ontario produces approximately 40% of the Canadian gold production. Mineral production in Ontario supports:

- 31,000 direct jobs
- 47,000 indirect jobs associated with mineral processing and mining supply and services (MINES 2024).

Gold and silver are required for many applications including for use as a monetary exchange medium; for art, jewelry and tableware; for electronic devices such as computers, cellular phones and televisions; and for medical equipment and devices and specialized medical treatments. Gold has been demonstrated to be an attractive investment during periods of political and economic uncertainty. Half of the gold consumption in the world is in jewelry, 40% in investments, and 10% in industry (Trading Economics 2024).

Although there is a strong gold recycling economy, approximately 25% of the second quarter 2024 available gold was from recycling (World Gold Council 2024), the strong global demand for gold cannot be fully met by recycling of metals already produced. This results in a need for additional mining and processing of ore containing these metals. Internal studies completed by Great Bear Resources Ltd. (Great Bear Resources) concluded that the Project could be successfully developed as an underground and open pit mining operation.

4.2.2 Alignment with Federal and Provincial Objectives

The Tailored Impact Statement Guidelines (TISG) require that the need for the Project in the Impact Statement describe whether and how the Project would support federal or provincial government objectives. As the Project is located in Ontario, it must meet applicable federal and provincial laws and regulations.

In addition, there are number of overarching government policies which outline federal and provincial objects for mining development. Three government policies have been identified, which are most pertinent to the Impact Statement and Project:

- Minerals and Metals Policy of the Government of Canada (NRCan 2024)
- Federal Net-zero emissions by 2050 (Canada 2024)
- Provincial Consultation Framework (MEM 2025).

4.2.2.1 Federal Mineral and Metals Policy

The Minerals and Metals Policy of the Government of Canada (Canada 2024) is intended to help fulfill federal government commitments. The Policy affirms provincial jurisdiction over mining, delineates a role for the federal government in minerals and metals that is tied to other federal responsibilities, and commits the government to pursuing partnerships with stakeholders in addressing issues within its jurisdiction. Two of the purposes of the policy are:

- Promoting economic growth and job creation
- Meeting the challenge of sustainable development.

The minerals and metals industry is a major contributor to Canada's economic well-being and particularly for more remote communities. The Project is located in northwestern Ontario, where mining is an important driver of the economy. The Project will generate direct, indirect and induced effects totalling \$18.7 billion in additional gross domestic product (on average \$520 million per year), 110,000 person-years of employment (3,060 persons employed in an average year), \$9.1 billion in labour compensation (on average \$250 million per year), and \$5.9 billion in government revenues (on average \$170 million per year) based on economic modelling completed (Appendix O-2). Of these total economic effects, up to 95,760 person-years of employment (2,660 persons employed in an average year) and up to \$7.9 billion in labour compensation (on average \$220 million per year) are expected to occur in the local area. Accordingly, the Project is well-aligned with promoting economic growth and job creation.

The federal government has accepted the World Commission on Environment and Development (the Brundtland Commission) definition of sustainable development as *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”* Sustainable development as described in the policy in the context of minerals and metals includes consideration of elements including:

- Finding, extracting, producing mineral products in efficient, competitive and environmentally responsible manners
- Maintaining or enhancing the quality of life and the environment for present and future generations
- Participation of stakeholders, individuals and communities.

The sustainability approach of Great Bear Resources as part of Kinross Gold Corp., focuses on responsible mining practices, prioritizing health and safety, environmental stewardship and community benefits. The aim is to generate sustainable value for investors, host countries, and communities while exceeding regulatory expectations and striving for positive impacts beyond the lifespan of the mine. Further detail regarding the approach is provided in Section 18.6.

4.2.2.2 Federal Climate Change Plan

The federal government enacted the *Canadian Net-Zero Emissions Accountability Act* in June 2021 which outlines the Canadian commitment to achieve net-zero GHG emission by 2050, as a part of Canada's efforts to avert the impacts of climate change (Canada 2024b). The Act establishes a legally binding process to set five-year national emissions-reduction targets as well as develop credible, science-based emissions-reduction plans to achieve each target.

A Net-Zero Plan (Appendix W-1) has been prepared following the requirements of the Strategic Assessment of Climate Change developed by Environment and Climate Change Canada (ECCC; 2021a), to demonstrate the commitment of Great Bear Resources for climate action and GHG mitigation in alignment with the *Net-Zero Emissions Accountability Act*. The Net-Zero Plan outlines technologies, energy source options, operating practices, and environmental practices to be implemented for the reduction of GHG emissions from all phases and all activities at the Project. Where residual GHG emissions cannot be mitigated using current technologies, carbon offset credits may be used to bring the GHG emissions to net-zero.

The implementation of the Net-Zero Plan involves the planning, evaluation, and implementation of mitigation technologies and environmental practices throughout the Project lifetime, and the implementation of offset measures to neutralize residual emissions. The Project Net-Zero Plan presents two credible scenarios to achieve net-zero emissions by 2050, supportive of the federal commitment to achieve net-zero GHG emission by 2050 (Appendix W-1).

4.2.2.3 Provincial Consultation Framework

The Consultation framework: implementing the duty to consult with Aboriginal communities on mineral exploration and mine production in Ontario (MEM 2025) outlines that the provincial Crown has a duty to consult with Indigenous communities with respect on mineral exploration and development, recognizing that consultation is a reciprocal process, calling for the good faith participation of Indigenous communities.

While the duty to consult is with the Ministry of Energy and Mines, Great Bear Resources has been responsive to supporting this policy, as demonstrated in Section 3 and the Record of Consultation provided in Appendix C. Consistent with the provincial policy, Great Bear Resources has:

- Provided communities with clear and accessible information about their proposed activities, and fully considered community capacity needs in reviewing and understanding that information, including providing funding to Wabauskang First Nation (WFN), Lac Seul First Nation (LSFN), Asubpeeschoseewagong Netum Anishinabek (ANA) and the Northwestern Ontario Métis Community (NWOMC)
- Meetings with the community and leaders have been held in person, or by videoconference according to community preferences and practical logistics, including to discuss potential concerns regarding adverse effects to Aboriginal or treaty rights
- Discussing potential ways to avoid, eliminate or minimize adverse effects to Aboriginal or treaty rights.

4.3 Identification of Alternatives

4.3.1 Background

The *Impact Assessment Act* requires the consideration of technically and economically feasible:

- Alternatives to the designated project
- Alternative means of carrying out the designated project.

Alternatives are only considered appropriate to be assessed if they provide a viable solution, and are likely to satisfy the following questions (adapted from MOE 2014):

- Are they proven and technically feasible at the scale required?
- Are they consistent with relevant planning objectives, policies and decisions?
- Are they consistent with government priority initiatives, such as climate change?
- Could potential effects to any sensitive environmental features be mitigated?
- Are they practical, financially realistic and economically feasible?
- Are they able to be implemented and at the defined location?

These questions were used to identify a reasonable range of potentially viable alternatives for assessment. A detailed assessment is completed of viable alternatives identified through this screening.

4.3.2 Influence of Consultation and Engagement

Consultation and engagement activities were initiated prior to, and have been ongoing throughout the Impact Assessment process as summarized in Section 3. Great Bear Resources provided information to stakeholders and local Indigenous Nations regarding the alternatives identified to potentially be considered in the Impact Statement, and sought feedback on these and other potential alternatives for inclusion.

Specific engagement activities where potential alternatives for assessment were presented and feedback was requested occurred in June 2023, January 2024, March 2024, May 2024 and June 2024:

- Community meeting with LSFN and WFN, June 12 and 13, 2023
- Environmental Management Committee (LSFN and WFN) meeting, January 15, 2024
- Community open houses in the Township of Ear Falls and the Municipality of Red Lake, March 18 and 20, 2024
- Community meeting in LSFN Reserve, June 17 and 18, 2024
- Community open houses in the Township of Ear Falls and the Municipality of Red Lake, March 19 and 20, 2025
- Community presentation with the Regional Consultation Committee, NWOMC, March 19, 2024

- Presentation to LSFN and WFN technical review team on tailings management, May 22, 2025
- Community presentation, NWOMC, June 11, 2025.

On June 12, 2023 representatives of the LSFN and WFN asked about alternative power technologies under consideration. Potential power alternatives being considered was also raised by a member of the public during an open house in Red Lake on November 27, 2023. Great Bear Resources indicated that supplemental power sources will be considered as the Project advances, but that they are unable to meet all the Project needs. Power alternatives are considered in Section 4.14.

During the Ear Falls open house on March 18, 2024, a member of the public asked whether the ore will be processed on site or transported off site for processing related to the Advanced Exploration (AEX) Program. Great Bear Resources indicated that the AEX Program does not include processing of ore. Alternative locations for processing ore for the Project were considered and are described in Section 4.11.

Queries were received regarding accommodations (in a Project camp versus in communities and commuting) and transport to the Project from representatives of the LSFN and WFN on June 5, 2024. Representatives of the LSFN and WFN indicated that having a camp in the middle of site may not be ideal and that noise and safety controls will need to be considered on January 23, 2025 and that separating heavy equipment and light vehicle traffic would also be important. A member of the public also queried during an open house in Red Lake on March 20, 2025 about camp plans. These comments were considered in the assessment of alternative camp locations provided in Section 4.16.

Although not specific to alternatives assessment process, a number of other comments received during engagement activities are also relevant to the assessment alternatives.

Both WFN and LSFN expressed interest in understanding how the proposed Project would affect the surrounding lands. Birds landing on the TMF was an environmental concern noted. The process plant includes a cyanide destruction circuit to lower the cyanide concentrations to a level that is protective of the environment prior to storage. In-system water treatment including alternative means of cyanide destruction is discussed in Section 4.4.3.

Potential accidents and malfunctions, particularly related to the TMF have also been raised as topics of concern (WFN / LSFN technical review team and within a confidential Indigenous knowledge report prepared for WFN). The potential for accidents or malfunctions that may have a material effect on the environment is one of the indicators considered in assessing the technical performance of viable alternatives (Section 4.5.1.2.3). Potential accidents and malfunctions are assessed in the Impact Statement for the Project (Section 16) and include dam breach scenarios (Appendix U-1). A draft spills and emergency response plan is appended as Appendix U-2, that will be expanded upon prior to construction.

Concerns have been expressed by ANA regarding the potential for changes to groundwater and surface water, and particularly water quality in the receiving environment, at a result of the Project. The potential for changes to groundwater and surface water are considered in assessing the natural environment performance of viable alternatives (Section 4.5.1.2.1). A robust Project design is proposed and regulatory requirement will need to be met. Potential effects to groundwater and surface water is consider within the assessment of all alternatives methods, and is described for the proposed Project in Section 7.5, Section 7.6 and Section 7.7.

The selection of a location for the TMF is a key component of the alternatives assessment (and for the Assessment for Alternatives for Storage of Mine Waste; Appendix R). It is a larger surface facility that has specific siting requirements and constrains the placement of other site facilities. The following key topics of interest were identified as a result of consultation input and considered for the Assessment for Alternatives for Storage of Mine Waste detailed in Appendix R:

- Water (waterbodies and watercourses)
- Plants (terrestrial footprint)
- Fish (loss of fish habitat)
- Wild Rice
- Moose
- Caribou habitat
- Loss of Indigenous trapping
- Loss of traditional foods.

These topics are also captured within the natural environment and human environmental performance objectives (Section 4.5.1.2), when in evaluating viable alternatives in this section.

4.3.3 Alternatives to the Project

The TISG require that the Impact Statement provide a description of the alternatives to the Project that are technically and economically feasible, that meet the Project need and achieve the Project purpose from the perspective of the proponent.

Mines are unique from other types of Projects for which a number of Project alternatives might be available, because the ore body to be mined has a fixed location, and the only way to proceed is to mine the ore body in place. The following potential alternatives to the Project were identified:

- Proceed with the Project in the near term as planned
- Delay the Project until circumstances are more favourable
- Abandon the Project. (i.e., no-action alternative).

No other alternatives to the Project were identified during internal proponent meetings or through consultation and engagement activities.

Table 4.3-1 provides an assessment of the identified alternatives to the Project, considered against the questions provided in Section 4.3.1.

The alternative of abandoning the Project is not a viable solution as it does not meet the Project need or purpose and is not considered for assessment. If the Project did not proceed, existing environmental baseline conditions would be maintained with no local or regional economic benefits. There would not be a return of the investment for shareholders, and abandonment of the Project could affect proponent share values as the purchase of the Property for future development was viewed favourable by the market.

4.3.4 Alternative Methods

The TISG indicates that the assessment of alternative methods should consider a number of Project components or activities where relevant to the Project, including:

- Mining
 - Underground and open pit
 - Timing options for components and phases of the Project
- Stockpile management for ore, mine rock and overburden including:
 - Location and design
 - Storage, management and re-use of excavated materials
 - Methods of managing acid mine rock drainage, neutral metal mine drainage, and/or metal(loid) leaching potential of all excavated materials
- Processing facilities location and design
- Tailings management including:
 - Tailings storage methods
 - Location
 - Methods of managing acid mine rock drainage, neutral metal mine drainage, and/or metal(loid) leaching potential of all excavated materials
- Water and wastewater management including:
 - Water supply sources (potable and industrial, surface water and groundwater)
 - Treatment technologies and techniques to control effluent quality
 - Location of effluent discharge points (construction phase and operations phase)
- Location, construction and crossing methods for waterbodies, watercourses, wetlands and other obstacles
- Aggregate (rock, and sand and gravel) supply sources
- Energy and power sources (temporary and permanent, stationary and mobile)
- Route or corridor options for linear Project components
- Domestic waste management
- Suspension, decommissioning and abandonment options (closure)
- Workforce hiring, scheduling and accommodation strategies.

For each of these Project components or activities Great Bear Resources attempted to identify a reasonable range of potentially viable alternatives (i.e., alternatives that fulfilled all the questions provided in Section 4.3.1) using information available, including from the following sources:

- Engineering studies including trade-off studies
- Proponent internal workshops, meetings and discussions

- Consultation with interested persons and comments, received during consultation and engagement activities
- Professional experience and expertise of the Impact Statement authors, briefly listed in Section 22.

The identification of potentially viable alternatives for screening and the detailed assessment methodology has also been guided in part by the results of ongoing engagement and consultation with Indigenous communities and stakeholders (Section 4.3.2). Great Bear Resources has provided information to stakeholders and local Indigenous Nations regarding the alternatives identified to be considered, and have sought feedback on these and other potential alternatives for inclusion, including as summarized in Section 3.

The potential alternatives were considered with the application of standard mitigation for potential adverse environmental effects, including but not limited to the following general topics raised during consultation and engagement to date:

- Air: dust management, controlled blasting, vehicle speed management, anti-idling policy and preventative maintenance of equipment
- Water: collect, manage and treat contact waters, design for prevention of acid rock drainage, avoid waterbodies and watercourses or compensate and offset for effects to fish and fish habitat, and implement erosion and sediment control measures
- Land: minimize clearing of natural vegetation, maintain a compact site, minimize new or parallel existing infrastructure corridors and reclaim the site after operations to mitigate potential effects to wildlife and wildlife habitat
- People: avoid or minimize adverse effects to local residences and camps, engage local indigenous communities on reclamation strategies and implement a procurement approach to support local employment and contracts, including Indigenous peoples.

Table 4.3-1 provides an assessment of the identified Project components or activities for potential alternatives, considered against the questions provided in Section 4.3.1. A summary is presented in Table 4.3-2 for the identified viable alternative methods considered for detailed assessment.

Section 4.4 provides the additional information for the Project components or activities listed in the TISG for which viable alternatives were not identified.

Table 4.3-1: Identification of Alternatives to the Project that Satisfy Initial Questions

Project Alternative	Are there alternatives that (are) ⁽¹⁾ :						
	Viable solution ⁽²⁾	Proven and technically feasible	Consistent with planning	Consistent with priorities	Support mitigation for sensitive features	Practical and economically viable	Appropriate for the location
Proceed with the Project in the near term as planned	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Delay the Project until circumstances are more favourable	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Abandon the Project	Not assessed further; see Section 4.3.3 for additional information						

Notes:

1. See Section 4.3.1 for detail regarding screening questions.
2. Only alternatives that provide a viable solution are assessed for other screening questions.

Table 4.3-2: Identification of Alternative Methods that Satisfy Initial Questions

Project Facility or Activity	Are there alternatives that (are) ⁽¹⁾ :							Alternative Method Identified
	Viable solution ⁽²⁾	Proven and technically feasible	Consistent with planning	Consistent with priorities	Support mitigation for sensitive features	Practical and economically viable	Appropriate for the location	
Mining								
Method (underground and open pit)	No	Not assessed further. A combined open pit and underground mining operation is the only viable alternative for the ore deposit based on engineering studies completed to date. Additional information is provided in Section 4.4.1.1.						
Timing	No	Not assessed further. Operating either the underground mine after open pit mining ceases, or operating the open pits after underground mining ceases is not practical, financially realistic or economically viable. See Section 4.4.1.2 for additional information.						
Mined materials management								
Mine rock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.8)
Low grade ore	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.9)
Overburden	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.10)
Ore Processing								
Location	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.11)
Technology	No	Not assessed further. The only commercially viable method for recovering gold from the ore is appropriate application of a cyanide solution to dissolve the gold present in the ore for recovery (cyanidation). The only technically and economically viable method for the destruction of residual cyanide in the is the SO ₂ / Air process. Membrane filtration is the only technical viable alternative for treating residual sulphate. See Section 4.4.3 for additional information.						
Tailings management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.6), technology (Section 4.7)
Buildings, facilities and general infrastructure	No	Not assessed further. The siting constraints posed by major facilities including the open pits, stockpiles, process plant and tailing management facility (TMF) and local watercourses, along with a primary goal to minimize the Project footprint result in few viable alternatives for the siting of most of the other required components. As such, for many of the site buildings, facilities and general infrastructure, there are no alternative locations that would be a determining factor. See Section 4.4.4 for additional information.						
Water and wastewater management								
Industrial water supply	No	Not assessed further. A high level of water re-use is proposed. The Chukuni River is the only water source within reasonable proximity to the Project that is viable to provide additional water as needed. See Section 4.4.5 for additional information.						
Potable water supply	No	Not assessed further. Establishment of a different supply for the lower volume potable water needs than the industrial water supply is not reasonable. Groundwater well(s) could potentially be installed to as a supplementary potable water source if an appropriate location could be established. See Section 4.4.5 for additional information.						
Contact water management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.12)
Membrane treatment reject solution management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.13)
Treated effluent discharge location	No	Not assessed further. The Chukuni River is the only watercourse near the PA that has a large assimilative capacity and could potentially receive the treated effluent discharge from the Project. See Section 4.4.6 for additional information.						
Aggregate supply	No	Not assessed further. The majority of the aggregate required to develop the Project will be mine rock and overburden produced incidental to ore extraction, and native materials such as sand and gravel, that must be stripped as part of development activities. Additional aggregate needs must be developed on the Property and cannot reasonably be purchased. See Section 4.4.7 for additional information.						
Water crossings	No	Not assessed further. No large water crossings including bridges or culverts are planned as part of the Project. See Section 4.4.8 for additional information.						

Project Facility or Activity	Are there alternatives that (are) ⁽¹⁾ :							Alternative Method Identified
	Viable solution ⁽²⁾	Proven and technically feasible	Consistent with planning	Consistent with priorities	Support mitigation for sensitive features	Practical and economically viable	Appropriate for the location	
Power supply	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Technology (Section 4.14)
Corridors	No	Not assessed further. The Project has been designed in part to establish a compact footprint and to take advantage of existing infrastructure corridors, to reduce environmental disturbance. No new major corridors are proposed. See Section 4.4.9 for additional information.						
Domestic waste management								
Domestic solid waste	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.15)
Domestic sewage	No	Not assessed further. For a larger industrial operation in northern Ontario that does not have access to a municipal system, the only viable solution for domestic sewage management is a package sewage treatment plant. See Section 4.4.10 for additional information.						
Workforce								
Hiring	No	Not assessed further. The hiring framework for the Project considers, both policy and statutory obligations, and a commitment to hiring of local employees where available. See Section 4.4.11.1 for additional information.						
Scheduling	No	Not assessed further. The operations work cycles at the Project will meet local labour laws and will facilitate continuous mine and process plant operation (24 hours per day, 7 days per week). Adaptation will be considered to foster inclusivity. See Section 4.4.11.2 for additional information.						
Accommodation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.16)
Mine closure ⁽³⁾								
LP Central pit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Technology (Section 4.17)
VMF	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Technology (Section 4.18)
Demolition waste	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Location (Section 4.19)

Notes:

1. See Section 4.3.1 for detail regarding screening questions.
2. Only alternatives that provide a viable solution are assessed for other screening questions.
3. Mine decommissioning and closure must satisfy the Mine Rehabilitation Code under Ontario Regulation 35/24, Rehabilitation of Lands, of the *Mining Act* or future equivalent. Select alternatives are presented herein anticipated to be of particular interest based on consultation and engagement to date.



Table 4.3-3: Alternative Methods Assessed in the Impact Statement

Potential Alternative Methods	Potentially Viable Alternatives Identified	Range of Alternatives Considered	Primary Means of Identifying Individual Alternative Methods Assessed
Tailings management (Sections 4.6 and 4.7)	<ul style="list-style-type: none"> Location Technology 	<ul style="list-style-type: none"> 15 locations 6 technologies 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies Assessment for Alternatives for Storage of Mine Waste (Appendix R)
Mine rock management (Section 4.8)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 6 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies Assessment for Alternatives for Storage of Mine Waste (Appendix R)
Low grade ore temporary storage (Section 4.9)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 4 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies
Overburden storage (Section 4.10)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 6 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies Assessment for Alternatives for Storage of Mine Waste (Appendix R)
Processing ⁽¹⁾ (Section 4.11)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 3 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies
Contact water management (Section 4.12)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 8 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies Assessment for Alternatives for Storage of Mine Waste (Appendix R)
Membrane treatment reject solution management (Section 4.13)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 10 locations 	<ul style="list-style-type: none"> Internal engineering studies including trade-off studies
Power supply (Section 4.14)	<ul style="list-style-type: none"> Technology (source) 	<ul style="list-style-type: none"> 7 technologies 	<ul style="list-style-type: none"> Internal engineering studies
Domestic solid waste (Section 4.15)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 2 location types 	<ul style="list-style-type: none"> Internal engineering studies Professional experience and judgement

Potential Alternative Methods	Potentially Viable Alternatives Identified	Range of Alternatives Considered	Primary Means of Identifying Individual Alternative Methods Assessed
Accommodations (Section 4.16)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 2 location types 2 locations 	<ul style="list-style-type: none"> Internal engineering studies
Mine closure, LP Central pit filling (Section 4.17)	<ul style="list-style-type: none"> Technology 	<ul style="list-style-type: none"> 6 technologies 	<ul style="list-style-type: none"> Internal engineering studies Professional experience and judgement
Mine closure, VMF filling (Section 4.18)	<ul style="list-style-type: none"> Technology 	<ul style="list-style-type: none"> 6 technologies 	<ul style="list-style-type: none"> Internal engineering studies Professional experience and judgement
Mine closure, demolition waste (Section 4.19)	<ul style="list-style-type: none"> Location 	<ul style="list-style-type: none"> 2 location types 	<ul style="list-style-type: none"> Internal engineering studies

Note:

- Including run of mine ore temporary storage.

4.4 Summary of Rationale for Screened Alternative Methods

This section provides an explanation for each of the Project components or activities listed in the TISG, for which using application of the standard mitigation, viable alternatives were not identified (Table 4.3-1). In many instances, alternatives could only be identified that would materially expand the Project Area (PA) without additional benefit, and are therefore considered not viable. The rationale for the alternatives for which viable alternatives were not identified is summarized in Table 4.4-1.

4.4.1 Mining

4.4.1.1 Underground and Open Pit Mining

The choice of a mining method (or methods) is a function of the:

- Geometry and character of the ore body in relation to the surrounding geology and terrain
- Available applicable technologies
- Environmental sensitivities
- Economics, ore grade and costs relative to resource value (reflective of commodity pricing).

The Great Bear deposit occurs within a large mineralized system containing a world class resource in three primary zones: LP Central, Viggo and Discovery. While a portion of the deposit is near surface, it continues at depth, and the LP Central ore zone is not constrained at depth.

The available alternatives for mining of the ore body are:

- Open pit mining only
- Underground mining only
- Combination of open pit and underground mining.

Open pit mining requires the removal of surface materials to expose the ore body, followed by the stepwise development of concentric levels (benches) into the deposit, with an inclined roadway connecting the various mining levels. Open pit mining methods are well suited to:

- Shallow ore deposits that are exposed at surface, or are near surface covered by comparatively shallow overburden
- Large deposits that have a more uniformly distributed resource or scattered, often randomly distributed pockets, that are not readily traceable by underground mining methods
- High tonnage, low grade deposits which are uneconomic using underground mining techniques.

Underground mining requires the development of an access (ramp or shaft commonly) to enter the underground workings. Where the ore is near surface and / or is not covered by host rock, underground mining must leave a substantial portion of the ore body in place (a crown pillar) to maintain ground stability.

Ramp access mining involves the use of an inclined tunnel or ramp from surface to access the ore. Drifts are driven off from the ramp into the ore body at strategic levels. Ramp mining is more suited to shallower (although at surface) deposits, because of the cycle time it takes to truck ore and mine rock up the ramp to surface.

Shaft access mining requires the construction of a vertical, underground passage (shaft) from surface to the targeted depth. Horizontal tunnels (drifts) are driven from the shaft, at planned levels to access the ore body. Mining takes place off the drifts by drilling and blasting, and ore is transported to surface using a hoist. This type of mining is best suited to deeper, ore bodies.

Where ore bodies are complex and are in part near surface, a combination of open pit and underground mining is often used to extract the ore, with open pit mining being used to recover ore closer to surface, and underground mining being used to mine higher grade, more concentrated ore zones either adjacent and connected to the open pit, or deeper than the open pit and continue at depth.

For the Great Bear deposit, a combination of open pit and underground mining is the only viable alternative. Neither open pit nor underground mining in isolation can meet the purpose of the Project and provide a reasonable return on investment. In addition, because of the depth of the deposit, both ramp and shaft access will be required over the life of mine.

4.4.1.2 Timing

Great Bear Resources investigated the optimal timing as a combination of open pit and underground mining methods are proposed. The following timing alternatives were considered:

- Underground and open pit mining occurring in sequence or at the same time
- Open pits mined in sequence or at the same time.

Operating either the underground mine after open pit mining ceased, or operating the open pits after underground mining ceased was not practical, financially realistic and economically viable. Underground mining will be developed off the AEX Program underground workings and will provide higher grade ore for processing with the lower grade ore from open pit mining filling the remaining process plant capacity. The higher grade ore is required to balance production with the open pit ore and completion of underground mining fully before, or fully after open pit mining operations cease are not viable solutions.

The optimal timing of open pit mining from an environmental perspective was determined to also be the most viable approach that met the Project purpose. Mining both the LP Central pit and Viggo pit at the same time, will unnecessarily expand the Project footprint requiring additional surface facilities. By mining the smaller Viggo pit earlier, non-potentially acid generating (NPAG) rock for construction is made available. This will minimize the environmental impact associated with additional dedicated aggregate sources on the Property, or the cost of purchasing aggregate from suppliers. By depleting the open pit during the construction phase, the Viggo pit also becomes available for storage of PAG, concentrate tailings and for contact water management. This provides the best means of managing acid mine rock drainage as the tailings will be continually under water including after closure, and reduces the on surface tailings storage requirement. Contact water storage on surface is also reduced for at least the early part of operations.

4.4.2 Ore Processing

Gold can be liberated from gold-bearing ores using various methods:

- Gravity separation which relies only on physical separation, cannot provide sufficient gold recovery for the Project to be financially viable
- Mercury amalgamation although potentially effective for recovery is not appropriate from an environmental and worker safety perspective, and is not used in the modern industry
- Aqua regia relies on a mixture of concentrated hydrochloric and nitric acids commonly used in small-scale operations for recovering gold from scrap metal and other such sources, but it is not a commercially viable method for recovering gold from large-scale gold ore processing facilities
- Thiosulphate-based and related gold recovery technologies are being investigated for gold ore processing however these technologies are not proven or considered suitable
- Utilize a cyanide solution to extract gold into solution for subsequent recovery on activated carbon.

The only commercially viable method for recovering gold from the Project ore is appropriate application of a cyanide solution to dissolve the gold present in the ore for recovery (cyanidation). Cyanide use is the industry standard for gold processing and safe procedures for cyanide handling and subsequent detoxification are well established. Cyanide is combined with alkaline earth metals for use in processing, typically sodium, potassium or calcium, with sodium cyanide being the commonly utilized reagent. Cyanide can be safely used to extract gold while protecting workers and the environment with appropriate engineering design and application of effective management practices.

Cyanidation can either occur within a process plant through a series of designed processing stages or in an on-surface heap leach. A heap leach is a large, engineered structure composed of crushed ore stockpile on top of an impermeable pad, which is irrigated with a cyanide solution to extract metals into solution for subsequent recovery. Heap leaching was not considered a viable alternative due to the technical challenges of irrigating a crushed ore stockpile in a northern climate, as well as the additional large land disturbance that would result from using this method.

The only viable method for processing the Great Bear ore is cyanidation in a process plant on the Property, with consideration to the volume of ore to be transported.

4.4.3 In-system Water Treatment

Residual waters resulting from the processing of ore in the process plant will contain free cyanide and cyanide complexed with heavy metals (metallo-cyanide complexes). Technologies considered for decreasing this residual cyanide concentration include:

- In-plant cyanide destruction and heavy metal precipitation using the SO₂/Air treatment process, followed by natural degradation in the TMF and TMF pond
- Natural degradation in a pond within the TMF supplemented with hydrogen peroxide destruction of residual cyanide in the area
- Natural degradation in a pond within the TMF.

Cyanide and metallo-cyanide complexes are inherently unstable. If cyanide-containing waters are retained in a pond for a sufficient time under the right temperature and ultraviolet light conditions, cyanide and metallo-cyanide complexes in the water will naturally break down to simpler compounds. The alternative of natural degradation alone, or in combination with hydrogen peroxide treatment, is not economically viable for the Project. As the current TMF design has limited water storage, these alternatives would require much higher TMF dams, potentially water retaining, to provide greater water storage and the longer water retention period needed for natural degradation to be reasonably effective. Accordingly, Great Bear Resources proposed to treat the tailings underflow within the process plant using the SO₂/ Air process, to reduce the concentration of residual cyanide in the tailings prior to transport to final storage locations. No other technically and economically viable alternatives have been identified.

In-plant cyanide destruction using the SO₂/ Air process as proposed, is very effective in reducing the cyanide concentration in the tailings stream, but will result in an increase in the concentration of sulphate in the residual waters from the use of the necessary treatment chemicals (such as sodium metabisulphite and sulphur dioxide) in the process.

Membrane filtration, such as reverse osmosis, is the only technically viable treatment alternative that can reduce sulphate concentrations in water to the low levels to support the overall efficacy of the integrated water management system. Membrane filtration involves directing the water to be treated through semi-permeable membranes which collect sulphate and other dissolved solids, producing clear water and a reject brine solution. Membrane filtration has a very high capital and operating cost. It is not economically or technically viable to treat all site contact waters, including for the following reasons:

- Treatment of all contact waters at the Project site would result in creation of approximately 0.6 to 1.0 Mm³ of reject solution per year that would require storage on the Property. This storage of this large volume would expand the Project footprint considerably (approximately equivalent in scale to another TMF) and is not feasible.
- Incremental capital cost of approximately \$165 million to \$200 million and operating cost of approximately \$11 million per year for water treatment in addition to the capital costs for the reject solution storage, is not financially viable for the Project.
- Additional power requirement for the membrane filtration plant and evaporation plant of approximately 3.5 MW that is not available from grid power and sufficient pipeline natural gas is not available to generate this power at the start of operations power. This additional power would only be available if the regional provincial grid or natural gas pipeline is reinforced in the future, or by diesel fired generation on the Property (at high operating cost from fuel pricing and higher air emissions including GHG production).

Membrane filtration is however, considered technically and economically viable for the Project for use in a selective manner to provide the greatest treatment benefit as proposed (Section 5.14.7). Treating the most concentrated sources water is most efficient and is also expected to have a higher treatment efficacy compared to treating all water where there is greater dilution. Alternatives for reject solution storage are assessed in Section 4.14.

4.4.4 Buildings, Facilities and General Infrastructure

A limited number of dedicated construction-related facilities will be required to support the early construction stage. Availability of access is important, as the majority of the PA will not be

reasonably accessible, until site infrastructure is developed early in the construction phase. For that reason these early facilities will be located near Tuzyk's Road within the operations footprint.

One of the primary goals of the Project is to minimize the Project footprint while still providing some flexibility of operational changes. The constraints posed by major site facilities such as the open pits, stockpiles, process plant and TMF, result in few viable alternatives for the siting of most of the other required components, within the preference to limit the overall site footprint, and avoid waterbodies and watercourses as practicable. As such, for much of the site buildings, facilities and general infrastructure, there are no alternative locations that would be a determining factor. The explosive storage magazine building has stringent regulatory requirements including for remoteness (see Section 4.4.1.4) and although in order to meet regulatory requirements it necessarily extends the Project footprint outward; the footprint has been minimized as reasonable.

Site buildings and facilities will be supported by related transport, piping and power infrastructure as needed. The overall layout has been developed to facilitate efficient operating conditions and safety, generally with the least travel distances between the facilities and reduced overall site footprint. The positioning of supporting infrastructure and supporting facilities (such as mine site roads, pipelines and the onsite electrical distribution system) is constrained by the location of facilities that they are intended to service, or the site footprint will be unnecessarily expanded. Alternatives to supporting infrastructure locations are therefore not considered.

4.4.5 Industrial Water Supply

A water supply is required for onsite industrial uses including process water, fire water and miscellaneous uses, such as for dust control and vehicle washing. The Project has been designed including through the scheduling of construction, to recycle and re-use non-contact and contact water within the PA as practicable. The greatest industrial water requirement is for commissioning of the process plant during the construction phase, as during operations there is a very high level of water re-use. Water for commissioning the process plant will be primarily sourced by constructing the starter dam in the TMF area to collect spring runoff, rather than a directed freshwater taking from a watercourse.

Even with extensive water recycling proposed for all phases of the Project, a fresh water supply will still be required for a portion of the initial process plant start-up needs, potential temporary water deficits within the water management system, specific ore process plant needs and non-potable personnel needs. Up to approximately 1,180 m³/day of fresh water will be required primarily for the process plant and for other needs during the operations phase.

The Chukuni River is the only water source within reasonable proximity to the Project that is viable year round. The Chukuni River is a large river with an average annual flow of approximately 2.6 Mm³/day near the Project (Appendix I-1). The required water taking volume is less than 0.05% of this average flow. As a pipeline corridor is present from the AEX Program, this source also minimizes the Project footprint, although a short pipeline corridor extension of approximately 200 m will be required to the intake location.

Groundwater wells cannot reasonably meet this need. There are relatively few locations with fractured bedrock or thicker overburden sediments that could potentially support effective water supply wells and for the volume required, multiple wells would be needed.

Pakwash Lake is the only other large surface water source that could reasonably provide the required volume while maintaining reduce flow or water level effects and is viable. This waterbody would require an additional infrastructure (pipeline and road) corridor of 12 km or greater length and at least three additional watercourse crossings depending on routing. This potential alternative would unnecessarily expand the PA and cause additional environmental disturbance.

Water for potable uses will likely be drawn from the Chukuni River industrial water supply pipeline for treatment. It is not reasonable to establish a different supply for the lower volume potable water needs, which would require additional infrastructure and potentially require additional environmental disturbance. Groundwater well(s) could potentially be installed to as a supplementary potable water source, if an appropriate location can be established near the required need. Groundwater well(s) are potentially being considered for some of the camp potable water demand during construction and early operations.

4.4.6 Treated Effluent Discharge Location

There will be excess water in the integrated water management system that will require discharge to the environment even with the proposed internal water recycling. The effluent will be treated to meet applicable effluent discharge requirements are met, and will be protective of the receiving water aquatic life. The treatment technology will be determined during detailed engineering design.

The Chukuni River is the only watercourse near the PA that has a large assimilative capacity and could potentially receive the treated effluent discharge from the built-out integrated water management system for the Project. The specific location of the discharge may be refined during detailed engineering in full consideration of regulatory advice. Other watercourses close the Project site, such as Dixie Creek are not appropriate for the volume of effluent discharge required from the Project during operations.

Pakwash Lake is the next nearest large waterbody. Effluent discharges to lakes are not preferred if other options are available, as they are less effective at assimilating effluent than riverine receivers, where there is a more defined current to facilitate mixing. The lack of natural mixing in lakes can potentially be mitigated using additional engineering measures. This waterbody is however, also much more distant, and a treated effluent discharge to this waterbody would unnecessarily expand the PA. This waterbody would require an additional infrastructure (pipeline and road) corridor of 12 km or greater length and at least three additional watercourse crossings depending on routing. This potential alternative would expand the PA and cause additional environmental disturbance.

4.4.7 Aggregate Supply

The majority of the aggregate required to develop the Project will be mine rock produced incidental to ore extraction, and native materials such as sand and gravel, that must be stripped as part of development activities. Additional aggregate sources (rock, and sand and gravel) will be required where sufficient inert mine rock is not available on the schedule required for the construction, and for specialty needs that cannot reasonably be supplied from these incidental sources.

4.4.7.1 Quarried Rock

There are no commercial rock quarries located near the Property, and the only viable alternative apart from re-use of mine rock as proposed, is the development of dedicated rock quarries. These quarries could be located on or off the Property. Great Bear Resources propose to develop quarries within, and close to the proposed TMF where the majority of the rock is needed, to extract rock above the water table from three elevated areas of natural bedrock.

The quarry locations were identified for potential development based on professional experience and expertise, review of publicly available mapping, and desktop and field investigations:

- Q1: west and outside of the TMF
- Q2: within northwest corner of the TMF.

Locating the quarries further away from the location or use, on or off Property, would unnecessarily expand the Project footprint and could require additional road infrastructure.

Development of rock quarries below the natural groundwater level on the Property is not being considered at this time, as it would result in dewatering effects on the local aquifer, require additional infrastructure and water management facilities, and is less practical since rock is available above the water table. Development of one or more quarries to a great depth and below the water table at the proposed or similar locations, may be revisited during the Project approvals stage, pending the results of ongoing aggregate quality investigations and feedback from regulatory authorities at the time.

4.4.7.2 Sand and Gravel

Sand and gravel required for the Project could be obtained from dedicated sand and gravel pits on the Property or purchased from existing commercial sand and gravel pits nearby. Local geology is supportive of establishment of dedicated pits on the Property and there are a number of commercial sand and gravel pits located near the Project including along Tuzyk's Road. After discussions with those operators, it was determined that the volume of sand and gravel required could only be reasonably obtained through dedicated sand and gravel pits on the Property.

Development of sand and gravel pit(s) below the natural groundwater level on the Property is not currently being considered as it would result in additional localized dewatering effects and require additional infrastructure and water management facilities. Development of deeper sand and gravel pits may be revisited during the permitting approvals stage, depending on feedback from regulatory authorities at the time.

Two sand and gravel pit locations were identified based on professional experience and expertise, review of publicly available mapping, and desktop and field investigations that are proposed to be developed:

- BS3: north of the TMF near the Hydro One Networks regional E2R transmission line
- BS3B: north of the northern edge of the TMF.

4.4.8 Water Crossings

The Project has otherwise been designed to avoid larger permanent watercourses. No large water crossings including bridges or culverts are planned as part of the Project. There is an existing minor bridge over Dixie Creek that may be upgraded to allow safe passage of vehicle

and equipment to the proposed exhaust raise location south of Dixie Creek. Existing culverts within the PA may be upgraded as needed to support heavier equipment passage.

Crossings of minor tributaries within the PA cannot be avoided in the Project design. Minor watercourse crossings where needed, will be designed and constructed to meet regulatory requirements including for fish passage.

An assessment of crossing alternatives is therefore not provided in the Impact Statement.

4.4.9 Corridors

New infrastructure corridors can expand the environmental disturbance associated with a project and change wildlife movement patterns. The Project has been designed in part to establish a compact footprint and to take advantage of existing infrastructure corridors, to reduce environmental disturbance. This includes use of Tuzyk's Road as the primary access to the Project site, and use of the existing pipeline corridor for the AEX Program to access the Chukuni River for Project (intake and discharge pipelines). Accordingly, an assessment of corridor alternatives is not provided in the Impact Statement.

4.4.10 Domestic Sewage Management

For a larger industrial operation in northern Ontario that does not have access to a municipal system, the only viable solution for domestic sewage management is a package sewage treatment plant. A package sewage treatment plant consists of a pre-engineered and pre-fabricated modular system designed to treat domestic sewage. The plant is able to produce a final effluent quality that can be either released directly to the environment or into an integrated water management system. The plant will also produce a sludge product, which is disposed of separately. There are three primary types of package sewage treatment plants: rotating biological contactors, sequencing batch reactor systems and membrane bioreactor plants. Each system has its technical advantages and disadvantages from an operability standpoint and requires qualified operators to maintain the system. These different technologies are effectively equivalent from the environmental perspective.

Septic tanks and tile fields are also used for domestic sewage management for smaller scale applications. This system consists of below ground / near below ground holding tanks into which sewage is pumped (or fed by gravity), allowing solids to settle. Clarified liquid flows to a set of buried permeable pipes (the tile field) that enable the liquid to permeate into the ground over a broad area. Bacterial processes within the ground naturally break down elements in the liquid to safe levels. Sewage solids will be periodically removed from the septic tank(s) for disposal off site at an existing facility operated by others. Tile fields are optimally developed in coarse soils such as sandy loams. Where these materials are not naturally present, the tile field is constructed with aggregate transported to site. Sufficient setbacks must be in place to avoid potential release of seepage that has not been fully treated in area waterbodies / watercourses and potable groundwater sources.

Offsite treatment of sewage will require storage of the untreated sewage in tanks on site and trucking of raw sewage to a local sewage treatment plant. The number and volume of tanks required is related to the number of workers, as well as the frequency of transport. This alternative relies on suitable capacity at the receiving facility. It also relies on reaching and maintaining an agreement for receipt of domestic sewage waste by a facility, and will result in additional road traffic. Transporting raw sewage off site for treatment, particularly during the construction phase when there is a higher number of workers, could pose a logistical challenge,

even if an offsite facility were identified with sufficient capacity. There would be increased emissions related to transport and a materially higher cost. Great Bear Resources understands that the Ministry of Environment, Conservation and Parks (MECP) is unlikely to support long term transport of sewage. The potential alternative of transporting untreated domestic sewage to a local sewage treatment plant is not a viable alternative.

4.4.11 Workforce

4.4.11.1 Hiring

A key issue raised during consultation and engagement activities to date for the Project is related to maximization of local benefits, including the potential for local hiring. The hiring framework for the Project considers, both policy and statutory obligations, and a commitment to hiring of qualified local and Indigenous employees where available. Recruitment will focus on the local community and will offer a competitive relocation package to qualified professionals who are willing to relocate permanently to the area. Great Bear will develop a strategy to hire and attract employees from local Indigenous Nations.

Consistent with the model frequently used in other operating mines in Ontario, the Project will be constructed primarily using contractors and contracted workers, shifting to owner workers after main infrastructure construction is complete. As the skillset of workers needed is often different for the construction phases versus the operations phase, use a combination of experienced contractors shifting to a permanent workforce is ideal. This also provide additional time while construction is ongoing for seeking and training the permanent workforce.

4.4.11.2 Scheduling

The operations work cycles at the Project will meet local labour laws and will facilitate continuous mine and process plant operation (24 hours per day, 7 days per week). Operating only 12 hours per day, 7 days per week, is not a viable option due to the high fixed operating costs at a mining operation.

Work cycles will match the duties and negotiated employment, and may include a different schedule for production versus non-production workers. Production workers will be divided into four crews to cover this schedule and they will work seven days on and seven days off, which is consistent with the existing Red Lake operations. The crews will work 12-hour shifts. Management and administration workers will work five days on and two days off. Great Bear Resources have noted that 14 days on and 14 days off is becoming more common at Ontario mines, and this schedule may be implemented at the Project closer to start of operations. Adaptation of these work cycles may be considered as needed to prioritize local hiring including from local Indigenous Nations, and to foster inclusivity.

4.4.11.3 Accommodations

The Project is located within a potentially reasonable daily commuting distance of both the Municipality of Red Lake and Town of Ear Falls (approximately 30 minutes each way). Great Bear Resources completed a review of available housing within both of these communities as well as the projected household demand based on community growth. This assessment concluded that there is unavailable existing accommodations to support the Project, except potentially during the early construction and later closure phases.

Although there may be some in-community housing, including but not limited to local employees, the majority of workers and contractors are expected to stay in onsite accommodations and return to their permanent home after their work period. By locating the camp (to be used during construction, operations and closure phases) within the Great Bear Property (Property), the majority of workers have reduced travel time to work which improves overall Project safety for workers with longer shifts related to fatigue. With less daily travel, therefore there is lower traffic volumes and less potential for Project-related accidents on the highway, especially during poor weather or dark conditions before and after shifts. Great Bear Resources will also continue discussions with local municipalities to support considerations for potential housing improvement or infrastructure initiatives in the region.

Two alternative onsite camp locations were considered and are assessed in Section 4.17.

4.4.12 Closure

Closure of mining projects in Ontario is regulated by the *Mining Act* administered by the Ministry of Energy and Mines. A professionally-certified Closure Plan is required prior to Project-related construction activities. The Closure Plan is required to be amended over the mine life to reflect mine changes and to update the financial assurance for reclamation activities which is held by the Province.

Mine decommissioning and closure activities whether completed progressively during operation or at closure, must satisfy the Mine Rehabilitation Code under Ontario Regulation 35/24, Rehabilitation of Lands of the *Mining Act*. The Code emphasizes physical stability on surface, underground mine stability and chemical stability. Final approaches to closure are developed during the Project permitting stage when the detailed Project design is available. Alternatives to closure of the LP Central pit, VMF and for demolition waste identified areas of interest, are provided in Section 4.17, Section 4.18 and Section 4.19 respectively, recognizing that the final approach will be provided in the certified provincial Closure Plan. Appendix S provides a copy of a preliminary Closure Plan focussed on the technical aspects required by the Mine Rehabilitation Code.

4.5 Methodology for Assessing Viable Alternatives

For each viable alternative method (summarized in Table 4.3-2), a reasonable range of potentially viable candidate alternatives were determined using information available from the following sources and others:

- Engineering studies including trade-off studies
- Proponent internal workshops, meetings and discussions
- Consultation with interested persons, and comments received during consultation and engagement activities
- Professional experience and expertise of the Impact Statement authors briefly listed in Section 22.

These candidate alternatives were screened for technical and economic viability to identify the alternatives for further assessment.

The assessment of alternatives including presentation of the primary advantages and disadvantages, has been completed at a level sufficient to distinguish the different alternatives to provide transparency regarding the selection of the preferred alternative carried forward into the Project design choices summarized in Section 5 (Project Description). The preferred means of carrying out the Project is based on a consideration of potential effects to the environment, potential effects to Indigenous peoples, and technical and economic feasibility, as required by the TISG.

4.5.1 Performance Objectives, Criteria and Indicators Overview

4.5.1.1 Performance Objectives

When a single alternative does not stand out from the others, a more comprehensive assessment is completed utilizing performance objectives and criteria to provide a structure to the assessment. Performance objectives are meaningful attributes essential for the Project's environmental and technical success and provide a basis for distinguishing amongst viable alternatives, in consideration of the sustainability principles (Section 18.6). For the Great Bear Project the key performance objectives identified are:

- Potential effects on the natural environment
- Potential effects on the health, social and economic environment and Indigenous people (termed human environment for the remainder of this section of the Impact Statement)
- Technical and economic performance.

These performance objectives are reflective of the requirements and guidance provided in the *Impact Assessment Act* and TISG, and the requirement to assess the feasibility to meet the needs of Great Bear Resources.

The TISG also specifically requires that the assessment of viable alternatives consider potential effects to following which have been incorporated into the performance objectives listed in brackets:

- Air quality
- Water quality

- Wildlife and associated habitat
- Risk from accidents and malfunctions
- Species at risk (SAR) as per the *Species at Risk Act*.

4.5.1.2 Evaluation Criteria and Indicators

Evaluation criteria and specific indicators for each performance objective were selected that could reasonably be applied to the assessment of alternatives to the Project and alternative means for the Project, consistent with the identified valued components for the Project (Section 6.3) and the TISG guidance including as described above.

Each viable alternative was evaluated against the three performance objectives using criteria specific to each performance objective in a comparative manner. Rankings of most preferred and least preferred were defined for each criteria. A ranking of equally preferred is provided if the alternatives assessed are considered equivalent for the criteria. When there is no or very limited interaction of the alternative and the criteria, a ranking of neutral is assessed.

4.5.1.2.1 Natural Environment Criteria and Indicators

The evaluation criteria and indicators used in the assessment of the alternatives for the natural environment performance objective are provided below as well as the primary information sources in addition to confidential Indigenous knowledge shared with Great Bear Resources by local Indigenous communities:

Criteria Potential effects to:	Indicators	Primary Information Sources
Air quality	<ul style="list-style-type: none"> • Change in air quality 	<ul style="list-style-type: none"> • Appendix D-1: Air Quality Baseline Report • Appendix D-2: Air Quality Modelling Report • Appendix D-3: Greenhouse Gas Assessment
Sound	<ul style="list-style-type: none"> • Change in sound level 	<ul style="list-style-type: none"> • Appendix E-1: Sound and Vibration Baseline Report (Leaves On) • Appendix E-2: Sound and Vibration Baseline Report (Leaves Off) • Appendix E-3: Noise Modelling Report
Water	<ul style="list-style-type: none"> • Change to groundwater flow direction and level • Change in flows (watercourses), and areas and levels (waterbodies) • Change in quality of groundwater and surface water 	<ul style="list-style-type: none"> • Appendix H-1: Hydrogeology Baseline Report • Appendix H-2: Hydrogeological Modelling Report • Appendix I-1: Hydrology Baseline Report • Appendix I-2: Mine Site Water Balance Report • Appendix I-3: Receiver Water Balance Report • Appendix K-1: Water Quality Baseline Report • Appendix K-2: Mine Site Water Quality Modelling Report • Appendix K-3: Receiver Water Quality Modelling Report

Criteria Potential effects to:	Indicators	Primary Information Sources
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	<ul style="list-style-type: none"> Appendix F: Blasting Vibration and Overpressure Modelling Report Appendix L-1: Fisheries Resources Baseline Report Appendix L-2: Draft <i>Fisheries Act</i> Offset Plan and MDMER Schedule 2 Fish Habitat Compensation Plan Appendix N-1: Human Health and Ecological Risk Assessment
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered Change in the level of sensory disturbance Ability to maintain wetland connectivity 	<ul style="list-style-type: none"> Appendix E-3: Noise Modelling Report Appendix F: Blasting Vibration and Overpressure Modelling Report Appendix M-1: Terrestrial Baseline Environment Report Appendix M-2: Terrestrial Technical Methods and Results Appendix N-1: Human Health and Ecological Risk Assessment
SAR ⁽¹⁾	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered Change in the level of sensory disturbance 	<ul style="list-style-type: none"> Appendix E-3: Noise Modelling Report Appendix F: Blasting Vibration and Overpressure Modelling Report Appendix M-1: Terrestrial Baseline Environment Report Appendix N-1: Human Health and Ecological Risk Assessment

Note:

- SAR: species present on Property include wolverine, bats and a few migratory birds (Appendix M-2).

4.5.1.2.2 Human Environment Criteria and Indicators

The evaluation criteria and indicators used in the assessment of the alternatives for the human environment performance objective are provided below as well as the primary information sources in addition to confidential Indigenous knowledge shared with Great Bear Resources by local Indigenous communities:

Criteria Potential effects to:	Indicators	Primary Information Sources
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	<ul style="list-style-type: none"> Appendix E-3: Noise Modelling Report Appendix O-1: Socioeconomic Baseline Report Appendix O-3: Viewshed Analysis

Criteria Potential effects to:	Indicators	Primary Information Sources
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	<ul style="list-style-type: none"> Appendix M-1: Terrestrial Baseline Environment Report Appendix N-1: Human Health and Ecological Risk Assessment Appendix P-1: Cultural Heritage Report Appendix P-2: Cultural Heritage Evaluation Report
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	<ul style="list-style-type: none"> Appendix Q-1: Terrestrial Archaeological Assessments Appendix Q-2: Marine Archaeological Assessment
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	<ul style="list-style-type: none"> Appendix O-1: Socioeconomic Baseline Report Appendix O-2: Economic Modelling Results
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation supported by local Indigenous communities Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	<ul style="list-style-type: none"> Appendix N-1: Human Health and Ecological Risk Assessment Appendix N-2: Health Impact Assessment Appendix O-1: Socioeconomic Baseline Report Appendix O-2: Economic Modelling Results

The alternatives analyses considered whether the effects to Indigenous peoples could vary for diverse populations groups. Criteria and indicators related to GBA Plus were not established, as they would not be differentiating for the alternative means that remained after screening. If differentiating advantage or disadvantages for population groups were identified, they are noted in the text.

4.5.1.2.3 Technical and Economic Criteria and Indicators

The evaluation criteria and indicators used in the assessment of the alternatives for the technical performance objective are provided below, as well as the primary information sources:

Criteria Potential effects to:	Indicators	Primary Information Sources
Ability to service the site effectively	<ul style="list-style-type: none"> • Proven effectiveness and ability to consistently meet Project needs • Potential for accidents or malfunctions that may have a material effect on the environment 	<ul style="list-style-type: none"> • Engineering studies, including engineering scoping study, prefeasibility study, topic-specific investigation reports, topic-specific trade-off studies and engineering team information • Team experience with mining projects
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> • Change to GHG emissions released to the environment 	<ul style="list-style-type: none"> • Appendix D-3: Greenhouse Gas Assessment
Cost effectiveness	<ul style="list-style-type: none"> • Potential effect on Project financing resulting from investor attractiveness or risk • Degree to which alternative provides a competitive or acceptable return on investment 	<ul style="list-style-type: none"> • Team experience with financing mining projects • Engineering studies, including engineering scoping study, prefeasibility study, topic-specific investigation reports, topic-specific trade-off studies, engineering team information

Generation of GHG air emissions, including carbon dioxide, methane and nitrous oxide emissions, are of particular interest to the assessment of alternatives, because of the relationship between GHGs and climate change on the broader scale. This criterion aligns with the federal climate change plan and the Canadian commitment to achieve net-zero GHG emission by 2050 described in Section 4.2.2.2. The Project Net-Zero Plan is provided in Appendix W-1.

4.5.2 Alternatives Assessment and Identification of the Selected Alternative

The assessment of the viable alternatives was completed in consideration of the results of consultation and engagement with Indigenous communities and stakeholders. The findings of the alternatives assessment are summarized in the text, and tables are provided at the end of individual subsections documenting the comprehensive assessments where needed. A selected alternative is identified that is carried forward as part of the Project design summarized in Section 5 (Project Description). The selected alternative is the alternative that is the most advantageous overall, based on the balance of advantages to disadvantages for each alternative.

4.5.3 Other Regulatory Processes

An alternatives assessment is a common planning approach used and used in other regulatory processes. These assessments are complementary and support the assessment provided in this section of the Impact Statement.

The MDMER (SOR/2002-222) requires that an assessment of selected mineral waste-related alternatives be completed under certain circumstances, using the approach detailed in ECCC (2021b). A draft Assessment for Alternatives for Storage of Mine Waste was provided for regulatory review during Impact Statement preparation. The document was updated to reflect comments received from ECCC, and is provided as Appendix R. The approach required by the MDMER is different than that presented in this section; however, both approaches identify the same preferred alternatives for mineral waste management.

Measures will be required to be implemented to offset habitat losses to avoid adverse effects on fish and fish habitat under the *Fisheries Act*. Preliminary alternatives related to fish habitat offsetting to meet the regulatory needs were presented in the draft *Fisheries Act* Offsetting Plan and MDMER Schedule 2 Fish Habitat Compensation Plan provided for regulatory review during Impact Statement preparation. The draft considered the results of consultation and engagement to date. The document was revised based on DFO comments and input from community workshops and an updated draft of the plan is provided in Appendix L-2. The fish habitat offsetting plan will continue to be advanced in consultation with Fisheries and Oceans Canada, ECCC and Indigenous communities in parallel with the Impact Statement process.

4.6 Tailings Management - Location

4.6.1 Background

Approximately 80 Mt of tailings will be produced by the Project. The Great Bear Resources Environmental Management System for Tailings (Standard 10.07; EMS for Tailings) requires that tailings management facilities be physically and chemically stable and that the quality of seepage or surface runoff does not endanger groundwater, surface water, human health or the environment. Consistent with this environmental management strategy, Great Bear Resources has decided to incorporate desulphurization into their process flow sheet to produce two tailings streams: a desulphurized tailings that will be NPAG, and a lower volume PAG concentrate tailings.

Tailings will be used in paste backfill for the underground workings where reasonable to reducing the quantity of tailings that require storage on surface. Approximately 26 Mt of tailings will be pumped into the underground mining workings in the paste backfill, resulting in approximately 3.3 Mt of concentrate tailings and 51 Mt of desulphurized tailings to be stored on surface.

Establishment of a water-covered surface storage for the concentrate tailings was investigated, but was determined not to be preferred from a technical perspective. Great Bear Resources determined it was viable to modify the original mine plan, to fully develop the Viggo pit during the construction phase in order that it was available for mine waste storage and water management. At the end of the construction phase when fully excavated, the two-lobe Viggo pit will be repurposed as the Viggo management facility (VMF). Re-use of Viggo pit for storage of mine wastes is consistent with the Great Bear Resources approach to environmental management. Concentrate tailings will be permanently stored under water cover in the former east lobe of the Viggo pit (east VMF).

The remaining 51 Mt of desulphurized tailings will be stored on the surface in a TMF. There is insufficient storage in the VMF and the LP Central pit cannot be used for tailings storage at the start of operations as it will be an active mine.

This section provides a summary of the alternatives assessment for the TMF location for storage of desulphurized tailings. The MDMER require that an assessment of alternatives be completed using the prescribed approach (ECCC 2021) for a TMF that will overprint a natural, waterbody frequented by fish. An Assessment for Alternatives for Storage of Mine Waste structured to meet the needs of ECCC, is provided as Appendix R that provides additional detail.

4.6.2 Screening to Identify Alternatives for Assessment

An engineering study was completed in 2023 to identify potential alternative TMF siting locations that identified 15 candidate alternative locations (WSP 2023b; Figure 4.6-1). The number of potential locations was reduced to nine using the following exclusionary criteria as detailed in Appendix R:

- Distances greater than 10 km from the centroid of the LP Central pit, as locations of greater distance will result in a larger Project footprint, greater adverse effects to the environment (GHG emissions, increased disturbed footprint, greater number of water crossings, etc.) and will also adversely affect Project economics
- Locations within 500 m from the Pakwash Provincial Park

- Located in areas that could pose a safety risk to the public or Project works
- Required overprinting existing commercial aggregate operations.

Three of these remaining nine potential candidate alternatives (A, D and E) were similar in location and overlapped. Of the three, candidate alternative E is situated in a preferential watershed (same subcatchment area as the LP Central pit and process plant) and is nearest to Project infrastructure resulting in the overall smallest footprint and infrastructure requirements and was therefore selected to assess further of these three candidate alternatives.

The remaining six candidate TMF locations (E, G, H, I, J and O) were reviewed for practicality and economic feasibility, to identify viable alternatives for assessment. The preliminary dam characteristics for the six candidate TMF locations are summarized below (WSP 2023b, 2024):

- Candidate alternative E can store up to 52 Mm³ of tailings within an area of about 345 ha, constrained by natural topography and three constructed dams. The three dams have a total length of 5,568 m with a maximum height of 18 m, requiring about 3.6 Mm³ of fill material.
- Candidate alternative G is anticipated to have a footprint of about 456 ha and is designed to store up to 54.2 Mm³ of tailings. The tailings will be constrained through a combination of natural topography and three dams constructed in low lying areas. The dams will have a total length of 6,003 with a maximum dam height of 45 m. A high volume of dam fill is required (20.6 Mm³), equivalent to nearly 40% of the volume of tailings contained.
- Candidate alternative H has an area of approximately 606 ha and is designed to store up to 59.2 Mm³ of tailings. The storage of the tailings will use natural topography and two constructed dams of total length of about 5,062 m and maximum height of 26 m, requiring 8.9 Mm³ of dam fill.
- Candidate alternative I has a footprint of about 601 ha and is designed to store up to 58.4 Mm³ of tailings. The proposed TMF configuration will require a single dam of 6,278 m total length and a maximum height of 37 m. The dam will require 39.7 Mm³ of fill material.
- Candidate alternative J has a footprint of about 340 ha and will store up to 57.3 Mm³ of tailings. The proposed TMF configuration will require a single ring dam and is anticipated to have a total dam length of 5,722 m, with a maximum height of 60 m. The dam will require 35.5 Mm³ of fill material.
- Candidate alternative O is anticipated to have a TMF footprint of about 490 ha and is designed to store up to 51.5 Mm³ of tailings. The proposed TMF configuration will require three dams that are anticipated to have a total length of 5,176 m with a maximum height of 33 m, and dam fill volume of 19.1 Mm³.

Four of the six candidate alternatives require a very high volume of rock for dam construction, resulting in a very low ratio of dam fill to tailings storage. Creating containment dams that require excessive rockfill (as much rock for the dams as 20 to 40% of volume of tailings to be stored) is impractical.

Candidate alternatives G, I, J and O are not economically viable. Costs for initial site preparation and starter dams for these alternative locations are nearly twice to ten times the cost of candidate alternatives E and H. Overall dam fill costs for the candidate alternatives G, I, J and O

utilizing a placed rock cost of \$16/m³ for comparison purposes, are also considerably higher than for candidate alternative E and H:

- Candidate alternative E:
 - Initial dam clearing and starter dam construction: \$89.7M
 - Bulk rock placement cost for full dam height: \$57.6M
- Candidate alternative G:
 - Initial dam clearing and starter dam construction: \$507.7M
 - Bulk rock placement cost for full dam height: \$319.6M
- Candidate alternative H:
 - Initial dam clearing and starter dam construction: \$241.5
 - Bulk rock placement cost for full dam height: \$142.4M
- Candidate alternative I:
 - Initial dam clearing and starter dam construction: \$893.2
 - Bulk rock placement cost for full dam height: \$635.2M
- Candidate alternative J:
 - Initial dam clearing and starter dam construction: \$714.3M
 - Bulk rock placement cost for full dam height: \$568M
- Candidate alternative O:
 - Initial dam clearing and starter dam construction: \$467.3
 - Bulk rock placement cost for full dam height: \$305.6M.

The candidate TMF locations that require a higher dam fill volume may require that additional dedicated quarries be developed for the Project to supply the necessary construction rock, as there may not be sufficient mine rock available. This would further increase the construction costs for those locations.

Based on the engineering studies and screening completed as summarized above, two potentially technically and economically viable alternative locations for storage of desulphurized tailings were identified (Figure 4.6-2):

- Alternative 1 (candidate alternative E): located about 5 km northwest from LP Central pit in a single catchment that drains to Dixie Creek which ultimately reports to the Chukuni River.
- Alternative 2 (candidate alternative H): sited 8.8 km west of the LP Central pit outside the Property boundary. Alternative 2 is located fully within the subcatchment that drains to Dixie Lake, ultimately reporting to the Chukuni River via Dixie Creek. A diversion channel would be required to manage the non-contact water from upstream of Alternative 2 to minimize the volume of contact water requiring management.

Both alternatives overprint aquatic and terrestrial habitat. Table 4.6-1 provides a summary of select environmental features, including the small waterbodies and watercourses overprinted, as well as interests of Indigenous communities (Wild Rice and Moose habitat) for the two alternative TMF locations.

4.6.3 Assessment of Alternatives

Alternative 2 is not considered a viable alternative from the perspective of land tenure.

Alternative 2 is located off the Property on Crown lands with mining claims held by others, and overlaps a Ministry of Natural Resources (MNR) alienation (KRL-93/94) established to ensure the ecological integrity of a research site (permanent sample plot) for a long-term study. There is no certainty that the MNR alienation could be removed and Great Bear Resources would be able to obtain the mineral claims currently held by others to obtain the mining lease needed to construct, operate and close a TMF at this location.

Alternative 2 also has the following disadvantages (and no identifiable advantages) over Alternative 1:

- Greater distance (additional approximately 3.8 km) from the rock sources for construction of required dams, which would result in increased GHG emissions and operating costs
- Overprints a substantially greater amount of aquatic habitat (waterbody area and watercourse length) and Moose habitat (late wintering and foraging)
- Overall higher costs primarily related to the requirement to transport nearly 2.5 times the rock for dam construction.

Based on the descriptions above, Table 4.6-1 and the detailed alternatives assessment provided in Appendix R, the selected alternative carried forward in Section 5 (Project Description) without additional assessment required is:

- Alternative 1: located about 5 km northwest from LP Central pit.

Table 4.6-1: Summary of TMF Alternative Locations Select Attributes

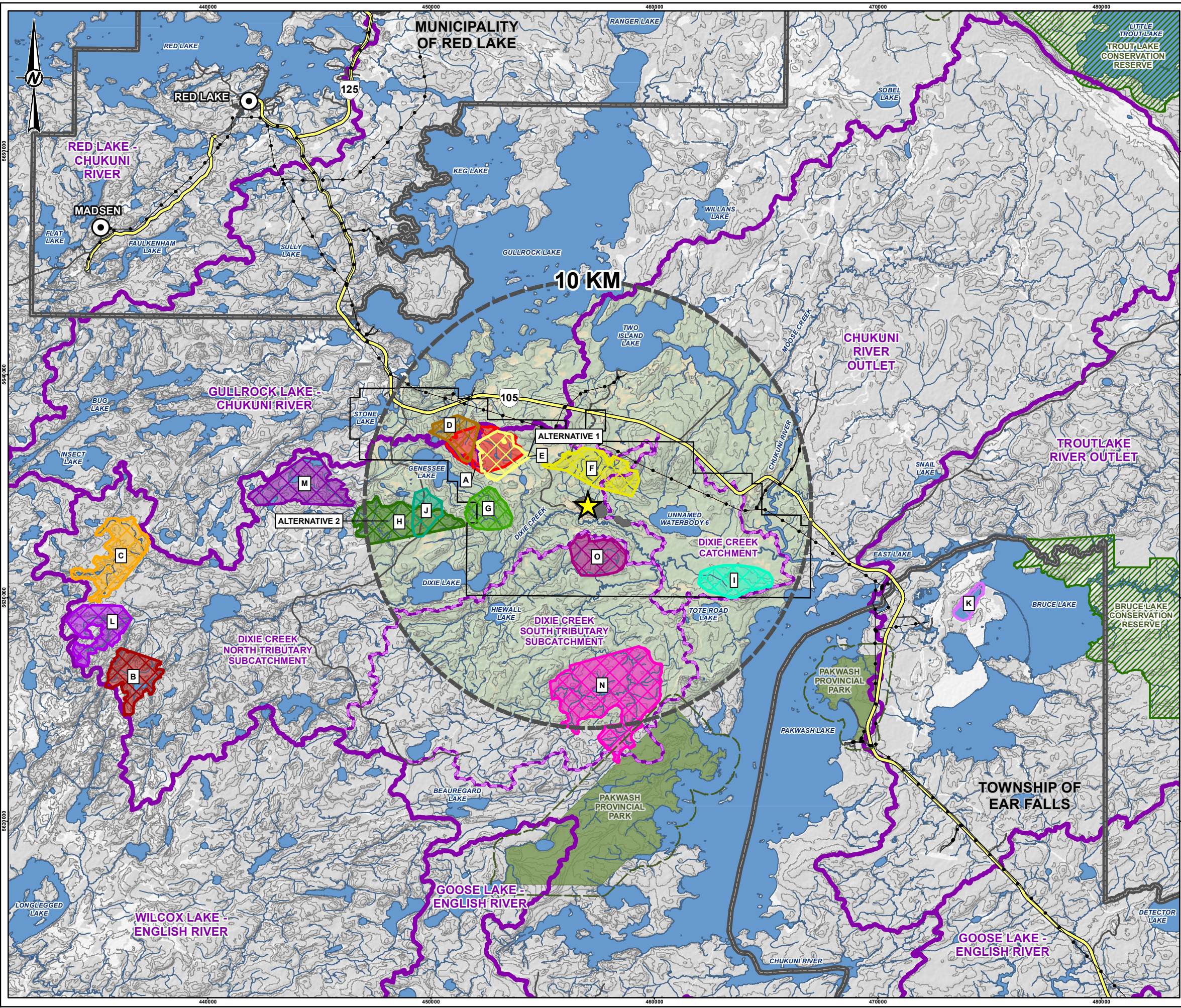
	Alternative 1 5 km northwest of LP Central pit	Alternative 2 8.8 km west of LP Central pit
Distance from LP Central pit centroid (km)	5	8.8
Land tenure	On Property	Off Property
TMF and dam footprint (ha)	345	606
Total length of dams (m)	5,568	5,062
Maximum dam height (m)	18	26
Dam fill volume required (Mm ³)	3.6	8.9
Storage to Dam Construction Fill Volume Ratio	14.72	6.00
Aquatic habitat (waterbody; ha)	1.6	2.1
Aquatic habitat (watercourse; km)	5.1	9.5
Number of watercourse crossings	2	3
Wild Rice (ha) ⁽¹⁾	0	0
Moose late wintering habitat (ha) ⁽¹⁾	307.1	563.9
Moose foraging habitat (ha) ⁽¹⁾	4.6	32.7

Notes:

Bold attributes are preferred.

See also Appendix R.

1. During consultation and engagement local Indigenous communities identified that Wild Rice stands and Moose habitat were of interest. This area is directly overprinted by the alternative.

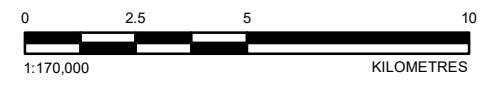


LEGEND

- ★ APPROXIMATE OPEN PIT CENTROID
- OPEN PIT
- OPEN PIT CENTROID BUFFER (LABELED ON MAP)
- PROPERTY BOUNDARY
- TOWN
- PROVINCIAL PARK
- PROVINCIAL PARK 500 M BUFFER
- CONSERVATION RESERVE
- EXISTING TRANSMISSION LINE
- HIGHWAY
- LOCAL ROAD
- LOWER TIER MUNICIPAL BOUNDARY
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- QUATERNARY CATCHMENT
- DIXIE CREEK SUBCATCHMENT

TAILINGS MANAGEMENT FACILITY ALTERNATIVES

■ CANDIDATE ALTERNATIVE A	■ CANDIDATE ALTERNATIVE I
■ CANDIDATE ALTERNATIVE B	■ CANDIDATE ALTERNATIVE J
■ CANDIDATE ALTERNATIVE C	■ CANDIDATE ALTERNATIVE K
■ CANDIDATE ALTERNATIVE D	■ CANDIDATE ALTERNATIVE L
■ CANDIDATE ALTERNATIVE E	■ CANDIDATE ALTERNATIVE M
■ CANDIDATE ALTERNATIVE F	■ CANDIDATE ALTERNATIVE N
■ CANDIDATE ALTERNATIVE G	■ CANDIDATE ALTERNATIVE O
■ CANDIDATE ALTERNATIVE H	



NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
 2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNR) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
 3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
 4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
 5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
TAILINGS MANAGEMENT FACILITY ALTERNATIVE LOCATIONS

CONSULTANT	YYYY-MM-DD	2026-03-31
	DESIGNED	---
	PREPARED	MD
	REVIEWED	---
	APPROVED	SD

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	4.6-1

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4.7 Tailings Management - Technology

4.7.1 Background

The means of transporting and storing tailings at the preferred TMF needs to contain the tailings in a structurally sound manner, be capable of withstanding natural events during operation, and be designed to ensure the long-term stability of the tailings after the mine closes. The approach also needs to be supportive of contact water management. For the Great Bear Project, energy efficiency is also important, as power availability is restricted in the region.

The MDMER require that an assessment of technology alternatives be completed using the prescribed approach (ECCC 2021) for a TMF that will overprint a natural, fish-bearing waterbody. The Assessment for Alternatives for Storage of Mine Waste provides additional detail (Appendix R).

4.7.2 Screening to Identify Alternatives for Assessment

Six potential candidate tailings storage technologies were identified as part of an engineering study for the Project (WSP 2023a) for initial screening. Each are described briefly below for reader understanding:

- Thickened slurry tailings, candidate technology A: are a tailings slurry with a typical consistency of solids content in the range of 30% to 40% solids by weight. This has been the conventional, more traditional method of tailings storage at northern Ontario mining operations and is one of the least expensive methods of tailings transfer and storage. Tailings are delivered to the TMF via a pipeline and are deposited hydraulically in a loose state. Embankment dams or natural topography are required to retain the tailings. Thickened slurry tailings are typically characterized by low strength, high water content and complex water management, with tailings potentially releasing high amounts of water to recovery ponds until fully drained.
- Thickened tailings, candidate technology B: have been dewatered at the process plant to a solids content in the range of 40% to 60% solids by weight. The tailings are delivered by pipeline and deposited hydraulically. Embankment dams or natural topography are required to retain the tailings. As the thickened tailings are deposited, the solids will segregate with the coarser material settling closer to the point of discharge and the finer fraction transported further from the discharge point. Thickened tailings produce reduced amounts of reclaim water compared to thickened slurry tailings, and can form nominally steeper beach angles therefore requiring less storage capacity as compared to candidate technology A.
- High-density thickened tailings, candidate technology C: have a solids content in the range of 60% to 70% solids by weight with dewatering occurring before the tailings are delivered to the TMF. The tailings are delivered in a pipeline and deposited hydraulically. High-density thickened tailings in general have steeper slopes on deposition compared to thickened slurry tailings. Embankment dams are required for containment, but can generally be reduced in size if beach slopes and natural topography can be utilized. High-density thickened tailings facilities generally operate with no or small ponds on the tailings surface, as less water is released from the tailings compared to thickened tailings slurry and thickened tailings.

- Paste tailings, candidate technology D: have a solids content in the range of 70% to 75% solids by weight with dewatering (i.e., water recovery) occurring before the tailings are delivered to the TMF. These tailings are delivered in a pipeline and deposited hydraulically in steeper slopes. Embankment dams are required for containment but can generally be reduced in size. Paste tailings management is not typically used for surface storage, and is not recommended for moderate to high production mines or with coarse tailing materials. Paste tailings as a sole solution is not suitable for the Project. The Project plans to use cemented paste backfill to backfill underground voids, but the underground workings can only store a portion of the tailings due to void spacing and extra tonnage of tailings resulting from the surface open pit operation.
- Filtered tailings, candidate technology E: are typically dewatered to a solids content of 80% or more before conveyance to the management facility. Filtered tailings are delivered to the TMF via truck or conveyor, bulldozed in lifts and compacted. Embankment dams are generally not required but structural zones within the TMF are often required. Filtered tailings have a high cost associated with the construction and placement of material and energy usage.
- Tailings and mine rock co-disposal, candidate technology F: refers the storage of tailings and mine rock in the same facility. Co-disposal could allow for the desulphurized tailings to cover placed mine rock. Covering of PAG mine rock in a co-disposal TMF with desulphurized tailings would help limit the onset of ML / ARD by decreasing the oxygen ingress through the desulphurized tailings to the underlying mine rock. The required management strategy requires increased handling of the mine waste materials to properly cover the PAG mine rock with a layer of desulphurized tailings such that the oxygen ingress would be appropriately limited to reduce the onset of acidity. Mine rock will predominantly be extracted from the LP Central pit, which will be developed during the first nine years of production. There may be insufficient desulphurized tailings to sufficiently cover the PAG mine rock during deposition. As such, the mine rock may be left uncovered for a number of years while waiting on sufficient desulphurized tailings material, which could result in the onset of acidity and deterioration of water quality from the mine rock (and negating the primary benefit of co-disposal). There are extremely high costs associated with management of the mine waste streams for the effective placement of mine rock and desulphurized tailings during co-disposal, which would negatively affect the Project economics. The risk of cost escalation for this technology is considered high as insufficient desulphurized tailings cover over the mine rock may result in the onset of acidity and result in poor water quality requiring additional costs for management.
- Tailings in-pit disposal, candidate technology G: requires the availability of a mined-out pit for storage. Pre-mining the Viggo pit during the construction phase is proposed to support in-pit disposal of concentrate tailings, reject solution and contact water. As LP Central pit will be actively mined for the first nine years of operations, it is not available for tailings storage. As that pit is connected to the underground workings, it is also not technically viable, unless effective bulkheads can be established to provide safe working conditions for workers in the underground mine.

The number of potential disposal alternatives was reduced after an assessment for the following critical criteria as detailed in Appendix R:

- Tailings disposal method is not feasible with the mine plan
- Method does not provide a significant benefit from the base case (thickened tailings slurry)
- There is an associated increased risk for cost escalation (capital costs and operating costs) over the life of the Project.

Candidate technologies F and G are not technically feasible with the proposed mine plan:

- Candidate technology F tailings and mine rock co-disposal is not technically feasible for the Project as the method relies on coincidental tailings and mine rock production and deposition. As the bulk of the mine rock is produced during the construction phase (Viggo pit) and when the LP Central pit is operating, co-disposal would require temporary storage and subsequent re-handling of mine rock into the co-disposal facility. This would require excessive handling of materials and would also not be economically feasible.
- Candidate technology G tailings in-pit disposal is not technically feasible for the entire Project. There is insufficient storage space in the Viggo pit for all of the tailings that will be produced over the life of the mine. Great Bear Resources may consider storage of desulphurized tailings in the LP Central pit after that pit is mined out; however, it is not currently in the Project design due to the potential or perceived safety risk posed by storage of tailings above active underground mine workings. In-pit tailing storage in LP Central pit may be revisited during operations, if the underground workings nearby are fully backfilled.

Candidate technology D (paste tailings) and E (filtered tailings) are not technically or economically feasible for the Project. Paste tailings is not a proven technology at high production rates. Both technologies require a very high energy consumption. Energy availability for the Project is highly constrained by the lack of available grid power, which make these technologies not feasible.

Candidate technology B (thickened tailings) is a midpoint on the slurry solids concentration gradation between candidate technology A (thickened slurry tailings) and candidate technology C (high-density thickened tailings). During the engineering trade-off study, it was found to not offer any additional benefit over these other candidates, so was not carried forward into the detailed alternatives assessment.

Based on the viability assessment summarized above, two alternative tailings disposal methods were identified for surface storage of the desulphurized tailings for further assessment:

- Alternative 1 (candidate technology A): thickened slurry tailings
- Alternative 2 (candidate technology C): high-density thickened tailings.

As noted in Section 4.6.1, Great Bear Resources propose to reuse tailings in paste backfill for the underground workings as practical and store concentrate tailings in the depleted Viggo pit (in the east VMF).

4.7.3 Assessment of Alternatives

A preliminary assessment of Alternatives 1 and 2 was made against the three performance objectives (natural environment, human environment, and technical and economic). The technologies were determined to be equivalent and there were no differentiating advantages or disadvantages for either alternatives for the natural environment and human environment performance objectives. The alternatives were also equivalent from a technical and economic perspective with no differentiating advantages or disadvantages except for costs.

An engineering trade-off study determined that Alternative 2 (high-density thickened tailings) will have lower capital, operating and sustaining costs compared to the thickened tailings alternative, and is the economically-preferred alternative for the Project (Appendix R).

Based on the descriptions above and detailed alternatives assessment provided in Appendix R, the selected alternative carried forward in Section 5 (Project Description) without additional assessment required is:

- Alternative 2: high-density thickened tailings.

4.8 Mine Rock Management

4.8.1 Background

Mine rock will be extracted from the LP Central pit and the underground mine during the construction and operation phases, and from the Viggo pit during the construction phase of the Project. Mine rock that is suitable will be used in site construction and maintenance, including for dam construction and dam raises at the TMF, to minimize the requirement for dedicated aggregate sources. Mine rock not suitable for construction will need to be stored in a surface MRS, as tailings will be used to backfill the underground workings where practical. Mine rock will also be used in select locations in the underground to fill voids as rockfill, although paste backfill will be primary backfill over the life of mine. Over the mine life it is anticipated that up to 76 Mm³ of mine rock will require storage.

Mine rock will be segregated as NPAG or PAG using a defined criteria for storage in separate areas of the MRS. It is anticipated that the MRS will achieve its final contours when the mining of LP Central pit ceases. The PAG MRS will be progressively rehabilitated during operations, where practical.

This section provides a summary of the alternatives assessment for the MRS location. The MDMER require that an assessment of alternatives be completed using the prescribed approach (ECCC 2021) for a MRS that will overprint a natural, fish-bearing waterbody. The Assessment for Alternatives for Storage of Mine Waste provides additional detail (Appendix R).

4.8.2 Screening to Identify Alternatives for Assessment

In-pit storage (backfilling) is not operationally feasible for the proposed mine plan, as the Viggo pit is already being re-purposed for concentrate tailings storage, and mine rock cannot be stored in the LP Central pit while it is being actively mined. Great Bear Resources will continue to investigate the potential for mine rock being retained in the LP Central pit nearing the end of open pit operations; however, a surface storage stockpile will be required for the majority of the mine rock that will be produced.

The MRS needs to be close to the primary sources of mine rock (i.e., the LP Central pit and Viggo pit) to minimize the overall Project footprint, minimize environmental effects (such as GHG emissions from rock transport), and to be economically feasible. Six candidate MRS locations (candidate alternatives A through F) were identified in proximity to the open pits as shown in Figure 4.8-1. As candidate MRS alternatives A and B overprint the preferred TMF location discussed in Section 4.6, these alternatives were not considered further.

Four MRS location alternatives were carried forward for assessment (Figure 4.8-1):

- Alternative 1 (candidate alternative C): situated about 2 km south of the LP Central pit on the southern side of Dixie Creek. Alternative 1 will have a footprint of about 279 ha and will overprint both aquatic and terrestrial habitat. This alternative will require a new haul road crossing of Dixie Creek.
- Alternative 2 (candidate alternative D): similarly situated, about 1 km south of the LP Central pit on the southern side of Dixie Creek. This alternative will have a footprint of about 262 ha and will overprint both aquatic and terrestrial resources. A new haul road crossing of Dixie Creek will be needed for this alternative.

- Alternative 3 (candidate alternative E): wholly situated within the Property and was designed to not overprint waterbodies or watercourses that may be frequented by fish. In order to accommodate the anticipated quantity of mine rock and avoid potential waterbodies and watercourses that may be frequented by fish, two stockpiles will be required, one of which is located close to Pakwash Lake. Both of the stockpiles are located east of the Viggo pit / VMF with one located on either side of Dixie Creek. A new haul road crossing of Dixie Creek will be needed for this alternative. This alternative will have a combined footprint of about 475 ha. Having two locations that are not adjoining will require considerable additional infrastructure, including for water management.
- Alternative 4 (candidate alternative F): located about 1 km north of LP Central pit on the northern side of Dixie Creek within the Property. This alternative will have a footprint of about 165 ha. Proposed MRS Alternative 4 will overprint both aquatic and terrestrial resources, noting that the minor headwater tributaries of Dixie Creek that would be overprinted would not be viable as they are intersected by the LP Central pit.

Table 4.8-1 provides a summary of provides a summary of select environmental features, including the small waterbodies and watercourses overprinted, as well as interests of Indigenous communities (Wild Rice and Moose habitat).

4.8.3 Assessment of Alternatives

A preliminary assessment of Alternatives 1, 2, 3 and 4 was made against the three performance objectives (natural environment, human environment, and technical and economic). Based on the Table 4.8-1 and the detailed assessment provided in Appendix R, Alternative 4 is clearly the preferred alternative over Alternatives 1, 2 and 3, with the following primary advantages:

- Alternative offers the shortest haul distance would result in lower air and GHG emissions and lower operating costs, and greater efficiency of operations; other alternatives are more than twice as distant
- Alternative 4 is the only alternative that supports gravity collection of runoff and seepage from the stockpile is captured in an open pit at closure, which would provide an additional buffer and environmental protection
- Alternative 4 maintains a smaller, compact Project footprint primarily located north of Dixie Creek:
 - Alternatives 1 and 2 considerably expand the footprint south of Dixie Creek
 - Alternative 3 expands the footprint considerably eastward, towards the Chukuni River.

The only identified disadvantage of Alternative 4 in comparison to the other alternatives, is that it would require a greater maximum height. The additional height is required to maintain a compact footprint in order to be situated on preferred subsurface conditions for geotechnical stability. This does however, provide the advantage of having a reduced effect on terrestrial habitat when compared to the other alternatives. The additional height is not of concern from the perspective of stability, but it may result in the top of stockpile being just visible in the far distance (i.e., greater than approximately 10 km), from a few viewpoints and times of the year, when it reaches its maximum extent. This would be mitigated by revegetation.

Based on the descriptions above and detailed alternatives assessment provided in Appendix R, the selected alternative carried forward in Section 5 (Project Description) without additional assessment required is:

- Alternative 4: located about 1 km north of LP Central pit.

Table 4.8-1: Summary of MRS Alternative Locations Select Attributes

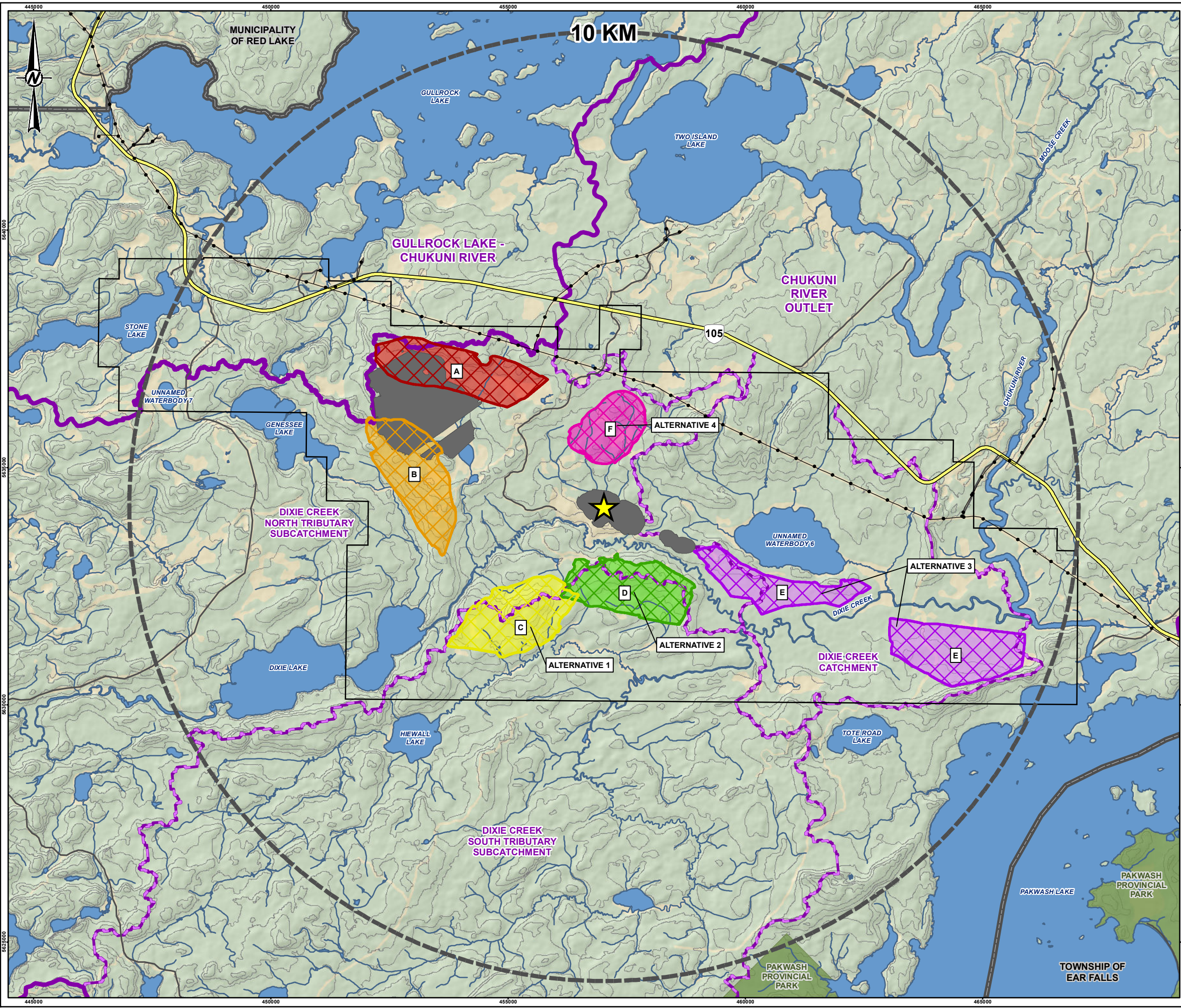
	Alternative 1 2 km south of LP Central pit	Alternative 2 1 km south of LP Central pit	Alternative 3 East of Viggo pit	Alternative 4 1 km north of LP Central pit
Haul distance (km)	2.9	2.6	6.4	1.1
MRS footprint (ha)	279.3	262.0	475.1	165.0
Haul / Access Road Corridor Footprint (ha)	4.6	4.1	4.4	1.5
Maximum MRS height (m)	90.0	72.9	41.6	140.0
MRS Cover and Reclamation Costs (\$M)	\$42.8	\$40.2	\$72.8	\$25.3
Aquatic habitat (waterbody; ha)	0.6	0.0	0.0	0.0 ⁽³⁾
Aquatic habitat (watercourse; km)	2.6	2.2	0.0	0.0 ⁽³⁾
Number of watercourse crossings	3 ⁽²⁾	1 ⁽²⁾	1 ⁽²⁾	0
Wild Rice (ha) ⁽¹⁾	0	0	0	0
Moose late wintering habitat (ha) ⁽¹⁾	276.3	258.9	471.5	163.7
Moose foraging habitat (ha) ⁽¹⁾	2.3	6.8	44.8	1.6

Notes:

Bold attributes are preferred.

See also Appendix R.

1. During consultation and engagement local Indigenous communities identified that Wild Rice stands and Moose habitat were of interest. This area is direct overprinting by the alternative.
2. Crossings listed include Dixie Creek.
3. Aquatic habitat of minor tributaries to Dixie Creek (5.1 km) and a minor waterbody (0.1 ha) present that would be overprinted is not listed, as it would not be viable due to intersection by open pit located downgradient from stockpile location.

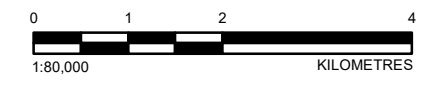


LEGEND

- ★ APPROXIMATE OPEN PIT CENTROID
- KEY MINE FEATURE (OPEN PIT AND TAILINGS MANAGEMENT FACILITY)
- OPEN PIT CENTROID BUFFER (LABELED ON MAP)
- ▭ PROPERTY BOUNDARY
- PROVINCIAL PARK
- EXISTING TRANSMISSION LINE
- HIGHWAY
- LOCAL ROAD
- ▭ LOWER TIER MUNICIPAL BOUNDARY
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- QUATERNARY CATCHMENT
- DIXIE CREEK SUBCATCHMENT

MINE ROCK STOCKPILE CANDIDATE ALTERNATIVES

- CANDIDATE ALTERNATIVE A
- CANDIDATE ALTERNATIVE B
- CANDIDATE ALTERNATIVE C
- CANDIDATE ALTERNATIVE D
- CANDIDATE ALTERNATIVE E
- CANDIDATE ALTERNATIVE F



NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
 2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
 3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
 4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
 5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
MINE ROCK STOCKPILE ALTERNATIVE LOCATIONS

CONSULTANT	YYYY-MM-DD	2026-03-31
DESIGNED	---	
PREPARED	MD	
REVIEWED	---	
APPROVED	SD	

PROJECT NO.	CONTROL	REV.	FIGURE
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4.9 Low Grade Ore Temporary Storage

4.9.1 Background

Mined low grade ore will be placed in a LGO unless it is sent directly for processing during operations. The LGO will need to be situated proximal to the process plant to reduce the high costs associated with double handling. The amount of material in the LGO will vary over the life of the mine up to approximately 14 Mm³ of low grade ore.

4.9.2 Screening to Identify Alternatives for Assessment

Four candidate LGO location alternatives were identified for the Project that were not in conflict with the preferred TMF or MRS (Figure 4.9-1). The four candidate alternatives were screened for technical and economic viability using the following criteria:

- Located less than 2.5 km from the process plant.

Based on that criteria, two alternative LGO locations were identified for further assessment:

- Alternative 1 (candidate alternative B): is located about 2 km west of LP Central pit and south of the process plant, close to the regional transmission line and Property boundary. Haul distance is approximately 2.1 km. It covers an area of about 39.1 ha and has a maximum height of about 50 m.
- Alternative 2 (candidate alternative D): is about 1 km northwest of the LP Central pit and south of the preferred MRS. Haul distance is approximately 0.8 km. The maximum extents of this LGO alternative will be 49.8 ha with a maximum height of 60 m.

Table 4.9-1 provides additional information regarding each alternative location, including a summary of the small waterbodies and watercourses overprinted, and habitats and vegetation communities associated with the interests of Indigenous communities (Wild Rice and Moose habitat).

4.9.3 Assessment of Alternatives

A preliminary assessment of Alternatives 1 and 2 was made against the three performance objectives (natural environment, human environment, and technical and economic).

Alternative 2 (east of process plant) has the following primary advantages and would be most preferred for all performance objectives:

- Maintains a smaller, compact Project footprint
- Shorter haul distance (approximately half the distance of Alternative 1) would result in lower air and GHG emissions, and lower operating costs
- Overprint a single watercourse that would be made non-viable, by its intersection with the LP Central pit.

No advantages were identified for Alternative 1. Alternative 1 unnecessarily expands the Project footprint, which is counter to the best practice and the preference of Great Bear Resources to establish a compact footprint to reduce overall environmental disturbance. This alternative would also overprint two minor tributaries to Dixie Creek.

Based on the descriptions above additional assessment was not needed to identify the selected alternative carried forward in Section 5 (Project Description):

- Alternative 2: located south of the MRS.

Table 4.9-1: Summary of LGO Alternative Locations Select Attributes

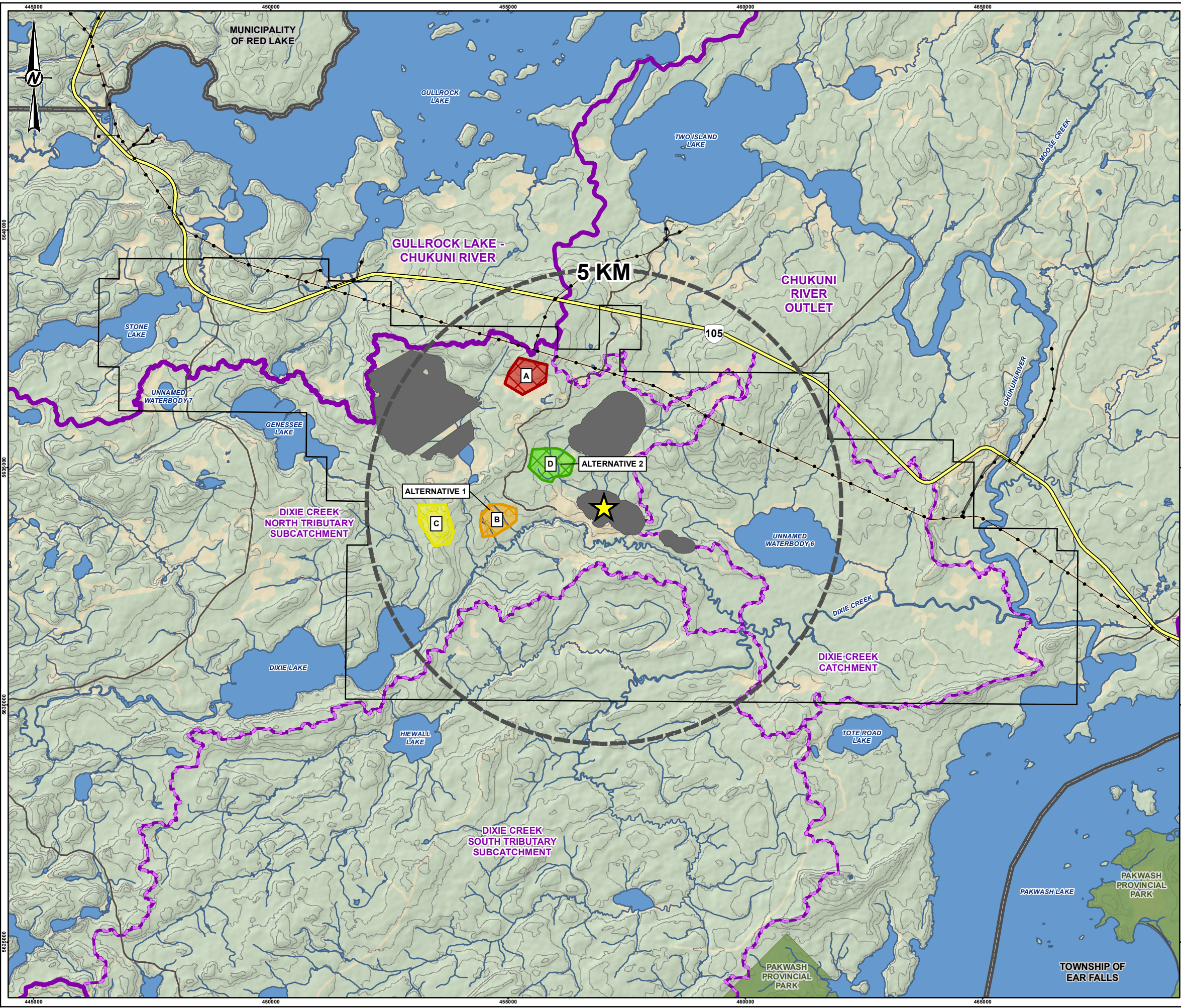
	Alternative 1 South of Process Plant	Alternative 2 East of Process Plant
Haul distance (km)	2.1	0.8
LGO footprint (ha)	39.1	49.8
Haul / Access Road Corridor Footprint (ha)	0.5	0 ⁽²⁾
Maximum LGO height (m)	50	60
Aquatic habitat (waterbody; ha)	0.2	0.0
Aquatic habitat (watercourse; km)	1.1	0 ⁽³⁾
Number of watercourse crossings	0	0
Wild Rice (ha) ⁽¹⁾	0	0
Moose late wintering habitat (ha) ⁽¹⁾	39.0	49.8
Moose foraging habitat (ha) ⁽¹⁾	0.0	0.0

Notes:

Bold attributes are preferred.

See also Appendix R.

1. During consultation and engagement local Indigenous communities identified that Wild Rice stands and Moose habitat were of interest. This area is direct overprinting by the alternative.
2. Dedicated haul / access road corridor note required.
3. Aquatic habitat of minor tributaries to Dixie Creek (1.4 km) present is not listed, as it is not viable due to intersection by open pit located downgradient from stockpile location irrespective of the LGO location.

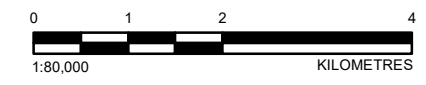


LEGEND

- APPROXIMATE OPEN PIT CENTROID
- KEY MINE FEATURE (OPEN PIT, TAILINGS MANAGEMENT FACILITY AND MINE ROCK STOCKPILE)
- OPEN PIT CENTROID BUFFER (LABELED ON MAP)
- PROPERTY BOUNDARY
- PROVINCIAL PARK
- EXISTING TRANSMISSION LINE
- HIGHWAY
- LOCAL ROAD
- LOWER TIER MUNICIPAL BOUNDARY
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- QUATERNARY CATCHMENT
- DIXIE CREEK SUBCATCHMENT

LOW GRADE ORE STOCKPILE CANDIDATE ALTERNATIVES

- CANDIDATE ALTERNATIVE A
- CANDIDATE ALTERNATIVE B
- CANDIDATE ALTERNATIVE C
- CANDIDATE ALTERNATIVE D



NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
 2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
 3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
 4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
 5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
LOW GRADE ORE STOCKPILE ALTERNATIVE LOCATIONS

CONSULTANT	YYYY-MM-DD	2026-03-31
	DESIGNED	---
	PREPARED	MD
	REVIEWED	---
	APPROVED	SD

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	4.9-1

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 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

4.10 Overburden Storage

4.10.1 Background

Overburden will need to be removed from the open pits during the construction and operations phases to access the ore beneath. Overburden material will also need to be excavated from other areas of the Project footprint where needed for foundation preparation, such as the TMF dam footprints. It is anticipated that up to 17 Mm³ of overburden will require storage on the surface. Overburden will be extracted from the stockpile for use in reclamation activities on the site, progressively during operations and at closure.

As a general mining practice reflecting practicality, overburden material is stored in stockpiles either near the primary source (open pits) or in close proximity to the site features where it will eventually be used for rehabilitation.

This section provides a summary of the alternatives assessment for the overburden storage location. The MDMER require that an assessment of alternatives be completed using the prescribed approach (ECCC 2021) for an overburden storage location that will overprint a natural, fish-bearing waterbody. The Assessment for Alternatives for Storage of Mine Waste provides additional detail (Appendix R).

4.10.2 Screening to Identify Alternatives for Assessment

Overburden removed during the preferred TMF preparation will be stored close to the TMF to:

- Minimize excessive transport during initial storage and subsequent extraction for reclamation of the TMF surface
- Avoid expanding the Project footprint unnecessarily
- Avoid waterbodies and watercourses frequented by fish as required by the MDMER where reasonable.

Transporting the overburden further away from the TMF, such as to a centralized stockpile, would result in a larger Project footprint, and additional atmospheric emissions. Alternative locations for these smaller stockpiles were therefore not considered further.

Six candidate alternative locations were identified for primary overburden storage for overburden extracted from the open pits, and main Project site as shown in Figure 4.10-1. A comprehensive alternative assessment of the six candidate location alternatives following the requirements of ECCC was completed and is provided in Appendix R.

The six candidate alternatives were assessed for conflict with the preferred locations for the TMF, MRS, LGO and mine water pond (MWP). Candidate alternatives A and B were removed from further assessment as they were in conflict with the location of other facilities have greater siting constraints than for siting an overburden stockpile.

Four candidate alternatives were considered for technical and economic viability:

- Candidate alternative C: situated about 2 km southwest of LP Central pit, south of Dixie Creek. The candidate alternative will have a footprint of about 149 ha and a maximum stockpile height of 39 m. The stockpile will overprint both aquatic and terrestrial resources. The overburden will need to be transported across Dixie Creek which will require a new bridge capable of supporting large haul trucks.

- Candidate alternative D: located about 1 km south of LP Central pit, and is also south of Dixie Creek. Candidate alternative D will have a stockpile footprint of about 148 ha and a maximum height of about 39 m. A haul road crossing will be required over Dixie Creek. The candidate alternative will overprint both aquatic and terrestrial resources.
- Candidate alternative E: located east of the Viggo pit, south of Unnamed Waterbody 6. The facility will have a footprint of about 164 ha and a maximum stockpile height of 19 m. The candidate alternative avoids covering over watercourses or waterbodies frequented by fish, but will cover terrestrial habitat and is partially located in a lower-lying area.
- Candidate alternative F: situated 1 km north of LP Central pit and north of Dixie Creek. This candidate alternative consists of two stockpiles with a combined footprint of about 127 ha and a maximum stockpile height of about 25 m. It will overprint both aquatic and terrestrial resources.

A single stockpile alternative was not proposed for candidate alternative F for the following reasons:

- Space is not available for a single stockpile that can store all of the overburden required to the west or north of the MRS, due to existing land use conflicts (access road, existing commercial aggregate operations and regional transmission line)
- A single stockpile east of the preferred MRS would need to be constructed partly over existing deep water surface deposits, which would limit the stockpile height and side slope angles to accommodate the potential geotechnical risk, resulting in a larger overall footprint for the same storage volume
- A single eastern stockpile would unnecessarily complicate water management, as gravity collection of surface runoff would not be possible, and a high capacity pumping system and new collection pond would be required to transfer the contact waters to the Collection Water Pond.

Candidate alternative C and candidate alternative D are both situated south of Dixie Creek. They would require construction of a new single or double lane bridge capable of supporting loaded haul trucks. Establishment of a haul bridge would add complexity to Project construction and operations, and additional capital costs expected to be in the order of \$10M. Locating an overburden stockpile south of Dixie Creek when other alternative locations are available, would unnecessarily expand the Project footprint. It would add complexity to contact water management including a need for additional pipelines and pumping infrastructure, and additional capital and operating costs. Candidate alternative C and candidate alternative D were therefore not considered further.

Two alternative locations for overburden storage were identified for further assessment:

- Alternative 1 (candidate alternative E): located east of the Viggo pit, south of Unnamed Waterbody 6
- Alternative 2 (candidate alternative F): situated 1 km north of LP Central pit.

Table 4.10-1 provides a summary of provides a summary of select environmental features, including the small waterbodies and watercourses overprinted, as well as interests of Indigenous communities (Wild Rice and Moose habitat).

4.10.3 Assessment of Alternatives

Based on the Table 4.10-1 and the detailed assessment provided in Appendix R, and in consideration of the performance objectives, Alternative 2 is clearly the preferred alternative for overburden storage. Alternative 1 unnecessarily expands the Project footprint, which is counter to the best practice and the preference of Great Bear Resources to establish a compact footprint to reduce the overall environmental disturbance.

Alternative 2 (north of LP Central pit) has the following primary advantages:

- Shortest haul distance for storage and reclamation backhaul (detailed below) would result in lower air and GHG emissions and lower operating costs, and greater efficiency of operations
- Maintains a smaller, compact Project footprint.

Alternative 2 is considerably closer to both the overburden sources and future location for reclamation than Alternative 1. Distances from the approximate centroids of the areas from the primary sources of overburden (and not considering distances related to road routing which would generally increase the distances) are provided in Table 4.10-2.

As the preferred OVB will be the primary source of overburden for site reclamation, the economic viability also needs to consider the cost for back haul of the material for use in reclamation. Most of the overburden used in reclamation will be at the MRS, LGO, process plant and AEX Program areas. The distances of candidate alternative E and candidate alternative F from these areas of reclamation needs based on approximate centroids (and not considering distances related to road routing which would generally increase the distances), are also provided in Table 4.10-2.

Alternative 1 would be much less efficient for materials movement, and the operating costs and GHG emissions for Alternative 1 would be approximately twice those for Alternative 2.

Based on the descriptions above (and additional detail provided in Appendix R), the selected alternative carried forward in Section 5 (Project Description) is:

- Alternative 2: situated 1 km north of LP Central pit.

Table 4.10-1: Summary of OVB Alternative Locations Select Attributes

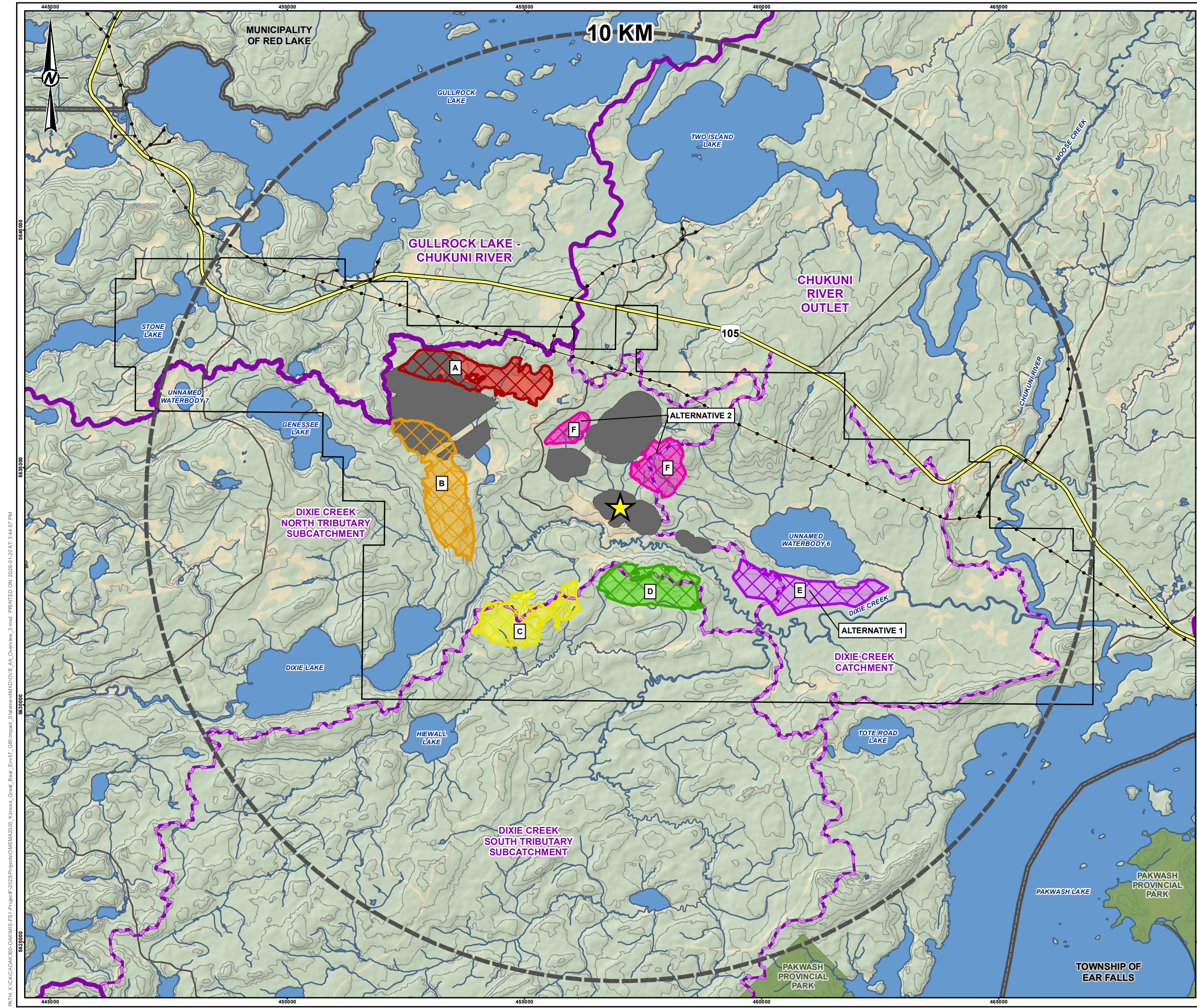
	Alternative 1 East of Viggo pit	Alternative 2 North of LP Central pit
OVB footprint (ha)	164	127
Typical haul distance from LP Central (cross-country km)	4.2	1.1
Typical backhaul distance to MRS (cross-country km)	4.9	1.4
Additional Haul / Access Road Corridor	1.3	0.3
Perimeter ditching (km)	7.1	2.3
Comparative construction cost (\$M)	7.7	3.9
Aquatic habitat (waterbody; ha)	0.0	0.0
Aquatic habitat (watercourse; km)	0.0	1.8
Wild Rice (ha) ⁽¹⁾	0.0	0.0
Moose late wintering habitat (ha) ⁽¹⁾	163.6	127
Moose foraging habitat (ha) ⁽¹⁾	35.0	1.5

Notes:

Bold attributes are preferred.

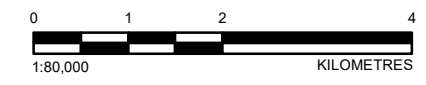
See also Appendix R.

1. During consultation and engagement local Indigenous communities identified that Wild Rice stands and Moose habitat were of interest. This area is directly overprinted by the alternative.



LEGEND

- ★ APPROXIMATE OPEN PIT CENTROID
- KEY MINE FEATURE (OPEN PIT, TAILINGS MANAGEMENT FACILITY, MINE ROCK STOCKPILE AND LOW GRADE ORE STOCKPILE)
- OPEN PIT CENTROID BUFFER (LABELED ON MAP)
- ▭ PROPERTY BOUNDARY
- PROVINCIAL PARK
- EXISTING TRANSMISSION LINE
- HIGHWAY
- LOCAL ROAD
- ▭ LOWER TIER MUNICIPAL BOUNDARY
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- QUATERNARY CATCHMENT
- DIXIE CREEK SUBCATCHMENT
- OVERBURDEN STOCKPILE CANDIDATE ALTERNATIVES
- CANDIDATE ALTERNATIVE A
- CANDIDATE ALTERNATIVE B
- CANDIDATE ALTERNATIVE C
- CANDIDATE ALTERNATIVE D
- CANDIDATE ALTERNATIVE E
- CANDIDATE ALTERNATIVE F



NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
 2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
 3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
 4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
 5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
OVERBURDEN STOCKPILE ALTERNATIVE LOCATIONS

CONSULTANT	YYYY-MM-DD	2026-03-31
DESIGNED	---	
PREPARED	MD	
REVIEWED	---	
APPROVED	SD	

PROJECT NO.	CONTROL	REV.	FIGURE
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Table 4.10-2: Summary of Hauling Distances for OVB Alternatives

OVB Alternatives	Approximate Distance from Overburden Source (km)		
	LP Central Pit (Largest Source)	Process Plant Area	Viggo Pit
Alternative 1: East of Viggo pit (single stockpile)	4.2	6.4	2.3
Alternative 2: North of LP Central pit (closest of two stockpiles)	1.4	1.1	1.7

OVB Alternatives	Approximate Backhaul Distance for Reclamation (km)			
	To MRS	To LGO	To AEX Site	To Process Plant Area
Alternative 1: East of Viggo pit (single stockpile)	4.9	5.5	5.9	6.4
Alternative 2: North of LP Central pit (distance for closest of two stockpiles)	1.1	1.5	1.4	1.1

Note:

Bold attributes (distances) are preferred.

4.11 Processing Location

4.11.1 Background

A dedicated process plant will be needed to process the ore from the Project as there are no existing gold ore process plants in the region that have predicted capacity, are able to process the Project ore effectively and are economically feasible.

Locating the process plant on the Property provides the greatest efficiency and would have reduced environmental effects associated with transporting ore including related to the emission of GHGs, as compared to transporting the ore to an offsite location which could also have traffic considerations. The alternative of constructing a dedicated process plant off site is not financially viable for the Project. For these reasons, development of an onsite process plant inclusive of supporting facilities on the Property is the only reasonable alternative.

4.11.2 Screening to Identify Alternatives for Assessment

Ore process plants are ideally located close to the ore source(s) at locations that have appropriate subsurface conditions from a geotechnical perspective. A run of mine stockpile is needed near the process plant area to support continuous feed to the process plant.

Potential process plant locations on the Property were considered during early engineering studies in consideration of the preferred locations for other key facilities including the TMF and stockpiles. The key considerations from a technical perspective considered in assessing the candidate process plant and run of mine ore stockpile locations were:

- Proximity to the ore sources (LP Central pit, Viggo pit, LGO and openings to underground) to minimize transport requirements
- Situated outside the blasting radius from the LP Central pit and Viggo pit for the safety of workers, buildings and related infrastructure
- Minimize distance from the TMF to minimize infrastructure and power consumption associated with primary tailings transfer
- Geotechnical subsurface conditions (i.e., suitability to support large equipment foundations).

Three candidate alternative locations were initially identified for the process plant and related facilities (Figure 4.11-1):

- Candidate alternative A: situated west of the existing commercial aggregate operations and south of the regional transmission line
- Candidate alternative B: located west of the mine access road and east of the TMF
- Candidate alternative C: located east of the mine access road and west of the MRS, avoiding land use conflicts with existing commercial aggregate operations.

Candidate alternative A is the furthest from the ore sources (open pits or underground mine openings). A direct routing would not be possible as existing commercial aggregate operations would need to be avoided. The additional travel time to transport the ore to the process plant made this alternative location not economically viable.

The two candidate alternative locations situated along the mine access road were determined to be economically and technically viable, and were assessed in detail:

- Alternative 1 (candidate alternative location B): located west of the mine access road and east of the TMF
- Alternative 2 (candidate alternative location C): located east of the mine access road and west of the MRS.

4.11.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.11-1. The alternatives are equally preferred or neutral for the natural environment and human environment performance objectives. The following performance objective, criteria and indicators were identified as the key differentiators in the assessment of processing location alternatives:

- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Supportive of net-zero GHG emissions by 2050
 - Change to GHG emissions released to the environment
 - Cost effectiveness
 - Degree to which alternative provides a competitive or acceptable return on investment.

Alternative 1 (west of the mine access road)

Advantages: this alternative is the preferred location for constructability and cost, and maintains a compact Project footprint with lower infrastructure requirements.

Disadvantages: the location may be perceived as less preferred as it is downgradient of the TMF in part; however the TMF and associated dams will be constructed to a high standard and will be monitored and this is not considered a disadvantage from a technical perspective. A haul road is being built on the West side of the process plant location to help reduce risk.

Alternative 1 (west of the mine access road) is the selected alternative for the processing location that is carried forward in the Project design described in Section 5 (Project Description).

Alternative 2 (east of the mine access road)

Advantages: maintains a compact Project footprint with lower infrastructure requirements, although greater than Alternative 1.

Disadvantages: the undulating bedrock surface at the location presents a challenge to construct, and would require additional build time in part due to complex blasting requirements, resulting in a scheduling challenge and higher costs.

Table 4.11-1: Alternatives Assessment – Processing Alternative Locations

Criteria	Indicators	Alternative 1 West of Mine Access Road	Alternative 2 East of Mine Access Road	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location for all Project phases. Changes to air quality would result from processing activities at both locations, but would not affect ability to meet regulatory requirements.
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location for all Project phases. Changes to sound levels would result from processing activities at both locations, but would not affect ability to meet regulatory requirements.
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No material changes to groundwater flow direction or level are anticipated from the construction, operation or closure of the processing facilities.
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No watercourses or waterbodies are present at either location, although requirement to collect and treat contact waters could result in reduced runoff to downgradient watercourses.
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No material changes to groundwater or surface water quality would be associated with processing facility location.
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No fish habitat is present at either alternative location. Requirement to collect and treat contact waters could result in reduced runoff to downgradient watercourses for both alternatives.
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the processing facility would remove vegetation communities present in the baseline condition, however neither alternative is located in habitat that is unique in the Property or region.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Changes to sensory disturbance would not be materially different at either alternative location.
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. Neither alternative location would have a material effect on wetland connectivity.
SAR and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the processing facility would remove vegetation communities present in the baseline condition, however neither alternative is located in SAR habitat that is unique in the Property.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Changes to sensory disturbance would not be materially different at either alternative location.
	Natural Environment	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location for any Project phase. Alternative 1: would overprint an area of terrestrial habitat not unique within the Property. Alternative 2: would overprint an area of terrestrial habitat not unique within the Property.
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the processing facility would remove vegetation communities present in the baseline condition (dominantly coniferous and / or deciduous forest), however neither alternative is located in habitat that is unique in the Property or region.
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No Wild Rice is present at either location, and no direct or indirect effects to Wild Rice would be anticipated.
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No known archaeological sites are present at either location, and no direct or indirect effects to would be anticipated.
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Equally preferred	Equally preferred	Development operation and closure of the Project, including associated with reject solution management, would generate considerable regional and local, employment and business opportunities. There are no differentiating advantages or disadvantages for either location.
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the processing facility would remove the area from other land and resource uses which would be mitigated with reclamation during the closure phase.
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location. No known spiritual sites are present at either location, and no direct or indirect effects to would be anticipated.
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location as Reserves are distant from Project.

Criteria	Indicators	Alternative 1 West of Mine Access Road	Alternative 2 East of Mine Access Road	Advantages and Disadvantages
	Human Environment Summary	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location for any Project phase. Alternative 1: would result in additional land disturbance within the Property that is not known to be unique, but could affect land use that could be mitigated with reclamation at closure. Alternative 2: would result in additional land disturbance within the Property that is not known to be unique, but could affect land use that could be mitigated with reclamation at closure.
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (C): location is preferred from a geotechnical stability perspective as buildings can be established on pilings which presents a scheduling advantage and improved constructability Alternative 2 (C): primary disadvantages would be that geotechnical investigations determined that the underlying bedrock elevations vary considerably creating a challenge to establish a level, stable area for building construction. Substantial risk of construction timeline delays and construction cost overruns. Alternatives 1 and 2 (O/CI): no material difference amongst alternatives.
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location for any Project phase. Best practices including secondary containment as appropriate would be used at either location.
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (C/O): is closest to the open pits and underground mines which would provide the primary source material for site construction, as well as the source of processing material, resulting in lower GHG emissions Alternative 2 (C/O): location is further away from the rock source for construction, and the ore for processing resulting in greater GHG from heavy equipment for rock movement Alternatives 1 and 2 (CI): locations would be approximately equivalent for reclamation and closure from the perspective of GHG emissions
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Neutral	Neutral	There are no differentiating advantages or disadvantages for either alternative location for any Project phase as both alternatives would be financially viable for the Project. Alternative 2 would be located partially downgradient of the TMF; however, the facility would be designed to required standards and monitored for stability, so the location is not expected to be perceived as a risk for investment.
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternatives 1 (C): would be less complex to construct and presents a scheduling advantage that may provide a competitive advantage, although the construction costs for either location are not limiting Alternatives 1 and 2 (C/CI): construction and closure costs for either location are not limiting Alternative 1 (O): located closest to open pit and underground mine resulting in improved efficiency and reduced costs. Allows the site operations teams to be closer together, improving efficiency and synergies onsite as one cohesive team Alternatives 2 (O): no apparent advantages for operations; increased distance from the ore sources would result in increased equipment needs and materially higher operating costs although not Project limiting
	Technical and Economic Summary	Most preferred	Least preferred	Both alternatives would be expected to be able to meet Project requirements. Alternative 1: would be best from a constructability perspective including scheduling, and would have the lowest operating costs as closer to the open pits and underground mine, reducing the timing and costs for ore movement. Alternative 2: presents additional construction complexity and costs resulting from the uneven bedrock surface, and increased operating costs and GHGs because of the greater distance from ore sources.
OVERALL ASSESSMENT		MOST PREFERRED (SELECTED)	LEAST PREFERRED	Alternative 1: is the most preferred and the selected alternative on balance of advantages and disadvantages. Alternative 2: is least preferred primarily from a technical and economic perspective as the locations are otherwise approximately equivalent.

Notes:
C: construction phase; O: operations phase; CI: closure phase

4.12 Contact Water Management

4.12.1 Background

The requirements for contact water management are a function of natural topography and watersheds, mine site layout and specific water management requirements for waters that come into contact with mining facilities (contact water as per MDMER). The primary objectives of the Project site water management system are to facilitate recycling of contact water to limit fresh water requirements and produce treated effluent that will meet regulatory requirements for discharge to the environment. The use of a single effluent discharge point to the environment is preferred over the use of multiple discharges to the environment, as the latter presents additional complexity both for management and monitoring and may result in increased environmental disturbance.

During early operations, contact water and the concentrate tailings will be stored in the east VMF with excess water sent to the treatment plant and discharged to the Chukuni River. Over time and later in the operations phase, the capacity of the east VMF will become reduced as the quantity of concentrate tailings increase, and a MWP is expected to be required for additional contact water storage. Although the MWP is a contingency facility, an alternatives assessment was completed as permitting of the facility may be required in the future.

For the purposes of the siting assessment, it was assumed that the MWP will need to store a minimum of 2 Mm³ of contact water with a preference to store up to 4 Mm³ of contact water. In addition, the MWP is preferentially a reasonable distance of the facilities that it serves for collection of contact water, to allow gravity drainage where possible or to minimize pumping distance and head.

4.12.2 Identified Alternatives

Eight candidate MWP locations (candidate alternatives A through H) were identified that were reviewed and screened for practicality and economic feasibility. Locations were screened out if they required more excavation than storage space provided which would be indicative of a high capital cost (candidate alternative E), extremely high dam fill requirements which would also be indicative of a high capital cost as it may not be supportable with the scheduling and availability of mine rock (candidate alternative F), or if the candidate location was in conflict with the preferred TMF, MRS, LGO or other fixed site facilities:

- Candidate alternative C: conflicts with existing commercial aggregate operation which is not owned by Great Bear Resources
- Candidate alternative D: coincident with the proposed location for shaft and headframe intended to access the underground workings located west of LP Central pit
- Candidate alternative G: located at the proposed area for fish habitat compensation and freshwater diversion northeast of the MRS
- Candidate alternative H: conflicts with a potential expansion area for the TMF (not planned).

Based on this screening assessment, three viable MWP locations were identified as shown on Figure 4.12-1:

- Alternative 1 (candidate alternative A): located west of TMF and about 6.3 km west of LP Central pit, with an anticipated surface area of 62 ha. Although located within the Property, it is situated in the Gullrock Lake watershed and not the Dixie Creek - Chukuni watershed (like the remainder of the Project). Water storage of up to 2.7 Mm³ can be established using natural topography and six water retaining dams having a cumulative dam length of 1,000 m and a maximum dam height of 10 m. The dam footprints will cover about 3 ha and require about 115,000 m³ of dam fill material, constructed with a downstream slope of 3H:1V (WSP 2023c).
- Alternative 2 (candidate alternative B): is sited down gradient of the TMF and about 3.0 km northwest of the LP Central pit. Alternative 2 will have a surface area of 40.9 ha and will use natural topography and one dam to provide storage for 2.1 Mm³ of contact water. The single water retaining dam is anticipated to have a length of 0.7 km and a maximum dam height of 6 m. The dam footprint will be less than 1 ha and will require about 233,000 m³ of dam fill material, constructed with a downstream slope of 1.5H:1V.

Table 4.12-1 provides a summary of the small waterbodies and watercourses overprinted by these alternatives, as well as habitats and vegetation communities associated with the interests of Indigenous communities (Wild Rice and Moose habitat).

4.12.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.12-2. The following performance objectives, criteria and indicators were identified as the key differentiators in the assessment of MWP location alternatives:

- Natural environment performance:
 - Water
 - Change in flows (watercourses), and areas and levels (waterbodies)
 - Wildlife and habitat
 - Area, type and functionality of habitat that would be displaced or altered
- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs.

Alternative 1 (west of TMF)

Advantages: there are no clear advantages for this alternative.

Disadvantages: is located in a different watershed than the remainder of the Project, requires the greatest additional terrestrial habitat disturbance, and is distant from the rest of the main site, reducing efficiency and increasing costs.

Alternative 2 (down gradient of TMF pond)

Advantages: this alternative is the best technical solution as it is located closer to other contact water facilities. This alternative involves lower GHG emissions than Alternative 1, and is overall expected to have limited environmental effects during operations. It is also expected to have lower operating costs.

Disadvantages: although the location requires overprinting aquatic and Wild Rice habitat, the unnamed waterbody and watercourse would not retain viability due to other Project facilities (TMF and TMF pond), irrespective of development of a mine water pond at this location.

Based on the descriptions above and details provided in Appendix R, the selected alternative carried forward in Section 5 (Project Description) is:

- Alternative 2: down gradient of TMF pond.

Table 4.12-1: Summary of MWP Candidate Alternative Locations Select Attributes

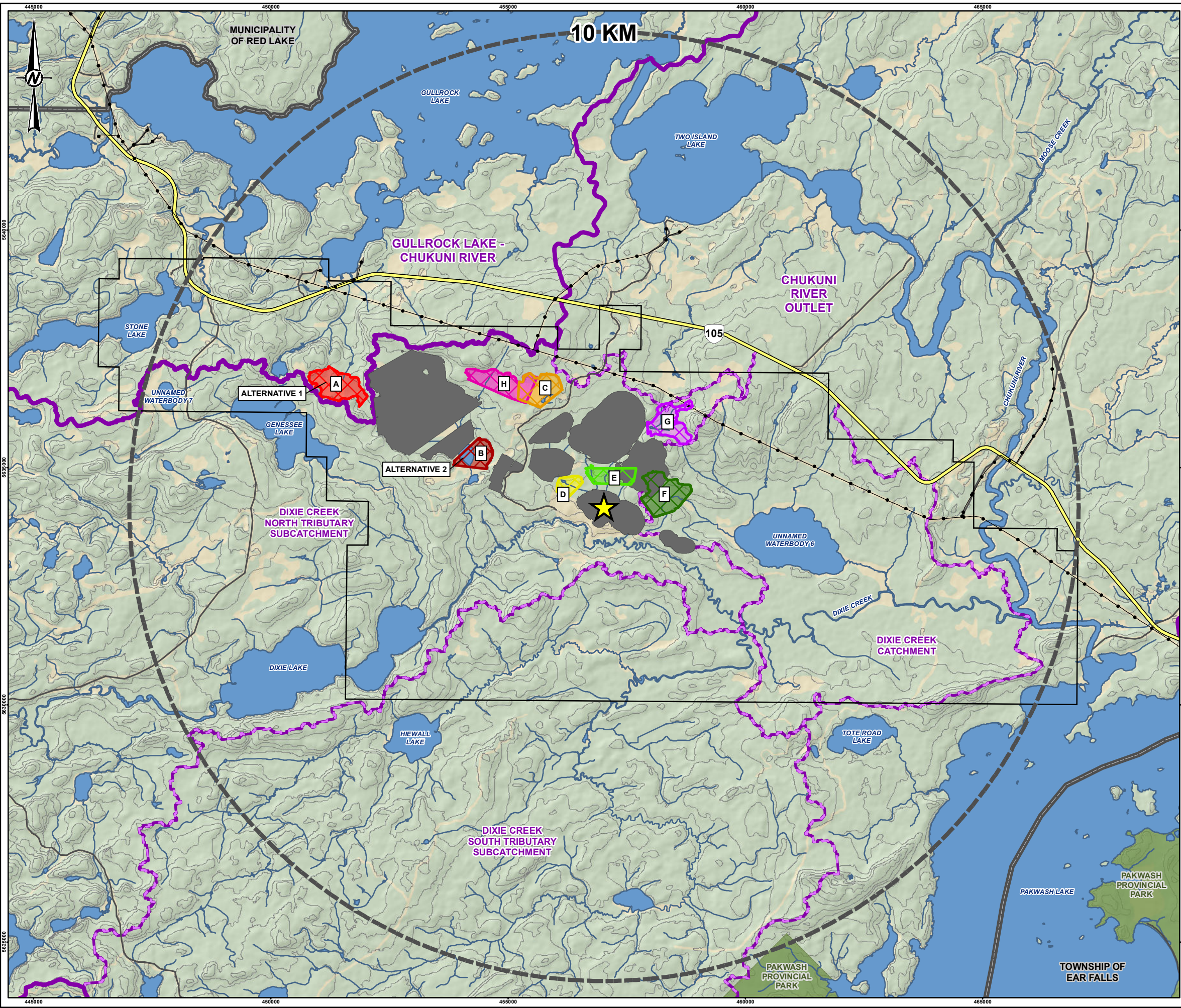
	Alternative 1 West of TMF	Alternative 2 Downgradient of TMF
Contact water storage (m ³)	2,700,000	2,100,000
MWP footprint (ha)	62.0	40.9
Maximum dam height (m)	10.0	6.0
Total dam length (m)	1,000	750
Dam fill requirements (m ³)	115,000	233,000
Contact water storage to dam fill volume ratio	23.48	9.01
Conveyance distance (to process plant; m)	5,157	1,216
Comparative site preparation and dam construction costs (\$M) ⁽¹⁾	4.7	4.1
Aquatic habitat (waterbody; ha)	0	7.5
Aquatic habitat (watercourse; km)	0.29	0.18
Wild Rice (ha) ⁽²⁾	0.0	7.2
Moose late wintering habitat (ha) ⁽²⁾	59.5	33.4
Moose foraging habitat (ha) ⁽²⁾	2.3	2.1

Notes:

Bold attributes are preferred.

See also Appendix R.

1. Comparative costs estimates were developed to support ranking of the MWP candidate alternatives. An allowance has been included for the dam clearing, foundation preparation, dam fill volume and sheet piles, as applicable.
2. During consultation and engagement local Indigenous communities identified that Wild Rice stands and Moose habitat were of interest. This area is direct overprinting by the alternative.



LEGEND

- ★ APPROXIMATE OPEN PIT CENTROID
- KEY MINE FEATURE (OPEN PIT, TAILINGS MANAGEMENT FACILITY, MINE ROCK STOCKPILE, LOW GRADE ORE STOCKPILE, OVERBURDEN STOCKPILE AND PROCESSING FACILITY)
- OPEN PIT CENTROID BUFFER (LABELED ON MAP)
- ▭ PROPERTY BOUNDARY
- PROVINCIAL PARK
- EXISTING TRANSMISSION LINE
- HIGHWAY
- LOCAL ROAD
- ▭ LOWER TIER MUNICIPAL BOUNDARY
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- QUATERNARY CATCHMENT
- DIXIE CREEK SUBCATCHMENT
- MINE WATER POND CANDIDATE ALTERNATIVES**
- CANDIDATE ALTERNATIVE A
- CANDIDATE ALTERNATIVE B
- CANDIDATE ALTERNATIVE C
- CANDIDATE ALTERNATIVE D
- CANDIDATE ALTERNATIVE E
- CANDIDATE ALTERNATIVE F
- CANDIDATE ALTERNATIVE G
- CANDIDATE ALTERNATIVE H

0 1 2 4
1:80,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
MINE WATER POND ALTERNATIVE LOCATIONS

CONSULTANT	YYYY-MM-DD	2026-03-31
DESIGNED	---	
PREPARED	MD	
REVIEWED	---	
APPROVED	SD	

PROJECT NO. CA0031271 CONTROL 0001 REV. A FIGURE 4.12-1

PATH: X:\CAGAC\030\CAKAMS-FB1-Project\2023\Project\01MEMA2023_Kinross_Creek_Beam_Enviz_GIS\map_SiteArea\MXD\MWP_All_Overview_2.mxd PRINTED ON: 2026-01-20 AT: 3:45:04 PM
 IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Table 4.12-2: Alternatives Assessment - MWP Alternative Locations

Criteria	Indicators	Alternative 1 West of TMF	Alternative 2 Downgradient of TMF pond	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C/CI): limited air emissions would be generated from the pond construction (including heavy equipment use) and closure Alternative 1 and 2 (O): air emissions would not be generated during facility operation <p>There are no differentiating advantages or disadvantages for the locations; air quality regulatory requirements would be met.</p>
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C/O/CI): limited noise would be generated from the construction (including heavy equipment use and backup beepers) and closure of the pond Alternatives 1 and 2 (O): noise would not be generated during facility operation <p>There are no differentiating advantages or disadvantages for the locations; regulatory requirements would be met.</p>
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location.
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint a short headwater reach of Unnamed Watercourse 8 (Unnamed Watercourse 8B) which flows to Gullrock Lake, and would reduce flows to Unnamed Watercourse 8 downstream, as a result of excess water from the mine water pond being directed to the Project site for treatment as needed and discharge to the Chukuni River Alternative 2 (C/O/CI): would overprint Unnamed Waterbody 1; this waterbody would have limited surface water inputs as a result of the construction and operation of the TMF and TMF pond, and would not retain viability, irrespective of the mine water pond
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	Alternatives 1 and 2: (C/O/CI): contact waters would be collected, and pumped to the main site for treatment and discharge to the Chukuni River as needed so that regulatory requirements for water quality are met; groundwater and surface water monitoring would be in place to confirm regulatory requirements would be met during all Project phases.
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint a short (0.3 km) headwater reach of Unnamed Watercourse 8 which flows to Gullrock Lake which is not fish bearing Alternative 2 (C/O/CI): would overprint Unnamed Waterbody 1 (7.5 ha) and a portion of Unnamed Watercourse 1 (0.2 km) which are both fish bearing, noting that the waterbody would have limited surface water inputs as a result of the construction and operation of the TMF and TMF pond, and would not retain viability, irrespective of the mine water pond
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint a larger (62 ha) generally low lying upland area of meadow marsh, conifer swamp and bog, in addition to upland conifer and deciduous forest; the habitat is not unique within the Property Alternative 2 (C/O/CI): would overprint a smaller (41 ha) generally low lying area of open water marsh, fen, conifer swamp and upland conifer forest; as the open water marsh is dominated by Wild Rice, the habitat is unique within the Property although not in the region, but would not retain viability (compensatory habitat is proposed to be provided) irrespective of the mine water pond
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	Limited additional disturbance would be generated primarily during facility construction (including heavy equipment use and backup beepers). Both locations are proximal to the TMF and TMF dam construction which could limit effect of change (area may already be avoided by wildlife).
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): is located in a headwater area that includes limited areas of meadow marsh, conifer swamp and bog; but would not affect wetland connectivity Alternative 2 (C/O/CI): would overprint Unnamed Waterbody 1 which is classified as open water marsh as well as surrounding fen, noting that these wetlands would not retain viability irrespective of the mine water pond; wetland connectivity is not affected by the mine water pond
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 and 2 (C/O/CI): would overprint an area of habitat not unique within the Property
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	Limited additional disturbance would be generated primarily during facility construction (including heavy equipment use and backup beepers). Both locations are proximal to the TMF and TMF dam construction which could limit the effect of change (area may already be avoided by wildlife).
	Natural Environment Summary	Least preferred	Most preferred	<p>Alternative 1: would have a much (19 ha) larger footprint and be located in a different watershed than the remainder of the Project which is generally avoided with mine development as reasonable.</p> <p>Alternative 2: has a small overprint of terrestrial habitat and is situated in the same watershed as the remainder of the Project; although it overprints an unnamed waterbody that would not retain viability as a result of other Project facilities.</p>

Criteria	Indicators	Alternative 1 West of TMF	Alternative 2 Downgradient of TMF pond	Advantages and Disadvantages
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location as neither location presents material land use opportunities, such as for forestry, although the footprint of Alternative 2 is about 20 ha less than Alternative 1.
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no Wild Rice is known to be present based on field investigations to date Alternative 2 (C/O/CI): Unnamed Waterbody 1 which would be overprinted contains Wild Rice, noting however that this Wild Rice area would not retain viability irrespective of the mine water pond and compensatory habitat is proposed to be provided
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Neutral	Neutral	<ul style="list-style-type: none"> Alternative 1 and 2 (C/O/CI): no known archaeological sites present or could be affected There are no differentiating advantages or disadvantages for either alternative location.
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Equally preferred	Equally preferred	Development construction, operation and closure of the Project, including associated with contact water management, would generate considerable regional and local, employment and business opportunities. There are no differentiating advantages or disadvantages for either location.
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would remove a greater area (62 ha) from other land and resource uses, including 59.5 ha of Moose late wintering habitat and 2.3 ha of Moose foraging habitat Alternative 2 (C/O/CI): would remove a lesser area (40.9 ha) from other land and resource uses, including 33.4 ha of Moose late wintering habitat and 2.1 ha of Moose foraging habitat
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Neutral	Neutral	<ul style="list-style-type: none"> Alternative 1 and 2 (C/O/CI): no known spiritual and ceremonial sites are present There are no differentiating advantages or disadvantages for either alternative location.
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Neutral	Neutral	<ul style="list-style-type: none"> Alternatives 1 and 2 (C/O/CI): no potential for effects as Reserves are distant from the Project There are no differentiating advantages or disadvantages for either location.
	Human Environment Summary	Equally preferred	Equally preferred	Alternative 1: requires the largest land disturbance which includes Moose late wintering habitat (Moose are of Indigenous interest). Alternative 2: overprints Unnamed Waterbody 1 which contains Wild Rice (of Indigenous interest), noting however that this Wild Rice area would not retain viability irrespective of the mine water pond and compensatory habitat is proposed to be provided.
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C): location is further away from the main site which adds complexity to construction, although infrastructure is available to the TMF north dam; distance from the primary mine rock sources may require using rock from a dedicated quarry for dam construction (rather than using mine rock) Alternative 2 (C): location is close to the main site and mine rock sources; access is readily available and necessary infrastructure aligns with other Project facilities offering greatest efficiency Alternative 1 (O): pipeline conveyance distance of 5 km may pose an operational challenge, particularly if water management requires water transfer in the winter Alternative 2 (O): location downgradient of the TMF and TMF improves efficiency of water management, and provides opportunity for seepage management Alternatives 1 and 2 (CI): pond would be decommissioned after necessary water quality is attained; no material difference amongst alternatives
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C/O/CI): The pond and related infrastructure will be designed to required standards and monitored for stability to mitigate the potential for malfunctions and accidents. Monitoring will be completed to confirm dam stability, as well as environmental protection. There are no differentiating advantages or disadvantages for the locations.
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited GHG emissions would be generated from the pond construction (including heavy equipment use) and closure, but are likely to be greater due to the distance from the main site Alternative 2 (C/O/CI): limited GHG emissions would be generated during facility construction, primarily from heavy equipment use in dam construction There are no differentiating advantages or disadvantages for the locations.

Criteria	Indicators	Alternative 1 West of TMF	Alternative 2 Downgradient of TMF pond	Advantages and Disadvantages
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for the locations.
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C): similar costs to construct (approximately \$10 million) and reclaim, and are not Project limiting at the scale proposed Alternatives 1 and 2 (O): no material operating costs differences amongst alternatives
	Technical and Economic Summary	Least preferred	Most preferred	<p>Both alternatives would be expected to be able to meet Project requirements.</p> <p>Alternative 1: would be equivalent except for operational aspects; having a water management pond in different watershed and more than kilometres away from other water management infrastructure would be limiting.</p> <p>Alternative 2: approximately equivalent in cost but not Project limiting at the scale proposed.</p>
OVERALL ASSESSMENT		LEAST PREFERRED	MOST PREFERRED (SELECTED)	<p>Alternative 1: would require the greatest additional habitat disturbance located in a different watershed than the remainder of the Project, and is distant from the rest of the main site, reducing efficiency and increasing costs.</p> <p>Alternative 2: located downgradient of the TMF and TMF pond which provide improved contact water management opportunities and efficiencies; it overprints aquatic habitat however, the waterbody would have limited surface water inputs as a result of the construction and operation of the TMF and TMF pond, and would not retain viability, irrespective of the mine water pond.</p>

Notes:
C: construction phase; O: operations phase; Cl: closure phase.

4.13 Membrane Reject Solution Management

4.13.1 Background

Membrane filtration is proposed to reduce sulphate concentrations in select site contact waters, in order to maintain the facility water balance and quality of effluent discharge. The treatment process will produce very high quality effluent and a concentrated reject solution that requires storage. The reject solution is a concentrated solution with high sulphate and metals content that needs to be stored in a manner that is protective of the environment.

The majority of the reject solution produced by membrane filtration process will be used in producing paste backfill during the operations phase, and will be permanently bound in backfill in the underground mine. The remaining reject solution volume will require storage on surface, during operations.

4.13.2 Screening to Identify Alternatives for Assessment

An engineering trade-off study was completed of ten candidate reject solution storage locations (candidate alternatives A through J) initially identified, in consideration of the preferred TMF, MRS, LGO and open pit locations (Figure 4.13-1) to store up to 2 Mm³ of reject solution. Initial candidate alternative locations were screened out if they:

- Expanded the Project into a different watershed (candidate alternative A)
- Overprinted the archaeological buffer area at Unnamed Waterbody 2 (candidate alternative B).
- Posed a potential risk to lands with surface rights held by others that could not reasonably be obtained: candidate alternative C (Lafarge pit) and candidate alternative G (Hydro One Networks regional transmission line)
- Required excessive excavation (candidate alternatives D and E) or dam construction (candidate alternative F), and were not economically viable

Based on this screening assessment, three viable reject solution storage locations were identified that may be technically and economically viable to store the reject solution that is not used in backfill preparation (Figure 4.13-1):

- Alternative 1 (candidate alternative H): is located northeast of the TMF and will have an anticipated pond surface area of 32 ha. Reject solution storage of up to 2 Mm³ can be established using natural topography and water retaining dams having a maximum dam height of 15 m. A diversion channel for freshwater will be required. The alternative will overprint a portion of Unnamed Watercourse 1.
- Alternative 2 (candidate alternative I): is formed within the TMF, between the TMF north dam and new internal dam. Alternative 2 will have a pond surface area of 36 ha and provides storage for up to 2 Mm³ of reject solution.
- Alternative 3 (candidate alternative J): located in the mined west lobe of the Viggo pit to be repurposed for reject solution storage after the construction phase (west VMF). The Viggo pit (east lobe) is proposed to be repurposed for contact water management and concentrate tailings over the life of the mine (as the east VMF), and would not be available to store the required reject solution.

4.13.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.13-1. The following performance objectives, criteria and indicators were identified as the key differentiators in the assessment of reject solution pond location alternatives:

- Natural environment performance:
 - Air quality
 - Change in air quality
 - Sound
 - Change in sound level
 - Fish and fish habitat
 - Area and functionality of fish habitat that would be displaced or altered
 - Wildlife and habitat
 - Area, type and functionality of habitat that would be displaced or altered
 - SAR and habitat
 - Area, type and functionality of habitat that would be displaced or altered
- Human environment performance:
 - Indigenous people
 - Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities
- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Supportive of net-zero GHG emissions by 2050
 - Change to GHG emissions released to the environment
 - Cost effectiveness
 - Degree to which alternative provides a competitive or acceptable return on investment.

Alternative 1 (northeast of the TMF)

Advantages: provides a technical solution, but there are no material advantages to this alternative over other alternatives.

Disadvantages: would disturb additional aquatic and terrestrial habitat, would have a higher capital cost and additional regulatory requirements.

Alternative 2 (within the TMF at the North Dam)

Advantages: provides a technical solution that would not disturb additional aquatic or terrestrial habitat.

Disadvantages: would have a higher capital cost, and presents additional operational complexity for monitoring integrity of liner as located within the TMF, and for operation of the TMF.

Alternative 3 (depleted Viggo pit)

Advantages: provides a technical solution that would not disturb additional aquatic or terrestrial habitat.

Disadvantages: would have the lowest capital cost, and presents operational simplicity particularly as located proximal to the east VMF.

Alternative 3 is most preferred and is carried forward at the selected alternative in the Project design described in Section 5 (Project Description).

Table 4.13-1: Alternatives Assessment - Reject Solution Storage Alternative Locations

Criteria	Indicators	Alternative 1 Northeast of TMF	Alternative 2 Within TMF	Alternative 3 Depleted Viggo pit	Advantages and Disadvantages
Natural Environment					
Air quality	<ul style="list-style-type: none"> Change in air quality 	Least preferred	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 and 2 (C): limited air emissions would be generated from the pond construction (including from heavy equipment use) Alternative 3 (C): no additional construction (including heavy equipment use) would be required to re-purpose the west lobe of the Viggo pit for reject solution management Alternative 1, 2 and 3 (O/CI): limited air emissions would be generated during operation and closure of all alternatives
Sound	<ul style="list-style-type: none"> Change in sound level 	Least preferred	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 and 2 (C): limited noise would be generated from the pond construction (including from heavy equipment use) Alternative 3 (C): no additional construction (including heavy equipment use) would be required to re-purpose the west lobe of the Viggo pit for reject solution management Alternative 1, 2 and 3 (O/CI): limited noise emissions would be generated during operation and closure of all alternatives
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited changes to groundwater resulting from minor reduction in infiltration from surface within footprint would result from the lined pond Alternative 2 (C/O/CI): no anticipated additional effects to groundwater flows or levels as located with TMF footprint Alternative 3 (C/O/CI): no anticipated additional effects to groundwater flows or levels (Viggo pit would be dewatered during construction phase, and maintained partially dewatered for east VMF during operations) <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint a portion of Unnamed Watercourse 1 (which itself is overprinted by the TMF further downstream) and would therefore not retain viability Alternative 2 (C/O/CI): no additional effect, as it is located within the TMF Alternative 3 (C/O/CI): no effect as located within the Viggo pit
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	Equally preferred	<p>No change anticipated to water quality for any alternative during the construction phase; monitoring would occur and contact water would be treated with other site contact water as needed</p> <ul style="list-style-type: none"> Alternative 1 (O): facility would be lined and excess contact water collected and treated; groundwater and surface water monitoring would be in place to confirm proper control Alternative 2 (O): facility would be lined and excess contact water collected and treated; monitoring would be in place to confirm proper control, although more challenging to implement as the facility would be located within the TMF Alternative 3 (O): modelling has determined reject solution storage in the west VMF would be effective during operation; groundwater and surface water monitoring would be in place to confirm no material effect Alternatives 1, 2 and 3 (CI): reject solution would be pumped into the underground mine for permanent storage during closure; groundwater and surface water monitoring would be in place to confirm regulatory requirements would be met after reclamation
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Least preferred	Most preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint a portion of Unnamed Watercourse 1 which is fish-bearing and considered fish habitat; habitat compensation and offsetting would be needed noting that the downstream portion will be overprinted by the TMF and the upstream portion this facility overprints could not remain viable Alternative 2 (C/O/CI): no additional effect, as it is located within the TMF Alternative 3 (C/O/CI): no direct or indirect effects to surface watercourses or waterbodies, and located within the Viggo pit
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Least preferred	Most preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint an area of hardwood swamp and fen, in addition to upland conifer and deciduous forest; the habitat is not unique within the Property Alternative 2 (C/O/CI): no additional effect as it would be located within the TMF Alternative 3 (C/O/CI): no additional effect as it would be located within the Viggo pit
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C): limited additional disturbance would be generated primarily during facility construction (including heavy equipment use and backup beepers); located proximal to the TMF and commercial aggregate operation could limit effect of change (area may already be avoided by wildlife) Alternative 2 (C): limited additional disturbance would occur primarily during facility construction from heavy equipment use in dam construction; located with TMF which is anticipated in general to be avoided by wildlife Alternative 3 (C): no anticipated additional disturbance would be generated Alternatives 1, 2 and 3 (O/CI): limited noise emissions would be generated during operation and closure of all alternatives
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): wetland connectivity would not be affected by alternative (overprinted hardwood swamp and fen are not connected) Alternative 2 and 3 (C/O/CI): wetland connectivity would not be affected by alternative located within existing facility <p>There are no differentiating advantages or disadvantages for alternative locations.</p>

Criteria	Indicators	Alternative 1 Northeast of TMF	Alternative 2 Within TMF	Alternative 3 Depleted Viggo pit	Advantages and Disadvantages
SAR	• Area, type and functionality of habitat that would be displaced or altered	Least preferred	Most preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint an area of habitat not unique within the Property Alternative 2 (C/O/CI): no additional effect as it would be located within the TMF Alternative 3 (C/O/CI): no additional effect as it would be located within the Viggo pit
	• Change in the level of sensory disturbance	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited additional disturbance would be generated primarily during facility construction (including heavy equipment use and backup beepers); located proximal to the TMF and commercial aggregate operation could limit effect of change (area may already be avoided by wildlife) Alternative 2 (C/O/CI): limited additional disturbance would occur primarily during facility construction from heavy equipment use in dam construction; located with TMF which is anticipated in general to be avoided by wildlife Alternative 3 (C/O/CI): limited additional disturbance if any, would be generated across all Project phases
	Natural Environment Summary	Least preferred	Most preferred	Most preferred	<p>Alternative 1: would overprint an area of terrestrial habitat not unique within the Property and a portion of Unnamed Watercourse 1 which is fish-bearing and considered fish habitat.</p> <p>Alternative 2: no additional material effect as it would be located within the TMF.</p> <p>Alternative 3: no additional material effect as it would be located within the Viggo pit.</p>
Human Environment					
Land and resource use	• Change to local land and resource use opportunities	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would overprint an area of hardwood swamp and fen, in addition to upland conifer and deciduous forest; the lands are not unique within the Property or known to conflict with resources Alternative 2 (C/O/CI): no additional land disturbance would be required as it would be located within the TMF Alternative 3 (C/O/CI): no additional land disturbance would be required as it would be located within the Viggo pit <p>There are no differentiating advantages or disadvantages for either location.</p>
Cultural heritage	• Area or functionality of Wild Rice that would be displaced or altered	Neutral	Neutral	Neutral	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no Wild Rice is present or could be affected Alternatives 2 and 3 (C/O/CI): no additional land disturbance would be required as it would be located within existing facility; no potential to affect Wild Rice <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Archaeology	• Causes damage or disturbance to known archaeological sites	Neutral	Neutral	Neutral	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no known archaeological sites present or could be affected Alternatives 2 and 3 (C/O/CI): no additional land disturbance would be required as it would be located within existing facility; no potential to known archaeological sites <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Local and regional economy	• Change to local business and economic opportunities	Equally preferred	Equally preferred	Equally preferred	Development operation and closure of the Project, including associated with reject solution management, would generate considerable regional and local, employment and business opportunities. There are no differentiating advantages or disadvantages for either location.
Indigenous people	• Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities	Least preferred	Most preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): would remove the area from other land and resource uses which would be mitigated with reclamation during the closure phase Alternative 2 (C/O/CI): no additional land disturbance would be required as it would be located within the TMF Alternative 3 (C/O/CI): no additional land disturbance would be required as it would be located within the Viggo pit
	• Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation	Neutral	Neutral	Neutral	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no known spiritual and ceremonial sites are present Alternative 2 (C/O/CI): no additional land disturbance would be required as it would be located within the TMF (no known spiritual and ceremonial sites are present) Alternative 3 (C/O/CI): no additional land disturbance would be required as it would be located within the Viggo pit (no known spiritual and ceremonial sites are present)
	• Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1, 2 and 3 (C/O/CI): no potential for effects as Reserves are distant from Project <p>There are no differentiating advantages or disadvantages for either location.</p>
	Human Environment Summary	Least preferred	Most preferred	Most preferred	<p>Alternative 1: would result in limited additional land disturbance within the Property that is not known to be unique, but could affect land use that could be mitigated with reclamation at closure.</p> <p>Alternative 2: no additional land disturbance would be required as it would be located within the TMF.</p> <p>Alternative 3: no additional land disturbance would be required as it would be located within the Viggo pit.</p>

Criteria	Indicators	Alternative 1 Northeast of TMF	Alternative 2 Within TMF	Alternative 3 Depleted Viggo pit	Advantages and Disadvantages
Technical and Economic					
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C): additional care would be required during construction to maintain the integrity of the liner; would be somewhat further away from the main site which would require dedicated infrastructure Alternative 1 (O): lined ponds are commonly used in industry and are proven effective; separate facility will ease monitoring Alternative 2 (C/O): facility will be formed by a new dam and existing TMF North Dam which may require modification; establishing and operating a lined pond within the TMF would present additional challenges including for engineering, building and operations (including for monitoring to confirm integrity of liner) Alternative 3 (C): limited construction required as located in the west lobe of Viggo pit presenting a construction advantage Alternative 3 (O): proximity to east VMF infrastructure presents an operational advantage Alternatives 1, 2 and 3 (CI): reject solution would be pumped from the facility to the underground workings at closure and the area would be reclaimed; no material difference amongst alternatives
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Equally preferred	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1, 2 and 3 (C): no anticipated potential effects during construction Alternative 1 (O): groundwater monitoring would be completed to confirm integrity of liner; facility is located distant from watercourses and upstream of the TMF pond, failure of the liner could result in reject solution entering local groundwater; no expected material effect after remediation Alternative 2 (O): monitoring would be completed to confirm integrity of liner; facility is located within the TMF and distant from watercourses, failure of the liner could result in reject solution entering TMF mass and potentially local groundwater; no expected material effect after remediation although remediation could be challenging Alternative 3 (O): groundwater monitoring would be completed to confirm effective containment of reject solution; storage level would be maintained to ensure sufficient storage during extreme weather event without overtopping; should reject solution enter local groundwater no expected material effect after remediation although west VMF is located closer to a watercourse than other alternatives Alternatives 1, 2 and 3 (CI): reject solution would be pumped from the facility at closure and area reclaimed; no material difference amongst alternatives
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Least preferred	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 and 2 (C): limited GHG emissions would be generated from the pond construction (including heavy equipment use) Alternative 3 (C): no additional GHG emissions from re-purposing the west lobe of the Viggo pit for reject solution management Alternative 1, 2 and 3 (O/CI): limited GHG would be generated during operation and closure of all alternatives.
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Equally preferred	Equally preferred	Equally preferred	No other material difference amongst alternatives. Using a leading technology to improve water quality is expected to be viewed favourably. Alternative 1 overprints upper reaches of an unnamed watercourse and will require Schedule 2 listing providing an additional regulatory complexity.
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Least preferred	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C): comparatively costly to construct (approximately \$75 million) although not Project limiting at the scale proposed Alternative 3 (C): limited additional cost as located in Viggo pit and proximal to Viggo pit / East VMF infrastructure Alternatives 1, 2 and 3 (O): no material operating costs differences amongst alternatives Alternatives 1, 2 and 3 (CI): reject solution would be pumped from the facility at closure and area reclaimed; no material reclamation cost difference amongst alternatives, although the cost would be higher for Alternative 1 which is not co-located with another facility
	Technical and Economic Summary	Least preferred	Least preferred	Most preferred	All alternatives would be expected to be able to meet Project requirements. Alternative 1 and 2: approximately equivalent in cost but not Project limiting at the scale proposed. Alternative 3: would be the least costly alternative as it re-purposes a portion of the Viggo pit.
OVERALL ASSESSMENT		LEAST PREFERRED	LEAST PREFERRED	MOST PREFERRED (SELECTED)	<p>Alternative 1: would require the greatest additional habitat disturbance including overprinting part of a minor tributary, and is a separate facility increasing costs substantially although not limiting to the Project at the scale proposed.</p> <p>Alternative 2: is co-located within the TMF and does not require additional habitat disturbance, but requires additional components (dam and liner) increasing the costs substantially although not Project limiting; monitoring of liner integrity within the operating TMF could pose a challenge.</p> <p>Alternative 3: has the advantage of re-purposing a portion of the Viggo pit, not requiring additional surface disturbance and at substantially lower cost.</p>

Notes:
C: construction phase; O: operations phase; CI: closure phase

4.14 Power Supply

4.14.1 Background

Power is being provided for the AEX Program through a combination of diesel and natural gas power generation, and electrical grid power. Additional power will be required for the Project. The majority of the power requirements are associated with ore processing. The Project power requirement will peak at approximately 50 MW of power. Energy-saving equipment and processes will be used where practical; however, conservation cannot materially change the energy requirements for the Project.

4.14.2 Screening to Identify Alternatives for Assessment

Six candidate power sources for the Project were identified and screened for technical and economic viability:

- Candidate alternative A: connection to the regional electrical grid
- Candidate alternative B: natural gas power generation (pipeline source)
- Candidate alternative C: natural gas power generation (compressed gas source)
- Candidate alternative D: diesel power generation
- Candidate alternative E: wind turbines
- Candidate alternative F: solar panel farm
- Candidate alternative G: hydro-electric power generation.

Candidate alternatives C, D, E, F and G were determined to not be technically or economically viable, including for the following reasons:

- Generation of power using compressed natural gas (candidate alternative C) is not technically or economically viable. There are no nearby sources of compressed natural gas which result in a very high number of trucks and travel trips to transport the necessary fuel. Without a high level of storage on the Property, the supply would be unreliable, due to potential disruptions related to inclement winter weather and lack of alternate road routes closer to the Project site.
- Banks of diesel generators (candidate alternative D) could be technically viable for the Project. Diesel power generation is used for very remote mine sites that do not have access to regional power infrastructure. While the capital cost is relatively low for diesel power generators, the operating costs for fuel and fuel transport by tanker truck are very high. The fuel supply could be disrupted by inclement weather or similar, requiring additional fuel storage on site. Diesel-fired generation is not an economically viable alternative to meet all of the Project needs.
- Wind energy technology (candidate alternative E) is not known to be effective as a sole power source for a large scale mine in a northern environment. Wind turbine(s) in combination with the required battery storage sufficient to power a large scale mine, would not be financially viable for the Project.
- Solar photovoltaic technology uses solar cells in panel banks to directly convert sunlight into electricity. Solar panels (candidate alternative F) cannot provide a reliable primary

source of power for a large industrial operation in northwestern Ontario. The potential for solar energy generation varies between summer and winter months, as it is reliant on the sun. Extensive batteries would be required to store the energy to accommodate this daily and seasonal variation. The cost of the solar panels and required battery storage to provide sufficient power is not economically feasible for the Project.

- Construction of a new hydroelectric generating station (candidate alternative G) would require damming a large watercourse such as the Chukuni River. This alternative would not be supported by Great Bear Resources from an environmental perspective. It also not financially viable for the Project.

Grid power is commonly used for power at Canadian mine sites wherever available. Natural gas-fired generation may also be used where a natural gas source is reasonably available and grid power capacity is lacking. A regional transmission line (Hydro One Networks E2R regional transmission line) and regional natural gas pipeline (Enbridge Gas) are both present and located close to the Project.

Although there is a regional Hydro One Networks E2R transmission line that crosses the Property (Figure 4.14-1), Great Bear Resources understands from discussions with Hydro One Networks, that the line currently has insufficient capacity available to support all of Project operations (candidate alternative A). Great Bear Resources understands that grid infrastructure upgrades by Hydro One Networks in the region may be complete as early as 2031, with early study work in progress for a regional solution that would expand the currently available capacity. Establishment of a dedicated transmission line to provide the required power for the Project is not economic for the Project as the closest connection location where additional power may be available is approximately 165 km away. The cost for a new, dedicated transmission line would be in the order of \$250 million, not including potential costs for land. Upgrading the existing transmission line to enhance the existing power capacity although technically feasible and less costly, would require a very large number of outage days for the region.

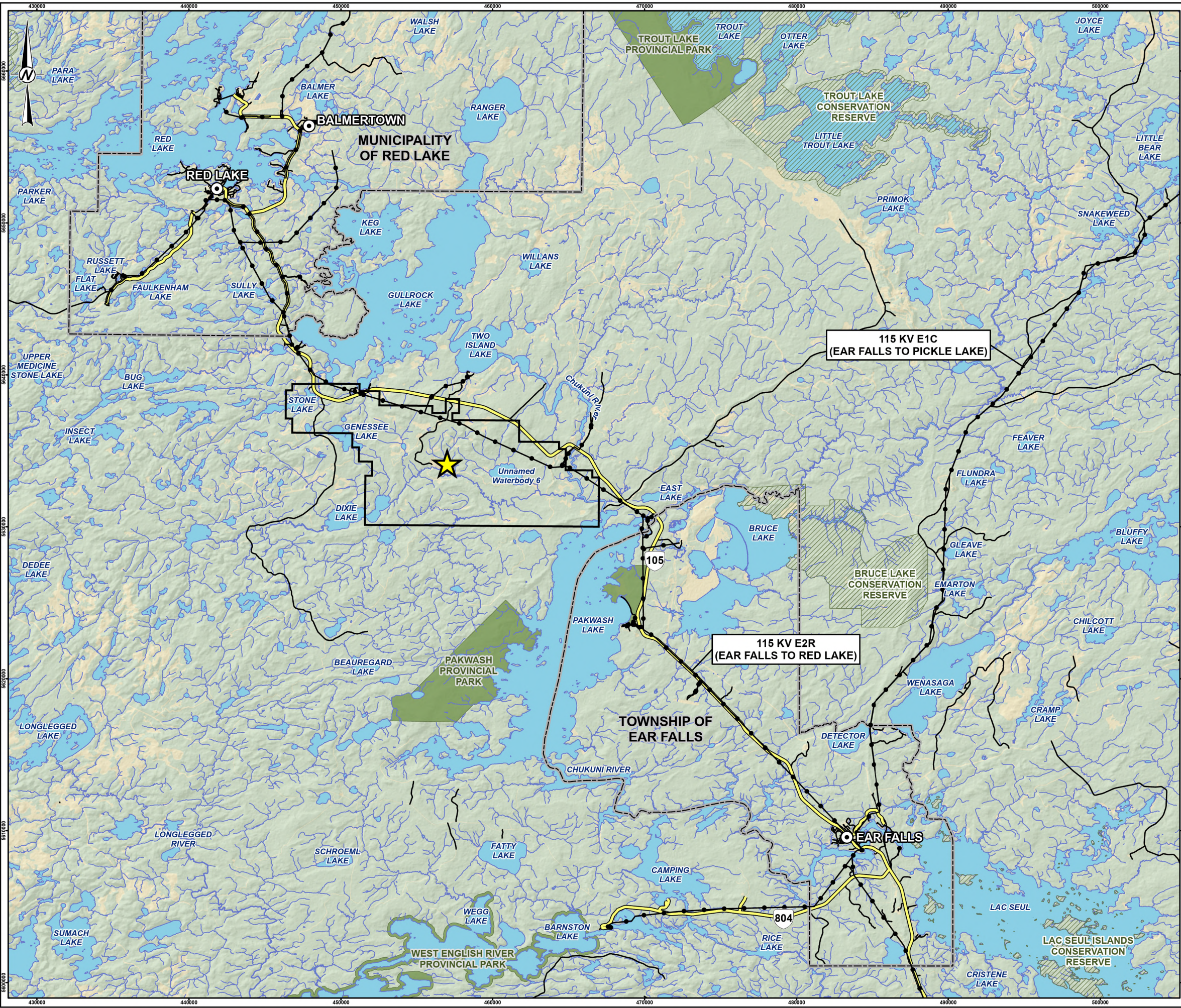
There is also a regional natural gas distribution line operated by Enbridge Gas located at Highway 105 (candidate alternatives B). Although there is some excess capacity within the pipeline, the pipeline does not have sufficient capacity to provide all of the Project natural gas needs to generate all the power requirement for the Project. Great Bear Resources does not know of any proposals to enhance the capacity of the existing pipeline network.

4.14.3 Assessment of Alternatives

There is currently no single power source that can provide the necessary power for the start of the operations phase of the Project. A combination of available grid power and natural gas power generation is the only technically and economically viable option currently available for the Project. This could change in the future if the regional power grid is reinforced by Hydro One Networks as proposed, and additional grid power becomes available.

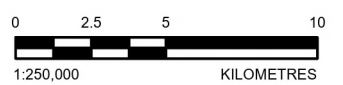
The only viable alternative to provide power for the life of the Project which is carried forward as the selected alternative in Section 5 (Project Description) is:

- Combination of grid power and natural gas power generation (combined candidate alternatives A and B).



LEGEND

- APPROXIMATE OPEN PIT CENTROID
- PROPERTY BOUNDARY
- EXISTING TRANSMISSION LINE
- TOWN
- PROVINCIAL PARK
- CONSERVATION RESERVE
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- LOWER TIER MUNICIPAL BOUNDARY



NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
 2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNR) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
 3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
 4. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
 5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
 GREAT BEAR RESOURCES

PROJECT
 GREAT BEAR PROJECT

TITLE
 REGIONAL TRANSMISSION LINES

CONSULTANT	YYYY-MM-DD	2026-03-31
	DESIGNED	---
	PREPARED	MD
	REVIEWED	---
	APPROVED	SD



PROJECT NO. CA0031271 CONTROL 0001 REV. A FIGURE 4.14-1

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4.15 Domestic Solid Waste Management

4.15.1 Background

Solid waste will be produced during all phases of the Project. Non-hazardous solid wastes will consist of materials such as:

- Domestic waste (food scraps, refuse and clothing)
- Combustible wastes (wood and paper products)
- Other inert wastes (scrap metals, glass and plastics).

Hazardous wastes include such items as used petroleum products, batteries, spent solvents, biomedical wastes, as well as contaminated soils. Consideration was not given to permanent storage and / or treatment of hazardous wastes on the site, as it is not economically practical or preferred from an environmental perspective to establish a hazardous waste treatment facility on site for the low volume anticipated to be produced. Hazardous solid waste will be shipped off site in accordance with regulatory requirements.

Demolition wastes associated with mine closure are assessed in Section 4.19.

4.15.2 Screening to Identify Alternatives for Assessment

Waste management is highly controlled in Ontario under the *Environmental Protection Act* and other regulatory instruments to support protection of the environment. The only candidate alternatives available for solid waste management for this locale is permanent storage in an approved landfill on site or off site, or burning in an incinerator. Recycling of all solid waste materials is not a viable alternative for this location, but will be considered during all phases where practical. Open air controlled burning may be completed for clean wood and cardboard waste at certain times of the year, under the guidance of the MNR.

Establishment of an onsite incinerator is not considered a technically viable alternative for the Project, as there would be a high challenge to obtaining the necessary provincial environmental approvals given the strict emission requirements for incineration.

A landfill for the Project could potentially be established on the Property at a location with appropriate subsurface and hydrogeologic conditions that provides for environmental protection. The onsite landfill would be operated and closed in accordance with applicable provincial regulations and guidelines. Dedicated landfills have been previously established at mining projects in Ontario, including because of the lack of capacity present in a large number of municipal landfills across the Province.

There are two municipal landfills located in the Red Lake and Ear Falls area that are road accessible, that are candidate offsite landfills (Figure 4.15-1):

- Red Lake Regional Landfill, located in Balmertown near Highway 125 (Environmental Compliance Approval A600903)
- Ear Falls Landfill, located on Highway 105 west of Ear Falls (Environmental Compliance Approval A7107001).

Utilization of either offsite alternative is subject to commercial agreements including confirmation of capacity and willingness to accept the Project waste.

Exporting the waste to other more distant locations is not considered to offer any technical or economical advantage, but could be considered if commercial arrangements could not be established with a local municipal landfill. There would be additional GHG and other emissions associated with that transport.

The following alternatives were considered for non-hazardous domestic waste:

- Alternative 1: truck off site to an existing landfill
- Alternative 2: develop an onsite domestic landfill.

4.15.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.15-1. The following performance objectives and criteria were identified as the key differentiators in the assessment of domestic waste management alternatives:

- Human environment
 - Local and regional economy
 - Change to local business and economic opportunities
- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Potential effect on Project financing resulting from investor attractiveness or risk
 - Cost effectiveness
 - Potential effect on Project financing resulting from investor attractiveness or risk.

Alternative 1 (truck off site to an existing landfill)

Advantages: this alternative provides financial benefit and economic opportunities to local business(es), with the long term liability for the waste management borne by the landfill operator supported by the tipping fees paid by Great Bear Resources.

Disadvantages: there is a greater potential for disruption of service, should the landfill capacity be fully utilized before the mine closes.

Alternative 2 (develop an onsite domestic landfill)

Advantages: this alternative is the best solution for long term availability as it is fully under the control of Great Bear Resources.

Disadvantages: long term monitoring management of the site will be required, potentially continuing after the mine closes.

Alternative 1 is the most preferred and selected alternative on the balance of advantages and disadvantages over all phases of the Project.

Alternative 2 could be selected in the future should circumstances changes (such as an inability to make appropriate commercial arrangements or future lack of capacity with the selected offsite landfill).

Table 4.15-1: Alternatives Assessment - Domestic Solid Waste Alternative Locations

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited air emissions would be generated transporting waste although more than Alternative 2 due to the great travel distance Alternative 2 (C/O/CI): limited air emissions would be generated from heavy equipment and transport vehicles associated with the construction, operation and closure of the landfill <p>There are no differentiating advantages or disadvantages for either location.</p>
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited noise would be generated by transport of waste off site Alternative 2 (C/O/CI): limited noise would be generated from the transport of waste and heavy equipment operation including use of backup beepers required for safety <p>There are no differentiating advantages or disadvantages for either location.</p>
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): groundwater would not be affected by solid waste transport off site Alternative 2 (C/O/CI): no anticipated effects to groundwater flows or levels <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no effects from solid waste transport off site Alternative 2 (C/O/CI): would have a small footprint and would be sited away from existing watercourses and waterbodies, no material effects on surface water are expected <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): groundwater quality would not be affected by solid waste transport off site Alternative 2 (C/O/CI): groundwater quality could be affected during all Project phases; however, this would be mitigated through engineering design to meet regulatory requirements, and treatment of leachate if needed
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): fish would not be affected by solid waste transport Alternative 2 (C/O/CI): fish would not be affected by solid waste landfilling (landfill would be appropriately sited to avoid fish habitat) <p>There are no differentiating advantages or disadvantages for either location.</p>
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no effects anticipated as the temporary storage area necessary to support the transport of waste would be established within the Project footprint Alternative 2 (C/O/CI): potential for minor habitat disruption; however, it would be sited to minimize any effect (landfill would be appropriately sited to avoid sensitive habitat) <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited sensory disturbance would be generated by transport of waste off site Alternative 2 (C/O/CI): limited changes to sensory disturbance would result from the transport of waste and periodic landfill heavy equipment operations <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): wetland connectivity would not be affected by solid waste transport Alternative 2 (C/O/CI): wetland connectivity would not be affected by alternative (landfill would be appropriately sited) <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no effects anticipated, as the temporary storage area necessary to support transport of waste would be established within the Project footprint Alternative 2 (C/O/CI): potential for minor habitat disruption; however, landfill would be sited to minimize any effect (landfill would be appropriately sited) <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited sensory disturbance would be generated by transport of waste off site Alternative 2 (C/O/CI): limited changes to sensory disturbance may result from the transport of waste and periodic landfill heavy equipment operations <p>There are no differentiating advantages or disadvantages for either location.</p>
	Natural Environment Summary	Equally preferred	Equally preferred	<p>Alternative 1: transport of waste to an existing landfill off site would have less effect on the natural environment overall, although there would be additional transport off site which could have a limited increased potential for vehicle – wildlife interactions.</p> <p>Alternative 2: there is the potential for limited disruption of the baseline environmental conditions with the construction and operation of an onsite landfill; however, it would be sited to minimize any effect (landfill would be appropriately sited) and mitigated through reclamation at closure.</p>

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): no additional land disturbance would be required as the temporary storage area necessary to support transport of waste would be established within the Project footprint Alternative 2 (C/O/CI): potential for minor habitat disruption; however, it would be sited to minimize any effect (landfill would be appropriately sited) and landfill would be operated to minimize attraction of nuisance wildlife <p>There are no differentiating advantages or disadvantages for either location.</p>
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): Wild Rice would not be affected by solid waste transport Alternative 2 (C/O/CI): Wild Rice would not be affected by solid waste landfilling (landfill would be appropriately sited) <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): archaeology sites would not be affected by solid waste transport Alternative 2 (C/O/CI): archaeology sites would not be affected by solid waste landfilling (landfill would be appropriately sited) <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): provides a potential income opportunity for a third-party to transport solid wastes off site, as well as tipping fees for the local landfill operator / municipality Alternative 2 (C/O/CI): Project development would generate considerable regional and local, employment and business opportunities, however there are no material effects associated with this alternative
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): transport of solid waste off site is not anticipated to have a material effect on traditional land uses Alternative 2 (C/O/CI): construction would remove the area from other land and resource uses which would be mitigated with reclamation during the closure phase <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): sites would not be affected by solid waste transport Alternative 2 (C/O/CI): no known spiritual and ceremonial sites are present; sites would not be affected by solid waste landfilling (landfill would be appropriately sited) <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (C/O/CI): no potential for effects as Reserves are distant from Project and is not expected to be located along the travel route. <p>There are no differentiating advantages or disadvantages for either location.</p>
	Human Environment Summary	Most preferred	Least preferred	<p>Alternative 1: transport of waste to an existing landfill off site would provide limited additional economic opportunities / benefits for local communities and businesses</p> <p>Alternative 2: there are no advantages or disadvantages as the facility would be sited to minimize potential effect (landfill would be appropriately sited)</p>
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): commercial arrangements would need to be made and capacity confirmed in a local landfill within a reasonable distance; this alternative poses a schedule risk if commercial terms cannot be reached, as design and obtaining regulatory approvals for a new landfill could take years Alternative 2 (C/O/CI): this alternative is expected to be able to consistently meet Project needs as the site would be fully within Great Bear Resources control
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited potential from effects from a vehicular accident involving waste transport Alternative 2 (C/O/CI): limited potential from effects as design would be required to meet strict provincial regulatory requirements, including ongoing monitoring and report of results
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): limited GHG emissions would be generated from transport of the waste Alternative 2 (C/O/CI): limited GHG emissions would be generated from heavy equipment and transport vehicles associated with the construction, operation and closure of the landfill <p>There are no differentiating advantages or disadvantages for either location.</p>

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): transport and storage would be under the care and control of a third party with liability presumed to be held by those parties which is an advantage for Great Bear Resources Alternative 1 (C/O/CI): there is a risk the landfill may not be fully available over the entire life of the mine or for all types of domestic waste or access could be disrupted, as it would be operated by a third party Alternative 2 (C/O/CI): establishing a landfill presents an additional potential risk of liability at closure, which would require long-term management and monitoring
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (C/O/CI): comparatively higher operating cost (lower capital cost) but the increased operating costs would not be limiting to the Project Alternative 2 (C/O/CI): comparatively higher capital cost (lower operating cost) but the increased capital costs are not limiting to the Project <p>There are no differentiating advantages or disadvantages for either location.</p>
	Technical and Economic Summary	Most preferred	Least preferred	<p>Alternative 1: transporting waste to an existing landfill off site would minimize the long term liability for Great Bear Resources, but this alternative presents a potential scheduling risk if commercial terms cannot be reached or the selected landfill closes unexpectedly.</p> <p>Alternative 2: provides greater certainty of being fully available for site needs, but at an additional cost and long term liability.</p>
OVERALL ASSESSMENT		MOST PREFERRED (SELECTED)	LEAST PREFERRED	<p>Alternative 1: is the most preferred and selected alternative on balance of advantages and disadvantages over all phases of the Project.</p> <p>Alternative 2: is least preferred and could be selected in the future should circumstances changes (such as an inability to make appropriate commercial arrangements or future lack of capacity with the selected offsite landfill).</p>

Notes:
C: construction phase; O: operations phase; CI: closure phase.

4.16 Accommodations

4.16.1 Background

The Project is located within a potentially reasonable daily commuting distance of both the Municipality of Red Lake and Township of Ear Falls as noted in Section 4.4.9.3. Studies to date however, indicate there is unavailable existing accommodations in the communities to support the entire Project. Dedicated accommodations are proposed for the Project construction and operations phases, to alleviate the potential effect on these communities and the surrounding area.

4.16.2 Screening to Identify Alternatives for Assessment

The candidate alternatives considered were to locate the new accommodations for the Project either within the Property on lands held by Great Bear Resources, or on lands located off the Property. Locating the new accommodations on the Property provides the greater Project efficiency. An offsite location which would expand the Project footprint, would result in longer commuting time for workers, and could also have local traffic considerations. Accordingly, the candidate alternative of a dedicated facility located on lands not held by Great Bear Resources (i.e., off Property) was not considered technically viable.

Two alternative locations within the Property were identified during engineering studies, which would support efficient worker access and site security (Figure 4.16-1):

- Alternative 1: along Tuzyk's Road north of the regional transmission line (as shown on Figure 4.16-1, or potentially on the west side)
- Alternative 2: along the mine access road near the process plant complex.

4.16.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.16-1. The following performance objective and criterion was identified as the key differentiators in the assessment of accommodations camp location alternatives:

- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs.

Alternative 1 (north of the regional transmission line)

Advantages: this alternative accommodations camp location is expected to be more attractive to workers, as it is further away from the main industrial area. It also presents a security advantage, as camp-related workers and suppliers would not need access to the main site area.

Disadvantages: this alternative requires a shuttle service to transport workers to the main Project site, and there is additional travel time although it is not of material length.

Alternative 2 (near the process plant)

Advantages: this alternative is the most efficient for quick access to main site by workers staying at the camp.

Disadvantages: a camp in close proximity to the industrial area is expected to be less pleasing to attract workers for the Project; and is of greater concern for worker safety with increased potential for vehicle interactions with mining activities.

Alternative 1 is the most preferred and selected alternative on balance of advantages and disadvantages over all phases of the Project, and is carried forward into Section 5 (Project Description).

Table 4.16-1: Alternatives Assessment - Accommodations Camp Alternative Locations

Criteria	Indicators	Alternative 1 North of Transmission Line	Alternative 2 Near Process Plant	Advantages and Disadvantages (applies to all Project phases except as noted)
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location for all Project phases. Minor changes to air quality may result, primarily during the construction phase, but would not affect ability to meet regulatory requirements.
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either location for all Project phases. Changes to sound levels may result from the accommodations camp, primarily during the construction phase, but would not affect ability to meet regulatory requirements.
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. No material changes to groundwater flow direction or level are anticipated from the construction, operation or closure of the accommodations camp.
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. No watercourses or waterbodies are present at either location or could be affected by construction, operation or closure of the accommodations camp.
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. No material changes to groundwater or surface water quality are anticipated from the construction, operation or closure of the accommodations camp.
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. No fish habitat is present at either alternative location or could be affected by construction, operation or closure of the accommodations camp.
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the accommodations camp would remove vegetation communities present in the baseline condition (primarily upland coniferous forest), however neither alternative is located in habitat that is unique in the Property or region.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Limited changes to sensory disturbance may result from the accommodations camp and activity associated with the camp.
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Neither alternative location would have a material effect on wetland connectivity.
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Construction of the accommodations camp would affect terrestrial habitat present in the baseline condition, however neither alternative is located in SAR habitat that is unique in the Property.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either alternative location. Limited changes to sensory disturbance may result from the accommodations camp and activity associated with the camp.
Natural Environment Summary		Equally preferred	Equally preferred	Alternatives 1 and 2: There are no differentiating advantages or disadvantages for either location.
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Equally preferred	Equally preferred	Construction at both alternative locations would remove the area from other land and resource uses, through operations and into closure. This effect would be mitigated with reclamation during the closure phase. There are no differentiating advantages or disadvantages for either location.
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Equally preferred	Equally preferred	No Wild Rice is present at either location or could be affected by construction, operation or closure of the accommodations camp.
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Equally preferred	Equally preferred	No known archaeology sites are present at either location or could be affected by construction, operation or closure of the accommodations camp. There are no differentiating advantages or disadvantages for either location.
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Equally preferred	Equally preferred	Development operation and closure of the Project, including of the accommodations camp, would generate considerable regional and local, employment and business opportunities. There are no differentiating advantages or disadvantages for either location.
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Equally preferred	Equally preferred	Construction at both alternative locations would remove the area from other land and resource uses. This effect would be mitigated with reclamation during the closure phase. There are no differentiating advantages or disadvantages for either location.
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Equally preferred	Equally preferred	No known spiritual and ceremonial sites are present at either location or could be affected by construction, operation or closure of the accommodations camp. There are no differentiating advantages or disadvantages for either location.
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Equally preferred	Equally preferred	No potential for effects; the Reserves are distant from Project and is not expected to be located along the travel route. There are no differentiating advantages or disadvantages for either location.
Human Environment Summary		Equally preferred	Equally preferred	Alternatives 1 and 2: There are no differentiating advantages or disadvantages for either location.

Criteria	Indicators	Alternative 1 North of Transmission Line	Alternative 2 Near Process Plant	Advantages and Disadvantages (applies to all Project phases except as noted)
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Most preferred	Least preferred	<p>Alternative 1 (C/O/CI): located further away from the main site, which is considered to be preferred from the perspective of attracting and retaining workers, including for local dust and sound levels for sleeping (transport would be provided to shuttle workers to the main site area)</p> <ul style="list-style-type: none"> Alternative 1 (C/O/CI): presents a security and efficiency advantage, as general camp suppliers and support workers would not be provided access and would not need to clear main site security Alternative 2 (C/O/CI): would be closer to the main site area, and would provide a very short, walkable commute for many of the workers staying at the camp (a covered walkway could be provided to mitigate adverse weather conditions) <p>Both locations are equally accessible by existing infrastructure. On balance of the advantages and disadvantages, Alternative 1 is most preferred, in recognition of the anticipated challenges associated with hiring qualified individuals.</p>
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Equally preferred	Equally preferred	No material accidents or malfunctions are anticipated from the accommodations camp and activity associated with the camp during any Project phase. There are no differentiating advantages or disadvantages for either location.
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	There would be limited GHG emission associated with the construction of the accommodations camp, which would approximately the same for both alternative locations. There are no differentiating advantages or disadvantages for either location.
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Equally preferred	Equally preferred	Neither location is considered material to the attractiveness of the Project for financing or as a potential topic of risk. There are no differentiating advantages or disadvantages for either location.
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	Neither location is considered materially different from perspective of capital or operations costs. A site shuttle service may be provided for Alternative 2 which would have a limited increase in costs. There are no differentiating advantages or disadvantages for either location.
	Technical and Economic Summary	Most preferred	Least preferred	<p>Alternative 1: locating the camp further from the main site area is believed to assist with attracting workers wanting a quieter location away from the primary working area.</p> <p>Alternative 2: provides greater efficiency but may pose a challenge for attracting and retaining workers in a competitive employment market.</p> <p>Alternative 1 is most preferred for the ability to meeting Project needs, including attracting workers. There are otherwise no differentiating advantages or disadvantages for either location.</p>
OVERALL ASSESSMENT		MOST PREFERRED (SELECTED)	LEAST PREFERRED	<p>Alternative 1: is the most preferred and selected alternative on balance of advantages and disadvantages, over all phases of the Project.</p> <p>Alternative 2: is least preferred and could be selected in the future should circumstances changes.</p>

Notes:
C: construction phase; O: operations phase; CI: closure phase.

4.17 Mine Closure – LP Central Pit

4.17.1 Background

Mine decommissioning and closure in Ontario must be completed to satisfy the Mine Rehabilitation Code under Ontario Regulation 35/24, Rehabilitation of Lands of the *Mining Act* or future equivalent. The primary intent of reclamation and closure of an open pit is to achieve a physically safe and chemically stable environment. Both progressive and final reclamation as required by the Code is inherent in the Project design.

Despite these regulatory requirements, an assessment of the alternatives for closure of the LP Central pit has been provided for transparency purposes, and as it has been raised as an area of interest during consultation and engagement activities.

4.17.2 Screening to Identify Alternatives for Assessment

Section 21 of the Mine Rehabilitation Code identifies the following potentially acceptable strategies and candidate alternatives for reclamation and closure of the LP Central pit:

- Candidate alternative A: backfilling
- Candidate alternative B: filling with water (passively)
- Candidate alternative C: filling with water (actively)
- Candidate alternative D: sloping if determined to be more appropriate than backfilling or filling with water
- Candidate alternative E: boulder fencing or berming may be used if the above measures are impracticable
- Candidate alternative F: fencing and signs may be used if fully justified in the closure plan if all of the measures above are impracticable.

The open pit will passively fill with water once dewatering ceases, through a combination of groundwater inflow, direct precipitation and runoff without action by Great Bear Resources. For that reason candidate alternatives A, B and C (backfilling and filling with water) are the only potentially technical viable alternatives of these closure strategies.

Pit backfilling (candidate alternative A) is the process of refilling an excavated pit with mining waste materials, such as tailings, mine rock or overburden, either coincidentally during operations or with double-handling after closure. Backfilling with other materials is generally not allowed in Ontario. Approximately 67 Mm³ of mineral materials (tailings, mine rock or overburden) would be required to fill the LP Central pit to surface at closure.

Mining of the LP Central pit is expected to be completed in year 9 of operations, followed by an additional approximately 16 years of underground mining. During this latter period, stockpiled ore from the open pit as well as ore extracted directly from underground will be processed, resulting in approximately 21 Mm³ of tailings solids requiring storage. The tailings during this period could be stored in the LP Central pit rather than in the TMF, provided that the underground workings which daylight into the open pit could be effectively sealed. There are potential safety concerns and worker perceptions of safety with this approach, as the underground mine will continue to operate beneath the open pit after open pit mining ceases. For that reason, backfilling the LP Central pit with slurry tailings during operations is not

considered technically viable based on current information. The alternative of backfilling the LP Central pit with tailings may be reconsidered during operations, when the underground mine design is finalized and when additional in-pit geotechnical information is available.

Excavating, transporting and backfilling of the material in the LP Central pit after it is already stored in the TMF, MRS or OVB during the operations phase, would cost in excess of \$570 million. This cost cannot be supported by the Project, and the candidate alternative of backfilling the LP Central pit with mineral waste at closure is not an economically viable alternative. The Project may look at opportunities to retain or directly place mine rock in the LP Central pit during operations.

Passive filling with water (candidate alternative B) is defined as filling of the open pit with water that will naturally enter the open pit through direct precipitation, groundwater inflow and surface runoff. It does not include pumping from external watercourses or waterbodies, or adjustment of the operational water management practices (such as pumping of runoff from other site areas). The Project site plan has purposefully been designed so that at closure, runoff from a large portion of the PA including the primary stockpiles, will drain by gravity into the LP Central pit. It will take approximately 25 years for the LP Central pit to fill with water passively, and stabilize at the natural water table level elevation with only these water inputs (assuming that the underground mine is also filled). Passive filling of the LP Central pit with water is an economically and technically viable candidate alternative that satisfies the requirements of the Mine Rehabilitation Code.

The length of time until the LP Central pit is filled with water could be reduced through active filling (candidate alternative C). Active filling would require the pumping of water from a local water source, in addition to the natural filling processes, to reduce the length of time for the pit to fill. As a pipeline is in place to discharge treated effluent to the Chukuni River, it could potentially be repurposed to draw water from the Chukuni River to enhance the filling of the LP Central pit at closure. No other watercourses or waterbodies would be able to supply the volume of water required that would make a material difference to the filling time, and has the necessary infrastructure in place. Withdrawal of water from other larger waterbodies in the region would unnecessarily expand the PA and cause additional environmental disturbance, including potentially to wildlife from the required infrastructure corridor. Active filling of the LP Central pit with water from the Chukuni River is economically and technically viable.

Two alternatives were identified for closure of the LP Central pit that would satisfy the Mine Rehabilitation Code and are technically and economically viable:

- Alternative 1 (candidate alternative B): passive filling of the pit with natural runoff, groundwater inflow and direct precipitation
- Alternative 2 (candidate alternative C): supplementation of passive filling with active pumping of water from the Chukuni River.

4.17.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.17-1. The following performance objectives and criteria were identified as the key differentiator in the assessment of LP Central pit closure alternatives:

- Natural environment performance:
 - Water
 - Change to groundwater flow direction and level
- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Cost effectiveness
 - Potential effect on Project financing resulting from investor attractiveness or risk.

Alternative 1 (passive water filling)

Advantages: this alternative meets the requirements of the *Mining Act* for closure and has a lower overall cost as there would be no additional pumping or revision to existing site infrastructure to support pumping of water from the Chukuni River to fill the pit.

Disadvantages: it will take longer to fill the LP Central pit passively with water, which would delay completion of site reclamation and associated reduction in closure liability. The delay in covering of pit walls with water could also potentially affect pit lake water quality (natural environment).

Alternative 2 (passive and active water filling)

Advantages: this presents the best technical solution as it will meet the requirements of the *Mining Act* for closure sooner. It will also expedite a reduction in Project closure liability sooner.

Disadvantages: there will be additional power consumption and other costs associated with pumping freshwater from the Chukuni River to fill the LP Central pit. The costs are not limiting to the Project.

Alternative 2 (passive and active water filling) is the selected alternative for closure of the LP Central pit that is carried forward in the Project design described in Section 5 (Project Description).

Table 4.17-1: Alternatives Assessment - LP Central Pit Closure Alternatives

Criteria	Indicators	Alternative 1 Passive Filling	Alternative 2 Active and Passive Filling	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	No material air emissions would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	No material noise generation would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): passive filling with water will take longer for the groundwater level to return to a steady state Alternative 2 (CI): active filling with water will take less time for the groundwater level to return to a steady state Alternative 1 (CI): would not have affect surface water levels or flows, but would take longer from groundwater levels and groundwater baseflow for local watercourses to return to a steady state Alternative 2 (CI): would require pumping of water from the Chukuni River to expedite filling of the open pit; the rate of pumping would be regulated (anticipated to be less than 10% of flow) and would be sufficiently low to remain within natural flow variations; would reduce time until baseflow returns to steady state conditions
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either approach. The rate of water withdrawal for Alternative 2 would be establish sufficient low to avoid effects to fish habitat and the pit lake would not be developed for fish habitat.
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	No material changes to sensory disturbance would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	No material changes to sensory disturbance would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Natural Environment Summary		Equally preferred	Equally preferred	Alternative 1: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure. Alternative 2: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure. There are no differentiating advantages or disadvantages for either approach.
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Human Environment Summary		Neutral	Neutral	Alternative 1 and 2: Neither alternative closure method would be anticipated to have an effect on the human environment. There are no differentiating advantages or disadvantages to the human environment for either approach.

Criteria	Indicators	Alternative 1 Passive Filling	Alternative 2 Active and Passive Filling	Advantages and Disadvantages
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): filling the open pit with water at closure meets the requirements of the <i>Mining Act</i> for closure Alternative 2 (CI): active filling of the open pit with water at closure meets the requirements of the <i>Mining Act</i> for closure and would reduce the length of time for complete filling of the pit which is preferred
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	No material GHG emissions would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduces the Project closure liability Alternative 2 (CI): active filling of the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and expedites reduction of the Project closure liability
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): there would be no additional costs for filling the pit with water passively Alternative 2 (CI): comparatively higher cost that would not be limiting to the Project, associated primarily with revision to site infrastructure and the energy costs for pumping water from the Chukuni River <p>There are no differentiating advantages or disadvantages for either location.</p>
	Technical and Economic Summary	Least preferred	Most preferred	<p>Alternative 1: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure.</p> <p>Alternative 2: active filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduce the closure liability sooner.</p>
OVERALL ASSESSMENT		LEAST PREFERRED	MOST PREFERRED (SELECTED)	<p>Alternative 1: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure at the lowest cost.</p> <p>Alternative 2: active filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduce the closure liability sooner at a cost that is not limiting to the Project, and may improve pit lake water quality by covering exposed potentially acid generating rock on pit walls with water faster.</p>

Note:
CI: closure phase.

4.18 Mine Closure – VMF

4.18.1 Background

The Viggo pit which is developed during the construction phase, will be repurposed during operations, for reject solution management (west VMF), and to store concentrate tailings and for contact water management (east VMF). At the end of operations, the west VMF will be partially filled with reject solution, and the east VMF will be partially filled with concentrate tailings and contact waters. Great Bear Resources intend to pump the approximately 300,000 m³ of reject solution temporarily stored during operations in the west VMF, into the underground mine at depth (1500 level below surface currently planned) for permanent storage over a period of approximately three months, to reduce the potential risk of this solution mixing with pit lake water, and rising to surface despite the inherent density gradient expected to be present. After the transfer to underground is completed, overburden may be placed in the base of the west VMF to cover settled reject solution solids.

Decommissioning and closure of the VMF must satisfy the Mine Rehabilitation Code under Ontario Regulation 35/24, Rehabilitation of Lands of the *Mining Act* or future equivalent. The primary intent of reclamation and closure of an open pit is to achieve a physically safe and chemically stable environment. Despite these regulatory requirements, an assessment of the alternatives for closure of the VMF has been provided for transparency purposes, as it is expected to be an area of interest.

4.18.2 Screening to Identify Alternatives for Assessment

The VMF is repurposed open pit. Section 21 of the Mine Rehabilitation Code identifies the following potentially acceptable strategies and candidate alternatives for reclamation and closure of open pits:

- Candidate alternative A: backfilling
- Candidate alternative B: filling with water (passively)
- Candidate alternative C: filling with water (actively)
- Candidate alternative D: sloping if determined to be more appropriate than backfilling or filling with water
- Candidate alternative E: boulder fencing or berming may be used if the above measures are impracticable
- Candidate alternative F: fencing and signs may be used if fully justified in the closure plan if all of the measures above are impracticable.

The VMF (i.e., the combined east VMF and west VMF) will passively fill with water once dewatering ceases at the end of operations, through a combination of groundwater inflow, direct precipitation and runoff without action by Great Bear Resources. For that reason candidate alternatives A, B and C (backfilling and filling with water) are the only potentially technical viable alternatives of these closure strategies. Note that the other candidate pit closure alternatives listed above (candidate alternatives D, E and F) may be appropriate as temporary measures.

Pit backfilling (candidate alternative A) is the process of refilling an excavated pit with mining waste materials, such as tailings, mine rock or overburden, either coincidentally during operations or with double-handling after closure. The east lobe of the Viggo pit (east VMF) will

be partially backfilled with concentrate tailings during operations, that will be maintained under a water cover. Excavating, transporting and backfilling of the material in the west VMF and east VMF after it has already been stored in the TMF, MRS or OVB during the operations phase, would cost in excess of \$55 million. This cost cannot be supported by the Project, and the candidate alternative of backfilling the Viggo pit with mineral waste at closure is not an economically viable alternative.

Passive filling with water (candidate alternative B) is defined a filling of the open pit with water that will naturally enter the open pit through direct precipitation, groundwater inflow and surface runoff. Passive filling with water is an economic and technically viable candidate alternative that satisfies the requirements of the Mine Rehabilitation Code.

The length of time until the VMF is filled with water could be reduced through active filling (candidate alternative C). As a pipeline is in place to discharge treated effluent to the Chukuni River, it could potentially be repurposed to draw water from the Chukuni River to enhance the filling of the VMF, as is proposed for the LP Central pit. Withdrawal of water from other larger waterbodies in the region, would unnecessarily expand the PA and cause additional environmental disturbance. Active filling of the VMF with water from the Chukuni River is economically and technically viable.

Two alternatives were identified for closure of the VMF (after the reject solution is transferred from the west VMF to the underground mine for permanent storage), which would satisfy the Mine Rehabilitation Code that are technically and economically viable:

- Alternative 1 (candidate alternative B): passive filling of the VMF with natural runoff, groundwater inflow and direct precipitation
- Alternative 2 (candidate alternative C): supplementation of passive filling with active pumping of water to the pit from the Chukuni River.

4.18.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.18-1. The following performance objectives and criteria were identified as the key differentiators in the assessment of VMF closure alternatives:

- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Cost effectiveness
 - Potential effect on Project financing resulting from investor attractiveness or risk.

Alternative 1 (passive water filling)

Advantages: this alternative meets the requirements of the *Mining Act* for closure and has a lower overall cost as there would be no additional pumping or revision to existing site infrastructure to support pumping of water from the Chukuni River to fill the VMF.

Disadvantages: it will take longer to fill the VMF passively with water, which would delay completion of site reclamation and associated reduction in closure liability. The delay in covering of pit walls with water could also potentially affect pit lake water quality (natural environment).

Alternative 2 (passive and active water filling)

Advantages: this presents the best technical solution as it will meet the requirements of the *Mining Act* for closure sooner. It will also expedite a reduction in Project closure liability sooner.

Disadvantages: there will be additional power consumption and other costs associated with pumping freshwater from the Chukuni River to fill the VMF. The costs are not limiting to the Project.

Alternative 2 (passive and active water filling) is the selected alternative for closure of the VMF that is carried forward in the Project design described in Section 5 (Project Description).

Table 4.18-1: Alternatives Assessment - VMF Closure Alternatives

Criteria	Indicators	Alternative 1 Passive Filling	Alternative 2 Active and Passive Filling	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	No material air emissions would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	No material noise generation would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): passive filling with water will take longer for the groundwater level to return to a steady state Alternative 2 (CI): active filling with water will take less time for the groundwater level to return to a steady state
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): would not have affect surface water levels or flows, but would take longer from groundwater levels and groundwater baseflow for local watercourses to return to a steady state Alternative 2 (CI): would require pumping of water from the Chukuni River to expedite filling of the open pit; the rate of pumping would be regulated (anticipated to be less than 10% of flow) and would be sufficiently low to remain within natural flow variations; would reduce time until baseflow returns to steady state conditions
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	Filling with water would reduce potential effects from the long term exposure of acid generating material present on the pit walls. Active filling would reduce the exposure time; however, the walls would be exposed during operations. Accordingly, there may not be a differentiating advantage or disadvantage for either approach.
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	There are no differentiating advantages or disadvantages for either approach. The rate of water withdrawal for Alternative 2 would be establish sufficient low to avoid effects to fish habitat and the pit lake would not be developed for fish habitat.
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	No material changes to sensory disturbance would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	No material changes to sensory disturbance would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
	Natural Environment Summary	Equally preferred	Equally preferred	Alternative 1: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure Alternative 2: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure There are no differentiating advantages or disadvantages for either approach.
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
	Human Environment Summary	Neutral	Neutral	Alternative 1 and 2: Neither alternative closure method would be anticipated to have an effect on the human environment. There are no differentiating advantages or disadvantages to the human environment for either approach.

Criteria	Indicators	Alternative 1 Passive Filling	Alternative 2 Active and Passive Filling	Advantages and Disadvantages
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): filling the open pit with water at closure meets the requirements of the <i>Mining Act</i> for closure Alternative 2 (CI): active filling of the open pit with water at closure meets the requirements of the <i>Mining Act</i> for closure and would reduce the length of time for complete filling of the pit which is preferred
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Neutral	Neutral	This indicator does not apply to this alternative closure method.
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	No material GHG emissions would result from either alternative. There are no differentiating advantages or disadvantages for either approach.
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduces the Project closure liability Alternative 2 (CI): active filling of the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and expedites reduction of the Project closure liability
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): there would be no additional costs for filling the pit with water passively Alternative 2 (CI): comparatively higher cost that would not be limiting to the Project, associated primarily with revision to site infrastructure and the energy costs for pumping water from the Chukuni River <p>There are no differentiating advantages or disadvantages for either location</p>
	Technical and Economic Summary	Least preferred	Most preferred	<p>Alternative 1: filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure</p> <p>Alternative 2: active filling the open pit with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduce the closure liability sooner</p>
OVERALL ASSESSMENT		LEAST PREFERRED	MOST PREFERRED (SELECTED)	<p>Alternative 1: filling the VMF with water at closure would meet the requirements of the <i>Mining Act</i> for closure at the lowest cost</p> <p>Alternative 2: active filling the VMF with water at closure would meet the requirements of the <i>Mining Act</i> for closure and reduce the closure liability sooner at a cost that is not limiting to the Project, and may improve pit lake water quality by covering exposed potentially acid generating rock on pit walls with water faster</p>

Note:
CI: closure phase.

4.19 Mine Closure – Demolition Waste Management

4.19.1 Background

Mine decommissioning and closure must be completed to satisfy the Mine Rehabilitation Code under Ontario Regulation 35/24, Rehabilitation of Lands, of the *Mining Act* or future equivalent. Demolition wastes that are not transported off site for re-use or sale will require permanent disposal in a manner that meets the requirements of the Ontario *Environmental Protection Act* and associated regulations.

Domestic solid waste management is considered in Section 4.16. Hazardous waste from closure will be transported off site for management, the same as during other Project phases.

4.19.2 Screening to Identify Alternatives for Assessment

The only candidate alternatives available for management of demolition wastes, is permanent storage in an approved landfill either on site or off site. Deposition in an uncontrolled manner, such as in an open pit does not meet environmental regulatory requirements. Establishment of an onsite incinerator for the closure phase is not considered a viable alternative as the majority of the demolition waste cannot be incinerated, and there is a high challenge to obtaining the necessary environmental approvals and meeting strict emissions requirements for incineration.

A demolition landfill could potentially be established on the Property for inert demolition wastes, such as within the perimeter zone of the NPAG MRS or OVB2. An onsite landfill would need to be operated and closed in accordance with applicable provincial regulations and guidelines. Dedicated landfills have been previously established at mining projects in Ontario, including because of the lack of capacity present in a large number of municipal landfills across the Province.

There are two municipal landfills located in the Red Lake and Ear Falls area that are road accessible and are candidate offsite landfills for demolition waste based on current knowledge (Figure 4.15-1):

- Red Lake Regional Landfill (Balmertown near Highway 125; Environmental Compliance Approval A600903)
- Ear Falls Landfill (Highway 105; Environmental Compliance Approval A7107001).

The following alternatives were considered:

- Alternative 1: truck demolition waste off site to an existing landfill
- Alternative 2: develop an onsite demolition landfill.

4.19.3 Assessment of Alternatives

All alternative assessment performance objectives and criteria were considered in the comparative analysis as summarized in Table 4.19-1. The following performance objectives and criteria were identified as the key differentiators in the assessment of demolition waste management alternatives:

- Human environment
 - Local and regional economy
 - Change to local business and economic opportunities

- Technical and economic performance:
 - Ability to service the site effectively
 - Proven effectiveness and ability to consistently meet Project needs
 - Potential effect on Project financing resulting from investor attractiveness or risk.

Alternative 1 (truck off site to an existing landfill)

Advantages: this alternative provide financial benefit and economic opportunities to local business(es), with the long term liability for the waste management borne by the landfill operator supported by the tipping fees paid by Great Bear Resources.

Disadvantages: there is a greater potential for disruption of service, should the existing landfill capacity be fully utilized before the mine closes and additional landfills not be developed in the region.

Alternative 2 (develop an onsite demolition landfill)

Advantages: this alternative is the best solution for long term availability as it is fully under the control of Great Bear Resources.

Disadvantages: long term monitoring management of the site will be required, continuing after the mine closes.

Alternative 1 is the most preferred and selected alternative on balance of advantages and disadvantages over all phases of the Project.

Alternative 2 could be selected in the future should circumstances changes (such as an inability to make appropriate commercial arrangements or future lack of capacity at a local offsite landfill).

Table 4.19-1: Alternatives Assessment - Demolition Waste Alternatives

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
Natural Environment				
Air quality	<ul style="list-style-type: none"> Change in air quality 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): air emissions would be generated from transporting demolition waste Alternative 2 (CI): air emissions would be generated from heavy equipment and transport vehicles associated with the construction, operation and closure of the landfill <p>There are no differentiating advantages or disadvantages for either location.</p>
Sound	<ul style="list-style-type: none"> Change in sound level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): limited noise would be generated by transporting demolition waste off site Alternative 2 (CI): limited noise would be generated from transporting waste and heavy equipment operation including use of backup beepers required for safety <p>There are no differentiating advantages or disadvantages for either location.</p>
Water	<ul style="list-style-type: none"> Change to groundwater flow direction and level 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): groundwater would not be affected by demolition waste transport off site Alternative 2 (CI): no anticipated effects to groundwater flows or levels <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in flows (watercourses), and areas and levels (waterbodies) 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): no effects from demolition waste transport off site Alternative 2 (CI): would have a small footprint and would be sited away from existing watercourses and waterbodies, no material effects on surface water are expected <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in quality of groundwater and surface water 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): groundwater would not be affected by demolition waste transport off site Alternative 2 (CI): the potential for groundwater to be affected would be mitigated through engineering design to meet regulatory requirements, and monitoring and treatment of leachate if needed.
Fish and fish habitat	<ul style="list-style-type: none"> Area and functionality of fish habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): fish would not be affected by demolition waste transport Alternative 2 (CI): fish would not be affected by demolition waste landfilling (landfill would be appropriately sited to avoid fish habitat) <p>There are no differentiating advantages or disadvantages for either location.</p>
Wildlife and habitat	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): no effects anticipated as the laydown area necessary to support transporting waste would be established within the Project footprint Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional habitat disturbance <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): limited sensory disturbance would be generated by the transport of demolition waste off site Alternative 2 (CI): activity would be coincident with site reclamation and additional changes to sensory disturbance would be unlikely to result from the transport of demolition waste and landfill heavy equipment operations <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Ability to maintain wetland connectivity 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): wetland connectivity would not be affected by demolition waste transport Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and wetland connectivity would not be affected <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
SAR	<ul style="list-style-type: none"> Area, type and functionality of habitat that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): no effects anticipated, as the laydown area necessary to support transporting demolition waste would be established within the Project footprint Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional habitat disturbance <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Change in the level of sensory disturbance 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): limited sensory disturbance would be generated by the transport of demolition waste off site Alternative 2 (CI): limited changes to sensory disturbance may result from the transport of demolition waste and periodic landfill heavy equipment operations <p>There are no differentiating advantages or disadvantages for either location.</p>
	Natural Environment Summary	Equally preferred	Equally preferred	<p>Alternative 1: limited disruption of the baseline environmental conditions, although transporting waste to an existing landfill off site would require additional transport off site which could result in a limited increased potential for vehicle – wildlife interactions.</p> <p>Alternative 2: limited disruption of the baseline environmental conditions, as demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile; effect would be mitigated through reclamation of the area after demolition activities completed.</p>

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
Human Environment				
Land and resource use	<ul style="list-style-type: none"> Change to local land and resource use opportunities 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): no effects anticipated as the laydown area necessary to support transport of waste would be established within the Project footprint Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional habitat disturbance <p>There are no differentiating advantages or disadvantages for either location.</p>
Cultural heritage	<ul style="list-style-type: none"> Area or functionality of Wild Rice that would be displaced or altered 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): Wild Rice would not be affected by demolition waste transport Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional habitat disturbance <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Archaeology	<ul style="list-style-type: none"> Causes damage or disturbance to known archaeological sites 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): archaeology sites would not be affected by demolition waste transport Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional disturbance <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
Local and regional economy	<ul style="list-style-type: none"> Change to local business and economic opportunities 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (CI): provides a potential income opportunity for a third-party to transport demolition wastes off site, as well as tipping fees for the local landfill operator / municipality Alternative 2 (CI): Project closure would generate local, employment and business opportunities, however there are no material effects associated with this alternative
Indigenous people	<ul style="list-style-type: none"> Maintains access to traditional lands for current traditional land uses except as otherwise agreed to with local Indigenous communities 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): transport of demolition waste off site is not anticipated to have a material effect on traditional land uses Alternative 2 (CI): demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional habitat disturbance; site would be reclaimed after demolition is completed potentially for future use <p>There are no differentiating advantages or disadvantages for either location.</p>
	<ul style="list-style-type: none"> Causes damage or disturbance to known spiritual and ceremonial sites, or implements preservation 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): sites would not be affected by demolition waste transport Alternative 2 (CI): no known spiritual and ceremonial sites are present within the Property; demolition landfill would be sited at an area disturbed by operations, likely adjacent to a remaining stockpile and would not result in additional disturbance <p>There are no differentiating advantages or disadvantages for either alternative location.</p>
	<ul style="list-style-type: none"> Change to Indigenous people's social conditions (community services and infrastructure, and wellbeing) and health 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternatives 1 and 2 (CI): no potential for effects as Reserves are distant from Project and is not expected to be located along the travel route. <p>There are no differentiating advantages or disadvantages for either location.</p>
	Human Environment Summary	Most preferred	Least preferred	<p>Alternative 1: transport of waste to an existing landfill off site would provide limited additional economic opportunities / benefits for local communities and businesses</p> <p>Alternative 2: there are no advantages or disadvantages as the facility would be sited to minimize potential effect (at an area disturbed by operations, likely adjacent to a remaining stockpile)</p>
Technical and Economic				
Ability to service the site effectively	<ul style="list-style-type: none"> Proven effectiveness and ability to consistently meet Project needs 	Least preferred	Most preferred	<ul style="list-style-type: none"> Alternative 1 (CI): commercial arrangements would need to be made at the end of operations and capacity confirmed in a local landfill within a reasonable distance; this alternative could pose a schedule risk without proper planning, as design and obtaining regulatory approvals for a new landfill could take years Alternative 2 (CI): this alternative is expected to be able to consistently meet Project needs as the site would be fully within Great Bear Resources control
	<ul style="list-style-type: none"> Potential for accidents or malfunctions that may have a material effect on the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): limited potential from effects from a vehicular accident involving demolition waste transport Alternative 2 (CI): limited potential from effects as design would be required to meet strict provincial regulatory requirements, including ongoing monitoring and report of results
Supportive of net-zero GHG emissions by 2050	<ul style="list-style-type: none"> Change to GHG emissions released to the environment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (CI): limited GHG emissions would be generated from transport of the waste Alternative 2 (CI): limited GHG emissions would be generated from heavy equipment and transport vehicles associated with the construction, operation and closure of the landfill <p>There are no differentiating advantages or disadvantages for either location.</p>
Cost effectiveness	<ul style="list-style-type: none"> Potential effect on Project financing resulting from investor attractiveness or risk 	Most preferred	Least preferred	<ul style="list-style-type: none"> Alternative 1 (CI): transport and storage would be under the care and control of a third party with liability presumed to be held by those parties which is an advantage for Great Bear Resources Alternative 1 (CI): there is a risk a landfill with capacity and willingness to accept demolition wastes may not be available at the end of mine operations Alternative 2 (CI): establishing a landfill presents an additional potential risk of liability at closure, which would require long-term management and monitoring

Criteria	Indicators	Alternative 1 Existing Offsite Landfill	Alternative 2 Onsite Landfill	Advantages and Disadvantages
	<ul style="list-style-type: none"> Degree to which alternative provides a competitive or acceptable return on investment 	Equally preferred	Equally preferred	<ul style="list-style-type: none"> Alternative 1 (Cl): comparatively higher operating cost (lower capital costs) but the increased operating costs would not be limiting to the Project Alternative 2 (Cl): comparatively higher capital cost (lower operating costs) but increased capital costs are not limiting to the Project <p>There are no differentiating advantages or disadvantages for either location.</p>
	Technical and Economic Summary	Most preferred	Least preferred	<p>Alternative 1: transporting demolition waste to an offsite landfill would minimize the long term liability for Great Bear Resources, but this alternative presents a potential scheduling risk if commercial terms cannot be reached or the landfill capacity is not available at the time of closure.</p> <p>Alternative 2: provides greater certainty of being fully available for site needs once approvals are in place, but at an additional cost and long term liability.</p>
	OVERALL ASSESSMENT	MOST PREFERRED (SELECTED)	LEAST PREFERRED	<p>Alternative 1: is the most preferred and selected alternative on balance of advantages and disadvantages.</p> <p>Alternative 2: is least preferred and could be selected in the future should circumstances changes (such as an inability to make appropriate commercial arrangements or future lack of capacity at local offsite landfill).</p>

Note:
Cl: closure phase.

4.20 Summary of Alternatives

The assessment of alternatives completed in Section 4 is intended to provide sufficient information to support an understanding of the rationale for the Project design described in Section 5 (Project Description). The selected alternatives that have become part of the Project design are summarized in Table 4.20-1.

Table 4.20-1: Summary of Selected Alternatives by Project Component

Project Facility or Activity	Selected Alternative
Mining	
Method	<ul style="list-style-type: none"> • Combined underground and open pit mining operation
Timing	<ul style="list-style-type: none"> • Underground and open pit mining occurring at the same time
Mined materials management	
Mine rock	<ul style="list-style-type: none"> • Re-used in construction and for site maintenance • Stockpile located north of LP Central pit
Low grade ore	<ul style="list-style-type: none"> • Temporary facility located south of MRS
Overburden	<ul style="list-style-type: none"> • Two primary stockpiles located west and east of the MRS • Small stockpiles at TMF • Re-used in site construction and reclamation
Ore Processing	
Location	<ul style="list-style-type: none"> • Facility located west of the mine access road
Technology	<ul style="list-style-type: none"> • Gold recovery by cyanidation in a process plant
In-system Water Treatment	<ul style="list-style-type: none"> • Destruction of residual cyanide using the SO₂/ Air process
Tailings	
Location	<ul style="list-style-type: none"> • Desulphurized tailings stored in a surface TMF located west of the main Project site • Concentrate tailings stored in re-purposed depleted east lobe of Viggo pit (east VMF)
Technology	<ul style="list-style-type: none"> • High-density thickened tailings
Buildings, facilities and general infrastructure	<ul style="list-style-type: none"> • Constrained by major facilities including the open pits, stockpiles, process plant, TMF and local watercourses, along with a primary goal to minimize the Project footprint
Water and wastewater management	
Industrial water supply	<ul style="list-style-type: none"> • Water re-use • Chukuni River
Potable water supply	<ul style="list-style-type: none"> • Drawn from industrial water supply (Chukuni River pipeline)
Contact water management	<ul style="list-style-type: none"> • Integrated water management system • East VMF during primary operation period • Mine water pond located downgradient of the TMF if needed
Membrane treatment reject solution management	<ul style="list-style-type: none"> • West VMF (re-purposed depleted west lobe of Viggo pit)
Treated effluent discharge location	<ul style="list-style-type: none"> • Chukuni River



Aggregate supply	<ul style="list-style-type: none"> • Mine rock and overburden produced incidental to site construction and ore extraction • Native materials such as sand and gravel that must be stripped as part of development activities • Dedicated aggregate operations will be developed on the Property as needed
Water crossings	<ul style="list-style-type: none"> • No large water crossings including bridges or culverts are planned
Power supply	<ul style="list-style-type: none"> • Combined grid power and natural gas power generation • Transitioning to only grid power later in mine life if available
Corridors	<ul style="list-style-type: none"> • No new major corridors are proposed
Domestic waste management	
Domestic solid waste	<ul style="list-style-type: none"> • Transport to existing local municipal landfill subject to commercial agreements
Domestic sewage	<ul style="list-style-type: none"> • Package sewage treatment plant
Workforce	
Hiring	<ul style="list-style-type: none"> • Hiring framework considers statutory obligations and corporate policy • Commitment to hire from local communities as reasonable
Scheduling	<ul style="list-style-type: none"> • Work cycles will meet local labour laws and will facilitate continuous mine and process plant operation • Adaptation will be considered to foster inclusivity
Accommodation	<ul style="list-style-type: none"> • Facility on Property north of the regional transmission line along Tuzyk's Road
Mine closure	
LP Central pit	<ul style="list-style-type: none"> • Active filling with water from the Chukuni River
VMF	<ul style="list-style-type: none"> • Active filling with water from the Chukuni River after reject solution pumped to underground mine at depth
Demolition waste	<ul style="list-style-type: none"> • Transport to existing local municipal landfill subject to commercial agreements

4.21 References

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