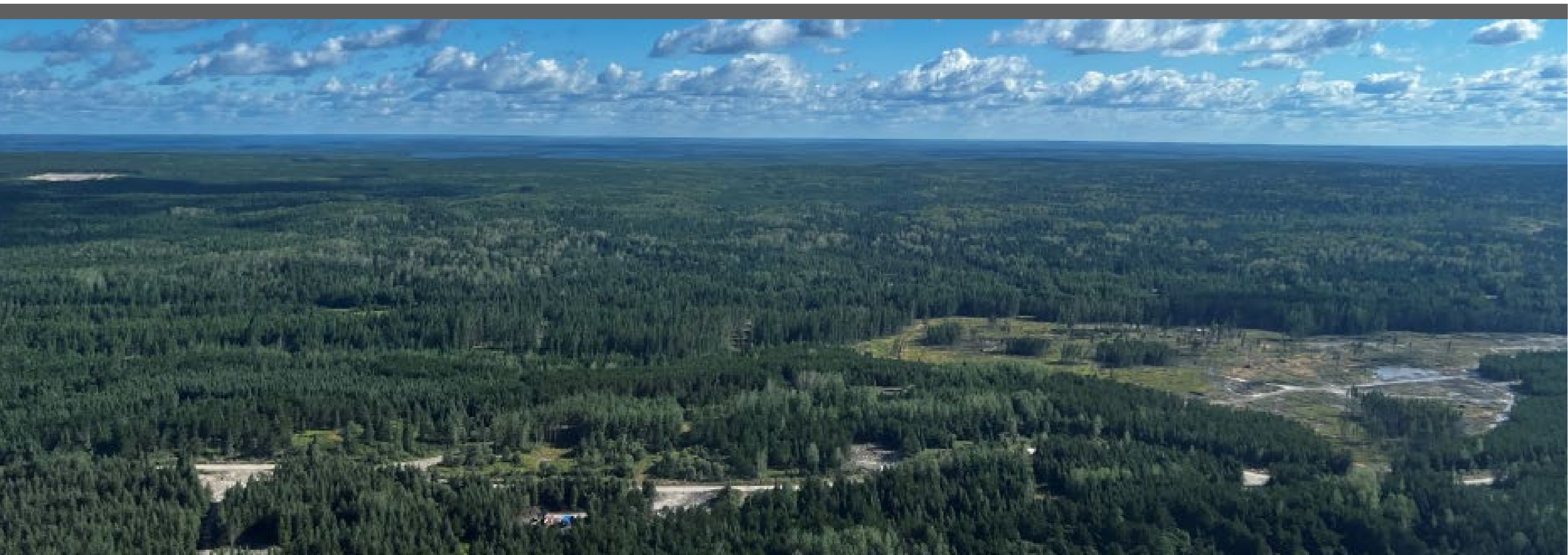
# Great Bear Gold Project
# Impact Statement

## Section 7: Analysis of Changes to Pathway Valued Components

### Influence of Consultation and Engagement and Atmospheric pVCs
### Section 7.1 to Section 7.4



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## Acronyms and Abbreviations

| | |
|---|---|
| λ | Population growth rate |
| %HA | Percent highly annoyed |
| AAQC | Ambient Air Quality Criteria |
| AEX | Advanced Exploration |
| ANA | Asubpeeschoseewagong Netum Anishinabek |
| asl | Above sea level |
| ATV | All-terrain vehicle |
| BC WQG | British Columbia Long-term Exposure Guidelines, Freshwater |
| BHR | Built Heritage Resource |
| BSR | Baseline receptor |
| CAAQS | Canadian Ambient Air Quality Standards |
| CCME | Canadian Council of Ministers of the Environment |
| CHER | Cultural Heritage Evaluation Report |
| CHIA | Cultural Heritage Impact Assessment |
| CHL | Cultural Heritage Landscape |
| CHVI | Cultural Heritage Value or Interest |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| CWQG | Canadian Water Quality Guidelines for protection of aquatic life |
| DFO | Fisheries and Oceans Canada |
| DPM | Diesel particulate matter |
| E2 plan | Environmental emergency plan |
| ECCC | Environment and Climate Change Canada |
| ESA | *Endangered Species Act* |
| FEQG | Federal Environmental Quality Guidelines |
| FMU | Forest Management Unit |
| FMZ | Fisheries Management Zones |
| FRI | Forest Resource Inventory |
| fVC | Valued component under federal jurisdiction |
| FWCA | *Fish and Wildlife Conservation Act* |
| GIS | Geographic information system |
| Great Bear Resources | Great Bear Resources Ltd. |
| HC | Health Canada |
| iPWQO | Interim Provincial Water Quality Objectives for protection of aquatic life |
| ISEE | International Society of Explosive Engineers |
| ISID | Impact segment identification |
| $L_{Aeq}$ | A-weighted, equivalent sound level |
| $L_{Aeq\text{-}1hr}$ | Average cumulative A-weighted, equivalent sound level over a 1-hour period |
| $L_{dn}$ | Day-night sound level |
| $L_{LM}$ | Logarithmic mean impulse sound level |
| LGO | Low grade ore |
| LiDAR | Light Detection and Ranging |
| LPeak | Peak pressure level |
| LSA | Local study area |
| LSFN | Lac Seul First Nation |
| LWCB | Lake of the Woods Control Board |
| MBCA | *Migratory Birds Convention Act* |
| MCM | Ministry of Citizenship and Multiculturalism |
| MDMER | Metal and Diamond Mining Effluent Regulations of the *Fisheries Act* |
| MECP | Ministry of the Environment, Conservation and Parks |
| MEM | Ministry of Energy and Mines |

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| ML / ARD | Mine leaching and acid rock drainage |
| MNR | Ministry of Natural Resources |
| MRS | Mine rock stockpile |
| MTO | Ministry of Transportation |
| MWP | Mine water pond |
| na | Not applicable |
| NAPS | National Air Pollutant Surveillance Program |
| NPAG | Non-potentially acid generating |
| NWOMC | Northwestern Ontario Métis Community |
| OLT | Ontario Landscape Tool |
| OVB | Overburden stockpile |
| P-P | Peak-production period |
| PA | Project Area |
| PAG | Potentially acid generating |
| PAH | Polycyclic aromatic hydrocarbon |
| $PM_{10}$ | Particulate matter less than 10 micrometres in diameter |
| $PM_{2.5}$ | Particulate matter less than 2.5 micrometres in diameter |
| POI | Point of impingement |
| POR | Point of reception |
| PPeak | Peak pressure |
| PPV | Peak particle velocity |
| Project | Great Bear Project |
| Property | Great Bear Property |
| pVC | Pathway valued component |
| PWL | Sound power level |
| PWQO | Provincial Water Quality Objectives for protection of aquatic life |
| Q1 | Quarry 1 |
| Q2 | Quarry 2 |
| R | Average recruitment rate |
| ROM | Run of mine |
| RPD | Relative percent difference |
| RSA | Regional study area |
| SAR | Species at Risk |
| SARA | *Species at Risk Act* |
| SCA | *Species Conservation Act* |
| SDW | Specially Designated Waters |
| SEQG | Saskatchewan Environmental Quality Guidelines |
| SFL | Sustainable Forest License |
| SOCC | Species of Conservation Concern |
| SPM | Suspended particulate matter |
| TC | Transport Canada |
| TISG | Tailored Impact Statement Guidelines |
| TMF | Tailings management facility |
| U-P | Underground production period |
| UTM | Universal Transverse Mercator |
| VMF | Viggo management facility |
| VOC | Volatile organic compound |
| WFN | Wabauskang First Nation |
| WHO | World Health Organization |
| WMU | Wildlife Management Unit |
| WQG PAL | Water Quality Guideline for the Protection of Aquatic Life |
| WSC | Water Survey of Canada |
| WSP | WSP Canada Inc. |

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| WTP | Water treatment plant |
| ZOI | Zone of influence |

# 7.0 Analysis of Changes to the Environment – Pathway Valued Components

Valued components are components of the natural and human environment that are of particular concern or value to participants and that may be affected by the Great Bear Project (Project). As detailed in Section 6.3, valued components have been identified based on the Tailored Impact Statement Guidelines (TISG) and feedback received during consultation and engagement. As the federal Impact Assessment process is intended to prevent or mitigate significant adverse effects within federal jurisdiction, the selected valued components were further characterized as:

- Valued components within federal jurisdiction: federal valued components (fVCs) as guided by key issues identified by IAAC (2024)
- Valued components that provide a pathway for direct or indirect effects to fVCs: pathway valued components (pVCs).

This section provides the analysis of the changes to pVCs to support an assessment of changes to fVCs. Each pVC is considered in a dedicated subsection, and changes after mitigation which may have a pathway to changes in fVCs are identified. Changes to fVCs are detailed in Sections 8 through Section 14 and within associated appendices. The lead consulting firm for each pVC subsection prepared by qualified consultants and reviewed by experts, is as follows:

- Subsections 7.1, 7.2, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10. 7.11, 7.12, 7.14 and 7.15, WSP Canada Inc. (WSP)
- Subsections 7.3 and 7.4, Wood plc (subconsultant to WSP)
- Subsection 7.13, SLR Consulting (Canada) Ltd.

## 7.1 Influence of Consultation and Engagement

### 7.1.1 Background

The Impact Statement is required to demonstrate how questions and comments raised through the consultation and engagement processes were considered in the preparation of the Impact Statement. Great Bear Resources Ltd. (Great Bear Resources) have actively engaged with members of the public and rights holders prior to, and during preparation of the Impact Statement with a goal of obtaining their viewpoints on the Project, as described in Section 3 and detailed in Appendix C, as well as Indigenous knowledge and local knowledge. Key rights holders and stakeholders that have influenced the Project design and assessment of potential effects include, but are not limited to:

- Local Indigenous Nations and Métis communities:
  - Asubpeeschoseewagong Netum Anishinabek (ANA)
  - Lac Seul First Nation (LSFN)
  - Northwestern Ontario Métis Community (NWOMC)
  - Wabauskang First Nation (WFN)

- Federal departments and agencies, provincial ministries, local municipalities and regional governments
- Members of the public.

Responses were provided to feedback received through consultation and engagement activities for the Project, in writing or in follow-up meetings. Relevant comments and information received not specific to the Project, have also been considered in the development of mitigation measures and assessment of potential effects.

This section provides a summary of the influence of consultation and engagement on the assessment of potential changes to pVCs. The summary is presented by major topics of interest raised to date aligned to the selected pVCs:

- Atmospheric: including pVCs air quality, sound and vibration
- Water: including pVCs groundwater, surface water flows and levels, and water quality
- Biological: including pVCs vegetation communities, Wild Rice, Moose, Species at Risk (SAR) and other wildlife [1]
- Socio-cultural: including pVCs land and resource use, cultural heritage, archaeology, and local and regional economy [2].

Great Bear Resources has provided funds to support the documentation of Indigenous knowledge for local communities and to help inform the Impact Statement preparation. Confidential reports have been prepared for the LSFN, NWOMC and WFN, that have been shared with Great Bear Resources to help guide the Project design and inform the Impact Statement. Funding has also been provided to ANA to support documentation of Indigenous knowledge and to help inform the Project, but to date a report has not been shared with Great Bear Resources.

Indigenous knowledge and local knowledge shared with Great Bear Resources has been incorporated throughout the Impact Statement as appropriate, including in this section.

### 7.1.2 Influence of Consultation on Atmospheric pVCs

Engagement input was incorporated into the assessment of effects to atmospheric pVCs consistent with the TISG. Engagement activities that included presenting and discussion of potential effects to atmospheric pVCs were initiated in 2024, and continued to be part of engagement activities in 2025. Additional information regarding consultation and engagement activities is provided in Section 3 and Appendix C. Key comments relevant to the assessment of atmospheric pVCs are summarized below.

Monitoring for mercury vapour in air quality was added to the baseline program as a result of heightened interest from Indigenous people in mercury in general, although not specifically in relation to comment on air quality. Existing baseline mercury vapour concentrations are

[1] Influence of consultation on the assessment of biological fVCs is also presented in Section 8 (fish and fish habitat) and Section 9 (migratory birds).
[2] Influence of consultation on the assessment of the fVC Indigenous Peoples is presented in Section 10 (LSFN), Section 11 (WFN), Section 12 (ANA), Section 13 (NWOMC) and Section 15 (Red Lake and Ear Falls).

extremely low and below detection levels. The baseline air quality report is provided in Appendix D-1.

#### 7.1.2.1 ANA

During the approvals process for the Advanced Exploration (AEX) Program, representatives of ANA expressed concerns through multiple submissions in 2024 and 2025, about the potential under-estimation of the effects of dust overburden and mine rock stockpiles, and direct and indirect effects from dust on the surrounding soil, vegetation, aquatic life and terrestrial life. An air quality model has been prepared using the methodology appropriate for an impact assessment and by the Ministry of Environment, Conservation and Parks (MECP) for environmental approvals (Appendix D-2). The results from this modelling have been used in the analysis of effects, including related to dust and metals from stockpiles, to other pVCs and fVCs where pathways for direct, indirect or induced effects are present. Additional dust deposition modelling over waterbodies within the leased claim boundary was undertaken to support a discussion around how deposition could influence water quality; this discussion is part of the water quality assessment (Appendix K-3).

#### 7.1.2.2 LSFN and WFN

During a Project workshop, representatives of LSFN and WFN queried whether greenhouse gas emissions would be considered in the Impact Statement. Great Bear Resources indicated an assessment of greenhouse gas emission would be included in the Impact Statement, which is found in Appendix D-3. The modelling results for greenhouse gas parameters are described in Section 5.13.2 and Section 7.2. During the meeting the representatives also asked if noise effects on wildlife would be considered. This was confirmed in the meeting. The modelling results for noise are presented in Section 7.3 and detailed in Appendix E-3, which were considered in indirect effects to biological pVCs.

Representatives of LSFN and WFN recommended that Great Bear Resources carry out dust monitoring and assessment of the efficacy of road dust management, and potential for fugitive dust for the AEX Program. Mitigation measures are proposed to limit dust generation and fugitive dust monitoring is proposed for the Project, including to measure the efficacy of road dust management. A fugitive dust management plan will be prepared for the Project.

Representatives of the LSFN and WFN asked that a confidential burial site downstream of the Project and outside the Project Area (PA) be considered in atmospheric modelling efforts for the Project. The location has not been shown on figures in the Impact Statement for confidentiality reasons; however, the modelling results presented in the Impact Statement (Appendix D-2) cover the location of concern.

A community member from LSFN or WFN commented on the potential for more dust and noise resulting from the Project during an archaeology tour in 2024. Changes to baseline air quality and sound are analyzed in Section 7.2 and Section 7.3. Mitigation measures are proposed to reduce these emissions. Modelling results are detailed in Appendix D-2 and Appendix E-3 and compared against regulatory requirements.

A confidential report on Indigenous knowledge prepared for LSFN in 2025 and shared with Great Bear Resources, identified that both Indigenous and non-Indigenous local residents have locations within the Great Bear Property (Property) where they pick edible mushrooms in the fall at unspecified locations. A concern was expressed that they may not be able to continue to pick mushrooms, given the potential for dust and pollutants from the Project. Air quality modelling provides a detailed assessment of changes to air quality related to the Project (Section 7.2 and Appendix D-2). Mitigation for indirect effects of dust on vegetation is proposed for the Project, and the potential for effects of dust (suspended particulate matter; SPM) is considered in the assessment of the pVC vegetation communities (Section 7.8).

#### 7.1.2.3 NWOMC

An attendee at the virtual open house for the NWOMC asked about potential dust released from the tailings management facility (TMF). Great Bear Resource indicated that there are products that can be applied to control dusting. The modelling results (Appendix D-2) conservatively assume no additional product application for dust control on the tailings surface, although this will be considered as needed. Only water or regulatory-approved chemical suppressants will also be used to control dust in the PA.

The Indigenous knowledge and traditional land use study shared in confidence by NWOMC with Great Bear Resources identified in addition, that some Indigenous participants perceived that changes to air quality and carbon emission from the use of vehicle and heavy equipment will contribute to climate change. Air quality modelling includes assessment of emissions from vehicles and heavy equipment and considers greenhouse gases that contribute to climate change (Section 7.2 and Appendix D-2). A dedicated greenhouse gas assessment is provided in Appendix D-3 (and climate change, risk and resilience is detailed in Appendix W).

#### 7.1.2.4 General Public

During a public open house in Ear Falls an audience member ask how far the sound of blasting and trucks will carry and which stakeholders are at risk from being affected by noise. Similarly in the Red Lake open house, a member of the public asked what the noise level will be around Pakwash Lake. A local resident who received a hand-delivered information package indicated they were seasonal residents and that their only comment was an interest in noise from the Project. A noise modelling assessment has been completed and is provided as part of the Impact Statement to address these comments (Appendix E-3). Results are summarized in Section 7.3.

### 7.1.3 Influence of Consultation on Water pVCs

Great Bear Resources recognizes and respects the importance of Nibi (water), and acknowledges our collected responsibility to protect Nibi today and for future generations. Great Bear Resources is expected to consider the importance of Nibi (water) as a holistic valued component for First Nations as per the Nibi Declaration of Treaty #3 which indicates in part that "*Nibi (water) is alive and has a spirit. It is the lifeblood of our mother (Aki) and connects everything. It can give, sustain and take life*". Water may come into contact and may be affected by Project facilities and activities during all Project phases. An integrated water management system has been developed for the Project, that incorporates best management practices and provides a comprehensive water management approach that is protective of the environment (Section 5.14).

Concerns regarding potential changes to water quality were raised in confidential Indigenous knowledge and traditional land use reports shared with Great Bear Resources by LSFN, NWOMC and WFN, including as briefly summarized in the bullets below:

- LSFN: the report identifies use of surface waterbodies for traditional purposes including for travel, and members have expressed concern regarding water

- NWOMC: water contamination of surrounding water systems resulting from the Project was expressed of concern, including from spills and use of cyanide, potentially restricting future their use of the area
- WFN: fishing, trapping and hunting are important to the community, and concerns were expressed regarding the effects of the Project on land use from chemical use, sedimentation, altered hydrology and spills on water and water systems.

Community feedback was considered in the evaluation of potential effects on the surface water and groundwater in accordance with the TISG. Comments related to potential effects to water-related pVCs (surface water flows and levels, groundwater and water quality) were commonly raised during meetings and communications with Indigenous Nations and stakeholders for the Project, including during specific consultation events. These consultation efforts are presented in Section 3 and detailed Appendix C. A summary of public comments relevant to the assessment of water pVCs generally when the topic was first documented as raised to Great Bear Resources, is provided below. These comments or similar were raised with Great Bear Resources on multiple occasions throughout the Impact Assessment process, and are presented herein to support the valued component selections and content and indicators presented in the assessment of changes.

#### 7.1.3.1 ANA

Through a number of submissions during 2024 and 2025 such as on March 26, 2024, primarily related to the AEX Program but also regarding the Project, ANA expressed a concern regarding the potential risk of mercury methylation from sulphate released by the Project, directly or indirectly into the Chukuni River, which is part of the English River system. Great Bear Resources understands the source of this concern to the community. Project rock does not have elevated concentrations of mercury and no potential for mercury leaching was observed during kinetic tests. Extensive efforts have been made to assess the current baseline conditions around the proposed PA including analysis of samples from various environmental media to extremely low levels of detection. Recognizing this concern, Great Bear Resources modified the integrated water management system for the Project to include enhanced water treatment (membrane filtration) of select contact water streams to further reduce sulphate concentrations in treated effluent, which could interact and create methylmercury if the necessary environmental conditions are present. This potential effect has been considered and is assessed with other water quality parameters in Section 7.7 and in Appendix K-3. The potential for increased mercury and methylmercury related to the Project has also been modelled further downstream in response to comments, outside the spatial boundaries used to bound the assessment of the potential effects of the Project in the Impact Statement. A dedicated report has also been provided on the topic as Appendix T. Comments were received from LSFN, NWOMC and WFN on the draft study plan, which were responded to, and fully considered and incorporated into the design of the dedicated mercury report as appropriate.

In subsequent communications from ANA, including a letter dated April 25, 2024, concern was expressed about other potential water quality pollutants (including sulphate, nitrate, nitrite and cyanide byproducts) from the mine and proposed effluent discharge quality. The process plant design includes a cyanide destruction circuit to reduce the total cyanide, and the target concentration of total cyanide in the desulphurized tailings stream sent to the TMF will be compliant with the International Cyanide Management Code (ICMI 2021) which sets a limit that is protective of wildlife and birds (Section 5.6.2). A portion of the contact water treatment stream (excess water from the TMF) will be subject to enhanced water treatment (membrane filtration) to reduce sulphate concentrations in treated effluent in addition to the primary water management system and treatment system (Section 5.14.7). The potential change to water quality parameters potentially associated with mining effluent have been modelled and assessed, as summarized in Section 7.7 and detailed in Appendix K-3.

Comments were also provided by the ANA during 2024 and 2025, regarding the potential hydrogeological effects of the underground development, including drawdown of surrounding aquifer and potential effects on wetlands, and the interconnectedness of groundwater and surface water in a letter on June 24, 2024. Potential changes to local groundwater levels from the required dewatering of mine workings so that mining can occur was assessed, as described in Section 7.5 and detailed in the comprehensive groundwater modelling report (Appendix H-2). The results of this modelling effort were used in the modelling of potential effects to surface water within the mine site (Appendix I-2) and at the receiver (Appendix I-3), and considered various scenarios including climate change queried in a letter of June 30, 2024. Changes identified in both groundwater and surface water were carried forward into the assessment of changes to other pVCs and fVCs as appropriate, documented in related sections and appendices.

#### 7.1.3.2 LSFN and WFN

During a community meeting on October 10, 2023 during the Planning Phase for the Impact Assessment, an Elder of the LSFN spoke on the intrinsic value of water including to all life, fish and traditional medicines, and the importance of protecting water for future generations. This view on the importance of water was heard consistently from all Indigenous Nations and the public, during consultation and engagement as detailed in Appendix C and individuals expressed interest in an assessment of potential changes to water. The importance of water including to Indigenous Nations and other stakeholder was fully considered in the Project design described in Section 5. This includes in the initial design of a compact site and Project optimizations during preparation of the Impact Statement (Section 5.20), including but not limited to:

- Introduction of a flood protection berm so that Dixie Creek cannot flow into and be captured by the LP Central pit during extreme weather events
- Addition of a new circuit in the process plant to produce two tailings streams, non potentially acid generating desulphurized tailings and a smaller volume of potentially acid generating concentrate tailings to allow differential management to mitigation acid generation and potential effects on water quality
- Mining of the Viggo pit during the construction phase, including for the purpose of providing storage for reject solution and concentrate tailings, and for water management during operations (Section 5.4.2.1)
- Additional water management and treatment measures, including selective use of membrane filtration.

Water is considered in three separate pVCs within the Impact Statement (surface water flows and levels, groundwater and water quality) including because of its value to local Indigenous Nations. Potential pathways from these pVC to other valued components are also discussed in the Impact Statement.

A member of the WFN expressed a concern regarding potential effects to natural spring water that could be used for drinking water related to the AEX Program on October 17, 2023. During the environmental baseline studies specific efforts were made to identify springs that could potentially be affected by the Project, however no suitable springs were identified in the area during baseline investigations.

The location for effluent discharge from the Project was raised during a LSFN / WFN Environmental Management Committee meeting on January 15, 2024, and whether different locations were considered for discharge. Discharge location alternatives are discussed in Section 4.4.6 of the Impact Statement, and an assessment of the potential change to water flows and levels, and water quality for all Project phases, are discussed in Section 7.6 and Section 7.7, and detailed in related modelling reports in Appendix I-3 and Appendix K-3, respectively. During the same meeting, a concern was expressed regarding potential cumulative effects to the Chukuni River, as there are other industrial projects in the region discharging into the Chukuni River. The baseline information on which the Project assessment is based document these aspects, which will continue to be documented during ongoing monitoring upstream of the discharge location.

During a meeting with LSFN and WFN representatives regarding the Anishinaabe-led Impact Assessment on March 5, 2024, a concern was raised regarding whether potential Project-related water level changes in the Dixie Creek and Chukuni River could have an effect on a confidential Indigenous heritage location downstream of the Project, closer to the outlet of the Chukuni River into Pakwash Lake, or on navigation. Changes to water flow and level in both Dixie Creek and the Chukuni River are considered in detail in Section 7.6 and Appendix I-3.

During technical meetings with advisors representing LSFN and WFN on May 12, 2025 and May 22, 2025, a comment was raised regarding climate change predictions, and Project design including storm event design criteria. A comprehensive assessment of potential climate change effects and risk was completed for the Impact Statement and is included in Appendix W. Climate change was also considered in the assessment of changes to surface water flows and levels as detailed in Section 7.6, as well as Appendix I-2 and Appendix I-3.

#### 7.1.3.3 NWOMC

The NWOMC asked during a workshop on valued components on June 22, 2025, whether the water quality program included a reference site for future comparison, as well as which lakes and rivers are expected to be affected by the Project. Reference sites are part of the environmental baseline investigations and are available for future comparison in relation to potential Project effects on surface water flows and levels, and water quality. The potential change to water quality parameters potentially associated with mining effluent have been modelled and assessed, as summarized in Section 7.7 and detailed in Appendix K-3.

#### 7.1.3.4 Government Agencies

Transport Canada followed up with Great Bear Resources on July 24, 2025, asking about potential changes to flows and levels in Dixie Creek and Unnamed Waterbody 4, to support their assessment of navigability. Information was provided to Transport Canada, and changes to water flow and level in both Dixie Creek and Unnamed Waterbody 4 are considered in detail in Section 7.6 and Appendix I-3.

Meetings and responses have been provided to the government review team with respect to the supplemental mercury study plan, including with:

- Environment and Climate Change Canada (ECCC)

- Fisheries and Oceans Canada (DFO)
- Health Canada (HC)
- Impact Assessment Agency of Canada
- Indigenous Services Canada
- Ministry of Energy and Mines (MEM)
- MECP
- Ministry of Natural Resources (MNR)
- Natural Resources Canada.

The comments received have been considered in the assessment of water quality, and incorporated into the study plan as applicable which guided the mercury study report provided in Appendix T.

#### 7.1.3.5 General Public

During a meeting with the Pakwash Lake Owners Association on March 28, 2024, questions were raised regarding the quality of the effluent from the Project, including related to phosphate and nitrate, and whether the effluent would be detectable. Great Bear Resources has designed the Project to minimize the distance until the background concentrations are achieved in the effluent receiver, through the design of the integrated water management system, including the approach to water treatment (Section 5.14.7). The quality of the effluent leaving the Project and the mixing zone in the Chukuni River until background concentrations are met is detailed in the receiver water quality report in Appendix K-3.

### 7.1.4 Influence of Consultation on Biological pVCs

Engagement during the preparation of the Impact Statement with Indigenous Nations and stakeholders was completed to gather the necessary information to identify and determine how the Project may affect biological pVCs (vegetation communities, Wild Rice, Moose, SAR and other wildlife) that could interact with the interests of stakeholders. Confidential Indigenous knowledge reports prepared for LSFN, WFN and NWOMC shared with Great Bear Resources as well as other consultation and engagement information was used to inform the existing baseline conditions in support of the effects assessment. Common animal, fish and plant names were generally shared by Indigenous people and stakeholders. Where reasonable, this knowledge was interpreted to specific species. Through these information sources, Great Bear Resources was informed of the species of importance to Indigenous people considered within the biological pVCs including the following and other plant species identified in Table 3-8 of Appendix M-2:

- Wild Rice (manoomin)
- Bald Eagle
- Beaver
- Black Bear
- Boreal Caribou

- Canada Lynx
- Gray Wolf
- Moose
- Mustelids
- Ruffed Grouse
- Spruce Grouse
- Sharp-tailed Grouse
- Snowshoe Hare.

The assessment of effects to vegetation communities used changes in abundance of plant species of special interest as an indicator in the effects assessment, which includes species identified of importance to Indigenous people (Section 7.8; Table 7.8-1). Interest in Moose and potential effects to Moose was a recurring theme during engagement on wildlife during 2024 and 2025. For that reason, Moose was considered as a separate pVC for the Impact Statement (Section 7.10). Wild Rice was also of particular interest and is also considered as a separate pVC for the Impact Statement (Section 7.9). Other wildlife species of importance to Indigenous people, including Bald Eagle, Spruce Grouse, Ruffed Grouse and Sharp-tailed Grouse, were considered specifically in the assessment of changes to other wildlife (Section 7.11).

#### 7.1.4.1 LSFN

Early in 2025, a non-First Nations trapper who traps on trapline RL068 held by a member of the LSFN, provided Great Bear Resources with a summary of their wildlife sightings, including furbearers, collected during their 2018 to 2024 trapping seasons. The recorded observations include incidental sightings, tracks, and other evidence of wildlife activity (i.e., predation on trapped animals) of furbearing mammals not targeted for trapping. These species include Wolverine, which was used to help inform the assessment of effects to SAR (Section 7.12).

As noted in the LSFN traditional land and resource use study, a Boreal Caribou track was observed on a Pakwash Lake beach. The PA is located within the Sydney Range for Boreal Caribou. Due to past disturbance caused by forestry and fires, the PA and the area around the PA is comprised of low-quality habitat for Boreal Caribou. Boreal Caribou are not expected to use the PA for key seasonal critical habitat use; however, knowledge of the track confirmed the anticipated presence of Boreal Caribou locally.

#### 7.1.4.2 LSFN and WFN

Four workshops were held with a specific focus on SAR and culturally important species with LSFN and WFN members during the week of March 24, 2025. After presentation of the baseline findings questions were raised about potential effects and mitigation measures. The mitigation measures discussed, such as use of bat gates and establishment of pollinator gardens at closure, have been documented and will be considered for site reclamation.

#### 7.1.4.3 NWOMC

The Indigenous knowledge and traditional land use study shared in confidence by NWOMC with Great Bear Resources identified that habitat loss due to clearing of trees for the Project will disrupt wildlife populations in the area, causing birds to move and potentially result in changes to predation. They also expressed a concern that wildlife and habitat will be disturbed by additional construction and operation activities. Both direct and indirect effects to habitat and wildlife are considered in Section 7.8 to Section 7.12, with further detail regarding the effects assessment methodology provided in Appendix M-2.

#### 7.1.4.4 WFN

A confidential report prepared for WFN identified a concern that while forest harvesting can benefit species like blueberries, raspberries, Moose and deer, reduced plant diversity and degraded habitat may also arise. There is concern that development of the Project may add to habitat fragmentation and pose a water quality risk that could affect fish, Wild Rice and waterfowl. Habitat fragmentation is considered as an indicator in the assessment of effects to vegetation communities (Section 7.8), Moose (Section 7.10) and other wildlife (Section 7.11). The results of water quality modelling and assessment were considered in the assessment of potential effects to Moose (Section 7.10) and other wildlife (Section 7.11). Great Bear Resources understands that Indigenous people may have a concern that changes to water quality may affect the availability of Wild Rice and waterfowl for community members. The potential effect of changes to water quality were considered in Section 7.7.

### 7.1.5 Influence of Consultation on Socio-cultural pVCs

Feedback related to the socio-cultural pVCs (land and resource use, cultural heritage, archaeology, and local and regional economy) was considered in the Project design, development of mitigation measures and assessment of potential changes resulting from the Project. Note that socio-cultural aspects related to Indigenous people are addressed in Section 10 to Section 14 (fVC Indigenous Peoples).

#### 7.1.5.1 ANA

The integral relationship between that landscape and the ceremonial sites, spiritual sites, burial sites and other cultural heritage sites distributed across it has been highlighted by ANA, as well as the need to preserve that relationship to retain the sacred character of these sites.

#### 7.1.5.2 LSFN and WFN

Consultation with local trapline holders has been ongoing since the start of this Project to support efforts to mitigate potential effects on traplines close to the PA. Local trapline holder(s) will be notified in cases of nuisance wildlife within the PA and utilized as needed for removal. Great Bear Resources has also maintained engagement with Pakwash Lake Owners Association to address feedback regarding the flow and quality of water into the Chukuni River and possible effects on wildlife. Great Bear Resources has addressed this feedback and provided resources to provide further information on flow levels as well as water quality. Further engagement has occurred with guide outfitters surrounding ongoing bear hunting activities near the PA which has been shared with Great Bear Resources, as well as Great Bear Resources sharing information regarding the Project footprint and activities which may disrupt land and resource use such as when blasting activities will be occurring with local resource users.

The baseline investigation of heritage resources identified that the manoomin (Wild Rice) stand between Unnamed Waterbody 1 and Unnamed Waterbody 2, is a cultural heritage resource. Indigenous knowledge shared with Great Bear Resources has identified that manoomin harvesting is a traditional practice in the area and that it is a culturally and ecologically important plant. Great Bear Resources has not been informed of any harvesting in the PA and no recent harvesting of the manoomin within the PA has been observed. Historical use nonetheless may have occurred. As effects to the stand between Unnamed Waterbody 1 and Unnamed Waterbody 2 cannot be avoided by the Project, Great Bear Resources sought guidance from local Indigenous Nations including during regular LSFN and WFN Environmental Management Committee meetings regarding the preferred means of mitigation. The proposed mitigation strategy provided in Section 7.14.6 is based on the guidance provided by the LSFN and WFN.

Information was shared and ongoing discussions held since 2022 with interested parties and local Indigenous people regarding the four identified archaeological assessments that could potentially be affected by the Project. Indigenous engagement was completed by Great Bear Resources throughout the terrestrial archaeological studies, and the confidential information provided by local Indigenous Nations through Indigenous knowledge studies was incorporated as available. The proposed site plan purposefully avoids all of the identified archaeological sites, including because of feedback received from Indigenous people. Only one of the identified archaeological sites (EfKj-1 at Unnamed Waterbody 2) is located within PA.

There was ongoing communication with LSFN and WFN to develop an appropriate mitigation strategy for known archaeology sites. LSFN and WFN have indicated to date that they would like to preserve and protect the sites. Great Bear Resources propose to continue to avoid these sites, and work with these Indigenous Nations to identify appropriate buffers to be implemented for the Project as per Section 7.15.6. Great Bear Resources has also developed and will implement a chance find procedure, in part in response to expressed concern from local Indigenous Nations regarding as yet unknown archaeological resources that could be disturbed during subsurface excavations in the PA.

#### 7.1.5.3 NWOMC

The NWOMC confirmed that no Métis historic or cultural sites were recorded within the PA; however, areas of use and occupation were identified in the LSA.

#### 7.1.5.4 LSFN, NWOMC, WFN and General Public

Through all consultation events to date, Great Bear Resources has consistently received inquiries and comments regarding employment, business procurement processes and training opportunities and have responded with the information requested as detailed in Appendix C. These inquiries and concerns raised about the ability to participate in the Project, have guided the mitigation and enhancement measures described in Section 7.16.6 and the summary of economic benefits of the Project provided in Section 18.1.

## 7.2 Analysis of Changes to Air Quality

Air quality is included as a pVC since air quality parameters, such as dust and emissions from fuel combustion and mining operations, can have an effect on the environment and humans if present in certain concentrations. Air quality has intrinsic importance to the health and well-being of humans, wildlife and vegetation.

### 7.2.1 Pathway Linkages to other Valued Components

#### 7.2.1.1 Pathway Linkages to Air Quality

There are no identified pathway linkages to air quality.

#### 7.2.1.2 Pathway Linkages from Air Quality to fVCs

Changes to air quality may have linkages to, and inform, the analysis of potential effects on the fVCs migratory birds and fVC Indigenous Peoples. Changes in emissions from the Project may change the condition of adjacent vegetation communities, habitat, and surface water during the construction, operation and closure of the Project. Air quality may also affect health. These linkages are reflected in the assessment of migratory bird habitat (Section 9.4.1), current use of lands and resources for traditional purposes (Sections 10.6, 11.6, 12.6, 13.6 and 14.6), and health of Indigenous people (Sections 10.9, 11.9, 12.9, 13.9 and 14.9), as appropriate.

### 7.2.2 Assessment Approach

The approach to the assessment of potential changes to air quality includes:

- Description of the relevant regulatory and policy setting
- Description of the spatial and temporal boundaries used for this pVC
- Identification of criteria and indicators along with the associated rationale
- An outline of the analytical methodology conducted for the assessment and the key assumptions and use of the conservative approach.

The assessment of potential effects is supported by a description of the existing conditions for the pVC (Section 7.2.4), the identification and description of potential effects on the pVC (Section 7.2.5) and a description of applicable mitigation measures for the pVC (Section 7.2.6). With the application of mitigation measures to the potential effects on the pVC, the changes after mitigation are then characterized in Section 7.2.7.

#### 7.2.2.1 Regulatory Setting

The Project is located in Ontario and will need to meet applicable federal and provincial legislation and regulatory requirements. Provincial and federal regulatory agencies have prescribed criteria, benchmarks, and standards. Government policies, objectives, standards or guidelines most relevant to air quality are summarized below. Further information regarding anticipated approval requirements is provided in Section 19.

##### 7.2.2.1.1 Federal

The Canadian Ambient Air Quality Standards (CAAQS) for particulate matter less than 2.5 micrometres ($PM_{2.5}$), nitrogen dioxide ($NO_2$), ozone ($O_3$), and sulphur dioxide ($SO_2$) have been adopted by the Canadian Council of Ministers of the Environment (CCME 2025). The CAAQS are intended as a measure of ambient air quality within each Canadian air zone to determine appropriate air quality management actions; the CAAQS are not intended for the local assessment of specific emission sources or for enforcement. For the air quality effects assessment, the concentrations predicted by the air dispersion model were compared against the CAAQS to allow discussion of the predicted effects of air emissions on the air zone.

##### 7.2.2.1.2 Provincial

The provincial Ambient Air Quality Criteria (AAQC; MECP 2020) is used to assess general (ambient) air quality resulting from all sources of an air parameter inclusive of all sources and baseline. AAQCs are most commonly used in environmental assessments, special studies using ambient air monitoring data, assessment of general air quality in a community and annual reporting on air quality across the province. AAQCs are not regulatory values but rather air concentrations established to protect against potential adverse effects on health and / or the environment.

The Air Contaminant Benchmarks, prescribed under the Ontario regulation for Air Pollution – Local Air Quality (Ontario Regulation 419/05) by MECP (2021), are used for the assessment of stationary sources for the purposes of provincial permitting or to establish compliance with the regulation. The Air Contaminant Benchmarks include standards, guidelines and jurisdictional screening levels for more than 5,000 air parameters. In many cases, the AAQCs and the Air Contaminant Benchmarks are numerically the same.

A summary of the pertinent AAQCs and standards for indicator air parameters in this study are presented in Table 7.2-1.

#### 7.2.2.2 Spatial and Temporal Boundaries

Spatial boundaries are used to support consistent descriptions across disciplines and bound the assessment of the potential effects of the Project. The PA is consistent for all pVCs and fVCs, and encompasses the anticipated footprint of the Project, including all temporary and permanent areas associated with the mine site, as well as a buffer to allow flexibility for design optimizations prior to construction and over the mine life (Section 6.4).

The spatial boundaries used for the assessment of air quality are shown in Figure 7.2-1 and are defined as follows:

- Leased claims boundary: This boundary includes the PA and represents the extent of the mining claims that have been leased or are in the process of being leased. This boundary is used in the assessment to align with the needs of the provincial approvals process.
- Local Study Area (LSA): Based on the PA, and corresponds to the area in the vicinity of the Project where most of the air quality effects of the Project are expected to occur and can be predicted or measured with a reasonable degree of accuracy. This buffer includes the leased claims boundary, and extends 10 km from the PA excluding a buffer for the Chukuni River pipelines or pump house.
- Regional Study Area (RSA): Encompasses the leased claims boundary and LSA and extends 10 km further than the LSA to support a regional context in the assessment of potential Project effects. It is the maximum geographical extent or zone of influence (ZOI) in which potential effects from the Project are assessed. Potential air quality

effects of the Project would not be distinguishable from baseline concentrations beyond the RSA.

The purpose of a temporal boundary is to identify when a potential effect may occur in relation to specific Project phases (construction, operations and closure) and activities. The temporal boundaries for the assessment as defined in Section 6.5 are:

- Construction phase:
  - Years -3 to -1 representing the primary period of Project construction
  - Mining of the Viggo pit will be completed during this phase
  - Development in the LP Central pit will be initiated in the last year of construction
- Operations phase:
  - Years 1 to 26, during Year 1 the Project will transition from construction into operations and will not be at full capacity
  - Underground mine and ore processing will occur over the entire period
  - Open pit mining in the LP Central pit will be completed in about nine years
- Closure phase:
  - Years 27 to 29 represent the active closure period when the majority of the decommissioning and reclamation of the PA is completed
  - Year 30 is a passive closure period while the site is on care and maintenance as the filling of mine workings with water is completed
  - Year 31 is the final close out period when water treatment infrastructure is removed, and site waters are acceptable for passive release to the environment.

Potential effects on air quality were assessed for each Project phase (i.e., construction, operations and closure).

#### 7.2.2.3 Assessment Criteria

Project activities during the construction, operations and closure phases of the Project are expected to cause changes in air quality. To evaluate the potential effects, an assessment has been made of the predicted changes to the baseline conditions. The following indicators were used as detailed in Table 7.2-2:

- Changes in particulate and trace metal concentrations
  - SPM
  - Particulate matter less than 10 micrometres in diameter ($PM_{10}$)
  - $PM_{2.5}$
  - Respirable silica (<10 micrometres)
  - Metals (As, Cr, Cu, Fe, Hg, Mn, Ni, Pb and Zn)
- Changes in fuel combustion related air parameter concentrations
  - Diesel particulate matter (DPM)

  - Volatile organic compounds (VOCs)
  - Polycyclic aromatic hydrocarbons (PAHs)
  - Nitrogen dioxide ($NO_2$)
  - Sulphur dioxide ($SO_2$)
  - Carbon monoxide (CO)
- Change in other air parameter concentrations related to ore mining and processing
  - Hydrogen cyanide (HCN)
  - Calcium oxide (CaO)
  - Copper sulphate ($CuSO_4$).

The rationale for the selection of criteria was to generally group indicator air parameters and associated indicators by the type of sources and the general mitigations that may apply. The indicators were selected based on the:

- TISG
- Air quality parameters expected to be emitted by a mining operation based on professional experience
- Whether regulators or other stakeholders, or Indigenous people have historically showed heighted interest in the parameter or compound.

The specific AAQCs and standards for indicator air parameters are described in Table 7.2-1.

All of CAAQS air parameters were considered in this assessment for comparison to their respective CAAQS, except for $O_3$ (as outlined in Section 7.2.3.3).

Ammonia ($NH_3$) and $O_3$, although gaseous compounds potentially associated with mining projects, were not chosen as air quality indicators. $NH_3$ is known to be released during explosive detonation; however, the quantities discharged during each blast are not substantial. Although $O_3$ is monitored and regulated as an indicator of air quality in Canada, there are no anticipated sources of ozone associated with the Project. $O_3$ formed from the release of $NO_2$ and VOCs is not expected to have an appreciable effect on air quality in the LSA and RSA.

As there is no AAQC for DPM, the HC (2016) chronic and short-term exposure guidance values were used, as noted in Table 7.2-1. There is also no AAQC specific to copper sulphate; therefore, the AAQC for copper was used as noted in Table 7.2-1.

#### 7.2.2.4 Analytical Methods

The assessment of the potential air quality effects of the Project has been completed in accordance with standard air quality assessment methods. The prediction of potential effects involved the following steps:

- Identify stationary and mobile emissions sources associated with the Project.
- Identify the air parameters emitted to the atmosphere from the identified sources.
- Summarize the baseline ambient air quality conditions in the absence of the Project for each of the air parameters emitted.

- Identify the relevant regulatory AAQCs and standards for a mine site in Ontario, noting that for some of the air parameters there may be more than one applicable limit that depends upon the averaging period.
- Estimate the air emission rates for each of the air parameters using appropriate estimation methods and established data sources.
- Prepare a source summary table that identifies sources at the Project site which may release one or more of the air parameters emitted to the atmosphere in appreciable quantities and the corresponding emission rates.
- Perform the air dispersion modelling using the United States Environmental Protection Agency AERMOD version 22112, the current regulatory air dispersion model in Ontario, and using MECP meteorological data (Figure 7.2-2).
- Compare the potential effects on ambient air quality predicted by the air dispersion modelling to the respective AAQCs and standards for each air parameter and the relevant averaging periods. This comparison is with consideration of locations with potential human activity, which may include traditional land and resources use, near the Project that were identified as points of reception (PORs) for the air quality assessment (Figure 7.2-1).

The dispersion modelling was used to predict the air parameter concentrations beyond the leased claims boundary, as shown in Figure 7.2-1. The concentration of a given air parameter at the location of maximum predicted offsite concentration (i.e., the point of impingement; POI) and at the maximum POR were compared to the Ontario AAQC. This included consideration of the maximum predicted concentration, both with and without addition of the baseline concentration. The modelled changes in predicted concentrations were also compared to the CAAQS as an indicator of the Project's potential influence on the air zone CAAQS achievement and management level.

Mobile equipment, stationary equipment, and process plant related air parameters used to develop the appropriate emissions factors, the source summary and emission summary for the construction and operations phases of the Project, and a summary of the emission calculation methods are included in the Air Quality Modelling Report (Appendix D-2). Information with respect to the equipment selections are anticipated to be representative.

The PORs consist of residences, potential recreational use, cabins, lodges, and camp sites identified through field work and a review of the MNR Geospatial Ontario data. In some cases where a land use covered a large area, representative points were selected.

### 7.2.3 Assumptions and the Use of the Conservative Approach

Onsite data collected were used to establish baseline concentrations where robust datasets were available, with the 90th percentile statistics being used for shorter averaging periods and the average for annual averaging periods. Where onsite data did not provide a robust dataset, ECCC National Air Pollution Surveillance (NAPS) stations were used. Specifically, the Experimental Lakes station east of Kenora was used to estimate monthly $O_3$ and the Winnipeg station was used to estimate CO. While $O_3$ was not assessed as an air parameter, it is utilized in the $NO_2$ modelling for $NO_x$ / $NO_2$ conversion.

It is noted that use of data from areas more urbanized than the Project is expected to overestimate air concentrations at the Project as they are influenced by urban sources and are considered to be a conservatively high baseline; this is particularly true where the 90th percentile concentrations are used.

For the purpose of this effects assessment, the prediction of effects encompasses the sources of air emissions that are associated with the maximum operating scenario in each phase of the Project.

A maximum emission scenario was developed for the construction phase, which considered variability in the construction schedule and in the location of construction phase activities. The scenario combined the most intensive period of earthworks construction with other activities which, while not necessarily concurrent, were spatially offset. In some cases, modelling non-concurrent tasks together meant that emissions associated with certain construction equipment or activities were double-counted leading to conservatism in the predicted concentrations.

Similarly, a conservative approach was taken to capture potential variation in material movement during operations. The emissions scenario for material movement considered the maximum movements for each activity (i.e., ore from pit, mine rock from open pits and stockpile management) over the life of the Project. The scenario modelled was a maximum hybrid of all operational years, with the peak material movement on any given haul route assumed to happen concurrently. Other operational years are expected to have lower air emissions and effects.

### 7.2.4 Existing Conditions

The Project is located in the Red Lake mining district in a relatively undeveloped area approximately 25 km southeast of the Municipality of Red Lake. Local sources of emissions may include road dust, exploration and forestry activities, residential heating, operation of small generators, and recreational vehicles. Additionally, there are mining activities in the area and any associated concentration contributions were captured as part of the baseline at the Project (Appendix D-1).

Existing air quality conditions at the Property are also influenced by long-range transport of air parameters from anthropogenic sources as well as by natural sources, such as wildfires and VOC emissions from forest vegetation.

An onsite baseline air monitoring program was undertaken from July 2022 to August 2024 to characterize existing conditions in the LSA (measuring SPM, $PM_{10}$, $PM_{2.5}$, metals, $NO_2$, $SO_2$, VOCs, PAHs, DPM, silica, and dustfall). The baseline field program confirmed that baseline air concentrations are below respective AAQCs as expected. As an example, the 24-hour 90th percentile SPM concentration for the program was 18% of its AAQC, the highest metal of interest was cadmium at 4% of its 24-hour AAQC, and the highest baseline concentration relative to its AAQC was benzene at 76% of its annual AAQC.

Data was preferentially and primarily collected on site to develop a robust and representative existing conditions dataset. Side-by-side comparisons of the on site methods and ECCC NAPS data for each air parameter are provided in Appendix D-1.

Regional data summarized in Appendix D-1 were collected by regulatory agencies at Thunder Bay, Winnipeg (Ellen Station), and at the Experimental Lakes Area stations which are regional stations in the NAPS network. Although Thunder Bay is located approximately 420 km from the Project and Winnipeg approximately 270 km, these stations are still representative of the regional air quality experienced in northwestern Ontario. These urban stations will overestimate air concentrations at the Project as they are influenced by urban sources (e.g., traffic, industry and residential heating) and are considered to be a conservative baseline; this is particularly true where the 90th percentile of a measured dataset are used. The only regional data used in the modelling exercise were CO and $O_3$; all other air parameters use data collected on site.

The baseline concentration used in the assessment of air quality concentrations for each air parameter is provided in Table 7.2-1.

### 7.2.5 Identification of Potential Effects

The initial step in the assessment process is to identify interactions between the Project and the pVC that can result in pathways to potential effects. These potential effects may be direct, indirect and / or positive effects, where applicable. Table 7.2-3 includes the potential interactions of the Project with air quality, prior to the application of the mitigation measures. The professional judgment of technical experts experienced with mining projects in Ontario and Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those interactions that are likely to result in a pathway to a potential effect due to a measurable change to air quality. These pathways to potential effects are further described in Sections 7.2.5.1 to 7.2.5.3 for each phase of the Project, along with the rationale for those interactions excluded from further assessment. Section 7.2.6 and Table 7.2-4 provide a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The effects, after the application of the mitigation measures, are then described and further evaluated in Section 7.2.7.

#### 7.2.5.1 Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure. The following interactions with the Project, grouped by general indicators, result in potential effects on the air quality as described below.

The assessment of potential effects on air quality includes changes in particulate, silica, metals, $NO_2$, $SO_2$, CO, DPM, VOCs, PAHs and other air parameters from the following potential pathways due to emissions from the operation of equipment, material handling, and the use of unpaved surfaces interacting with air quality:

- Site preparation activities for the mine site area including clearing, grubbing, bulk earthworks, and development of aggregate resources including blasting
- Operation of the construction camp
- Construction of the onsite haul roads
- Construction of the TMF
- Construction of the underground mine including blasting
- Development and operation of the Viggo pit including blasting
- Development of the LP Central pit, including blasting and the commencement of mining for production
- Commissioning of the ore process plant

- Initiation of stockpiling of ore
- Operation of the natural gas generator power plant.

The assessment of potential effects on air quality also considers changes in particulate, metals, and silica from the potential pathway of emissions from the operation of a concrete batch plant, cemented rockfill plant, and paste plant interacting with air quality, not specifically identified as unique activities for the Project (Section 6.6-2).

#### 7.2.5.2 Operations Phase

The operations phase is anticipated to occur over a 26-year period. The following interactions with the Project, grouped by general indicators, result in potential effects on the air quality as described below.

The assessment of potential effects on air quality includes changes in particulate, silica, metals, $NO_2$, $SO_2$, CO, DPM, VOCs, PAHs and other air parameters from the following potential pathways of emissions from the operation of equipment, material handling, and the use of unpaved surfaces interacting with air quality:

- Operation of the underground mine including blasting and drilling
- Operation of the LP Central pit including blasting and drilling
- Operation of stockpiles and the TMF
- Crushing of ore, breaking and / or crushing of mine rock as needed
- Operation of haul trucks moving ore and mine rock along onsite haul roads
- Combustion of fuel for heating of mine site infrastructure and process heat
- Combustion of natural gas at the power plant for backup power.

The assessment of potential effects on air quality related to the processing of ore and management of rock and tailings, may also include changes in:

- HCN and $SO_2$ from the potential pathway of emissions from the gold leaching process and cyanide destruction process interacting with air quality
- CaO and $CuSO_4$ from the potential pathway of emissions from reagent handling during gold processing interacting with air quality
- Particulate, metals, and $NO_2$ from the potential pathway of emissions from assay lab operations interacting with air quality
- Particulate, metals, and silica from the potential pathway of emissions from the operation of a concrete batch plant, cemented rockfill plant, and paste plant interacting with air quality.

The maximum operating scenario is a conservative estimate of the material movement during mine operation and includes a hybrid of when the maximum extraction is occurring across all material types (overburden, ore, mine rock, and aggregate inclusive of sand and gravel, and quarried rock).

#### 7.2.5.3 Closure Phase

Activities during the active closure phase are similar to those during the construction phase and use similar mining and construction equipment but on a much smaller scale. The following interactions with the Project, grouped by general indicators, result in potential changes in air quality as described below.

The potential effects on air quality include changes in particulate, silica, metals, $NO_2$, $SO_2$, CO, DPM, VOCs, PAHs and other air parameters from the following potential pathways due to emissions from the operation of equipment, material handling, and the use of unpaved surfaces interacting with air quality:

- Removal of salvageable assets off site
- Reclamation of impacted portions of the PA, such as by regrading, placement of cover and revegetation, as applicable
- Demolition and recycling and / or disposal of remaining materials
- Removal and disposal of demolition-related wastes.

The passive and final closure periods consist predominantly of monitoring activities, with occasional maintenance and limited equipment use, and accordingly, is not specifically assessed for effects to air quality.

As active closure uses similar mining and construction equipment but on a much smaller scale, the potential for air quality effects is adequately captured by the construction and operations phase evaluations, and therefore was not quantitatively assessed.

### 7.2.6 Mitigation and Enhancement Measures

Measures to be implemented to avoid or minimize the potential effects of the Project on air quality include the following:

- Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and if appropriate, use of provincially-approved chemical suppressants particularly on roads
- Process plant emission sources will be designed and managed to allow for good atmospheric dispersion, and dust control equipment such as dust collectors and water sprays will be utilized together with best management practices, where necessary, to reduce emissions
- Air emissions from diesel consumption associated with mobile heavy equipment operations will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks
- Use of low sulphur diesel fuel
- Implementation of an anti-idling policy and speed limits
- Equipment meeting the ECCC vehicle emission requirements
- Effective preventive and responsive equipment maintenance
- Exposed dust sources will be vegetated during closure, if not completed progressively during the operations phase, to better control dust emissions from exposed areas.

A dust management plan will be prepared prior to the construction phase that will be modified for the operations phase and closure phase as appropriate, to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation, and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed. The proposed dust control measures will be based on current international best management practices, will be predictably effective and not prone to failure. The dust management plan will include opportunities for adaptive management, in which the intensity of the control measures would be increased if site inspections and monitoring indicate that current measures are insufficient to prevent offsite dust concentrations from being above AAQCs.

A blast management plan will be prepared and implemented during the construction phase and operations phase.

The application of mitigation measures for the pathways for potential effects is illustrated in Table 7.2-4.

Monitoring programs will be implemented to verify the accuracy of the predicted effects and to assess the effectiveness of the implemented mitigation measures. The monitoring programs would be adaptive and further optimized in response to monitoring data results. Extensive monitoring programs have already been undertaken to assess existing conditions with several years of data collection completed. Monitoring will also be required as a condition of provincial approvals.

### 7.2.7 Assessment of Changes

Air dispersion modelling was used to predict the potential offsite changes in the indicator air parameters after mitigation, beyond the extent of the leased claims boundary as shown in Figure 7.2-1. Sources of air emissions were considered in the air dispersion modelling to predict concentrations at the POI for comparison against AAQCs (with and without inclusion of baseline concentrations) in Table 7.2-5 and Table 7.2-7. The modelling results demonstrate that there are no predicted POI concentrations above applicable guidelines associated with the construction phase or operations phase. Additionally, no current traditional land use activities were noted at the POI locations in the confidential studies received from LSFN, WFN and NWOMC.

The change in air quality indicators at the PORs (Figure 7.2-1) was also predicted, based on the modelled concentration combined with the baseline concentration. The maximum modelled air concentrations at these PORs for the operations phase are presented in Table 7.2-6 and Table 7.2-8. There are no predicted concentrations above applicable guidelines at the PORs associated with the operations phase or construction phase.

Effects to air quality during the closure phase were not assessed uniquely, as the scale of activities and potential effects are considerably less than either the construction phase or operations phase. As noted in Section 7.2.5.3, active closure uses similar mining and construction equipment but on a much smaller scale. The potential for air quality effects from active closure are adequately captured by the construction and operations phase evaluations and were therefore not quantitatively assessed.

As the CAAQS are not intended for the assessment of specific emission sources but rather to characterize air quality within a broader air zone, comparison of predicted concentrations against the CAAQS was not used in the characterization of effects. Comparison to the CAAQS is, however, included in the comprehensive air quality assessment provided in Appendix D-2 to allow for discussion of the predicted effects of air emissions on the air zone.

The assessment also considered varying dust control efficiencies that relate to the mitigation measures outlined in Section 7.2.6. The reduced control efficiencies represent scenarios in which the site is implementing few or no best management practices for fugitive dust. A sensitivity analysis of predicted SPM, $PM_{10}$, and $PM_{2.5}$ concentrations using these differing dust controls efficiencies is provided in Table 7.2-9 and Table 7.2-10 for the construction phase and operations phase, respectively.

#### 7.2.7.1 Changes in Particulate and Trace Metal Concentrations

##### 7.2.7.1.1 Construction Phase

The predicted concentrations of particulate matter (SPM, $PM_{10}$ and $PM_{2.5}$), respirable silica and concentrations of metals for the construction phase were combined with the baseline to estimate cumulative concentrations (Table 7.2-5 and Table 7.2-6). The modelled cumulative concentrations for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs during construction.

##### 7.2.7.1.2 Operations Phase

The predicted concentrations of particulate matter (SPM, $PM_{10}$ and $PM_{2.5}$), respirable silica and metal concentrations for the operations phase were combined with the baseline to estimate cumulative concentrations (Table 7.2-7 and Table 7.2-8). The modelled cumulative concentrations for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs within the LSA during operations.

##### 7.2.7.1.3 Closure Phase

As active closure uses similar mining and construction equipment but on a much smaller scale, the potential for air quality effects from the closure phase are assumed to meet AAQC at the extent of the leased claims boundary and at all PORs within the LSA.

#### 7.2.7.2 Changes in Air Parameter Concentrations related to Fuel Combustion

##### 7.2.7.2.1 Construction Phase

The predicted concentrations of DPM for the construction phase were combined with the baseline to estimate cumulative concentration (Table 7.2-5 and Table 7.2-6). The modelled cumulative concentrations for DPM for all averaging periods are below the respective HC guidelines at the extent of the leased claims boundary and at all PORs within the LSA during construction.

The predicted concentrations of the surrogate VOCs, PAHs, $NO_2$, $SO_2$ and CO for the construction phase were combined with the baseline to estimate cumulative concentration (Table 7.2-5 and Table 7.2-6). The modelled cumulative concentrations for the surrogate VOCs, PAHs, $NO_2$, $SO_2$ and CO for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs within the LSA during the construction phase.

##### 7.2.7.2.2 Operations Phase

The predicted concentrations of DPM for the operations phase were combined with the baseline to estimate cumulative concentrations (Table 7.2-7 and Table 7.2-8). The modelled cumulative concentrations for DPM for all averaging periods are below the respective HC guidelines at the extent of the leased claims boundary and at all PORs during operations.

The predicted concentrations of the surrogate VOCs, PAHs, $NO_2$, $SO_2$ and CO for the operations phase were combined with the baseline to estimate cumulative concentrations (Table 7.2-7 and Table 7.2-8). The modelled cumulative concentrations for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs within the LSA during operations.

##### 7.2.7.2.3 Closure Phase

As active closure uses similar mining and construction equipment but on a much smaller scale, the potential for air quality effects from the closure phase are assumed to meet AAQC at the extent of the leased claims boundary and at all PORs within the LSA.

#### 7.2.7.3 Change in Other Air Parameter Concentrations Related to Ore Mining and Processing

##### 7.2.7.3.1 Construction Phase

The predicted concentrations of HCN, CaO and $CuSO_4$ for the construction phase were combined with the baseline to estimate cumulative concentrations summarized in Table 7.2-5 and Table 7.2-6. The modelled cumulative concentrations for HCN, CaO and $CuSO_4$ for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs within the LSA during the construction phase.

##### 7.2.7.3.2 Operations Phase

The predicted concentrations of HCN, CaO and $CuSO_4$ for the operations phase were combined with the baseline to estimate cumulative concentrations (Table 7.2-7 and Table 7.2-8). The modelled cumulative concentrations for HCN, CaO and $CuSO_4$ for all averaging periods are below the respective AAQC at the extent of the leased claims boundary and at all PORs within the LSA during operations.

##### 7.2.7.3.3 Closure Phase

Mining and processing will not occur during the closure phase and no material emissions of HCN, CaO and $CuSO_4$ are predicted.

### 7.2.8 Change Pathway Outcome

#### 7.2.8.1 Summary of Changes after Mitigation

The modelled cumulative concentrations for all indicators for all averaging periods are below the respective AAQC during the construction phase, operations phase and closure phase at the extent of the leased claims boundary and at all PORs in the LSA. The predicted changes to air quality are illustrated in the Figure 7.2-3 to Figure 7.2-12. The black lines represent baseline conditions plus Project-related changes and are labeled as a percentage of the relevant AAQC or standard.

Figure 7.2-3 to Figure 7.2-12 were selected to summarize the findings with each figure representing the maximum predicted concentration contours across all Project phases and averaging times for a given air parameter. Appendix D-2 provides a more comprehensive set of figures depicting the total concentrations for indicator air parameters. The predicted concentrations of criteria indicators for the construction phase and operations phase were combined with the baseline to estimate cumulative concentrations, summarized in Table 7.2-5 and Table 7.2-6.

#### 7.2.8.2 Change Management

Changes to air quality are managed through existing federal and provincial regulatory mechanisms.

Under the *Canadian Environmental Protection Act*, owners or operators of facilities that meet published reporting requirements, must report emissions to the National Pollutant Release Inventory program. The Project is expected to be required to report to this program, which necessitates the submission of an annual publicly accessible inventory of pollutant releases, disposals, and recycling.

An environmental emergency plan (E2 plan) is required under the Environmental Emergency Regulations of the Act, for regulated substances listed in Schedule 1, at or above specified threshold quantities and stored in a container that has a maximum capacity equalling or being greater than the specified quantities for that substance. The Project is expected to meet or be above the specified threshold quantities for substances listed in Schedule 1 and therefore may require an E2 plan with air release modelling.

In Ontario, Section 9 of the *Environmental Protection Act* states that no person can "*use, operate, construct, alter, extend or replace any plant, structure, equipment or apparatus*" or "*alter a process or rate of production*" that emits a contaminant to the natural atmosphere i.e., an air emission source, without an approval. The Project will be required to obtain an air environmental compliance approval before commencing operations. This approval will include conditions that must be satisfied, such as:

- Making no modifications to the facility without verifying it does cause the facility to go above a production limit or Air Contaminant Benchmark
- Annually updating the Emission Summary and Dispersion Modelling Report
- Preparation, review by the MECP, and implementation of a Fugitive Dust Best Management Practices Plan
- Preparation, review by the MECP, and implementation of an ambient air monitoring program with data reported regularly to the MECP
- Preparation of operating procedures and maintenance programs for processes with significant environmental aspects
- Recording and reporting on complaints to the MECP.

#### 7.2.8.3 Confidence

The level of confidence in the conservative nature of the prediction of air quality effects is considered to be high. The predicted effects are assessed based on the modelled values from the industry-standard AERMOD air dispersion model and the maximum operating scenario (the peak material movement for all routes assumed to happen concurrently) for each phase of the project. The modelled concentrations represent a conservative, worst-case approach that is expected to overestimate concentrations during the construction phase and operations phase, and considers a wide range of potential meteorological conditions. As noted in Section 7.2.5.3, the active closure phase uses similar mining and construction equipment but on a smaller and less intense scale, therefore the potential for air quality effects is adequately captured by the construction and operations phase evaluations and conservatism.

**Table 7.2-1: Baseline Air Quality Concentrations and Standards**

| Air Parameter | Averaging Period | Baseline Concentration ($\mu g/m^3$) | AAQC ($\mu g/m^3$) | CAAQS ($\mu g/m^3$) |
|---|---|---|---|---|
| SPM | 24-hour | 21.4 | 120 | - |
| | Annual | 5.8 | 60 | - |
| $PM_{10}$ | 24-hour | 18.3 | 50 (Interim) | - |
| $PM_{2.5}$ | 24-hour | 10.0 | 27 | 23 (1) |
| | Annual | 5.8 | 8.8 | 8.0 |
| DPM | 24-hour | 0.19 | 10 (2) | - |
| | Annual | 0.089 | 5 (2) | - |
| Respirable silica ($SiO_2$, <10 µm) | 24-hour | 1.2 | 5 | - |
| $NO_2$ (3) | 1-hour | 4.8 | 400 | 79 |
| | 24-hour | 3.9 | 200 | - |
| | Annual | - | - | 23 |
| CO | 0.5-hour | - | - | - |
| | 1-hour | 114 | 36,200 | - |
| | 8-hour | 114 | 15,700 | - |
| $SO_2$ | 10-minute | 4.8 | 175 | - |
| | 1-hour | 3.9 | 105 | 170 |
| | Annual | 3.2 | 10 | 10 |
| HCN | 24-hour | - | 8 | - |
| CaO | 24-hour | 1.7 (as Ca) | 10 | - |
| As | 24-hour | 0.0028 | 0.3 | - |
| Cr | 24-hour | 0.0023 | 0.5 | - |
| Cu | 24-hour | 0.10 | 50 (4) | - |
| Fe | 24-hour | 0.13 | 25 | - |
| Pb | 24-hour | 0.0014 | 0.5 | - |
| | 30-day | 0.0014 | 0.2 | - |

| Air Parameter | Averaging Period | Baseline Concentration (µg/m³) | AAQC (µg/m³) | CAAQS (µg/m³) |
|---|---|---|---|---|
| Mn | 24-hour | 0.0071 | 0.4 (as SPM) | - |
| | | 0.0071 | 0.2 (as $PM_{10}$) | - |
| | | 0.0071 | 0.1 (as $PM_{2.5}$) | - |
| Hg | 24-hour | 0.0000093 | 2 | - |
| Ni | 24-hour | 0.0014 | 0.2 (as SPM) | - |
| | | 0.0014 | 0.1 (as $PM_{10}$) | - |
| | Annual | 0.0010 | 0.04 (as SPM) | - |
| | | 0.0010 | 0.02 (as $PM_{10}$) | - |
| Zn | 24-hour | 0.013 | 120 | - |
| Benzene | 24-hour | 0.55 | 2.3 | - |
| | Annual | 0.34 | 0.45 | - |
| 1,3-Butadiene | 24-hour | 0.56 | 10 | - |
| | Annual | 0.56 | 2 | - |
| Benzo(a)pyrene (5) | 24-hour | 0.000013 | 0.00005 | - |
| | Annual | 0.0000050 | 0.00001 | - |

Notes:
1. 2030 CAAQS for $PM_{2.5}$. Note that the CAAQS are based on specific statistical forms and not for direct comparison of the maximum modelled effects.
2. Acute and chronic standard for DPM (HC 2016).
3. NOx expressed as $NO_2$.
4. The copper fraction of $CuSO_4$ was compared to the copper AAQC.
5. Benzo(a)pyrene, as a surrogate for total PAHs.

< : less than; µm : micrometre; - : no criterion or standard for the respective air parameter and / or averaging period.

**Table 7.2-2: Assessment Criteria, Indicators and Rationale**

| Criteria | Indicator (1) | Rationale for the Selection Criteria |
|---|---|---|
| **Change in Particulate and Trace Metals:** | | |
| SPM | • Air concentrations for the 24-hour and annual averaging periods | • Emissions generated from Project material handling, use of unpaved roads, and blasting are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| $PM_{10}$ | • Air concentration for the 24-hour averaging period | |
| $PM_{2.5}$ | • Air concentrations for the 24-hour and annual averaging periods | • Emissions generated from Project material handling, use of unpaved roads, blasting, and fuel combustion are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| Respirable $SiO_2$ | • Air concentration for the 24-hour averaging period | • Emissions generated from mine rock handling are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| As, Cr, Cu, Fe, Hg, Mn and Zn | • Air concentration for a 24-hour averaging period | • Emissions generated from mine rock handling are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| Pb | • Air concentration for the 24-hour and 30-day averaging period | |
| Ni | • Air concentration for the 24-hour and annual averaging periods | |
| **Changes in Air Parameters related to Fuel Combustion:** | | |
| DPM | • Air concentrations for the 24-hour and annual averaging periods | • Emissions generated from diesel fuel combustion have acute and chronic exposure HC guidelines. |
| Benzene and 1,3-butadiene as surrogates for VOCs | • Air concentrations for the 24-hour and annual averaging periods | • Emissions generated from Project fuel combustion are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| Benzo(a)pyrene as a surrogate for PAHs | • Air concentration for the 24-hour and annual averaging period | • Emissions generated from Project fuel combustion are subject to provincial and federal regulatory objectives, guidelines and / or standards. B(a)p is an industry accepted surrogate for PAH. |
| $SO_2$ | • Air concentrations for the 10-minute, 1-hour and annual averaging periods | • Emissions generated from Project blasting, tailpipes and cyanide destruction are subject to provincial and federal regulatory objectives, guidelines and / or standards. |

| Criteria | Indicator (1) | Rationale for the Selection Criteria |
|---|---|---|
| $NO_2$ | • Air concentrations for the 1-hour and 24-hour averaging periods | • Emissions generated from Project blasting and fuel combustion are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| CO | • Air concentrations for the 1-hour and 8-hour averaging periods | • Emissions generated from Project blasting and fuel combustion are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| **Change in other Air Parameters** | | |
| HCN | • Air concentration for the 24-hour averaging period | • Emissions generated from Project ore cyanidation for gold recovery are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| CaO | • Air concentration for the 24-hour averaging period | • Emissions generated from Project reagent handling are subject to provincial and federal regulatory objectives, guidelines and / or standards. |
| $CuSO_4$ | • Air concentration for the 24-hour averaging period | |

Note:
1. Measured as $\mu g/m^3$.

**Table 7.2-3: Potential Interactions of Project Components with Air Quality**

| Project Component / Activity | Air Quality |
|---|---|
| **Construction Phase** | |
| Site preparation activities | Yes |
| Establishment and operation of water management and treatment facilities | - |
| Open pit mining | Yes |
| Underground mining | Yes |
| Management of rock and unconsolidated materials in stockpiles | Yes |
| Establishment of onsite fish habitat and compensation measures | Yes |
| Establishment of onsite aggregate operations | Yes |
| Construction of the starter embankments for the TMF | Yes |
| Construction and operation of buildings and infrastructure | Yes |
| Waste management | - |
| Commissioning of the process plant | - |
| Power supply | Yes |
| Employment and expenditures | - |
| **Operations Phase** | |
| Underground mining | Yes |
| Mining of the LP Central pit | Yes |
| Management of rock and unconsolidated materials in stockpiles | Yes |
| Process plant operation | Yes |
| Management of desulphurized tailings in the TMF | - |
| Management of concentrate tailings and contact water in the Viggo Management Facility (VMF) | - |
| Operation of water management and treatment facilities | - |
| Construction of a mine water pond (MWP) | Yes |
| Operation and maintenance of buildings and infrastructure | - |
| Waste management | - |
| Power supply | Yes |
| Progressive reclamation activities | Yes |
| Employment and expenditures | - |

| Project Component / Activity | Air Quality |
|---|---|
| **Closure Phase** | |
| Active closure period | Yes (1) |
| Passive closure period | No |
| Final reclamation period | - (2) |
| Employment and expenditures | - |

Notes:
- : The interaction is not expected to be material, and no further assessment is warranted.
1. Active closure period is adequately captured by construction and operations phase evaluations and was therefore not assessed quantitatively.
2. Very limited activities will occur during this period over a limited period of time. The potential effect will be very localized.

**Table 7.2-4: Mitigation Measures for Changes to Air Quality**

| Pathways to Potential Effect / Criteria | Phase | | | Proposed Mitigation Measure |
|---|---|---|---|---|
| | Con | Op | Cl | |
| Change in particulate and trace metal concentrations | • | • | - | A dust management plan will be implemented to identify potential sources of fugitive dusts, outline mitigation measures that will be employed to control dust generation and detail the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed. |
| | • | • | • | Dust emissions from roads and mineral stockpiles will be controlled through the application of water spray and supplemented by dust suppressants if required. |
| | • | • | • | Site roads will be maintained in good condition, with regular inspections and timely maintenance completed to minimize the silt loading on the roads. |
| | • | • | • | Vehicle speeds will be limited. |
| | - | • | - | The process plant emission sources will be enclosed where possible and designed to allow good atmospheric dispersion. To reduce emissions, dust control equipment and best practices will be used, where necessary, as described below:<br>• Conveyor transfer (drop) points will be controlled via enclosure or water spray<br>• Crushed ore stockpile will be enclosed, and emissions controlled by a baghouse<br>• A wet scrubber or equivalent will be used to control emissions in grinding<br>• Truck unloading at the primary crusher will be enclosed and emissions controlled by a baghouse<br>• Drill rigs will be equipped with a dust shroud on the drill and a wet suppression (spray) system will be used<br>• Travel surfaces will be maintained to minimize silt (fine material)<br>• Crushing of ore materials and reclaim at stockpiles will be controlled by baghouses<br>• Areas for ore mixing and handling will be controlled by dust collectors<br>• A regular maintenance schedule will be followed to confirm baghouses and dust collectors are functioning properly. |
| | - | • | • | Exposed dust sources will be revegetated, and progressive reclamation will be conducted wherever appropriate to better control dust emissions. |

| Pathways to Potential Effect / Criteria | Phase | | | Proposed Mitigation Measure |
|---|---|---|---|---|
| | Con | Op | Cl | |
| Change in particulate and trace metal concentrations | ● | ● | ● | A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects. |
| Changes in fuel combustion related air parameter concentrations | ● | ● | ● | A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment and standby power generation) and all processes with the potential for air quality effects. |
| | ● | ● | ● | Use of equipment that complies with the ECCC off-road engine emission criteria. |
| | - | ● | - | Testing one emergency generator at a time to reduce short-term emissions. |
| | - | ● | - | Air emissions from the use of diesel fuel for the mobile heavy equipment will be controlled through strategic mine scheduling to minimize the total distance travelled by haul trucks and other equipment and through the use of low sulphur diesel fuel. |
| Change to other air parameters concentrations related to ore mining and processing | - | ● | - | Hydrogen cyanide emissions will be eliminated through the sulphur dioxide / oxygen cyanide treatment process to reduce cyanide in the tailings at the process plant and before deposition of tailings in the TMF. Excess sulphur dioxide used in this process will be recirculated (i.e., a closed loop) without release to the air. |
| | - | ● | - | The vents from the lime silo will be controlled by a dust collector. |
| | - | ● | - | Dust collectors to control emissions from the lime slaker and handling and mixing of dry chemicals.<br>Maintenance procedure(s) will confirm dust control equipment is functioning properly. |

Notes:
Con: Construction; Op: Operations; Cl: Closure
● : Mitigation is applicable.
- : Mitigation is not applicable.

**Table 7.2-5: Construction Phase - Predicted POI Concentrations**

| Air Parameter | Averaging Time | Project Emission Rate (g/s) | Project Concentration (µg/m$^3$) | Baseline Concentration (µg/m$^3$) | Project + Baseline Concentration (µg/m$^3$) | AAQC (µg/m$^3$) | % of AAQC (µg/m$^3$) |
|---|---|---|---|---|---|---|---|
| SPM | 24-hour | 76.9 | 17.4 | 21.4 | 38.8 | 120 | 32% |
| | annual | | 2.3 | 5.8 | 8.1 | 60 | 14% |
| $PM_{10}$ | 24-hour | 30.2 | 12.5 | 18.3 | 30.8 | 50 | 62% |
| $PM_{2.5}$ | 24-hour | 7.5 | 4.9 | 10.0 | 14.9 | 27 | 55% |
| | annual | | 0.66 | 5.8 | 6.5 | 8.8 | 73% |
| DPM | 24-hour | 3.0 | 4.2 | 0.19 | 4.5 | 10 | 45% |
| | annual | | 0.65 | 0.089 | 0.74 | 5 | 15% |
| $SiO_2$ | 24-hour | 2.3 | 0.9 | 1.2 | 2.2 | 5 | 43% |
| $NO_2$ | 1-hour | 115 | 94.6 | 4.8 | 99.4 | 400 | 25% |
| | 24-hour | 72.7 | 51.1 | 3.9 | 55.0 | 200 | 27% |
| CO | 1-hour | 281 | 2805 | 114 | 2919 | 36200 | 8% |
| | 8-hour | 48.3 | 577 | 114 | 691 | 15700 | 4% |
| $SO_2$ | 10-minute | 3.2 | 56.8 | 4.8 | 61.6 | 178 | 35% |
| | 1-hour | 3.2 | 34.4 | 3.9 | 38.3 | 100 | 38% |
| | annual | 0.19 | 0.38 | 3.2 | 3.6 | 10 | 36% |
| HCN | 24-hour | 0.56 | 0.89 | - | 0.89 | 8 | 11% |
| CaO | 24-hour | 0.13 | 0.18 | 1.7 | 1.8 | 10 | 18% |
| As | 24-hour | 0.057 | 0.013 | 0.0028 | 0.016 | 0.3 | 5% |
| Cr | 24-hour | 0.0098 | 0.0022 | 0.0023 | 0.0045 | 0.5 | 1% |
| $CuSO_4$ | 24-hour | 0.040 | 0.12 | - | 0.12 | 50 | 0.2% |

| Air Parameter | Averaging Time | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC (µg/m³) |
|---|---|---|---|---|---|---|---|
| Cu | 24-hour | 0.022 | 0.0050 | 0.10 | 0.10 | 50 | 0.2% |
| Fe | 24-hour | 9.6 | 2.2 | 0.13 | 2.3 | 25 | 9% |
| Pb | 30-day | 0.032 | 0.0073 | 0.0014 | 0.0087 | 0.5 | 2% |
| | 24-hour | 0.032 | 0.0073 | 0.0014 | 0.0087 | 0.2 | 4% |
| Mn in $PM_{2.5}$ | 24-hour | 0.019 | 0.013 | 0.0071 | 0.020 | 0.1 | 20% |
| Mn in $PM_{10}$ | 24-hour | 0.079 | 0.032 | 0.0071 | 0.040 | 0.2 | 20% |
| Mn in SPM | 24-hour | 0.20 | 0.045 | 0.0071 | 0.052 | 0.4 | 13% |
| Hg | 24-hour | 0.000019 | 0.0000042 | 0.0000093 | 0.000014 | 2 | 0.001% |
| Ni in SPM | 24-hour | 0.0070 | 0.0016 | 0.0014 | 0.0030 | 0.2 | 1% |
| | annual | | 0.00021 | 0.0010 | 0.0012 | 0.04 | 3% |
| Ni in $PM_{10}$ | 24-hour | 0.0070 | 0.0016 | 0.0014 | 0.0030 | 0.1 | 3% |
| | annual | | 0.00021 | 0.0010 | 0.0012 | 0.02 | 6% |
| Zn | 24-hour | 0.16 | 0.036 | 0.013 | 0.049 | 120 | 0.04% |
| Benzene | 24-hour | 1.2 | 1.0 | 0.55 | 1.6 | 2.3 | 68% |
| | annual | | 0.10 | 0.34 | 0.44 | 0.45 | 98% |
| 1,3-Butadiene | 24-hour | 0.051 | 0.080 | 0.56 | 0.64 | 10 | 6% |
| | annual | | 0.0081 | 0.56 | 0.57 | 2 | 28% |
| Benzo(a)pyrene | 24-hour | 0.0000068 | 0.0000057 | 0.000013 | 0.000019 | 0.00005 | 37% |
| | annual | | 0.0000010 | 0.0000050 | 0.0000060 | 0.00001 | 60% |

Note:
- : indicates that there is no value for the respective air parameter and / or averaging time.

**Table 7.2-6: Construction Phase - Predicted POR Concentrations**

| Air Parameter | Averaging Time | Receptor ID | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|---|
| SPM | 24-hour | POR1 | 76.9 | 4.3 | 21.4 | 25.7 | 120 | 21% |
| | annual | POR1 | | 0.50 | 4.5 | 5.0 | 60 | 8% |
| $PM_{10}$ | 24-hour | POR1 | 30.2 | 3.6 | 18.3 | 21.9 | 50 | 44% |
| $PM_{2.5}$ | 24-hour | POR4 | 7.5 | 1.2 | 10.0 | 11.2 | 27 | 42% |
| | annual | POR1 | | 0.14 | 5.8 | 5.9 | 8.8 | 68% |
| DPM | 24-hour | POR1 | 3.0 | 0.66 | 0.19 | 0.85 | 10 | 8% |
| | annual | POR1 | | 0.084 | 0.089 | 0.17 | 5 | 3% |
| $SiO_2$ | 24-hour | POR1 | 2.3 | 0.27 | 1.2 | 1.5 | 5 | 30% |
| $NO_2$ | 1-hour | POR1 | 115 | 82.0 | 4.8 | 86.8 | 400 | 22% |
| | 24-hour | POR1 | 72.7 | 10.6 | 3.9 | 14.5 | 200 | 7% |
| CO | 1-hour | POR7 | 281 | 958 | 114 | 1072 | 36200 | 3% |
| | 8-hour | POR7 | 48.3 | 158 | 114 | 272 | 15700 | 2% |
| $SO_2$ | 10-minute | POR1 | 3.2 | 11.2 | 4.8 | 16 | 178 | 9% |
| | 1-hour | POR1 | 3.2 | 6.8 | 3.9 | 11 | 100 | 11% |
| | annual | POR1 | 0.19 | 0.046 | 3.2 | 3.2 | 10 | 32% |
| HCN | 24-hour | POR1 | 0.56 | 0.18 | - | 0.18 | 8 | 2% |
| CaO | 24-hour | POR1 | 0.13 | 0.038 | 1.7 | 1.7 | 10 | 17% |
| As | 24-hour | POR1 | 0.057 | 0.0010 | 0.0028 | 0.0038 | 0.3 | 1% |
| Cr | 24-hour | POR1 | 0.0098 | 0.00017 | 0.0023 | 0.0025 | 0.5 | 0.5% |
| $CuSO_4$ | 24-hour | POR1 | 0.040 | 0.010 | - | 0.010 | 50 | 0.02% |
| Cu | 24-hour | POR1 | 0.022 | 0.00037 | 0.10 | 0.10 | 50 | 0.2% |

| Air Parameter | Averaging Time | Receptor ID | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|---|
| Fe | 24-hour | POR1 | 9.6 | 0.16 | 0.13 | 0.29 | 25 | 1% |
| Pb | 24-hour | POR1 | 0.032 | 0.063 | 0.0014 | 0.064 | 0.5 | 13% |
| | 30-day | POR1 | 0.032 | 0.00018 | 0.0014 | 0.0016 | 0.2 | 1% |
| Mn in $PM_{2.5}$ | 24-hour | POR1 | 0.019 | 0.00087 | 0.0071 | 0.0080 | 0.1 | 8% |
| Mn in $PM_{10}$ | 24-hour | POR1 | 0.079 | 0.0023 | 0.0071 | 0.0094 | 0.2 | 5% |
| Mn in SPM | 24-hour | POR1 | 0.20 | 0.0033 | 0.0071 | 0.010 | 0.4 | 3% |
| Hg | 24-hour | POR1 | 0.000019 | 0.00000031 | 0.0000093 | 0.0000096 | 2 | <0.01 % |
| Ni in SPM | 24-hour | POR1 | 0.0070 | 0.00012 | 0.0014 | 0.0015 | 0.2 | 1% |
| | annual | POR1 | | 0.000046 | 0.0010 | 0.0010 | 0.04 | 3% |
| Ni in $PM_{10}$ | 24-hour | POR1 | 0.0070 | 0.00021 | 0.0014 | 0.0016 | 0.1 | 2% |
| | annual | POR1 | | 0.000073 | 0.0010 | 0.0011 | 0.02 | 5% |
| Zn | 24-hour | POR1 | 0.16 | 0.0087 | 0.013 | 0.022 | 120 | 0.02% |
| Benzene | 24-hour | POR1 | 1.2 | 0.22 | 0.55 | 0.77 | 2.3 | 34% |
| | annual | POR1 | | 0.025 | 0.34 | 0.36 | 0.45 | 81% |
| 1,3-Butadiene | 24-hour | POR1 | 0.051 | 0.018 | 0.56 | 0.58 | 10 | 6% |
| | annual | POR1 | | 0.0020 | 0.56 | 0.56 | 2 | 28% |
| Benzo(a)pyrene | 24-hour | POR4 | 0.0000068 | 0.0000025 | 0.000013 | 0.000016 | 0.00005 | 31% |
| | annual | POR4 | | 0.00000022 | 0.0000050 | 0.0000052 | 0.00001 | 52% |

Note:
- : indicates that there is no value for the respective air parameter and / or averaging time.

**Table 7.2-7: Operations Phase - Predicted POI Concentrations**

| Air Parameter | Averaging Time | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|
| SPM | 24-hour | 63.6 | 16.9 | 21.4 | 38.3 | 120 | 32% |
| | annual | | 1.8 | 5.8 | 7.6 | 60 | 13% |
| $PM_{10}$ | 24-hour | 24.2 | 12.1 | 18.3 | 30.4 | 50 | 61% |
| $PM_{2.5}$ | 24-hour | 6.2 | 4.7 | 10.0 | 14.7 | 27 | 55% |
| | annual | | 1.5 | 5.8 | 7.3 | 8.8 | 83% |
| DPM | 24-hour | 2.4 | 4.1 | 0.2 | 4.3 | 10 | 43% |
| | annual | | 1.5 | 0.1 | 1.5 | 5 | 31% |
| $SiO_2$ | 24-hour | 1.8 | 0.91 | 1.2 | 2.1 | 5 | 43% |
| $NO_2$ | 1-hour | 114 | 94.6 | 4.8 | 99.4 | 400 | 25% |
| | 24-hour | 76.5 | 51.1 | 3.9 | 55.0 | 200 | 27% |
| CO | 1-hour | 257 | 768 | 114 | 882 | 36200 | 2% |
| | 8-hour | 53.1 | 106 | 114 | 220 | 15700 | 1% |
| $SO_2$ | 10-minute | 2.8 | 14.8 | 4.8 | 19.6 | 178 | 11% |
| | 1-hour | 2.8 | 9.0 | 3.9 | 12.9 | 100 | 13% |
| | annual | 0.16 | 0.013 | 3.2 | 3.2 | 10 | 32% |
| HCN | 24-hour | 0.56 | 0.89 | - | 0.89 | 8 | 11% |
| CaO | 24-hour | 0.13 | 0.18 | 1.7 | 1.8 | 10 | 18% |
| As | 24-hour | 0.047 | 0.012 | 0.0028 | 0.015 | 0.3 | 5% |
| Cr | 24-hour | 0.0081 | 0.0021 | 0.0023 | 0.0044 | 0.5 | 1% |
| $CuSO_4$ | 24-hour | 0.040 | 0.12 | - | 0.12 | 50 | 0.2% |
| Cu | 24-hour | 0.018 | 0.0048 | 0.10 | 0.10 | 50 | 0.2% |

| Air Parameter | Averaging Time | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|
| Fe | 24-hour | 7.9 | 2.1 | 0.13 | 2.2 | 25 | 9% |
| Pb | 30-day | 0.032 | 0.0084 | 0.0014 | 0.010 | 0.5 | 2% |
| | 24-hour | 0.032 | 0.0084 | 0.0014 | 0.010 | 0.2 | 5% |
| Mn in $PM_{2.5}$ | 24-hour | 0.016 | 0.012 | 0.0071 | 0.019 | 0.1 | 19% |
| Mn in $PM_{10}$ | 24-hour | 0.063 | 0.032 | 0.0071 | 0.039 | 0.2 | 19% |
| Mn in SPM | 24-hour | 0.17 | 0.044 | 0.0071 | 0.051 | 0.4 | 13% |
| Hg | 24-hour | 0.000015 | 0.0000041 | 0.0000093 | 0.000013 | 2 | 0.001% |
| Ni in SPM | 24-hour | 0.0058 | 0.0015 | 0.0014 | 0.0029 | 0.2 | 1% |
| | annual | | 0.00017 | 0.0010 | 0.0012 | 0.04 | 3% |
| Ni in $PM_{10}$ | 24-hour | 0.0058 | 0.0015 | 0.0014 | 0.0029 | 0.1 | 3% |
| | annual | | 0.00017 | 0.0010 | 0.0012 | 0.02 | 6% |
| Zn | 24-hour | 0.13 | 0.13 | 0.013 | 0.1 | 120 | 0.1% |
| Benzene | 24-hour | 0.99 | 1.0 | 0.55 | 1.5 | 2.3 | 67% |
| | annual | | 0.10 | 0.34 | 0.44 | 0.45 | 98% |
| 1,3-Butadiene | 24-hour | 0.042 | 0.079 | 0.56 | 0.64 | 10 | 6% |
| | annual | | 0.0081 | 0.56 | 0.57 | 2 | 28% |
| Benzo(a)pyrene | 24-hour | 0.0000078 | 0.0000053 | 0.000013 | 0.000018 | 0.00005 | 37% |
| | annual | | 0.0000011 | 0.0000050 | 0.0000061 | 0.00001 | 61% |

Note:
- : indicates that there is no value for the respective air parameter and / or averaging time.

**Table 7.2-8: Operations Phase - Predicted POR Concentrations**

| Air Parameter | Averaging Time | Receptor ID | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|---|
| SPM | 24-hour | POR2 | 63.6 | 4.1 | 21.4 | 25.5 | 120 | 21% |
| | annual | POR2 | | 0.45 | 5.8 | 6.3 | 60 | 10% |
| $PM_{10}$ | 24-hour | POR3 | 24.2 | 3.3 | 18.3 | 21.6 | 50 | 43% |
| $PM_{2.5}$ | 24-hour | POR3 | 6.2 | 1.1 | 10 | 11.1 | 27 | 41% |
| | annual | POR2 | | 0.11 | 5.8 | 5.9 | 8.8 | 67% |
| DPM | 24-hour | POR3 | 2.4 | 0.52 | 0.19 | 0.71 | 10 | 7% |
| | annual | POR2 | | 0.065 | 0.089 | 0.15 | 5 | 3% |
| $SiO_2$ | 24-hour | POR3 | 1.8 | 0.25 | 1.2 | 1.48 | 5 | 30% |
| $NO_2$ | 1-hour | POR2 | 114 | 85.6 | 4.8 | 90.4 | 400 | 23% |
| | 24-hour | POR2 | 76.5 | 10.7 | 3.9 | 14.6 | 200 | 7% |
| CO | 1-hour | POR7 | 257 | 729 | 114 | 843 | 36200 | 2% |
| | 8-hour | POR7 | 53.1 | 94.9 | 114 | 209 | 15700 | 1% |
| $SO_2$ | 10-minute | POR2 | 2.8 | 14.3 | 4.8 | 19.1 | 178 | 11% |
| | 1-hour | POR2 | 2.8 | 8.6 | 3.9 | 12.5 | 100 | 13% |
| | annual | POR1 | 0.16 | 0.0044 | 3.2 | 3.2 | 10 | 32% |
| HCN | 24-hour | POR2 | 0.56 | 0.18 | 0 | 0.18 | 8 | 2% |
| CaO | 24-hour | POR2 | 0.13 | 0.038 | 1.66 | 1.7 | 10 | 17% |
| As | 24-hour | POR2 | 0.047 | 0.0030 | 0.0028 | 0.0058 | 0.3 | 2% |
| Cr | 24-hour | POR2 | 0.0081 | 0.00052 | 0.0023 | 0.0028 | 0.5 | 1% |
| $CuSO_4$ | 24-hour | POR2 | 0.040 | 0.010 | 0 | 0.010 | 50 | 0.02% |
| Cu | 24-hour | POR2 | 0.018 | 0.0012 | 0.10 | 0.10 | 50 | 0.2% |

| Air Parameter | Averaging Time | Receptor ID | Project Emission Rate (g/s) | Project Concentration (µg/m³) | Baseline Concentration (µg/m³) | Project + Baseline Concentration (µg/m³) | AAQC (µg/m³) | % of AAQC |
|---|---|---|---|---|---|---|---|---|
| Fe | 24-hour | POR2 | 7.9 | 0.51 | 0.13 | 0.64 | 25 | 3% |
| Pb | 24-hour | POR2 | 0.032 | 0.0020 | 0.0014 | 0.0034 | 0.5 | 1% |
| | 30-day | POR2 | 0.032 | 0.0020 | 0.0014 | 0.0034 | 0.2 | 2% |
| Mn in $PM_{2.5}$ | 24-hour | POR2 | 0.016 | 0.0028 | 0.0071 | 0.010 | 0.1 | 10% |
| Mn in $PM_{10}$ | 24-hour | POR2 | 0.063 | 0.0086 | 0.0071 | 0.016 | 0.2 | 8% |
| Mn in SPM | 24-hour | POR2 | 0.17 | 0.011 | 0.0071 | 0.018 | 0.4 | 3% |
| Hg | 24-hour | POR2 | 0.000015 | 0.0000010 | 0.0000093 | 0.000010 | 2 | 0.001% |
| Ni in SPM | 24-hour | POR2 | 0.0058 | 0.00037 | 0.0014 | 0.0018 | 0.2 | 1% |
| | annual | POR2 | | 0.000042 | 0.0010 | 0.0010 | 0.04 | 3% |
| Ni in $PM_{10}$ | 24-hour | POR2 | 0.0058 | 0.00080 | 0.0014 | 0.0022 | 0.1 | 2% |
| | annual | POR2 | | 0.000062 | 0.0010 | 0.0011 | 0.02 | 5% |
| Zn | 24-hour | POR2 | 0.13 | 0.0084 | 0.013 | 0.021 | 120 | 0.02% |
| Benzene | 24-hour | POR2 | 0.99 | 0.18 | 0.55 | 0.73 | 2.3 | 32% |
| | annual | POR2 | | 0.017 | 0.34 | 0.36 | 0.45 | 79% |
| 1,3-Butadiene | 24-hour | POR2 | 0.042 | 0.014 | 0.56 | 0.57 | 10 | 6% |
| | annual | POR2 | | 0.0013 | 0.56 | 0.56 | 2 | 28% |
| Benzo(a)pyrene | 24-hour | POR4 | 0.0000078 | 0.0000027 | 0.000013 | 0.000016 | 0.00005 | 31% |
| | annual | POR3 | | 0.00000025 | 0.0000050 | 0.0000053 | 0.00001 | 52% |

**Table 7.2-9: Construction Phase - Predicted POI Results with varying Road Dust Control**

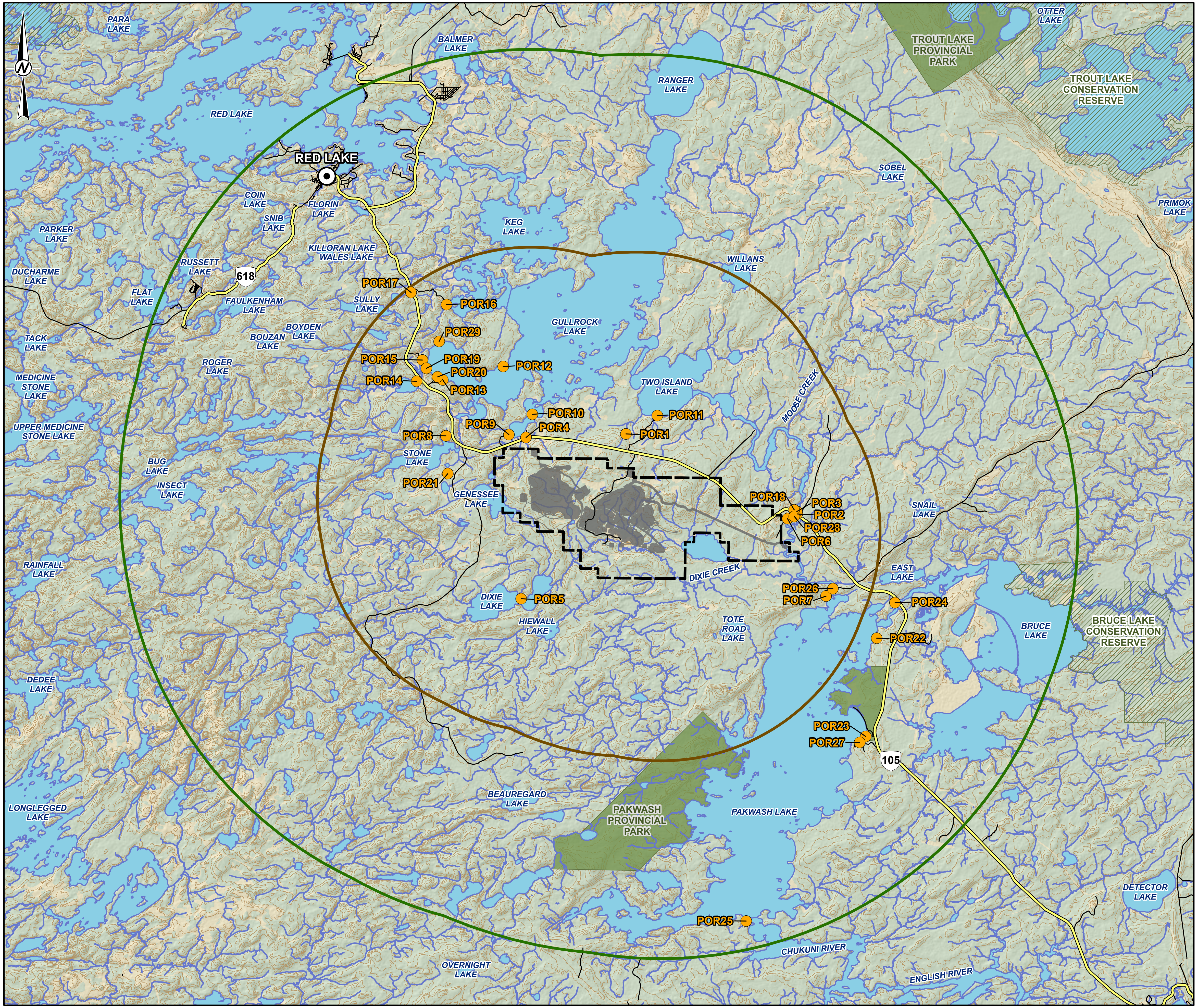
| Air Parameter | Averaging Time | AAQC ($\mu g/m^3$) | % of AAQC | | | |
|---|---|---|---|---|---|---|
| | | | 90% Control | 70% Control | 50% Control | 0% Control |
| SPM | 24-hour | 120 | 32% | 50% | 72% | **121%** |
| | annual | 60 | 12% | 19% | 23% | 38% |
| $PM_{10}$ | 24-hour | 50 | 62% | 87% | **118%** | **190%** |
| $PM_{2.5}$ | 24-hour | 27 | 55% | 59% | 64% | 60% |
| | annual | 8.8 | 73% | 75% | 78% | 83% |

Note:
Bolded text indicates a predicted concentration above guidelines. There are no predicted concentrations above guidelines at PORs for any road dust control level.

**Table 7.2-10: Operations Phase - Predicted POI Results with varying Road Dust Control**

| Air Parameter | Averaging Time | AAQC ($\mu g/m^3$) | % of AAQC | | | |
|---|---|---|---|---|---|---|
| | | | 90% Control | 70% Control | 50% Control | 0% Control |
| SPM | 24-hour | 120 | 32% | 54% | 76% | **131%** |
| | annual | 60 | 13% | 18% | 22% | 34% |
| $PM_{10}$ | 24-hour | 50 | 61% | 84% | **111%** | **180%** |
| $PM_{2.5}$ | 24-hour | 27 | 55% | 59% | 65% | 79% |
| | annual | 8.8 | 83% | 83% | 83% | 83% |

Note:
Bolded text indicates a predicted concentration above guidelines. There are no predicted concentrations above guidelines at PORs for any road dust control level.




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- LOCAL STUDY AREA FOR AIR QUALITY
- REGIONAL STUDY AREA FOR AIR QUALITY
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:195,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
**SPATIAL BOUNDARIES AND POINTS OF RECEPTION**

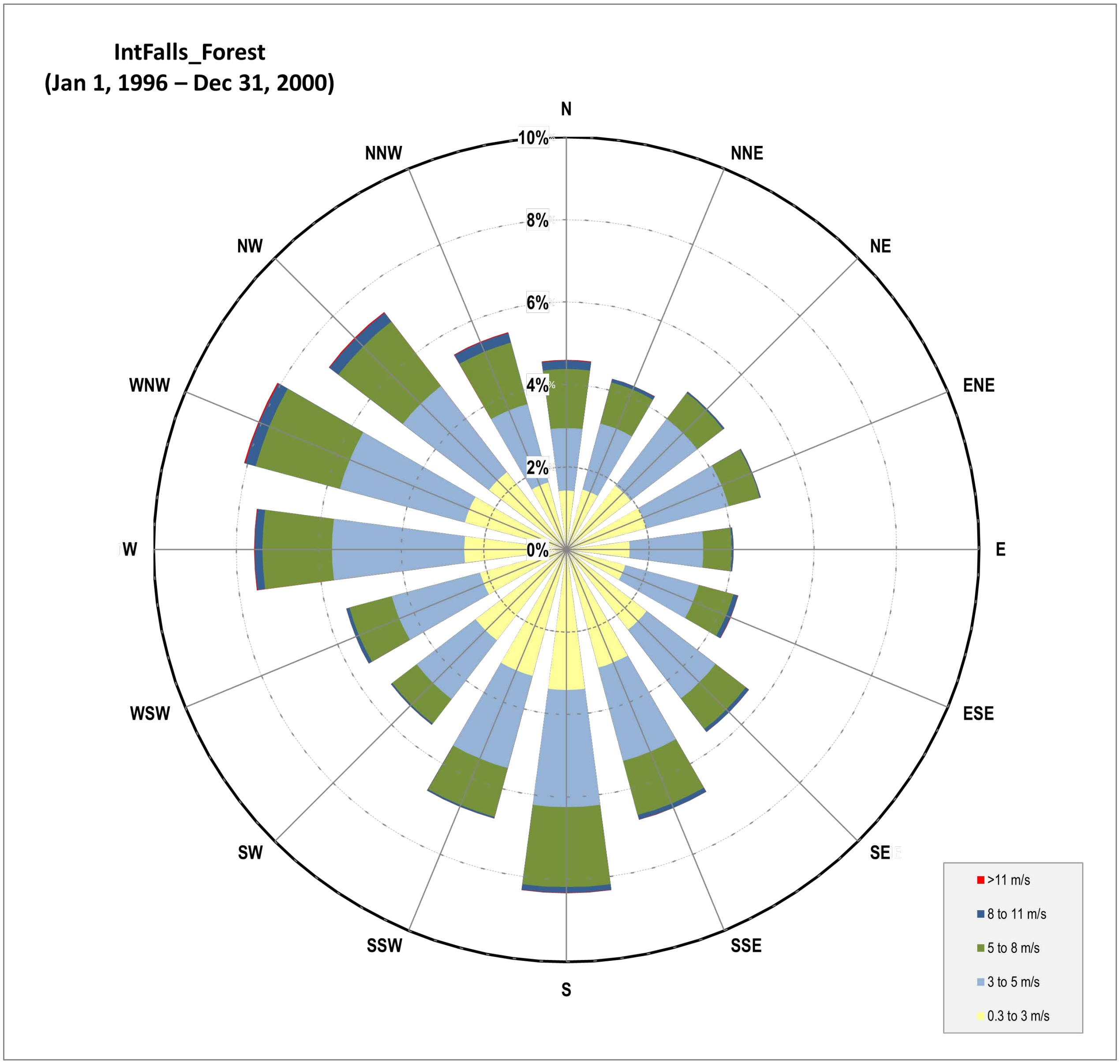
CONSULTANT

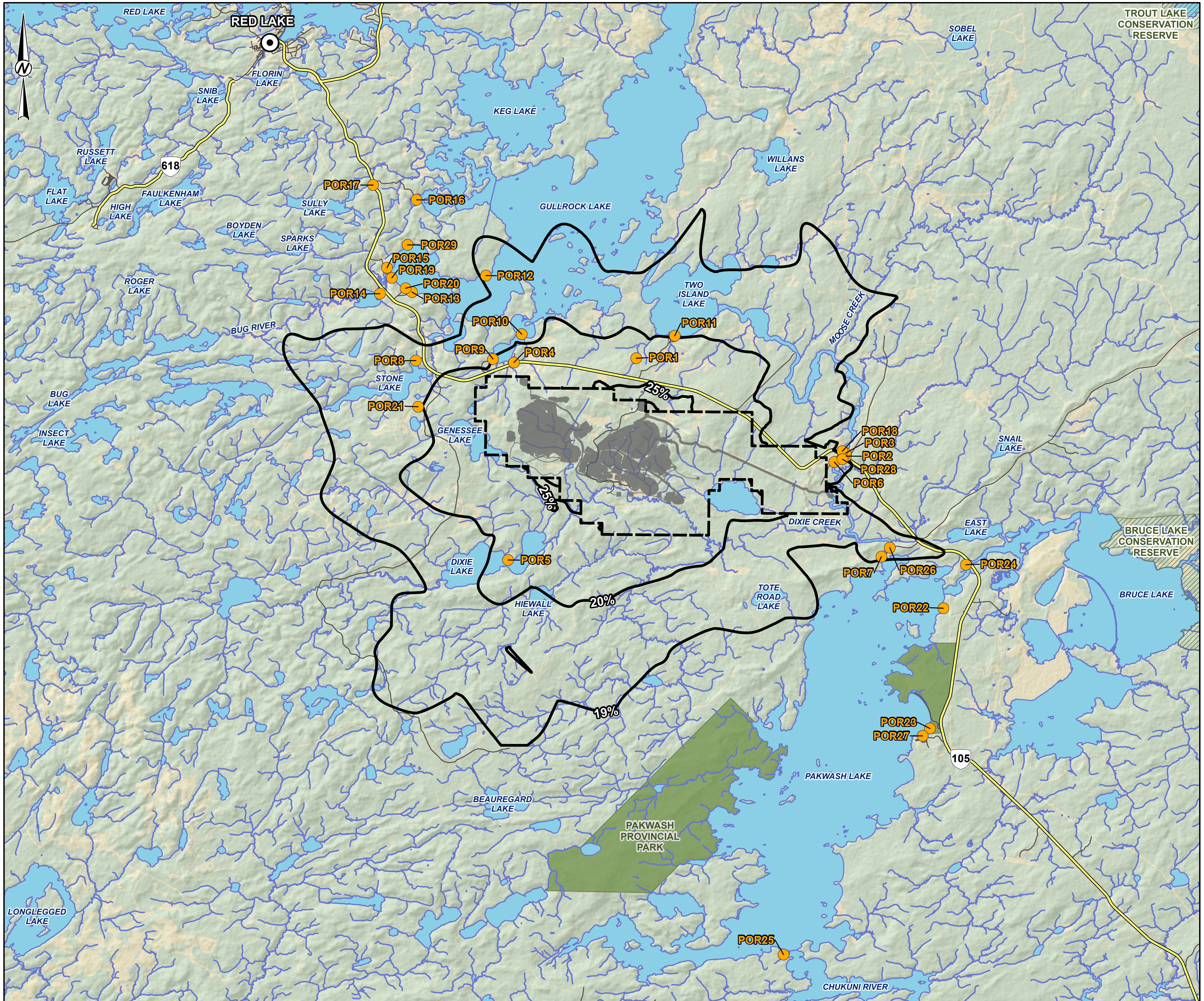
| | |
|---|---|
| YYYY-MM-DD | 2026-03-31 |
| DESIGNED | ---- |
| PREPARED | MD |
| REVIEWED | ---- |
| APPROVED | SD |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-1 |

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

**Figure 7.2-2: Representative Wind Rose (1996 to 2000)**






**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 17.8%**
  **ONTARIO AAQC: 120 ug/m³**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

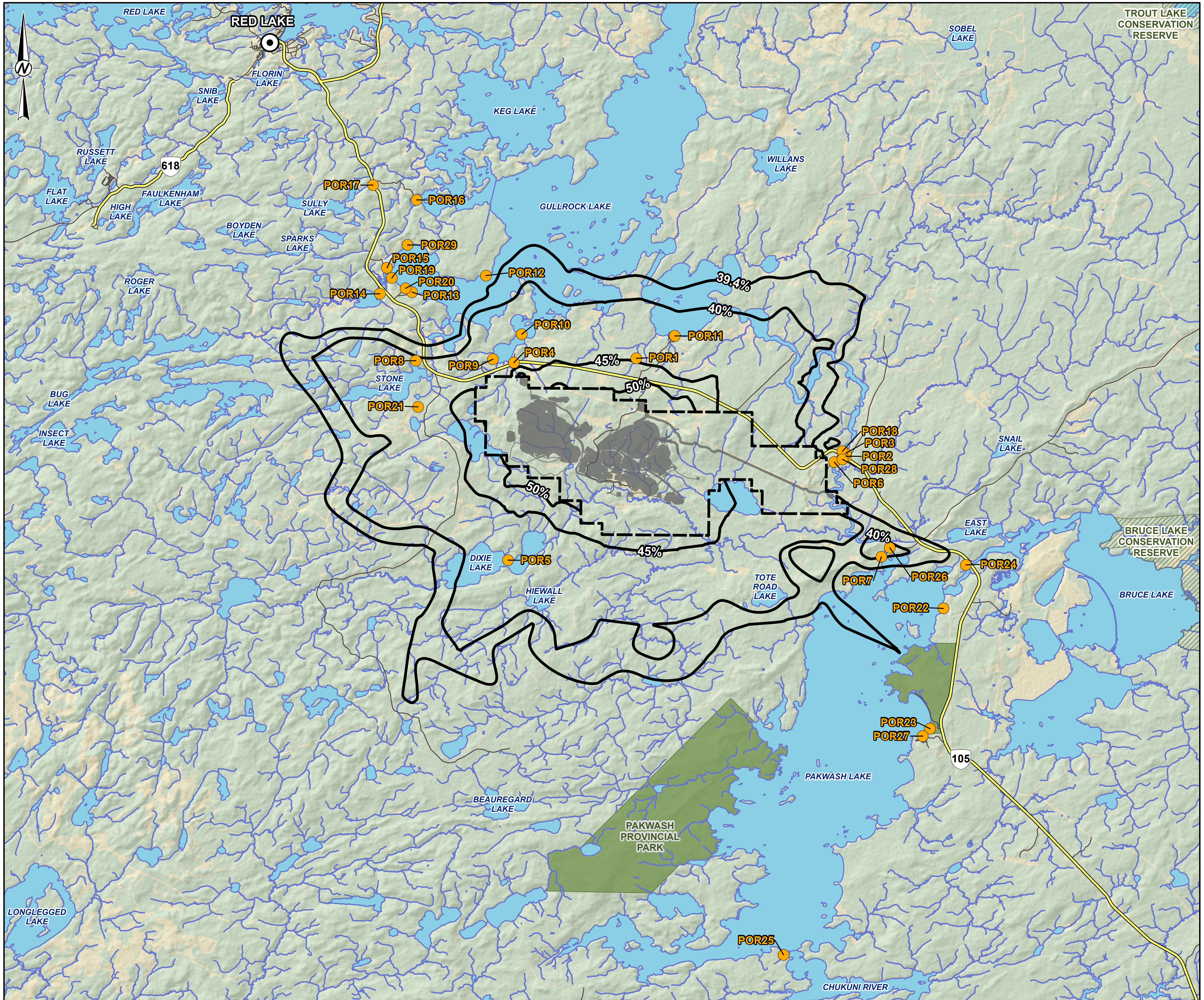
PROJECT
GREAT BEAR PROJECT

TITLE
**OPERATIONS - SPM CONCENTRATION CONTOURS (24-HOUR, 90% DUST CONTROL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-3 |




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 36.6%**
  **ONTARIO AAQC: 50 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - $PM_{10}$ CONCENTRATION CONTOURS (24-HOUR, 90% DUST CONTROL)**

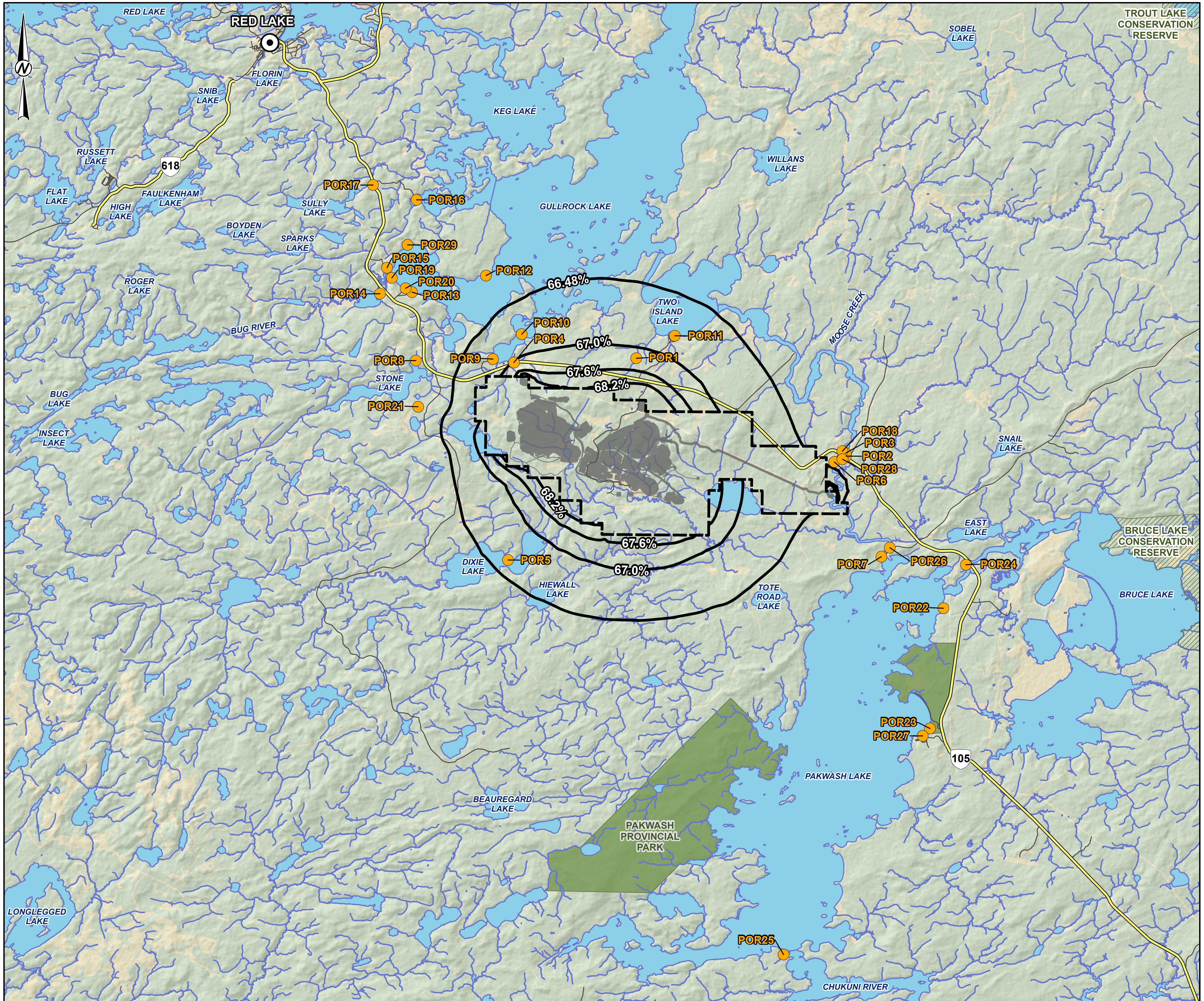
CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-4 |

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

25mm




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 65.9%**
  **ONTARIO AAQC: 8.8 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

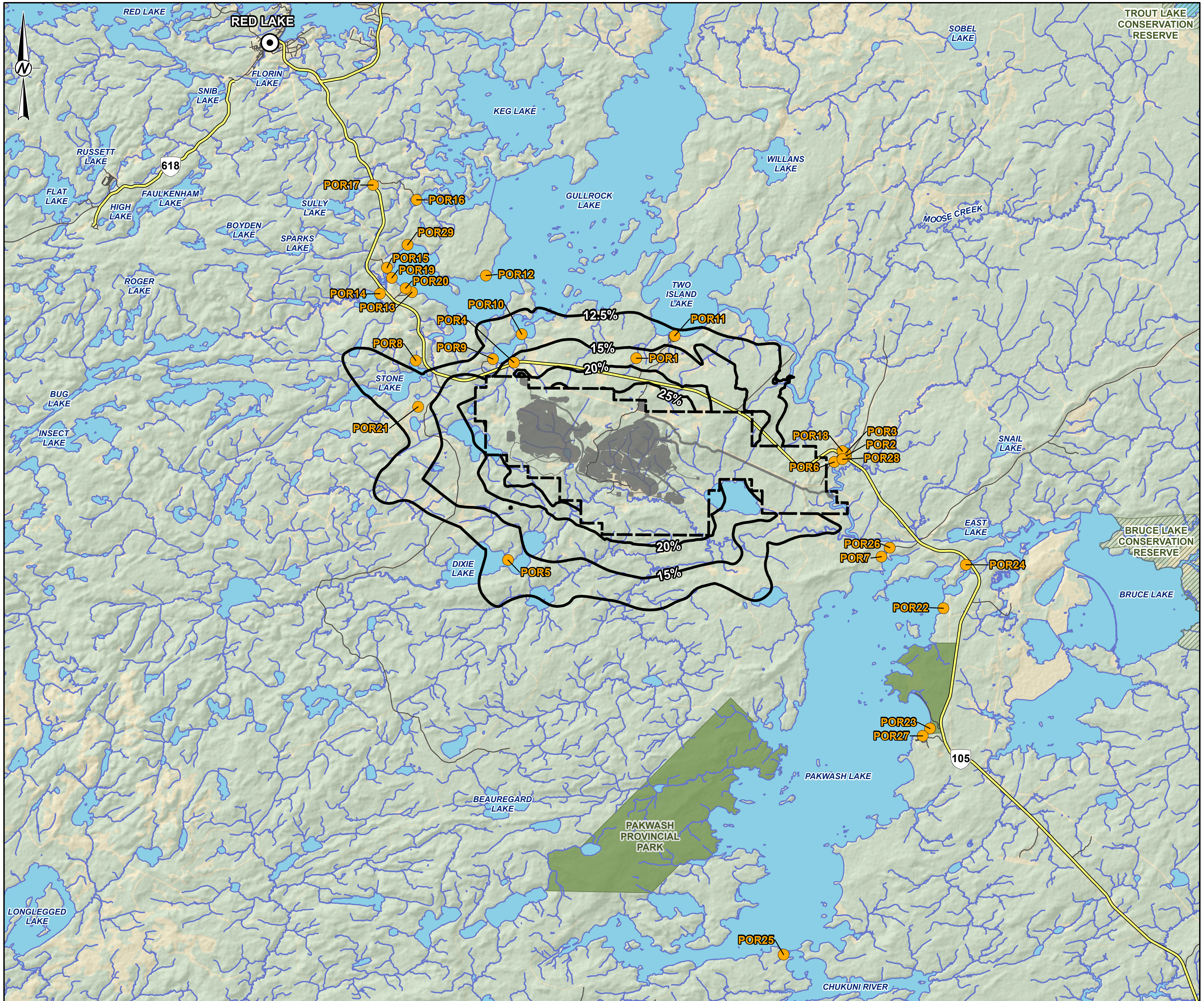
TITLE
**CONSTRUCTION - $PM_{2.5}$ CONCENTRATION CONTOURS (24-HOUR, 90% DUST CONTROL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-5 |

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




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 7.1%**
  **ONTARIO AAQC: 0.1 ug/m$^3$**
- TOWN
- HIGHWAY
- LOCAL ROAD
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

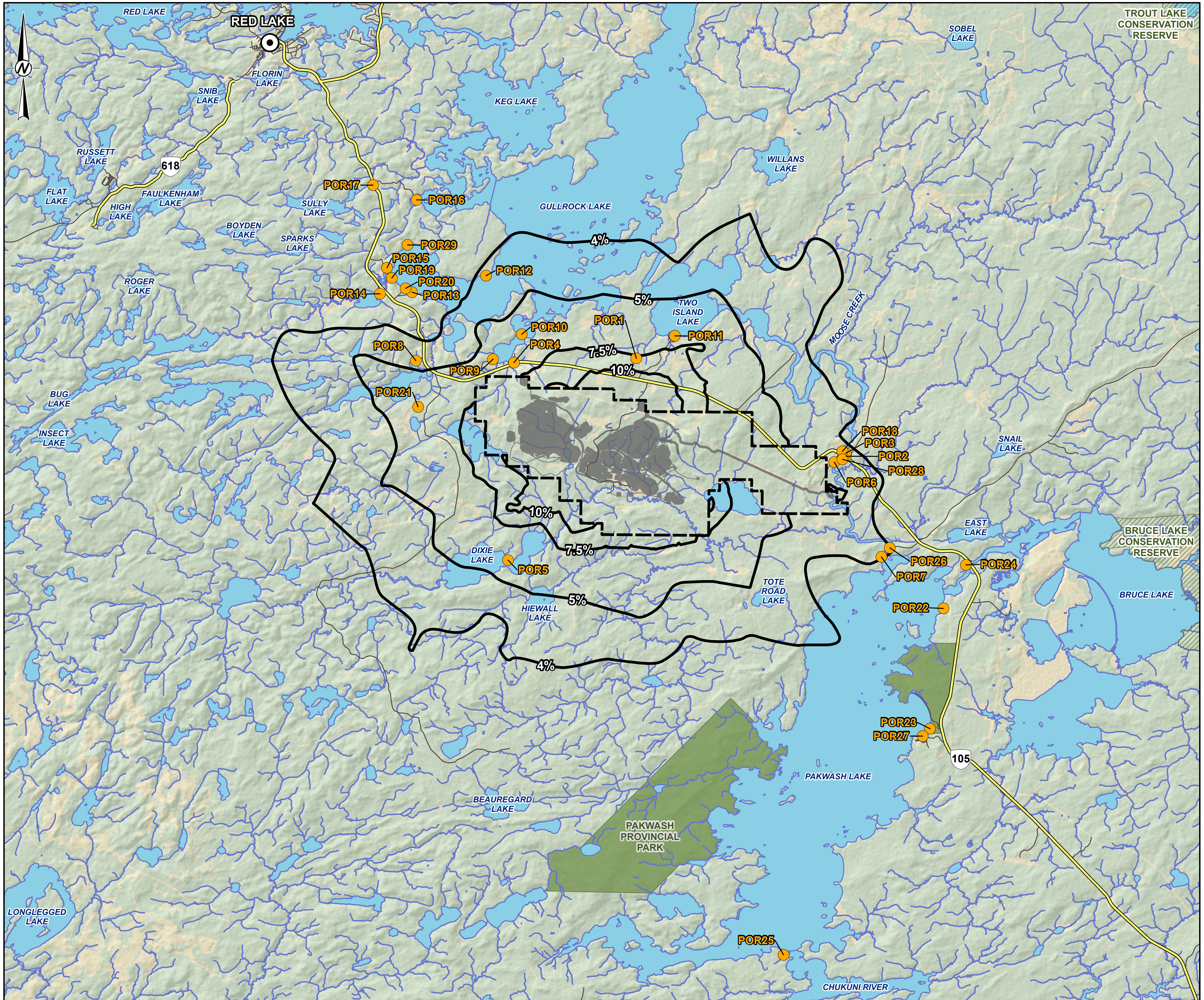
PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - Mn IN $PM_{10}$ CONCENTRATION CONTOURS (24-HOUR, 90% DUST CONTROL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-6 |




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 2.0%**
  **ONTARIO AAQC: 200 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

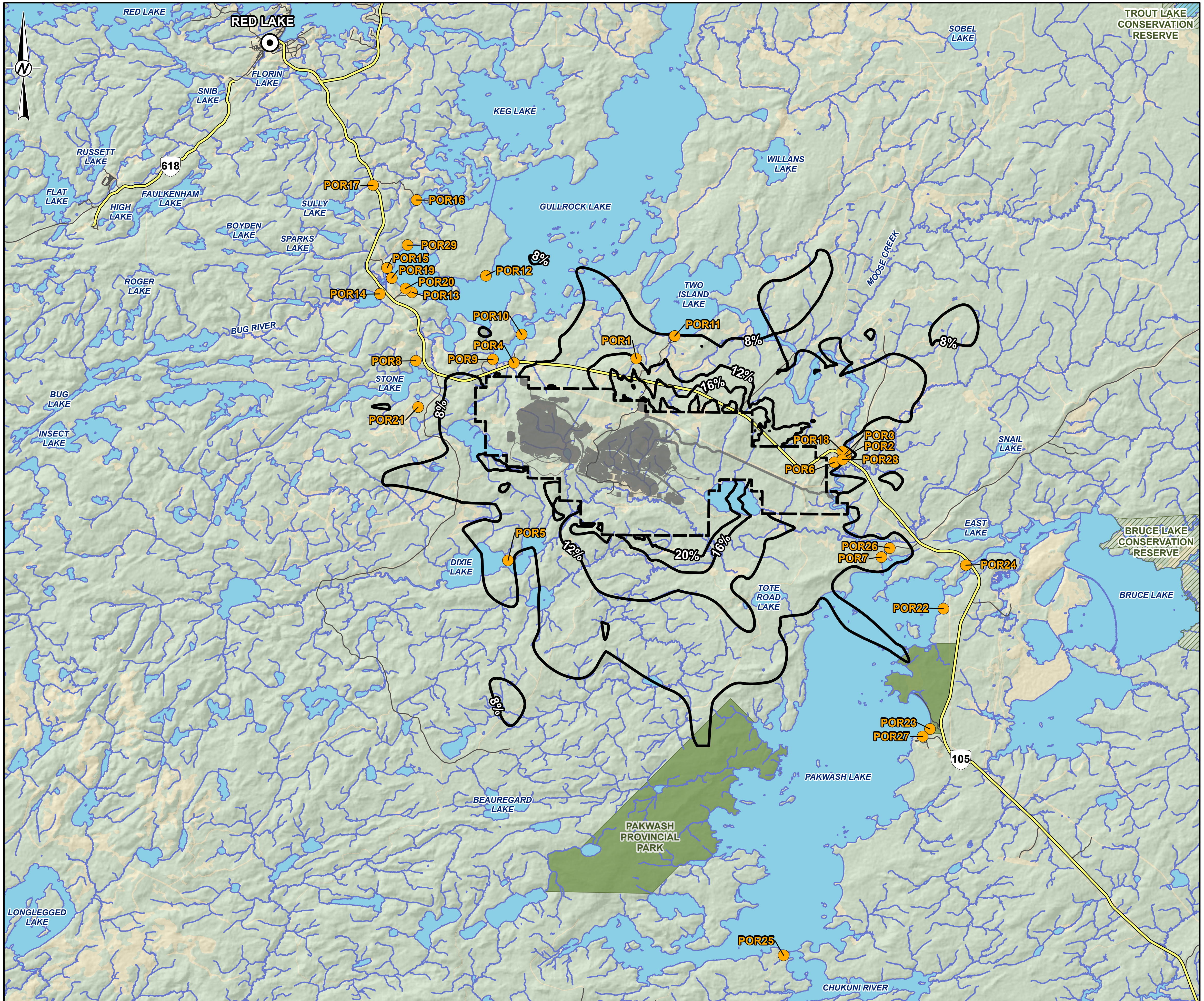
PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - $NO_2$ CONCENTRATION CONTOURS (24-HOUR)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-7 |




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 3.9%**
  **ONTARIO AAQC: 100 ug/m$^3$**
- TOWN
- HIGHWAY
- LOCAL ROAD
- CONSERVATION RESERVE
- PROVINCIAL PARK
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIM BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - $SO_2$ CONCENTRATION CONTOURS (1-HOUR)**

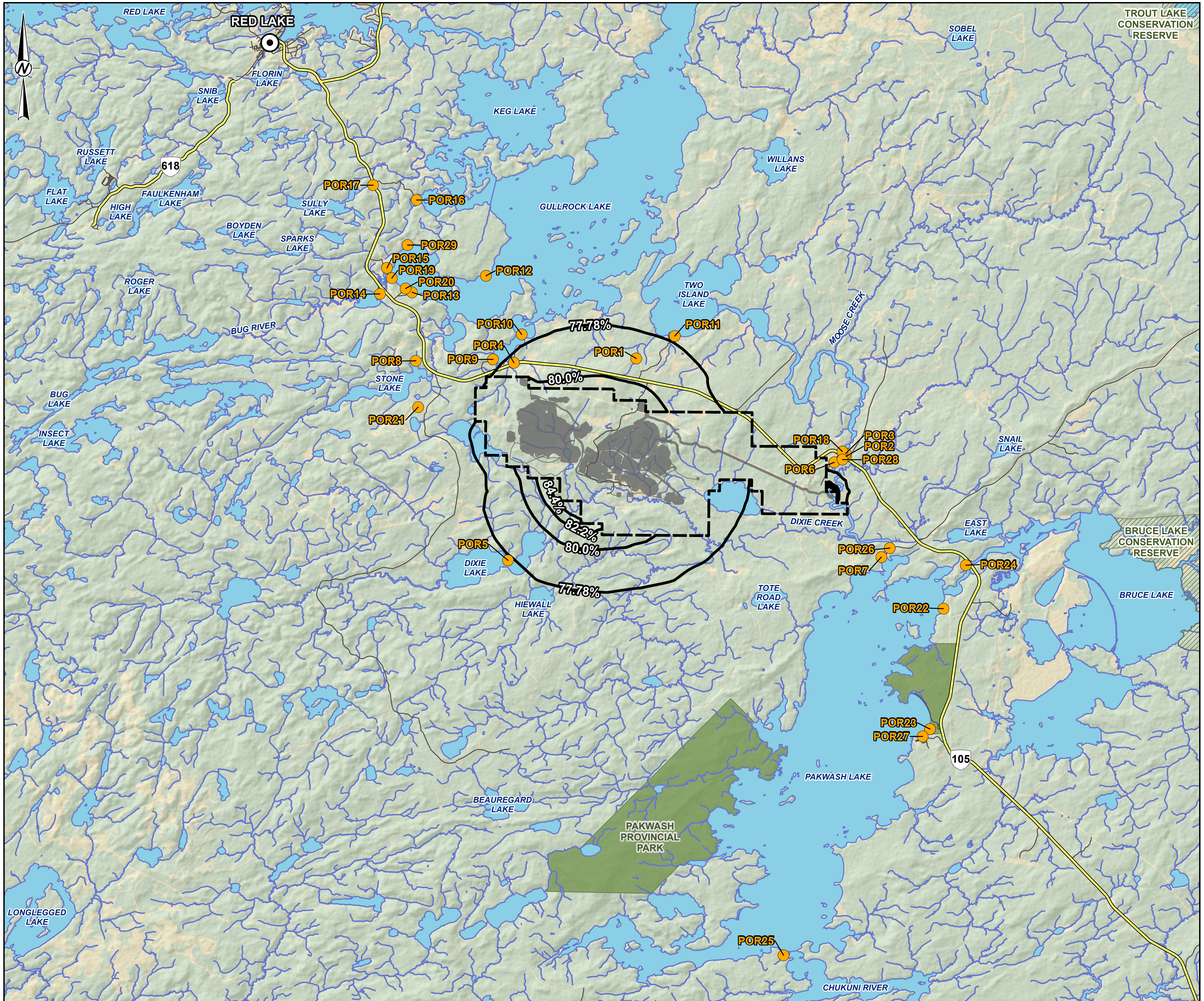
CONSULTANT

wsp

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-8 |

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




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 75.6%**
  **ONTARIO AAQC: 0.45 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**
1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIM BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

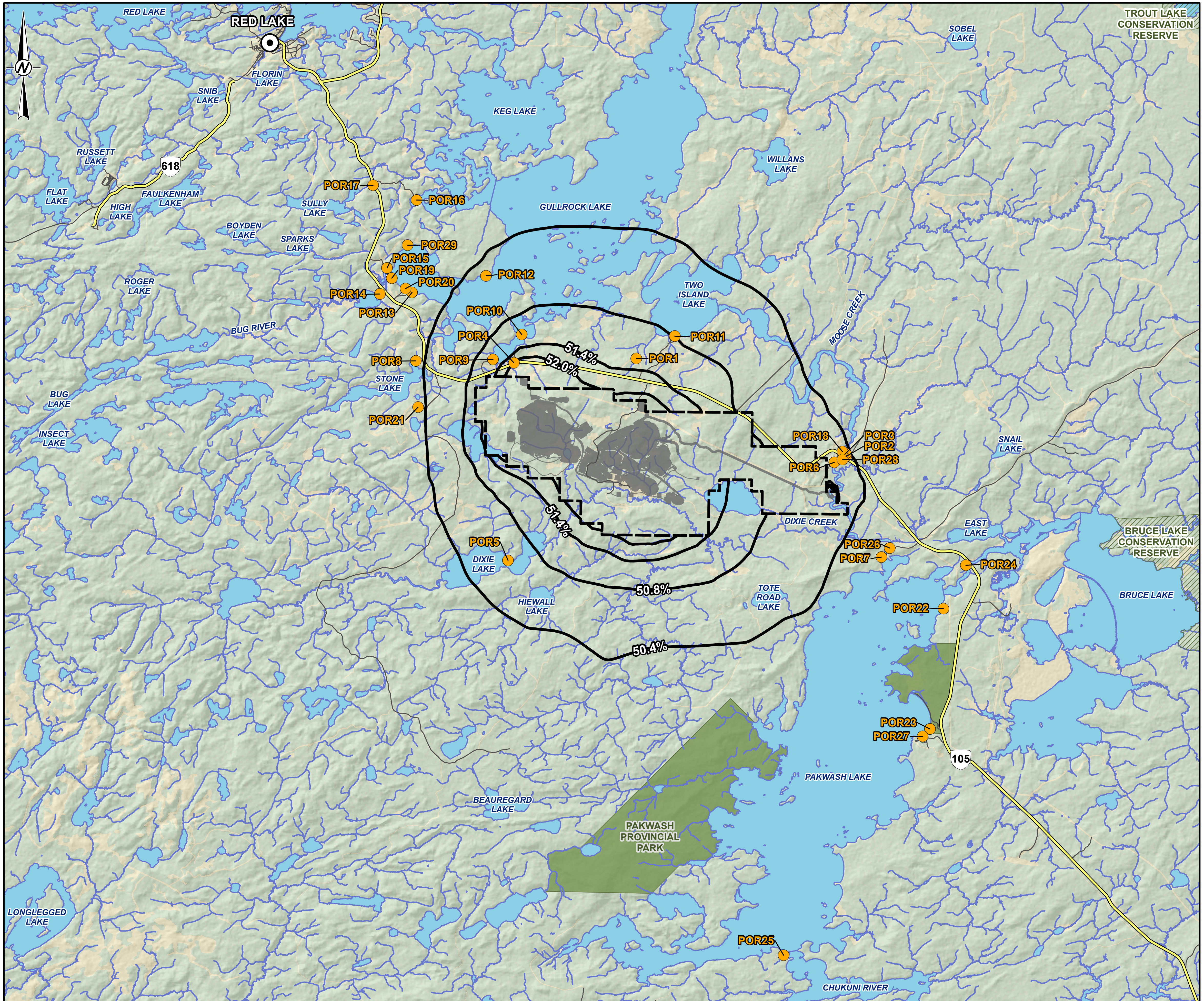
PROJECT
GREAT BEAR PROJECT

TITLE
**OPERATIONS - BENZENE CONCENTRATION CONTOURS (ANNUAL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-9 |




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 50.0%**
  **ONTARIO AAQC: 0.00001 ug/m³**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

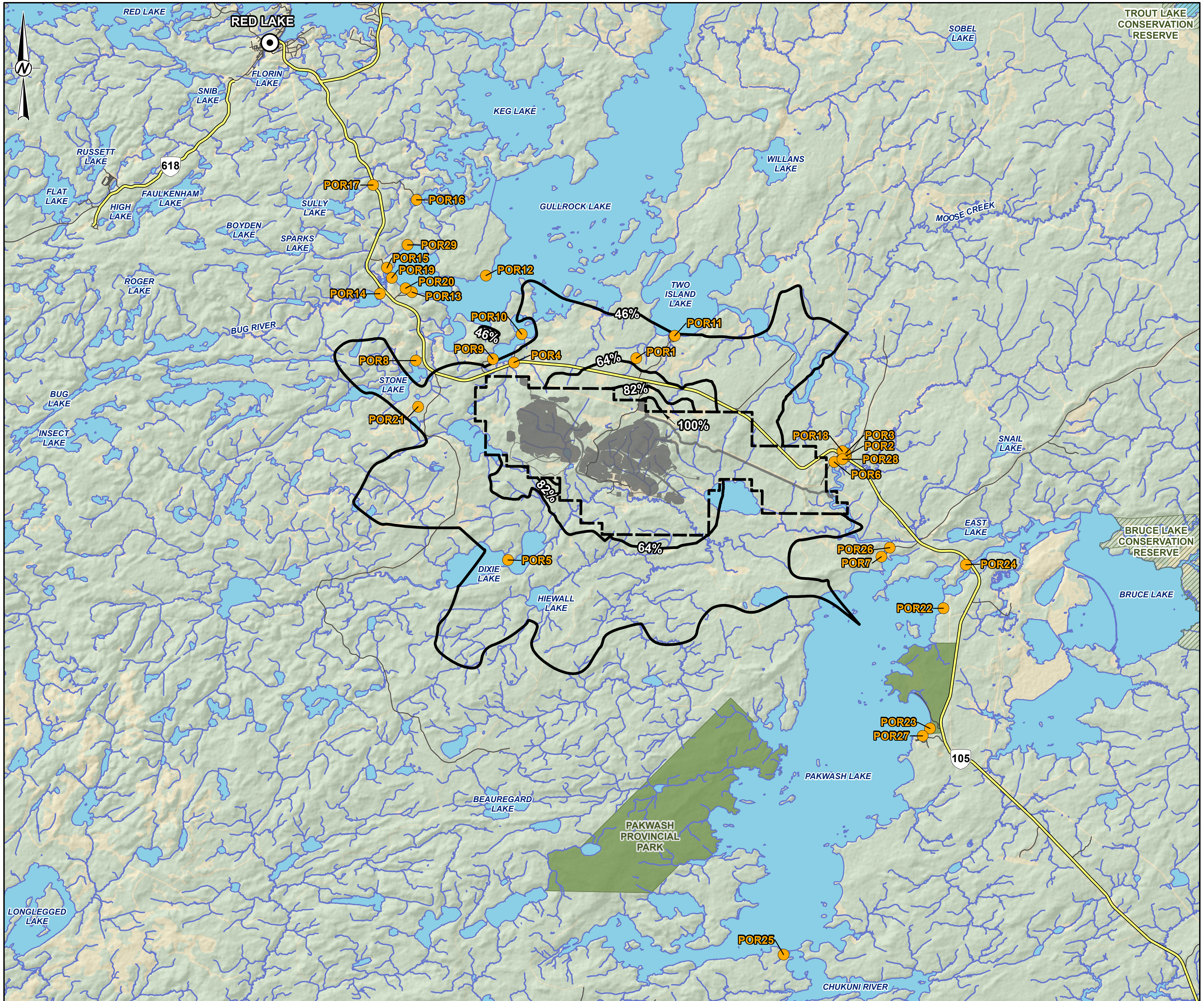
PROJECT
GREAT BEAR PROJECT

TITLE
**OPERATIONS - B(a)P CONCENTRATION CONTOURS (ANNUAL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-10 |




**LEGEND**

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 36.6%**
  **ONTARIO AAQC: 50 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

**POTENTIAL POINTS OF RECEPTION**

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

**NOTE(S)**

1. ALL LOCATIONS ARE APPROXIMATE

**REFERENCE(S)**

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - $PM_{10}$ CONCENTRATION CONTOURS (24-HOUR, 50% DUST CONTROL)**

CONSULTANT

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| CA0031271 | 0001 | A | 7.2-11 |

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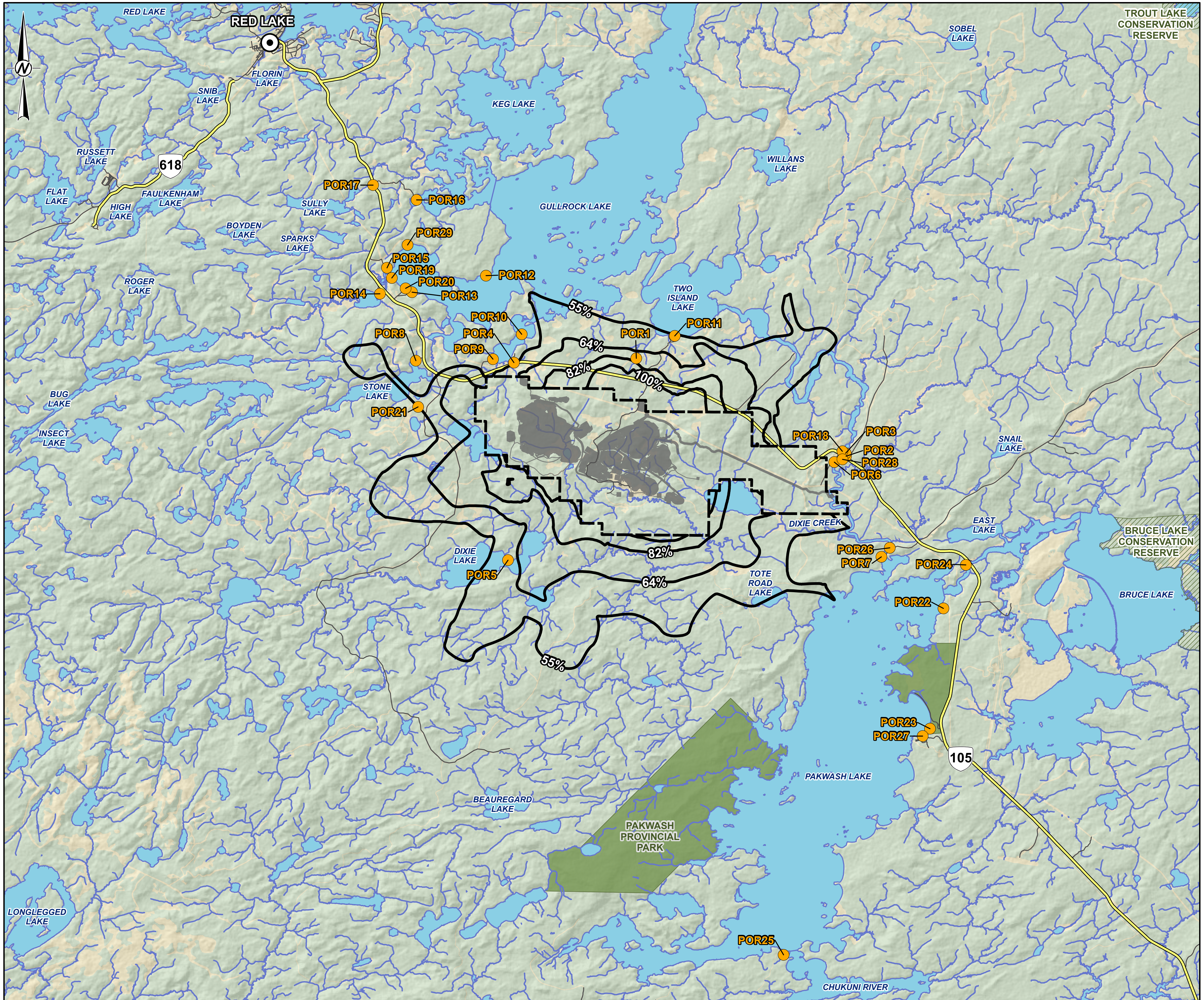


LEGEND

- LEASED CLAIMS BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- CONTOUR REPRESENT % OF ONTARIO AAQC
  **CUMULATIVE = EXISTING CONDITIONS + PROJECT**
  **BACKGROUND LEVEL (AS % OF ONTARIO AAQC): 36.6%**
  **ONTARIO AAQC: 50 ug/m$^3$**
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

POTENTIAL POINTS OF RECEPTION

- RESIDENCE / CABIN / LODGE / CAMP

0 2.5 5 10

1:160,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. LEASED CLAIMS BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, APRIL 2025.
3. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
**CONSTRUCTION - $PM_{10}$ CONCENTRATION CONTOURS (24-HOUR, 0% DUST CONTROL)**

CONSULTANT

wsp

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

| PROJECT NO. | CONTROL | REV. | FIGURE |
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## 7.3 Analysis of Changes to Sound

Sound is included as a pVC for the Project because sound is of Provincial regulatory interest and excessive sound (noise) can have effects on the environment and humans. It has also been identified as of interest during consultation and engagement activities.

### 7.3.1 Pathway Linkages to other Valued Components

#### 7.3.1.1 Pathway Linkages to Sound

There are no identified pathway linkages to sound.

#### 7.3.1.2 Pathway Linkages from Sound to fVCs

Changes to sound may have linkages to, and inform, the analysis of potential effects on the fVCs migratory birds and fVC Indigenous Peoples. Noise from the construction, operation and closure of the Project may disturb wildlife (including pVCs Moose, other wildlife and SAR) and migratory birds (Section 9). Effects to these species may affect traditional land and resource uses for Indigenous people (Sections 10.6, 11.6, 12.6, 13.6 and 14.6) and health of Indigenous people (Sections 10.9, 11.9, 12.9, 13.9 and 14.9), as appropriate.

Note that indirect linkages to fVCs if present, such as identified above for Indigenous people are considered in the pVC with the direct linkage to the fVC.

### 7.3.2 Assessment Approach

The approach to the assessment of potential changes to sound includes:

- Description of the relevant regulatory and policy setting
- Description of the spatial and temporal boundaries used for this pVC
- Identification of criteria and indicators along with the associated rationale
- An outline of the assessment methodology along with the key assumptions and use of the conservative approach.

The assessment of potential effects is supported by a description of the existing conditions for the pVC (Section 7.3.4), the identification and description of any potential effects on the pVC (Section 7.3.5) and a description of applicable mitigation measures for the pVC (Section 7.3.6). After applying the mitigation measures to the potential effects on the pVC, the potential changes are then outlined in Section 7.3.7.

#### 7.3.2.1 Regulatory Setting

The Project will need to meet applicable federal and provincial legislation and regulatory requirements. Government policies, objectives, standards or guidelines most relevant to sound are summarized below. Further information regarding anticipated approval requirements is provided in Section 19.

##### 7.3.2.1.1 Federal

Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (HC 2017) provides direction for predicting health risks related to noise levels and / or types of noise predicted in federal Impact Assessment process of proposed major resource and infrastructure projects (such as mines, dams, pipelines and other projects). In the context of an Impact Assessment process, the HC Noise Guidance considers the impacts of changes to baseline sound conditions (noise) to human health.

Certain community reactions to project-related noise are considered to represent potential indicator of adverse health (HC 2017). Two of the most common community reactions include complaints and annoyance. When the outdoor day-night sound levels ($L_{dn}$) from project-related sound levels reaches 62 dBA, it is considered that widespread complaints can, or are likely to, occur. When project-related sound levels are greater than 75 dBA ($L_{dn}$), complaints can be expected to include strong appeals to authorities to stop noise.

The percentage of highly annoyed (%HA) is also an important factor to consider for both community complaints and long-term high annoyance. The change in %HA is used by HC as the indicator of noise-included human health effects from exposure to project operational noise and to long-term construction noise exposure. To assess the impacts of noise from projects using this indicator, the project-related change in the sound environment and the related increase in %HA are evaluated using the dose-response relationship between noise levels and annoyance as per ISO 1996-1:2003 (ISO 2003). Noise control measures should be considered when a change in the calculated %HA at any given receptor location exceeds 6.5%.

HC considers the guidelines and recommendations of the WHO regarding sleep disturbance for quiet rural areas (HC 2017), where the most stringent criteria is 45 dBA as A-weighted, equivalent continuous sound level ($L_{Aeq}$) for continuous noise during the sleep period.

The risk of hearing loss is generally considered to correspond to two factors: the sound level and duration of daily exposure. The time period before damage occurs shortens as the average sound level increases (World Health Organization; WHO 1999). Regardless of the exposure duration, there is no known risk of permanent hearing loss associated with sound levels below 70 dBA (HC 2017). When considering impulsive noise such as from blasting, pile driving and jack hammering, HC suggests the WHO recommendation be followed to avoid hearing loss resulting from impulsive noise exposure and that peak sound pressures not exceed 140 dBZ for adults (HC 2017; WHO 1999). Hearing loss impacts are not considered in this Impact Statement as Project-related sound levels would not be approved at these high levels at potential receptors and protection of workers is consider through occupational health and safety requirements.

Based on HC guidance summarized above, the federal criteria pertaining to the Project are listed in Table 7.3-1.

#### 7.3.2.1.2 Provincial

The applicable provincial noise guideline used to assess the Project is the Publication NPC-300, Environmental Noise Guideline - Stationary and Transportation Sources - Approval and Planning (MOE 2013). The guideline establishes four classes of acoustical environments based on the ambient background sound environments and establishes class specific sound level limit criteria. The Project is considered Class 3, as the surrounding area is mainly undeveloped with the only interspersed industrial developments (such as the commercial aggregates operations along Tuzyk's Road) and infrastructure (such as Highway 105 and the regional Hydro One Networks Inc. transmission line). A Class 3 area is defined in the NPC-300 as "*a rural area with an acoustical environment dominated by natural sounds having little or no road traffic*" (MOE 2013). The Property and immediate area is best described as Class 3 in accordance with the area classifications defined within the guideline.

NPC-300 state the non-impulsive (steady or quasi-steady impulsive) 1-hour sound levels ($L_{Aeq-1hr}$, dBA) from stationary sources in Class 3 areas shall not exceed the higher of the background noise levels or the applicable exclusion limits defined in the guideline. The guidelines also stipulate that the assessment shall consider the potential noise impact during a predictable worst-case hour of operation, which is defined as a situation when the normally busy activity of the sources coincides with a low hourly background sound level. Given that the baseline sound levels discussed in Section 7.2.3, are lower than the exclusion limit values defined in the NPC-300, the latter were selected for the assessment as per the provincial guidance.

For impulsive sound, other than quasi-steady impulsive sound, from a stationary source, the sound level limit at a POR expressed in terms of the logarithmic mean impulse sound level ($L_{LM}$, dBA) is the higher of the applicable exclusion limit or the background sound level for that POR. Impulsive sources are categorized depending on the number of impulses in a period of one-hour, with the most-restrictive limit given to sources with more than nine impulses per hour. Exclusion limits for sound are detailed in the noise modelling report provided in Appendix E-3.

The NPC-300 guideline also states that for noise produced by emergency equipment operating in non-emergency operations (e.g., routine testing of emergency generators), the sound level limits are 5 dB greater than the sound level limits presented above. Noise produced by emergency equipment operating in non-emergency operations is assessed independently of all other stationary noise sources. For a worst-case scenario, it is assumed that all emergency equipment is being tested simultaneously.

The provincial criteria pertaining to the Project are listed in Table 7.3-2.

#### 7.3.2.2 Spatial and Temporal Boundaries

Spatial boundaries are used to support consistent descriptions across disciplines and bound the assessment of the potential effects of the Project. The PA is consistent for all pVCs and fVCs, and encompasses the anticipated footprint of the Project, including all temporary and permanent areas associated with the mine site, as well as a buffer to allow flexibility for design optimizations prior to construction and over the mine life (Section 6.4). There will be direct effects of sound in the PA; however, for the PA is not used as a spatial boundary in the assessment of sound.

The spatial boundaries are used to bound the assessment of the potential effect of changes to sound from the Project are shown in Figure 7.3-1 and are defined as follows:

- LSA: corresponds to the area in the vicinity of the Project where most of the direct and indirect effects of the Project on sound levels are expected to occur and can be predicted or measured with a reasonable degree of accuracy. This area extends 10 km beyond a bounding of the noise emission sources on site, and it is intended to capture potential direct and indirect effects resulting from the Project.
- RSA: encompasses and extends beyond the PA an additional 10 km and provides regional context in the assessment of potential changes from the Project. Potential sound effects of the Project would likely not be distinguishable from baseline levels beyond the RSA.

The purpose of a temporal boundary is to identify when an effect may occur in relation to specific Project phases (construction, operations and closure) and activities. The temporal boundaries for the assessment as defined in Section 6.5 are:

- Construction phase:
    - Years -3 to -1 representing the primary period of Project construction
    - Mining of the Viggo pit will be completed during this phase
    - Development in the LP Central pit will be initiated in the last year of construction
- Operations phase:
    - Years 1 to 26, during year 1 the Project will transition from construction into operations and will not be at full capacity
    - Underground mine and ore processing will occur over the entire period
    - Open pit mining in the LP Central pit will be completed in about nine years
- Closure phase:
    - Years 27 to 29 represent the active closure period when the majority of the decommissioning and reclamation of the PA is completed
    - Year 30 is a passive closure period while the site is on care and maintenance while the mine workings are filled with water
    - Year 31 is the final close out period when water treatment infrastructure is removed, after the LP Central pit is filled with water, and site waters are acceptable for passive release to the environment.

Potential changes to baseline sound levels were assessed for each Project phase (i.e., construction, operations and closure).

#### 7.3.2.3 Assessment Criteria

Project activities during the construction, operations and closure phases of the Project will result in noise above baseline sound levels. An assessment has been made of the predicted changes to the baseline conditions to evaluate the potential effects. The sound effects of the Project were evaluated against the following indicator, and assessment criteria defined from existing federal and provincial guidance:

- Changes in sound levels (in A-weighted dB).

This criterion was selected to align with the federal and provincial guidance described in Section 7.3.2.1, and is consistent with the TISG.

#### 7.3.2.4 Analytical Methods

The assessment of the potential changes to sound from the Project has been completed in accordance with standard methods. The detailed analytical methods used for the sound assessment for the Project are provided in Appendix E-3 and described briefly below, considering both the sound source data and modelling methods.

##### 7.3.2.4.1 Sound Source Summary

The greatest noise emissions from the Project are expected to originate from equipment and infrastructure used for construction and operational purposes. This includes stationary equipment and mobile equipment fleet operating at different locations within the PA, equipment used on surface, ventilation openings from the underground mine, and ventilation systems and noise transmission through walls, roofs and of major buildings.

The Project is expected to move a maximum of 120,000 tpd of overburden and rock during the construction phase and operations phase. Sound emission values for the equipment were determined using the following sources using conservative or representative selections:

- Manufacturer's data based on the preliminary equipment selections
- Empirical calculations based on equipment power ratings
- Wood VDN (internal) sound power level (PWL) database
- Reference levels published in the Federal Highway Administration Construction Noise Handbook (United States Department of Transportation 2006).

Information with respect to the equipment selections may change but are anticipated to be representative and conservative.

#### 7.3.2.4.2 Sound Assessment Methodology

Noise modelling for the Project in support of the assessment of changes to sound, was completed using a sound prediction software package, Cadna/A, published by Datakustik GmbH, which was configured to implement the ISO 9613-2:1996 (International Organization for Standardization 1996). The Cadna/A noise modelling software is widely accepted by the environmental acoustics professional community and the MECP. The assessment assumes that all steady noise sources operate simultaneously to model the predictable worst-case scenarios for the modelled periods of the Project:

- Construction phase (3 years)
- Peak-production period of the operations phase (8 years)
- Underground production period of the operations phase (18 years)
- Active closure period (3 years) of the closure phase.

Noise was modelled at 29 PORs within the LSA or RSA that consisted of properties such as residential, cabins, lodges and campsites not owned by Great Bear Resources, and vacant lots classified as non-mining land. The results modelled at these locations are representative, and other receptors further away would have lower noise levels than the furthest POR. A brief description of the PORs considered is summarized in Table 7.3-3.

To provide an accurate prediction of the sound levels at the POR due to noise emissions from a specific Project source(s), the modelling considers the following factors:

- Source sound PWL and directivity
- Distance attenuation
- Source-receptor geometry, including heights and elevations
- Barrier (shielding) effects of the building and surrounding topography
- Sound reflections off buildings and storage tanks
- Ground and air (atmospheric) attenuation.

Stationary equipment operation was modelled using point sources in the noise model. Certain mobile equipment operation was modelled as area sources with acoustic energy from the equipment spread out over the work area at the Project site, e.g., dozer and loaders in stockpiles. Noise emission from haulage trucks was considered by modelling the haulage routes as line sources accounting for the number of passbys per hour, which was calculated based on capacity of the trucks and a prorated material movement per route based on a maximum material movement of 120,000 tpd during the construction phase and operations phase. The complete list of source PWLs can be found in Appendix E-3.

### 7.3.3 Assumptions and the Use of the Conservative Approach

Equipment were modelled to operate simultaneously to evaluate the worst-case scenario and provide a conservative assessment. Equipment usage factors provided by Great Bear Resources Project engineering team were implemented to account for the percentage of time the equipment is expected to operate during the work hours. This excludes haulage trucks which was obtained using yearly tonnage movement data from Great Bear Resources modified to account for the maximum daily material movement.

Most of the equipment throughout the Project site was modelled without any noise reduction to provide a conservative prediction of potential effects, although measures may be added during detailed design and included during equipment procurement. The remaining noisier equipment, such as the underground mine ventilation fans on surface and power generators, were modelled including proposed engineering noise control options.

Additional assumptions used for the noise modelling include the ventilation raises whereby each consist of two surface fans operating in parallel, modelled above ground so that the predicted sound power level, dominated by those fans, represents a worst-case noise production.

Noise propagation from buildings facades was also considered in the models and were based on conservative assumptions such that there was no under-prediction, for example:

- Noise breakout energy is distributed across all facades and the roof in proportion to each surface area
- Major noise sources are placed at the centre of the building
- Interior surfaces and machine surfaces are treated as acoustically hard (i.e., fully reflective)
- Facade and roof sound transmission losses use construction details provided by Great Bear Resources
- Building openings permitting air changes are included, sized according to interior activity requirements.

### 7.3.4 Existing Conditions

The Project is in the Red Lake mining district in a relatively undeveloped area approximately 25 km east of the Red Lake, Ontario. Existing local sources of noise emissions may include traffic on Highway 105, aggregate operations along Tuzyk’s Road and occasional airplane fly-bys coming from Red Lake airport. Additionally, the baseline noise includes the natural soundscape typical of northern Ontario which is composed mainly of sounds made by birds, insects and wind passing through tree leaves.

Two baseline sound monitoring campaigns were conducted to characterize the existing environmental sound levels to be representative of the seasonal changes on the Property. These baseline field measurements were used to support the assessment of changes to sound from the Project. Baseline sound data was collected by Wood plc in 2022 and 2023, timed for when leaves were on the trees (termed leaves-on program; Appendix E-1), and when leaves were off the trees (termed leaves-off program; Appendix E-2). Each program occurred over a seven-day period and collected field data from four monitoring locations. The monitoring locations were selected to be representative of potential PORs based on proximity and location to the PA.

The baseline sound levels were characterized using a variety of sound metrics including the hourly $L_{Aeq\text{-}1hr}$ (dBA) and the $L_{dn}$(dBA) values. A summary of the baseline day and night levels obtained for both the leaves-on and leaves-off programs are presented in Table 7.3-4. Details of the baseline monitoring field programs as well as the collected data can be found in the baseline reports (Appendix E-1 and Appendix E-2).

The baseline field programs confirmed that the baseline sound levels are below the provincial and federal guidelines. The programs also showed that the existing sound levels, while representing a Class 3 environment, also reflect the presence of existing local activities such as the commercial aggregate operations on Tuzyk's Road and traffic on Highway 105.

### 7.3.5 Identification of Potential Effects

The initial step in the assessment process is to identify interactions between the Project and the pVC that can result in pathways to potential effects. The professional judgment of technical experts experienced with mining projects in Ontario and Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those interactions that are likely to result in a pathway to a potential effect due to a measurable change to sound. Table 7.3-5 provides a summary of the potential interactions of the Project with sound prior to the application of the mitigation measures. These pathways are summarized in Section 7.3.5.1 to Section 7.2.5.3 for each phase of the Project. Section 7.3.6 provides a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The changes after the application of the mitigation measures are then described and further evaluated in Section 7.3.7.

#### 7.3.5.1 Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure (Section 5). Project activities will cause changes to sound primarily from the operation of equipment and material handling including:

- Site preparation activities for the mine site area including clearing, grubbing, bulk earthworks, and development of aggregate resources including blasting at quarries
- Underground mining including blasting and ventilation
- Development and operation of the Viggo pit including blasting
- Development of the LP Central pit, including blasting and the commencement of mining for production
- Construction of buildings and infrastructure

- Management of rock and unconsolidated materials in stockpiles
- Construction of the starter embankments for the TMF
- Operation of the natural gas generator power plant.

#### 7.3.5.2 Operations Phase

The operations phase is anticipated to occur over a 26-year period, with both open pit and underground mining occurring during the first 9 years, and only underground mining for the remainder of the operations phase. During the operations phase, noise will be generated from a variety of activities at the Project site, including mining operations, processing activities, and other ancillary and supporting facilities, such as:

- Operation of the underground mine hauling or mine rock and ore, and ventilation
- Operation of the LP Central pit including blasting and drilling
- Operation of the natural gas generator power plant
- Management of rock and unconsolidated materials in stockpiles
- Management of tailings including embankment raises for the TMF
- Processing ore, including crushing and milling of ore as needed.

#### 7.3.5.3 Closure Phase

During active closure, the activities are similar to those occurring during the construction phase and operations phase, using similar mining and construction equipment, but on a much smaller scale. After the active closure period, there will be limited equipment or materials movement, and sound levels are expected to revert to the current baseline conditions.

### 7.3.6 Mitigation and Enhancement

Noise control measures to be implemented to minimize the effects of the Project on sound include the following equipment:

- All return air raise ventilation fans with reduced noise emissions
- Fresh air raise with reduced noise emissions
- Enclosures and exhausts for the diesel generators with a minimum capacity of 50 kW
- Enclosures and exhausts for all 5 MW natural gas generators.

Details of the equipment listed above can be found in Appendix E-3.

Mitigation measures described in this section and summarized in Table 7.3-6, are expected to be effective for their intended purposes given equipment outlined in the noise assessment meet the maximum allowable PWLs defined in Appendix E-3.

Additional measures to be implemented to avoid or minimize the effects of the Project on noise include the following:

- During construction and operation, site equipment will be operated to meet NPC-300 noise limits at PORs, as applicable, with motorized equipment selected or designed as appropriate with mufflers / silencers to reduce noise emissions

- Reversing alarms will be in accordance with the applicable health and safety regulations, but alternative approaches such will be considered, such as use of should strobe lights
- Regular inspections will take place to confirm that equipment and machinery used on site is operated in good working condition through regular maintenance
- Best practices will be followed for use of engine brakes, and engine idling (but in consideration of seasons and weather)
- Prepare a noise management plan to minimize sound impact to the surrounding area
- A mechanism will be established for receiving and responding to noise complaints in a timely manner during construction, operations and closure phases.

Monitoring programs will be implemented to verify the accuracy of the predicted effects and assess the effectiveness of the implemented mitigation measures. A framework for a follow up noise monitoring program for the Project is provided in Section 20. Monitoring will also be required as a condition of provincial approval(s).

### 7.3.7 Assessment of Changes

Noise modelling has been completed to predict the potential changes to baseline sound levels at the PORs. The combined steady sound levels ($L_{Aeq\text{-}1hr}$ and $L_{dn}$) for the predictable worst-case scenarios were calculated at all the identified PORs using the sound emissions from the key sources for each phase as summarized in Appendix E-3.

Noise modelling was completed for the Project for four modelling periods:

- Construction phase
- Peak production period (early operations phase)
- Underground production period (later operations phase)
- Active closure period of the closure phase.

The periods were assessed for both day and evening / night as per provincial and federal guidance. Given that the site and associated activities are planned to operate 24 hours per day, the Project noise emissions are similar during both time periods.

Noise contours at 1.5 m from the ground for the predictable worst-case hour ($L_{Aeq\text{-}1hr}$, dBA), as per the provincial guideline are presented in this section. Figure 7.3-2 displays the noise contour outlining the highest noise emissions which was found to occur during Underground Production period at daytime. Other noise contours are provided in Appendix E-3 (Figure C-1 through Figure C-8 therein). These results are contingent on the selected equipment meeting the maximum allowable PWLs listed in the Noise Modelling Report (Appendix E-3).

A summary of the noise modelling results at the nearest PORs within the LSA is provided in Table 7.3-7 to Table 7.3-9. Results for all PORs can be found in Appendix E-3. A summary of the noise modelling results with respect to the $L_{dn}$ and %HA metrics is presented in Table 7.3-8.

#### 7.3.7.1 Construction Phase

During the construction phase, sound levels predicted under the worst-case hour scenario (in $L_{Aeq\text{-}1hr}$, dBA) meet the provincial and federal guidelines at all PORs, during daytime and evening / nighttime periods.

During the daytime period, received noise levels were greatest at the PORs north and northwest of the PA within the LSA, with the highest received noise level of 43 dBA at PORs 1 and 4. Sources largely contributing to the received noise levels at these PORs include mobile equipment such as haul trucks (both CAT 777F and CAT 785), dozers and drills as well as crushers, 200 kW diesel generators and the LP fresh air raise ventilation fans.

Similarly, received noise levels were greatest at PORs to the north and northwest during the nighttime period. The highest received noise level of 38 dBA was experienced at POR 1. Dominating sources contributing to received noise levels at POR 1 was mobile equipment such as haul trucks (both CAT 777F and CAT 785), articulated trucks, blast trucks and front-end loaders as well as 100 kW diesel generators and the LP fresh and return air raise ventilation fans.

The change in %HA is predicted to meet the HC guideline of 6.5% for the construction phase.

#### 7.3.7.2 Operations Phase

During the peak production and underground production operations modelling periods, sound levels predicted under the worst-case hour scenario ($L_{Aeq\text{-}1hr}$, dBA) meet the provincial and federal guidelines at all PORs in the LSA and RSA, during daytime and evening / nighttime periods.

For the peak production period, the highest received noise level during the daytime period was 42 dBA at POR 4, and the nighttime period was 39 dBA at POR 1. The dominating sources contributing to daytime received noise levels include drill rigs, loaders, dozers, haul trucks (both CAT777F and CAT785), and aggregates crushers. During the nighttime period, dominating sources include mobile equipment such as dozers and haul trucks and fixed plant equipment including crushers, LP fresh air raise ventilation fans and the 5 MW natural gas generators.

Similarly, the underground production phase during the daytime period exhibited highest received noise level of 44 dBA at POR 4; and during the nighttime period, the highest received noise level of 40 dBA at POR 1. Daytime dominating sources contributing to noise levels at POR 4 include drill rigs, loaders, dozers and haul trucks (both CAT777F and CAT785) as well as crushers. During nighttime, dominating sources include mobile equipment such as dozers, front-end loaders and haul trucks and fixed plant equipment including crushers, Hinge and Limb fresh air raise ventilation fans and the 5 MW natural gas generators.

The change in %HA is predicted to meet the HC guideline of 6.5% for both the peak production and underground production phases.

#### 7.3.7.3 Closure Phase

During the closure phase (active closure period), sound levels predicted under the worst-case hour scenario ($L_{Aeq\text{-}1hr}$, dBA) meet the provincial and federal guidelines at all PORs, during daytime and evening / nighttime periods. Similar to the other Project phases, received noise levels during daytime and evening / nighttime periods were highest at the PORs north and northwest of the PA. The highest received noise level during daytime and nighttime periods was 31 dBA at POR 1. Dominating sources for both daytime and nighttime periods include mobile equipment such as CAT777F haul trucks, dozers, front-end loaders, road graders and excavators, as well as fixed plant equipment such as diesel and natural gas-powered generators (which may not be operating at that time).

The change in %HA is predicted to meet the HC guideline of 6.5% for the closure phase.

### 7.3.8 Change Pathway Outcome

#### 7.3.8.1 Summary of Changes after Mitigation

Sound levels at all of the identified PORs are predicted to be below the federal and provincial criteria after application of mitigation measures. The changes to sound levels associated with the Project are illustrated in Figure C-1 to Figure C-8 of Appendix E-3. The noise contour with the highest noise emissions occurs during the underground production period at daytime is shown in Figure 7.3-2 of this section. The change in %HA meets HC limit of 6.5%, which means that changes to sound levels are not expected to trigger noise complaints from PORs.

These results are carried forward to the analysis of the fVCs migratory birds (Section 9) and Indigenous Peoples (traditional land and resource uses) in Sections 10.6, 11.6, 12.6, 13.6 and 14.6, as appropriate.

#### 7.3.8.2 Change Management

The changes to sound are managed through existing provincial regulatory mechanisms. The provincial *Environmental Protection Act* requires that no person can "*use, operate, construct, alter, extend or replace any plant, structure, equipment or apparatus*" or "*alter a process or rate of production*" that emits a contaminant to the natural atmosphere, i.e., a noise emission source, without an approval. The Project will be required to obtain an environmental compliance approval before commencing operations. This approval may include conditions to be satisfied, such as:

- Making no modifications to the facility without verifying it does cause the facility to go above a specific production limit
- Preparation, reviewed by the MECP, and implementation of a Noise Abatement Action Plan
- Preparation, reviewed by the MECP, and implementation of a noise monitoring program with data reported regularly to the MECP
- Preparation of operating procedures and maintenance programs for processes with significant environmental aspects
- Recording and reporting on noise complaints to the MECP.

#### 7.3.8.3 Confidence

The level of confidence in the effects prediction is high. The continued representativeness of the modelling results will be managed through the following tasks:

- Verify equipment PWLs procured meet the maximum PWLs outlined in the noise modelling report during design and procurement
- Confirm noise control measures comply with the PWLs outlined in the noise modelling report.

The noise modelling work has been prepared according to applicable guidance documents and regulatory requirements. These effects are assessed based on the modelled values using industry standard (ISO 9613-2:1996). The modelled noise levels represent a conservative approach where equipment was assumed to operate simultaneously and most of them without noise control measures provided by the equipment manufacturer.

**Table 7.3-1: Health Canada Noise Guidance**

| Noise Metric | Guidance | Consideration |
|---|---|---|
| Daytime $L_{Aeq-1hr}$ | 55 dBA | • Interference with speech comprehension |
| Nighttime $L_{Aeq-1hr}$ | 45 dBA | • Noise-induced sleep disturbance |
| %HA | 6.5% | • Long-term community annoyance |

Notes:
The $L_{Aeq}$ are defined for outdoors. An outdoor-to-indoor transmission loss of 15 dB is assumed in the HC Noise Guidance (2017) for buildings with windows at least partially open, and it is considered that by meeting the outdoor noise criteria, the indoor noise limits will be respected.
The %HA to be assessed based on the outdoor day-night sound level ($L_{dn}$). The daytime and nighttime periods for calculation of $L_{dn}$ as per the local guidelines are defined as: daytime period from 07:00 to 23:00 and nighttime period from 23:00 to 07:00. As per HC guidance, the calculation of $L_{dn}$ considers a +10dB reduction for both daytime and nighttime because this project PORs are in a quiet rural area.

**Table 7.3-2: Provincial Noise Impact Criteria Based on NPC-300 Guidelines**

| Operating Scenario | Assessment Period Noise Guidance | | |
|---|---|---|---|
| | Daytime (07:00 to 19:00) | Evening (19:00 to 23:00) | Nighttime (23:00 to 07:00) |
| Steady state | 45 dBA | 40 dBA | 40 dBA |
| Impulsive | 45 dBA | 40 dBA | 40 dBA |
| Emergency | 50 dBA | 45 dBA | 45 dBA |

Source:
MOE (2013).

**Table 7.3-3: Points of Reception Summary**

| PORs | Description | UTM Coordinates NAD83 (zone 15N) | | Height Above Ground (m) | Distance to Portal (km) |
|---|---|---|---|---|---|
| | | Northing | Easting | | |
| POR1 | Residence / Cabin / Lodge / Camp | 456965 | 5639223 | 1.5 | 4.9 |
| POR2 | Residence / Cabin / Lodge / Camp | 465624 | 5635180 | 1.5 | 10.1 |
| POR3 | Residence / Cabin / Lodge / Camp | 465611 | 5635303 | 4.5 | 10.1 |
| POR4 | Residence / Cabin / Lodge / Camp | 451915 | 5639044 | 1.5 | 5.8 |
| POR5 | Residence / Cabin / Lodge / Camp | 451671 | 5630891 | 1.5 | 5.3 |
| POR6 | Residence / Cabin / Lodge / Camp | 465139 | 5634939 | 1.5 | 9.6 |
| POR7 | Residence / Cabin / Lodge / Camp | 467085 | 5631026 | 4.5 | 12.1 |
| POR8 | Residence / Cabin / Lodge / Camp | 447866 | 5639124 | 4.5 | 8.9 |
| POR9 | Residence / Cabin / Lodge / Camp | 451051 | 5639187 | 4.5 | 6.5 |
| POR10 | Residence / Cabin / Lodge / Camp | 452237 | 5640215 | 4.5 | 6.6 |
| POR11 | Residence / Cabin / Lodge / Camp | 458555 | 5640149 | 4.5 | 6.4 |
| POR12 | Residence / Cabin / Lodge / Camp | 450762 | 5642634 | 4.5 | 9.4 |
| POR13 | Residence / Cabin / Lodge / Camp | 447708 | 5641952 | 4.5 | 10.8 |
| POR14 | Residence / Cabin / Lodge / Camp | 446385 | 5641886 | 4.5 | 11.7 |
| POR15 | Residence / Cabin / Lodge / Camp | 446675 | 5642960 | 4.5 | 12.2 |
| POR16 | Residence / Cabin / Lodge / Camp | 447897 | 5645762 | 4.5 | 13.6 |
| POR17 | Commercial | 446102 | 5646375 | 4.5 | 15.1 |
| POR18 | Residence / Cabin / Lodge / Camp | 465476 | 5635383 | 1.5 | 10.0 |
| POR19 | Empty Lot, Non-mining Land Area | 446876 | 5642540 | 4.5 | 11.8 |
| POR20 | Residence/Cabin/Lodge/Camp | 447444 | 5642109 | 4.5 | 11.1 |
| POR21 | Commercial | 447961 | 5637216 | 4.5 | 8.0 |
| POR22 | Residence / Cabin / Lodge / Camp | 469646 | 5628897 | 4.5 | 15.2 |
| POR23 | Residence / Cabin / Lodge / Camp | 469091 | 5623932 | 4.5 | 17.2 |
| POR24 | Residence / Cabin / Lodge / Camp | 470572 | 5630691 | 4.5 | 15.5 |
| POR25 | Residence / Cabin / Lodge / Camp | 463047 | 5614594 | 4.5 | 21.3 |
| POR26 | Residence / Cabin / Lodge / Camp | 467430 | 5631399 | 4.5 | 12.3 |
| POR27 | Residence / Cabin / Lodge / Camp | 468788 | 5623627 | 4.5 | 17.2 |
| POR28 | Residence / Cabin / Lodge / Camp | 465478 | 5635052 | 4.5 | 10.0 |
| POR29 | Residence / Cabin / Lodge / Camp | 447525 | 5643902 | 4.5 | 12.3 |

Note:
UTM: Universal Transverse Mercator.

**Table 7.3-4: Baseline Sound Conditions**

| Location | Leaves-on Program | | | | | | Leaves-off Program | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2022 | | | 2023 | | | 2022 | | | 2023 | | |
| | $L_d$ | $L_n$ | $L_{dn}$ | $L_d$ | $L_n$ | $L_{dn}$ | $L_d$ | $L_n$ | $L_{dn}$ | $L_d$ | $L_n$ | $L_{dn}$ |
| BSR1 | 40 | 31 | 42 | 45 | 30 | 44 | 33 | 28 | 36 | 34 | 32 | 39 |
| BSR2 | 40 | 29 | 39 | 43 | 28 | 41 | 33 | 24 | 37 | 34 | 32 | 38 |
| BSR3 | 34 | 35 | 35 | 40 | 33 | 42 | 34 | 26 | 36 | 31 | 27 | 34 |
| BSR4 | 42 | 29 | 42 | 42 | 25 | 40 | 34 | 25 | 36 | 36 | 29 | 38 |

Notes:
BSR: Baseline receptor.
See Appendix E-1 and Appendix E-2.

**Table 7.3-5: Potential Interactions of Project Components with Sound**

| Project Component / Activity | Sound |
|---|---|
| **Construction Phase** | |
| Site preparation activities | Yes |
| Establishment and operation of water management and treatment facilities | Yes |
| Open pit mining | Yes |
| Underground mining | Yes |
| Management of rock and unconsolidated materials in stockpiles | Yes |
| Establishment of onsite fish habitat and compensation measures | Yes |
| Establishment of onsite aggregate operations | Yes |
| Construction of the starter embankments for the TMF | Yes |
| Construction and operation of buildings and infrastructure | Yes |
| Waste management | - |
| Commissioning of the process plant | - |
| Power supply | Yes |
| Employment and expenditures | - |
| **Operations Phase** | |
| Underground mining | Yes |
| Mining of the LP Central pit | Yes |
| Management of rock and unconsolidated materials in stockpiles | Yes |
| Process plant operation | Yes |
| Management of desulphurized tailings in the TMF | - |
| Management of concentrate tailings and contact water in the VMF | - |
| Operation of water management and treatment facilities | - |
| Construction of a MWP | Yes |
| Operation and maintenance of buildings and infrastructure | - |
| Waste management | - |
| Power supply | Yes |
| Progressive reclamation activities | Yes |
| Employment and expenditures | - |

| Project Component / Activity | Sound |
|---|---|
| **Closure Phase** | |
| Active closure period | Yes |
| Passive closure period | - (1) |
| Final reclamation period | - (1) |
| Employment and expenditures | - |

Notes:
- : The interaction with sound (i.e., noise) is not expected to be material, and no further assessment is warranted.
1. Very limited activities will occur during this period over a limited period of time. The potential effect will be very localized if present.

**Table 7.3-6: Mitigation Measures for Changes to Sound**

| Pathways to Potential Effect / Criteria | Phase | | | Key Proposed Mitigation Measure |
|---|---|---|---|---|
| | Con | Op | Cl | |
| Changes in sound levels (in A-weighted dB) | • | • | - | Prepare a noise management plan to minimize sound impact to the surrounding area |
| | • | • | • | Site equipment will be procured and operated to meet NPC-300 noise limits at PORs, as applicable, with motorized equipment selected or designed as appropriate with mufflers / silencers to reduce noise emissions |
| | • | • | • | Regular inspections will take place to confirm that equipment and machinery used on site is operated in good working condition through regular maintenance |
| | • | • | • | A mechanism will be established for receiving and responding to noise complaints in a timely manner during construction, operations and closure phases. |

**Table 7.3-7: Noise Modelling Results ($L_{Aeq\text{-}1hr}$ and HC Guidance)**

| Receptor | Time period | Predicted Sound Levels ($L_{Aeq\text{-}1hr}$) | | | | HC Criteria for Sleep |
|---|---|---|---|---|---|---|
| | | Con | P-P | U-P | Cl | |
| POR1 | Day | 43 | 41 | 43 | 31 | 55 dBA |
| | Evening / Night | 38 | 39 | 40 | 31 | 45 dBA |
| POR4 | Day | 43 | 42 | 44 | 25 | 55 dBA |
| | Evening / Night | 33 | 36 | 36 | 25 | 45 dBA |
| POR5 | Day | 39 | 38 | 40 | 23 | 55 dBA |
| | Evening / Night | 34 | 37 | 36 | 23 | 45 dBA |
| POR6 | Day | 34 | 32 | 33 | 18 | 55 dBA |
| | Evening / Night | 31 | 31 | 31 | 18 | 45 dBA |

Notes:
Con: Construction phase; P-P: Peak-production period; U-P Underground production period;
Cl: Active closure period.

**Table 7.3-8: Noise Modelling Results ($L_{dn}$ and Change in %HA)**

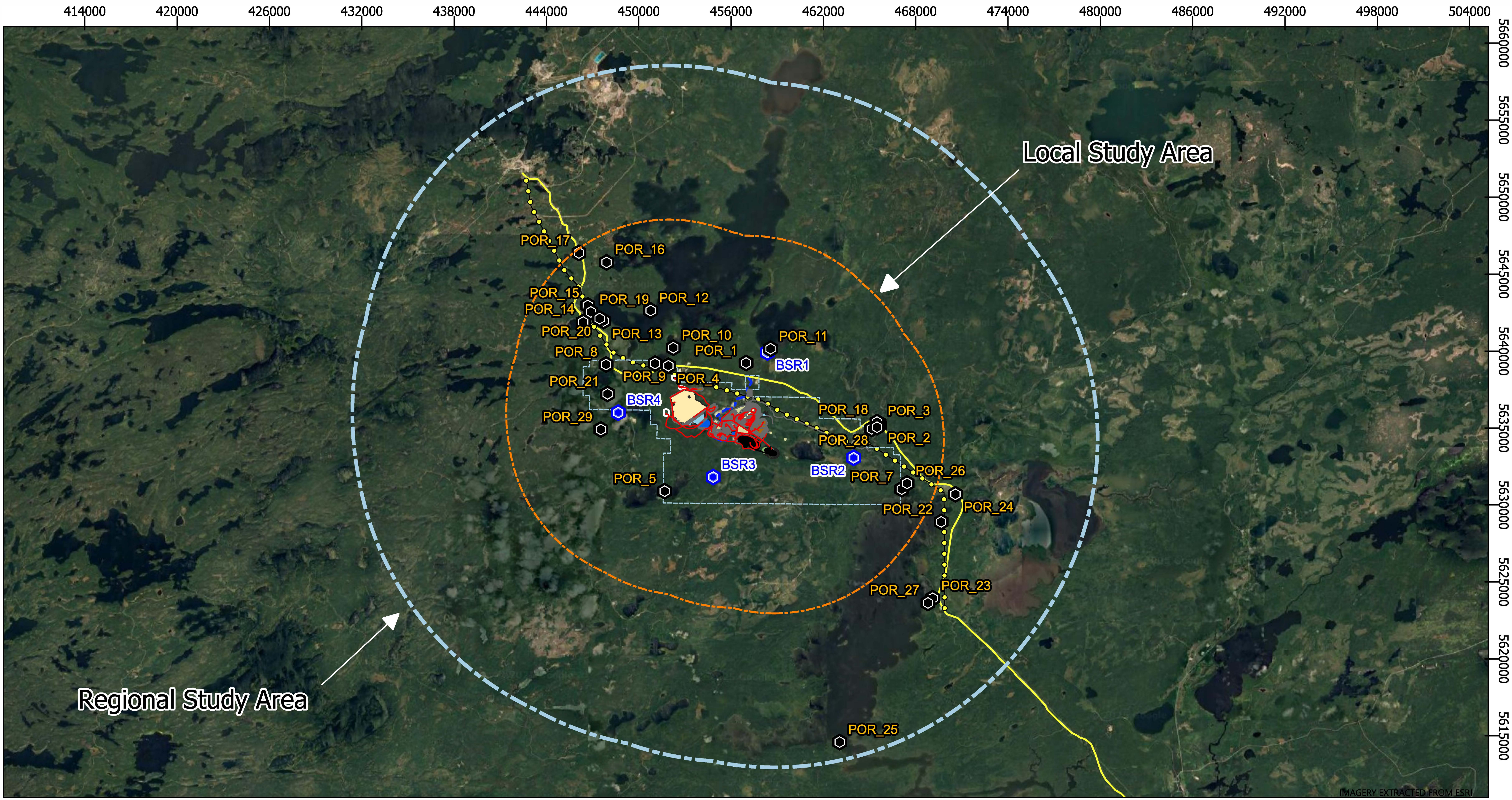
| POR | Baseline Level ($L_{dn}$) | Predicted Sound Levels ($L_{dn}$) | | | | Change in %HA | | | | HC Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Con | P-P | U-P | Cl | Con | P-P | U-P | Cl | |
| POR1 | 40 | 45 | 46 | 46 | 37 | 2.0 | 1.8 | 2.3 | 0.4 | 6.5 |
| POR4 | 39 | 42 | 43 | 44 | 31 | 1.9 | 1.7 | 2.1 | 0.1 | 6.5 |
| POR5 | 37 | 41 | 43 | 43 | 29 | 1.2 | 1.2 | 1.5 | 0.1 | 6.5 |
| POR6 | 39 | 37 | 37 | 37 | 24 | 0.5 | 0.4 | 0.4 | 0.0 | 6.5 |

Notes:
Con: Construction phase; P-P: Peak-production period; U-P Underground production period;
Cl: Active closure period.

**Table 7.3-9: Noise Modelling Results ($L_{Aeq\text{-}1hr}$ and NPC-300 Guidelines)**

| POR | Time Period | Predicted Sound Levels ($L_{Aeq\text{-}1hr}$) | | | | NPC-300 |
|---|---|---|---|---|---|---|
| | | Con | P-P | U-P | Cl | |
| POR1 | Daytime | 43 | 41 | 43 | 31 | 45 dBA |
| | Evening / Nighttime | 38 | 39 | 40 | 31 | 40 dBA |
| | Impulsive | 21 | - | - | - | 45 dBAI |
| | Testing | 18 | 36 | 36 | 28 | 50 dBA |
| POR4 | Daytime | 43 | 42 | 44 | 25 | 45 dBA |
| | Evening / Nighttime | 33 | 36 | 36 | 25 | 40 dBA |
| | Impulsive | 44 | - | - | - | 45 dBAI |
| | Testing | 9 | 24 | 24 | 17 | 50 dBA |
| POR5 | Daytime | 39 | 38 | 40 | 23 | 45 dBA |
| | Evening / Nighttime | 34 | 37 | 36 | 23 | 40 dBA |
| | Impulsive | 24 | - | - | - | 45 dBAI |
| | Testing | 9 | 18 | 18 | 12 | 50 dBA |
| POR6 | Daytime | 34 | 32 | 33 | 18 | 45 dBA |
| | Evening / Nighttime | 31 | 31 | 31 | 18 | 40 dBA |
| | Impulsive | 8 | - | - | - | 45 dBAI |
| | Testing | 1 | 18 | 18 | 11 | 50 dBA |

Notes:
Con: Construction phase; P-P: Peak-production period; U-P Underground production period;
Cl: Active closure period.




**LEGEND**

- Highway 105
- Powerline 115 kV
- Property Boundary
- Truck Haul Routes
- Baseline Receptor
- Point of Reception

0 7 14 21 28 35 km

Notes:
-"POR" (Point of Reception) provided by Great Bear Resources May 2025
-"BSR" (Baseline Receptor) from Wood baseline reports
-Site Plan provided by Great Bear Resources in June 2025

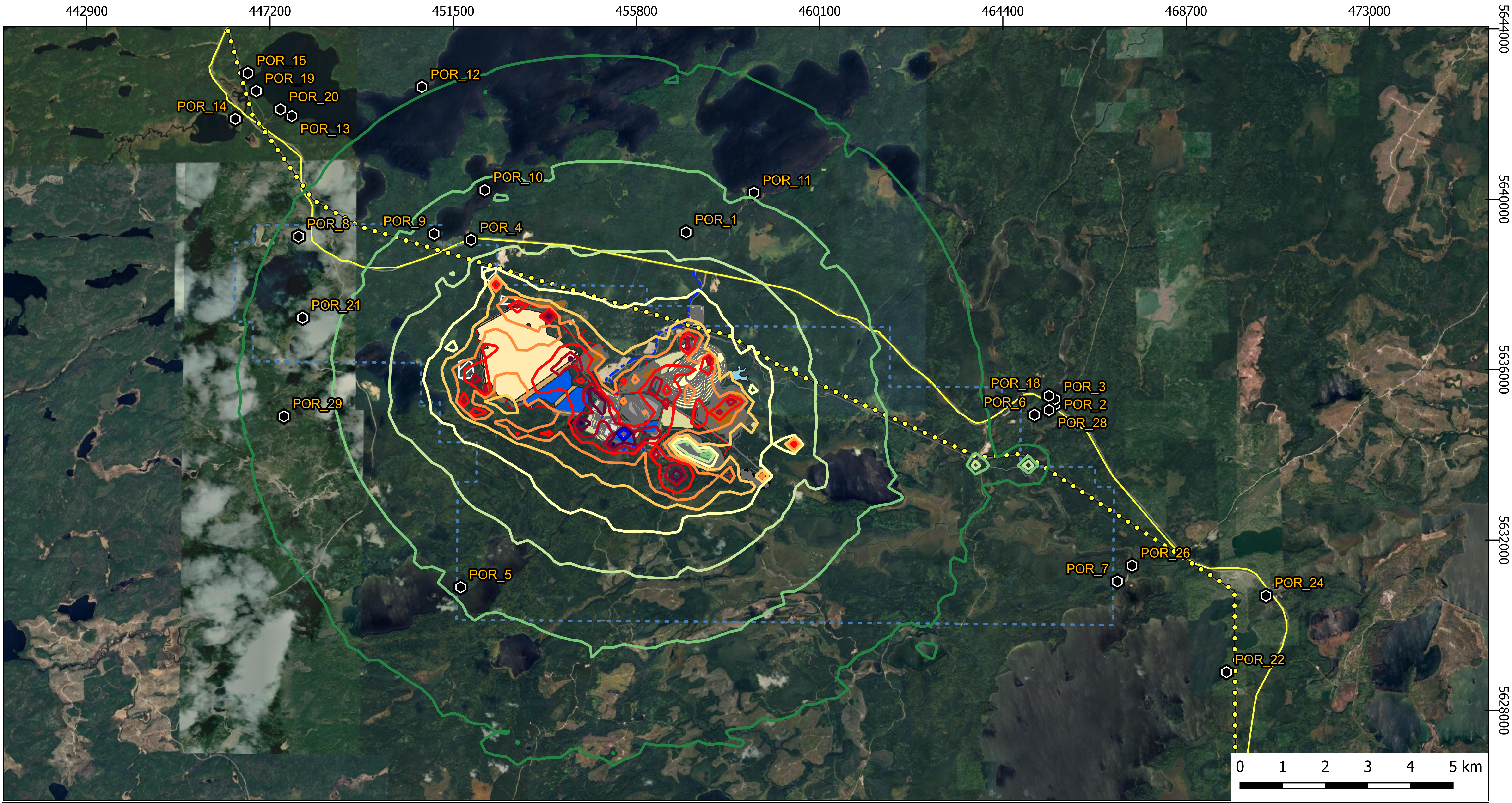
Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Resources**

Spatial Boundaries

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.3-1 |
| SCALE: 1:235895 | DATE: September 2025 |




**LEGEND**

- Highway 105
- Property Boundary
- Powerline 115 kV
- Point of Reception

**NOISE LEVELS (dBA)** 35 40 45 50 55 60 65 70 75 80

Notes:
-"POR" (Point of Reception) provided by Great Bear Resources May 2025
-"BSR" (Baseline Receptor) from Wood baseline reports
-Site Plan provided by Great Bear Resources in June 2025

Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Resources**
**Noise Assessment**

Daytime Noise Contours
Underground Production Phase

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.3-2 |
| SCALE: 1:85220 | DATE: September 2025 |

## 7.4 Analysis of Changes to Vibration

Vibration is considered a pVC for the Project given that blasting activities will occur during the construction and operations phases. These activities cause changes in ground vibration, air overpressure and water overpressure that can have an effect on wildlife and humans if present, and levels are above a certain limit.

### 7.4.1 Pathway Linkages to other Valued Components

#### 7.4.1.1 Pathway Linkages to Vibration

There are no identified pathway linkages to vibration.

#### 7.4.1.2 Pathway Linkages from Vibration to fVCs

Changes to vibration may have linkages to, and inform, the analysis of potential effects on the fVCs fish and fish habitat, and migratory birds. These linkages are reflected in the assessment of potential effects to fish and fish habitat (Section 8.5 and Section 8.7) and migratory birds (Section 9.5 and Section 9.7). Localized vibration resulting from the Project, may result in sensory disturbances, including to fish, migratory birds and other wildlife species, that could potentially affect traditional land and resource uses for Indigenous people, addressed in Sections 10.6, 11.6, 12.6, 13.6 and 14.6, as appropriate, and health of Indigenous people (Sections 10.9, 11.9, 12.9, 13.9 and 14.9), as appropriate.

### 7.4.2 Assessment Approach

The approach to the assessment of potential changes to vibration includes:

- Description of relevant regulatory settings
- Description of the spatial and temporal boundaries used for this pVC
- Identification of criteria and indicators with the associated rationale
- An outline of the analytical methodology conducted for the assessment and the key assumptions and use of the conservative approach.

The assessment of potential effects is supported by the description of the existing conditions for the pVC (Section 7.4.4), the identification of potential effects on the pVC (Section 7.4.5) and a description of applicable mitigation measures for the pVC (Section 7.4.6). With the application of mitigation measures to the potential effects on the pVC, the potential changes are then characterized in Section 7.4.7.

#### 7.4.2.1 Regulatory Setting

The Project will need to meet applicable federal and provincial requirements for blasting vibrations. Government policies, objectives, standards or guidelines most relevant to vibration are summarized below. Further information regarding anticipated approval requirements is provided in Section 19.

##### 7.4.2.1.1 Federal

The Federal HC (2017) noise guideline applicable to this Project, provides limits for blasting air-overpressure which are based on the WHO (1999) recommendations for hearing loss protection. Applicable limits from the HC (2017) guidance are outlined in Table 7.4-1.

The DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Hopky and Wright 1998) complemented with the technical paper by Cott (2005) provide guideline limits for blasting water-overpressure and ground-borne vibration when in proximity to Canadian Fisheries Waters. These limits are applicable at the land-water interface (shoreline). The applicable water-overpressure and vibration limits for blasting from these guidelines are outlined in Table 7.4-2.

##### 7.4.2.1.2 Provincial

The Model Municipal Noise Control By-law for Blasting in Mines and Quarries Noise Pollution Control 119 (NPC-119; MOE 1978b) provides guideline limits for blasting air-overpressure and ground-borne vibration. The applicable compliance air overpressure and ground-borne vibration limits for blasting from NPC-119 are outlined in Table 7.4-2. These compliance limits require the Project to carry out routine air overpressure and vibration monitoring as per the Publication NPC-103 Procedure for Measurement of Sound and Vibration due to Blasting Operations (MOE 1978a). Great Bear Resources will complete routine vibration monitoring as part of the Project environmental monitoring.

#### 7.4.2.2 Spatial and Temporal Boundaries

Spatial boundaries are used to support consistent descriptions across disciplines and bound the assessment of the potential effects of the Project. The spatial areas and boundaries used for the assessment of the potential effect of changes to the Project on vibration are defined as follows and shown in Figure 7.4-1:

- PA: encompasses the anticipated footprint of the Project, including all temporary and permanent areas associated with the mine site, as well as a buffer to allow flexibility for design optimizations prior to construction and over the mine life (Section 6.4) and is consistent for all pVCs and fVCs. Direct impacts from vibration are confined to the PA.
- LSA: the vibration effects are not expected to extend beyond the PA; however, changes in air overpressure caused by surface blasting may be perceived beyond the PA under certain weather conditions. A LSA for vibration the same as the sound LSA (Section 7.3) which extends 10 km beyond the PA has been used to be conservative.
- RSA: extends 20 km beyond the PA and provides regional context in the assessment of potential changes from the Project.

The purpose of a temporal boundary is to identify when an effect may occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, and the nature of the interactions with valued components. The temporal boundaries for the assessment as defined in Section 6.5 are:

- Construction phase:
  - Years -3 to -1 representing the primary period of Project construction

   - Underground mining will be ongoing, mining of the Viggo pit will be completed during this phase and will be initiated in the last year of construction in the LP Central pit
   - Blasting is expected to occur at limits of the LP Central pit and Viggo pit, centre of quarry source (Q1) and quarry source (Q2)
- Operations phase:
   - Years 1 to 26, during year 1 the Project will transition from construction into operations and will not be at full capacity
   - Blasting is expected to occur at the limits of LP Central pit, limits of Q1 and in the underground mine
- Closure phase:
   - Years 27 to 29 represent the active closure period when the majority of the decommissioning and reclamation of the PA is completed
   - Year 30 is a passive closure period while the site is on care and maintenance as filling of the mine workings with water is completed, and excess water is treated
   - Year 31 is the final close out period when water treatment infrastructure is removed.

Analysis of changes to vibration were assessed during the construction phase and operations phase when underground and open pit mining and explosive use will be occurring. Blasting is not expected during closure phase.

#### 7.4.2.3 Assessment Criteria

Blasting activities during the construction and operations phases of the Project are expected to cause changes in ground vibration, air overpressure and water overpressure. To evaluate the potential effects, an assessment has been prepared to predict the changes to the baseline conditions, based primarily on documentation provided by Great Bear Resources as well as onsite investigations. The following indicators were used:

- Changes in ground vibration and air overpressure (mm/s and dB)
- Changes in water overpressure (kPa).

#### 7.4.2.4 Analytical Methods

The primary source of vibration for the Project is due to blasting related to mining activities. A blasting assessment of Project has been completed in accordance with standard methods (Appendix F).

##### 7.4.2.4.1 Ground Vibration and Air Overpressure

The evaluation of the blasting vibration effects of the Project was completed in accordance with standard methods outlined by the United States Bureau of Mines and the International Society of Explosives Engineers (ISEE) found in the Blaster’s Handbook (ISEE 2011).

Ground-borne vibration caused by blasting operations is an undesired side effect from the use of explosives to fragment rock in mining, quarrying or construction. This vibration is essentially the excitation of ground particles resulting from the instantaneous release of energy that propagates through an elastic medium, such as the ground, and logarithmically decays from its originating point. This behaviour can be modelled via the propagation law equation. This equation is a function of the distance between blast location and receptor, the explosive charge, and specific constants that depend on the site conditions. Constants recommended by ISEE (2011) were used to calibrate the decay effect of ground vibration for the impact predictions as historic blast vibration data is not available for the Project site area.

Air overpressure is an airborne shock pressure wave that travels through the atmosphere from the detonation location of the explosives. Similar to ground vibration, the amplitude of air pressure wave decays with distance but at a lower rate. Thus, air overpressure prediction can be estimated for a specific location using the overpressure propagation law equation. This equation is a function of the distance between blast location and receptor, the explosive charge weight and depth, and some constants that depend on the site conditions. The United States Bureau of Mines has proposed constants that align well with several experimental studies (Siskind et. al. 1979, 1980; Nicholls 1971). The United States Bureau of Mines constants were used to calculate the prediction of this effect.

Twenty-nine PORs were identified in the LSA and RSA which were considered in the assessment for the effects on human receptors utilizing the MOE guideline and HC guidance. These consist of properties (such as residential, cabins, lodges and campsites) not owned by Great Bear Resources and vacant lots classified as non-mining land (see Table 7.4-4). The calculation approach for each POR remains the same for both the construction phase and the operations phase of the Project. Assessment was not completed for the closure phase as material blasting is not projected to be required during closure.

#### 7.4.2.4.2 Water Overpressure

The DFO has a requirement to assess the impact of blasting operations on fish habitats. The DFO Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Hopky and Wright 1998) defines the general propagation equations to determine setback distance for confined explosive to meet their guideline criteria of 50 kPa for underwater instantaneous overpressure and 13 mm/s for peak particle velocity (PPV) to protect spawning beds during egg incubation.

The article by Cott and Hanna (2005) indicates that DFO general equations provide a high-level assessment of the potential impact to fish habitats. The authors conclude that the unpredictability of water overpressure is due to the differences in substrate type, substrata, water depth, equipment failure and human subjectivity. Cott and Hanna (2005) recommend that site-specific propagation coefficients are defined to minimize the impact to fish habitats. Given that there is no historic blast vibration data of the Project site area, these site-specific coefficients were taken from the DFO guidelines. For conservatism, the predictions assumed a rock substrate to model low wave decay and thus further propagation.

By setting the instantaneous water overpressure limit to 50 kPa as per Cott and Hanna (2005), along with the site-specific coefficients, the substrate pressure can be determined. The substrate pressure and nominal explosive charge weight is then used to ultimately determine the setback distance from the blasting location. On the other hand, to determine the setback distance to meet the PPV limit during spawning periods, the inputs required are only the nominal explosive charges and the PPV limit set to 13 mm/s.

Fish bearing waterbodies and / or watercourses, that were assessed for water-overpressure and ground-borne vibration generated from blasting operations, were selected based on proximity to proposed blasting activities and those ones that would be retained in the Project (see

Figure 7.4-2). The general locations where blasting operations are highlighted in Figure 7.4-3 during the construction phase of the Project and in Figure 7.4-4 for the operations phase of the Project. Assessment was not completed for the closure phase as blasting is not projected to be required during closure.

The blasting locations and fish habitats are shown in Appendix F (Figure B-1 to Figure B-2 for the construction phase, and Figure B-3 and Figure B-5 for operations phase).

### 7.4.3 Assumptions and the Use of the Conservative Approach

The calculations to determine the setback distance from the general blast area consider a rock substrate with density and compressional wave velocity defined in the DFO guideline. The utilization of rock substrate yields a higher density and wave velocity than the use of frozen soil, ice, saturated soil and unsaturated soil. Therefore, this assumption allows for a model with low wave decay and thus farther wave propagation. For a conservative assessment, the worst-case blasting location was assumed to occur at the bedrock elevation in the general blast area.

The explosive charge is assumed to be the maximum charge designed for this Project:

- Open pit: nominal blast charge of 207.6 kg/delay
- Underground: nominal blast charge of 10.1 kg/delay
- Quarries: nominal blast charge of 41.2 kg/delay.

These values were defined by Great Bear Resources mine engineering team to be used for conservative modelling. Drill and blast optimization is continuing and these may be modified while continuing to meet regulatory requirements.

In addition, to account for the shortest path between two points, the Euclidean distance approach was utilized, representing the worst-case scenario. This approach does not account for topographical changes between two points. The georeferenced terrain elevation profile was based on a 1 m elevation grid resolution obtained via light detection and ranging (LiDAR).

The predicted ground vibration and air overpressure levels at each POR are dependent on the distance from the blast location to the POR. For example, to determine these predicted levels for blasting operations at the open pits, the distance was measured from the centre of LP Central pit and Viggo pit to the each of the 29 PORs. The shortest distance from each POR to either LP Central pit or the Viggo pit was used as input in calculating the PPV and air overpressure attenuation from blasting activity. The same approach is used for the quarries (Q1 and Q2) and underground mine.

### 7.4.4 Existing Conditions

Two baseline vibration monitoring campaigns were conducted in 2022 and 2023 to characterize the existing ground vibration for site conditions that are representative of the PA, including for seasonal changes (Appendix F). Ground vibration data was collected by Wood plc in 2022 and 2023, over seven day periods at four monitoring locations, summarized in Table 7.4-5. Baseline ground vibration levels were characterized by using relevant vibration indicators for daytime and nighttime.

The baseline ground vibration levels varied from 0.002 mm/s to 0.004 mm/s with most of the ground vibration values at the vibration floor of the measuring device. It was observed that none of the baseline ground vibration levels from the campaigns were above the NPC-119 limits.

### 7.4.5 Identification of Potential Effects

The initial step in the assessment process is to identify interactions between the Project and the pVC that can result in pathways to potential effects. The professional judgment of technical experts experienced with mining projects in Ontario and Canada, as well as input from Indigenous communities, government agencies and the public, informed the identification of those interactions that are likely to result in a pathway to a potential effect due to a measurable change to vibration.

Table 7.4-6 provides a summary of the potential interactions of the Project with vibration prior to the application of the mitigation measures. These pathways are summarized in Section 7.4.5.1 to Section 7.4.5.3 for each phase of the Project. Section 7.4.6 provides a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The changes after the application of the mitigation measures, are then described and further evaluated in Section 7.4.7.

#### 7.4.5.1 Construction Phase

The construction phase of the Project is expected to occur over a three-year period and will include preparation of the site and the construction of mine infrastructure (Section 5). Project activities that will cause vibration are related to blast activities to extract mine rock, ore and aggregate:

- Site preparation activities for the mine site area including blasting at quarries
- Underground mining including blasting
- Development and operation of the Viggo pit including blasting
- Development of the LP Central pit and the commencement of mining for production, both requiring blasting.

#### 7.4.5.2 Operations Phase

The operations phase is anticipated to occur over a 26-year period, with both open pit and underground mining occurring during the first 9 years, and only underground mining for the remainder of the operations phase. Blasting will not occur simultaneously at these locations. During the operations phase, vibration will be generated at the Project site from:

- Operation of the underground mine including blasting
- Operation of the LP Central pit including blasting.

#### 7.4.5.3 Closure Phase

Mining will not occur during the closure phase, and material blasting is not projected to occur. If blasting is required during demolition, it will be completed in a manner that meets regulatory requirements.

### 7.4.6 Mitigation and Enhancement

Key measures to be implemented to avoid or minimize the effects of the Project on vibration include the following:

- Preparation of a blast management plan prior to the start of construction and implement the proposed control strategies described therein
- Avoid performing simultaneous blasting operations at various locations within the Project site and primarily the underground mine, LP Central pit and Viggo pit
- Before any blasting activity occurs near fish habitat, Great Bear Resources will perform a series of test blasts to determine the site-specific parameters governing the propagation of ground vibration and water overpressure to impacted fish habitats, to update predictions using site-specific parameters and adjust mitigation measures before commencing regular blasting operations
- Implement ground vibration and water overpressure monitoring at the nearest active fish habitats from the open pits and underground blast locations.

The detailed blast management plan will be prepared prior to the start of the Project to identify and review potential blast locations, define mitigation measures, and detail the inspection and record keeping required to demonstrate that impact levels are being effectively managed. The plan will include opportunities for adaptive management, in which the intensity of the control measures would be increased if site inspections and continuous monitoring indicate that implemented measures are insufficient.

Monitoring programs will be implemented to verify the accuracy of the predicted effects and assess the effectiveness of the implemented mitigation measures. Underwater ground vibration and water overpressure monitoring will occur at the nearest active fish habitats from the open pits and underground blast locations to confirm predictions. A framework for a follow up vibration monitoring program for the Project is provided in Section 20.

### 7.4.7 Assessment of Changes

#### 7.4.7.1 Changes to Ground Vibration and Air Overpressure

Great Bear Resources provided the general blast locations that are planned during the construction and operations phases of the Project, which were considered for the evaluation of the change in ground-borne vibration and air overpressure. These effects were predicted at all 29 PORs within the LSA and RSA that consist of human-occupied properties not owned by Great Bear Resources and vacant lots classified as non-mining land, see Table 7.4-4.

##### 7.4.7.1.1 Construction Phase and Operations Phase

Changes to ground vibration and air overpressure from blasting operations at LP Central pit (construction phase and operations phase), Viggo pit (construction phase only) and Project quarries (Q1 and Q2; construction phase and operations phase) were evaluated at all PORs. The blasting design parameters were evaluated using the propagation law formulas. The equations and variables are explained further in Appendix F.

The predicted PPV from blasting operations at the nearest receptor to the open pits and the quarries are found in Table 7.4-7 and Table 7.4-8 respectively. The closest PORs to the open pits are POR 1 and POR 11, which are respectively 5,233 m and 6,276 m away from LP Central pit. The closest receptors to the quarries are POR 4 and POR 9, which are respectively 2,221 m and 2,622 m away from Q2. To comply with the applicable MECP limits, the distances of the PORs to the blast location need to be greater than the minimum predicted setback distance of 242 m for the open pits and 75 m for the quarries. Figure 7.4-5 shows the ground vibration decay for 207.6 kg per delay as distance increases from the open pit blasts. Ground vibration prediction for the closest receptor POR 1 location from the open pits is shown in Figure 7.4-5 with a blue diamond and the MECP ground vibration limit of 12.5 mm/s is plotted with a red line.

The predicted air overpressure at the two nearest PORs to the open pits and quarries are presented in Table 7.4-9 and Table 7.4-10 respectively. To meet the applicable MECP limits, the distances of the PORs to the general blasting locations need to be greater than the minimum predicted setback distances of 359 m away from the open pits and 353 m away from the quarries, which are considerably less than the separation between nearest receptors and blast area. Figure 7.4-6 shows the air overpressure decay for 207.6 kg per delay as distance increases from the open pit blasts. Air overpressure for the closest receptor POR 1 location from the open pits is plotted in Figure 7.4-6 with a blue triangle. The MECP air overpressure limit of 128 dB(L) is plotted with a red line, and the HC guidance of 120 dB(L) is plotted with an orange line.

The results above show that the blasting operations are within the provincial guideline NPC-119 (MOE 1978b) for ground vibration and air overpressure, and federal HC guidance for air overpressure (HC 2017), and there is no change to vibration at the PORs.

##### 7.4.7.1.2 Closure Phase

Ground vibration and air overpressure are not predicted to be generated during the closure phase as mining will not occur during the closure phase. If blasting is required during reclamation, such as for building demolition, it will occur over a short period of time, and will be completed in a manner that meets regulatory requirements.

#### 7.4.7.2 Changes to Underwater Ground Vibration and Water Overpressure

Great Bear Resources provided the general blasting locations that are planned during the construction and operations phases of the Project, which were considered for the evaluation of the change in underwater ground-borne vibration and water overpressure. Table 7.4-11 summarizes the watercourses and waterbodies that contain fish habitat and the blast locations that were assessed for water-overpressure and ground-borne vibration against the criteria provided in Table 7.4-2. For each of the blasting locations, the Euclidean distances were used to calculate the maximum allowable charges for PPV and instantaneous water overpressure from the DFO guidelines. The results are summarized in Table 4-13 and Table 4-14 of Appendix F, where the calculated maximum charges for PPV and instantaneous water overpressure are compared to the nominal Project explosive charges listed Section 7.4.3.

##### 7.4.7.2.1 Construction Phase

Blasting operations during the construction phase of the Project will occur at the limits of LP Central pit and Viggo pit and at the centre of Q1 and Q2. The predicted vibration changes shown as a blast impact area using the planned nominal charge are depicted in Figure 4-6 and Figure 4-7 of Appendix F. These figures show that the fish habitats indicated in Table 7.4-11 are within the blast impact areas of the LP Central pit during the construction phase. These blast impact areas are measured from the boundaries of the bedrock / overburden interface by considering the setback distances in Table 7.4-12 obtained by applying the DFO approach. The predictions show that the receptors that will be affected by the nominal charge are: Dixie Creek (no impact segment identification; ISID) and Unnamed Watercourse 3 (ISID IS-35).

This potential predicted change will be mitigated with the measures provided in Section 7.4.6, so that the requirements are met.

##### 7.4.7.2.2 Operations Phase

The predicted changes, shown as a blast impact area, are depicted in Figure 7.4-3 for the operations phase. These blast impact areas are measured from the boundaries of the bedrock and overburden interface by considering the setback distances shown in Table 7.4-12. This figure shows that there will be a change to vibration within fish habitat in Dixie Creek, as it is within the blast impact areas of the LP Central pit. The predictions show that the receptors that will be affected by the nominal charge are: Dixie Creek (no ISID) and Unnamed Watercourse 3 (ISID IS-35).

This potential predicted change will be mitigated with the measures provided in Section 7.4.6 to meet regulatory requirements.

##### 7.4.7.2.3 Closure Phase

Changes to water overpressure are not predicted to be generated during the closure phase as material blasting will not occur during the closure phase. If blasting is required during reclamation, such as for demolition, it will be limited and will be completed in a manner that meets regulatory requirements.

### 7.4.8 Change Pathway Outcome

#### 7.4.8.1 Summary of Changes after Mitigation

The predicted change to air overpressure and peak particle vibration are well below the MECP limits for all PORs and DFO requirements related to vibration for protection of fish will be met. The blast impact area is contingent on the blasting design parameters and site-specific conditions. The predicted ZOI of water overpressure and ground-borne vibration on fish habitats near the open pits can be seen in Figure 7.4-7.

These results are carried forward to the analysis of changes to migratory birds (Section 9) and Indigenous Peoples (traditional land and resource uses) in Sections 10.6, 11.6, 12.6, 13.6 and 14.6, as appropriate.

#### 7.4.8.2 Change Management

Changes to vibration will be managed through mitigation measures described in Section 7.4.6. In addition, the blast management plan will include opportunities for adaptive management, in which the intensity of the control measures would be increased if site inspections and continuous monitoring indicate that implemented measures are insufficient.

#### 7.4.8.3 Confidence

The level of confidence in the prediction is considered to be high due to the availability of baseline field vibration data and the use of conservative assumptions throughout the assessment.

**Table 7.4-1: Health Canada Noise Guidance Applicable to Air-overpressure**

| Assessment Type | Assessment Metric | Guidance |
|---|---|---|
| Air-overpressure | Peak Pressure Level (LPeak) | ≤ 140 dBL, Adults |
| | | ≤ 120 dBL, Children |

**Table 7.4-2: Fisheries and Oceans Canada Guidelines for Blasting near Fisheries**

| Assessment Type | Assessment Metric | Guideline |
|---|---|---|
| Instantaneous Water-overpressure (1) | Peak Pressure (PPeak) | • ≤ 50 kPa |
| Underwater Ground Vibration (2) | PPV | • ≤ 13 mm/s |

Notes:
1. DFO has set a guideline of 100 kPa (Hopky and Wright 1998). However, the Federal Authority Advice Record (DFO 2023) for the Great Bear Project recommends evaluating impact with respect to 50 kPa as defined in Cott (2005). Also, note that the underwater overpressure limit only tends to become a measurable metric when blasting occurs within the waterbody itself.
2. The vibration guideline applies with a maximum PPV level of 13 mm/s in a spawning bed during the period of egg incubation.

**Table 7.4-3: Provincial Vibration Impact Criteria based on NPC-119 Guidelines**

| Assessment Type | Assessment Metric | Guideline |
|---|---|---|
| Air-overpressure | LPeak | ≤ 128 dBL |
| Ground Vibration | PPV | ≤ 12.5 mm/s |

Notes:
This guideline requires the Project to carry out routine air overpressure and vibration monitoring as per the Ontario Publication NPC-103, Procedure for Measurement of Sound and Vibration due to Blasting Operations (MOE 1978a). This provincial guideline is used to show that the Project can be also compliant with provincial requirements.

**Table 7.4-4: Points of Reception Summary**

| PORs | Description | UTM Coordinates NAD83 (zone 15N) | | Distance to Portal (km) |
|---|---|---|---|---|
| | | Northing | Easting | |
| POR1 | Residence / Cabin / Lodge / Camp | 456965 | 5639223 | 4.9 |
| POR2 | Residence / Cabin / Lodge / Camp | 465624 | 5635180 | 10.1 |
| POR3 | Residence / Cabin / Lodge / Camp | 465611 | 5635303 | 10.1 |
| POR4 | Residence / Cabin / Lodge / Camp | 451915 | 5639044 | 5.8 |
| POR5 | Residence / Cabin / Lodge / Camp | 451671 | 5630891 | 5.3 |
| POR6 | Residence / Cabin / Lodge / Camp | 465139 | 5634939 | 9.6 |
| POR7 | Residence / Cabin / Lodge / Camp | 467085 | 5631026 | 12.1 |
| POR8 | Residence / Cabin / Lodge / Camp | 447866 | 5639124 | 8.9 |
| POR9 | Residence / Cabin / Lodge / Camp | 451051 | 5639187 | 6.5 |
| POR10 | Residence / Cabin / Lodge / Camp | 452237 | 5640215 | 6.6 |
| POR11 | Residence / Cabin / Lodge / Camp | 458555 | 5640149 | 6.4 |
| POR12 | Residence / Cabin / Lodge / Camp | 450762 | 5642634 | 9.4 |
| POR13 | Residence / Cabin / Lodge / Camp | 447708 | 5641952 | 10.8 |
| POR14 | Residence / Cabin / Lodge / Camp | 446385 | 5641886 | 11.7 |
| POR15 | Residence / Cabin / Lodge / Camp | 446675 | 5642960 | 12.2 |
| POR16 | Residence / Cabin / Lodge / Camp | 447897 | 5645762 | 13.6 |
| POR17 | Commercial | 446102 | 5646375 | 15.1 |
| POR18 | Residence / Cabin / Lodge / Camp | 465476 | 5635383 | 10.0 |
| POR19 | Empty Lot, Non-mining Land Area | 446876 | 5642540 | 11.8 |
| POR20 | Residence/Cabin/Lodge/Camp | 447444 | 5642109 | 11.1 |
| POR21 | Commercial | 447961 | 5637216 | 8.0 |
| POR22 | Residence / Cabin / Lodge / Camp | 469646 | 5628897 | 15.2 |
| POR23 | Residence / Cabin / Lodge / Camp | 469091 | 5623932 | 17.2 |
| POR24 | Residence / Cabin / Lodge / Camp | 470572 | 5630691 | 15.5 |
| POR25 | Residence / Cabin / Lodge / Camp | 463047 | 5614594 | 21.3 |
| POR26 | Residence / Cabin / Lodge / Camp | 467430 | 5631399 | 12.3 |
| POR27 | Residence / Cabin / Lodge / Camp | 468788 | 5623627 | 17.2 |
| POR28 | Residence / Cabin / Lodge / Camp | 465478 | 5635052 | 10.0 |
| POR29 | Residence / Cabin / Lodge / Camp | 447525 | 5643902 | 12.3 |

Note:
UTM: Universal Transverse Mercator.

**Table 7.4-5: Baseline Ground Vibration**

| Location | 2022 | | 2023 | |
|---|---|---|---|---|
| | Daytime (mm/s) | Nighttime (mm/s) | Daytime (mm/s) | Nighttime (mm/s) |
| BSR1 | 0.002 | 0.002 | 0.002 to 0.003 | 0.002 |
| BSR2 | 0.002 | 0.002 | 0.002 to 0.004 | 0.002 to 0.003 |
| BSR3 | 0.002 | 0.002 | 0.002 | 0.002 |
| BSR4 | 0.002 to 0.003 | 0.002 | 0.002 | 0.002 |

Note:
See Appendix F.

**Table 7.4-6: Potential Interactions of Project Components with Vibration**

| Project Component / Activity | Vibration |
|---|---|
| **Construction Phase** | |
| Site preparation activities | - |
| Establishment and operation of water management and treatment facilities | - |
| Open pit mining | Yes |
| Underground mining | Yes |
| Management of rock and unconsolidated materials in stockpiles | - |
| Establishment of onsite fish habitat and compensation measures | - |
| Establishment of onsite aggregate operations | Yes |
| Construction of the starter embankments for the TMF | - |
| Construction and operation of buildings and infrastructure | - |
| Waste management | - |
| Commissioning of the process plant | - |
| Power supply | - |
| Employment and expenditures | - |
| **Operations Phase** | |
| Underground mining | Yes |
| Mining of the LP Central pit | Yes |
| Management of rock and unconsolidated materials in stockpiles | - |
| Process plant operation | - |
| Management of desulphurized tailings in the TMF | - |
| Management of concentrate tailings and contact water in the VMF | - |
| Operation of water management and treatment facilities | - |
| Construction of a MWP | - |
| Operation and maintenance of buildings and infrastructure | - |
| Waste management | - |
| Power supply | - |
| Progressive reclamation activities | - |
| Employment and expenditures | - |

| Project Component / Activity | Vibration |
|---|---|
| **Closure Phase** | |
| Active closure period | - |
| Passive closure period | - (1) |
| Final reclamation period | - (1) |
| Employment and expenditures | - |

Notes:
- : The interaction is not expected to be material, and no further assessment is warranted.
1. Very limited activities will occur during this period over a limited time. The potential effect will be very localized if present.

**Table 7.4-7: Predicted Peak Particle Velocity at nearest PORs from Open Pits**

| Location | Distance (m) | PPV (mm/s) |
|---|---|---|
| Minimum predicted setback distance | 242 | 12.5 |
| Actual distance POR 1 to LP Central pit | 5,233 | 0.09 |
| Actual distance POR 11 to LP Central pit | 6,276 | 0.07 |

**Table 7.4-8: Predicted Peak Particle Velocity at nearest PORs from Quarries**

| Location | Distance (m) | PPV (mm/s) |
|---|---|---|
| Minimum predicted set back distance | 75 | 12.5 |
| Actual distance POR 4 to Quarry 2 | 2,221 | 0.026 |
| Actual distance POR 9 to Quarry 2 | 2,622 | 0.019 |

**Table 7.4-9: Predicted Air Overpressure at nearest PORs from Open Pits**

| Location | Distance (m) | Air Overpressure (dBL) |
|---|---|---|
| Minimum predicted set back distance (per MOE 1978a) | 170 | 128 |
| Minimum predicted set back distance (per HC 2017) | 359 | 120 |
| Actual distance POR 1 to LP Central pit | 5,233 | 93 |
| Actual distance POR 11 to LP Central pit | 6,276 | 92 |

**Table 7.4-10: Predicted Air Overpressure at nearest PORs from Quarries**

| Location | Distance (m) | Air Overpressure (dBL) |
|---|---|---|
| Minimum predicted set back distance (per MOE 1978a) | 131 | 128 |
| Minimum predicted set back distance (per HC 2017) | 353 | 120 |
| Actual distance POR 4 to Q2 | 2,221 m | 102 |
| Actual distance POR 9 to Q2 | 2,622 m | 102 |

**Table 7.4-11: Fish Bearing Waterbodies and Watercourses Evaluated for Vibration Change**

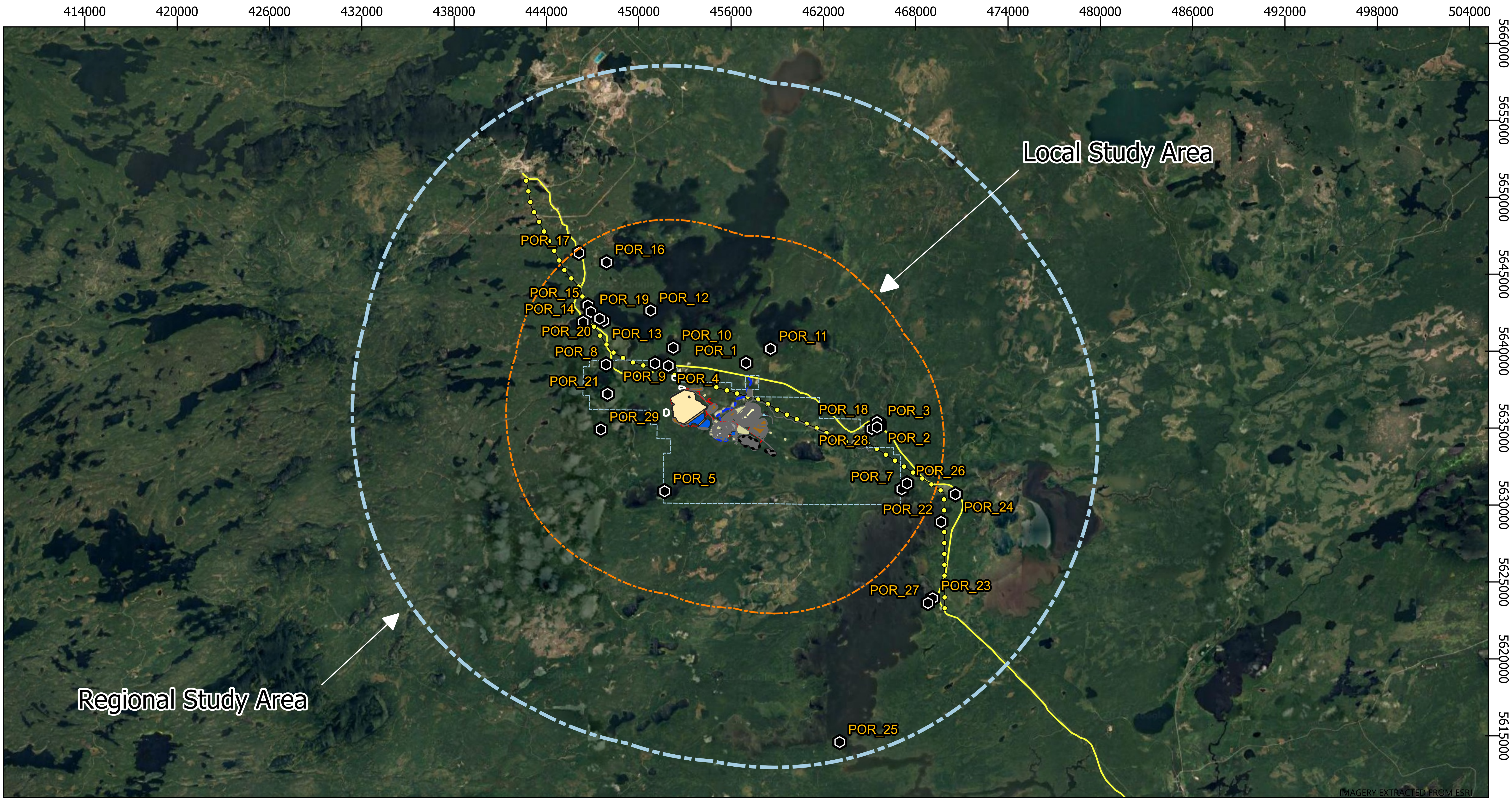
| Receptor Waterbody and Watercourse Name | Fisheries Segment ID (Figure 7.4-2) | Nearest Blasting Location |
|---|---|---|
| Dixie Creek | - | LP Central pit, Viggo pit, underground mine |
| Unnamed Watercourse 1B | IS-4 | Q2 |
| Unnamed Watercourse 3 | IS-35 | LP Central pit |
| Genesee Lake | - | Q1, Q2 |
| Unnamed Waterbody 4 | - | Q2 |
| Unnamed Waterbody 6 | - | Viggo pit |

**Table 7.4-12: Setback Distances to be within DFO Guidelines**

| Blasting Location | Planned Nominal Blasting Charge (kg/delay) | Non-spawning Season Setback Distance (m) | Spawning Season Setback Distance (m) |
|---|---|---|---|
| Viggo pit | 207.6 | 110.7 | 217.5 |
| LP Central pit | 207.6 | 110.7 | 217.5 |
| Quarry Sources 1 and 2 | 41.2 | 49.3 | 96.9 |
| Underground | 10.1 | 24.4 | 47.9 |

**Table 7.4-13: Mitigation Measures for the Control of Blasting Vibration and Overpressure**

| Pathways to Potential Effect / Criteria | Phase | | | Proposed Mitigation Measure |
|---|---|---|---|---|
| | Con | Op | Cl | |
| Changes in ground vibration and air overpressure (mm/s and dB) | • | • | - | Prepare a Blast Management Plan prior to the start of the Project. The plan shall include opportunities for adaptive management, in which the intensity of the control measures would be increase if site inspections and continuous monitoring indicate that implemented measures are insufficient. |
| | • | • | - | Avoid blasting at LP Central pit, Viggo pit and / or underground mine simultaneously. If this is unavoidable, reduce blast charge to minimize impact and / or maintain a monitoring program at the nearest fish habitats. |
| Changes in water overpressure (kPa). | • | • | - | Prepare a Blast Management Plan prior to the start of the Project. The plan shall include opportunities for adaptive management, in which the intensity of the control measures would be increase if site inspections and continuous monitoring indicate that implemented measures are insufficient. |
| | • | • | - | Before any blasting activity starts near Dixie Creek and Unnamed Watercourse 3 (IS-37), perform onsite low-charge blasts to determine the site-specific parameters governing the propagation of ground vibration and water overpressure to impacted fish habitats. These studies shall consider both open pits and underground blasting. The goal is to update predictions using site-specific parameters and adjust mitigation measures before commencing blasting operations. |
| | • | • | - | Avoid blasting at LP Central pit, Viggo pit and / or underground mine simultaneously. If this is unavoidable, reduce blast charge to minimize impact and / or maintain a monitoring program at the nearest fish habitats. |
| | • | • | - | Mitigate impact to fish habitats by satisfying the procedures and recommendations established in the DFO Guideline (Hopky 1998) and the technical paper by Cott and Hanna (Cott 2005). Reduce the weight of explosive charge detonated per delay period to avoid impact to the fish habitats. |




## LEGEND

- Highway 105
- Powerline 115 kV
- Property Boundary
- Truck Haul Routes
- Point of Reception

0 7 14 21 28 35 km

Notes:
-"POR" (Point of Reception) provided by Great Bear Resources May 2025
-"BSR" (Baseline Receptor) from Wood baseline reports
-Site Plan provided by Great Bear Resources in June 2025

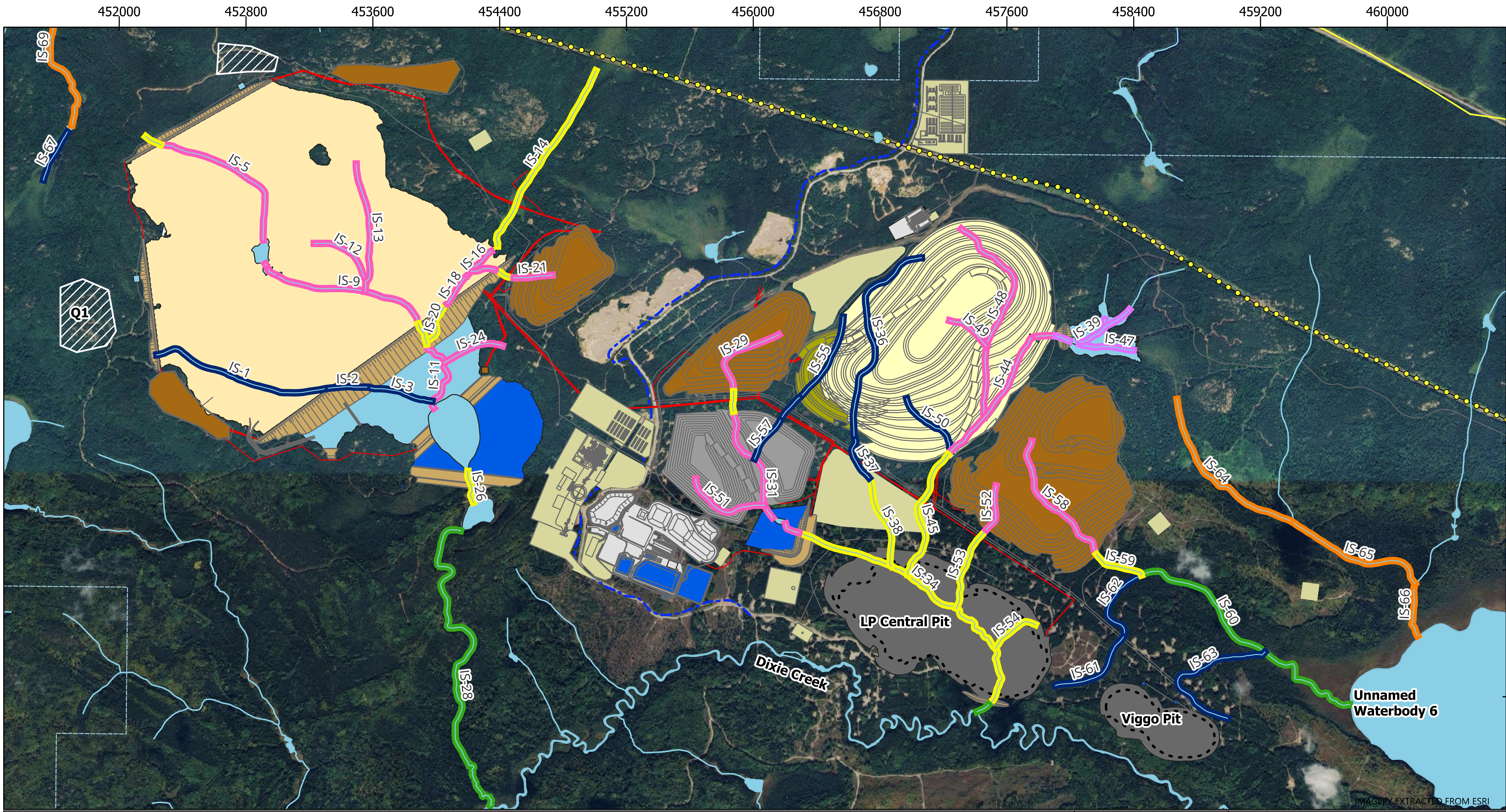
Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Resources**

Study Areas and Point of Reception Locations

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.4-1 |
| SCALE: 1:235895 | DATE: October 2025 |




**LEGEND**

- Tuzyks Road
- Peak Production Phase Haul Route
- Redirected Watercourses
- Redirected Watercourses
- Flow Reduction Watercourses
- Not Fish Frequented
- Flow Increased Watercourse
- Overburden/Bedrock Interface

0 100 200 300 400 500 600 700 800 900 1,000 m

Notes:
-Site plan provided by Great Bear Resources June 2025
-Fisheries Impacted Watercourses provided by WSP April 2025

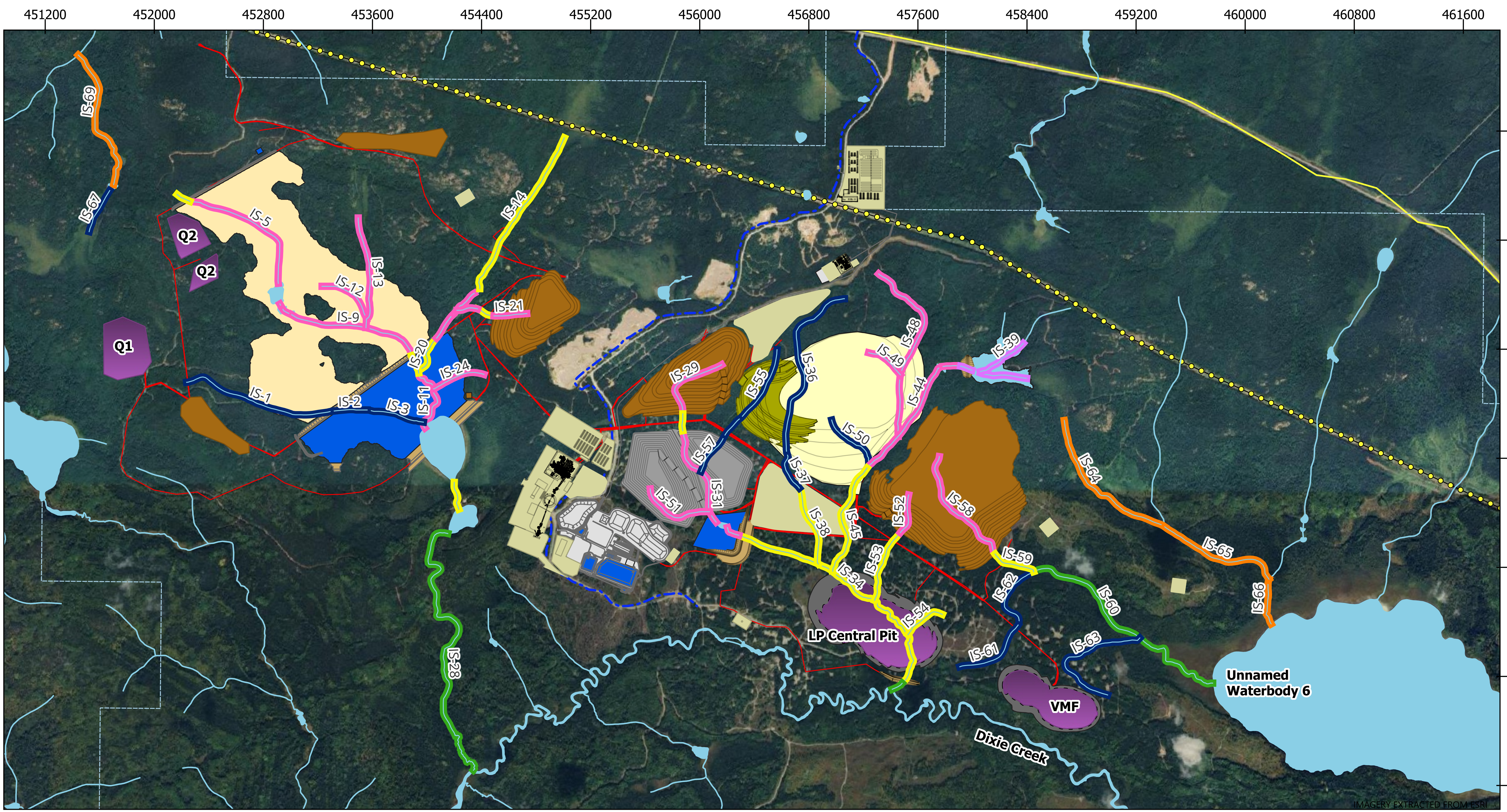
Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Mine**
**Blasting Impact Assessment**

Summary of Fisheries Resources

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.4-2 |
| SCALE: 1:23163 | DATE: October 2025 |




**LEGEND**

- Tuzyks Road
- Construction Phase Haul Route
- Property Boundary
- Redirected Watercourses
- Redirected Watercourses
- Flow Reduction Watercourses
- Not Fish Frequented
- Flow Increased Watercourse
- Overburden/Bedrock Interface
- General Blast Location

0 5 10 km

Notes:
-Site plan provided by Great Bear Resources June 2025
-Fisheries Impacted Watercourses provided by WSP April 2025

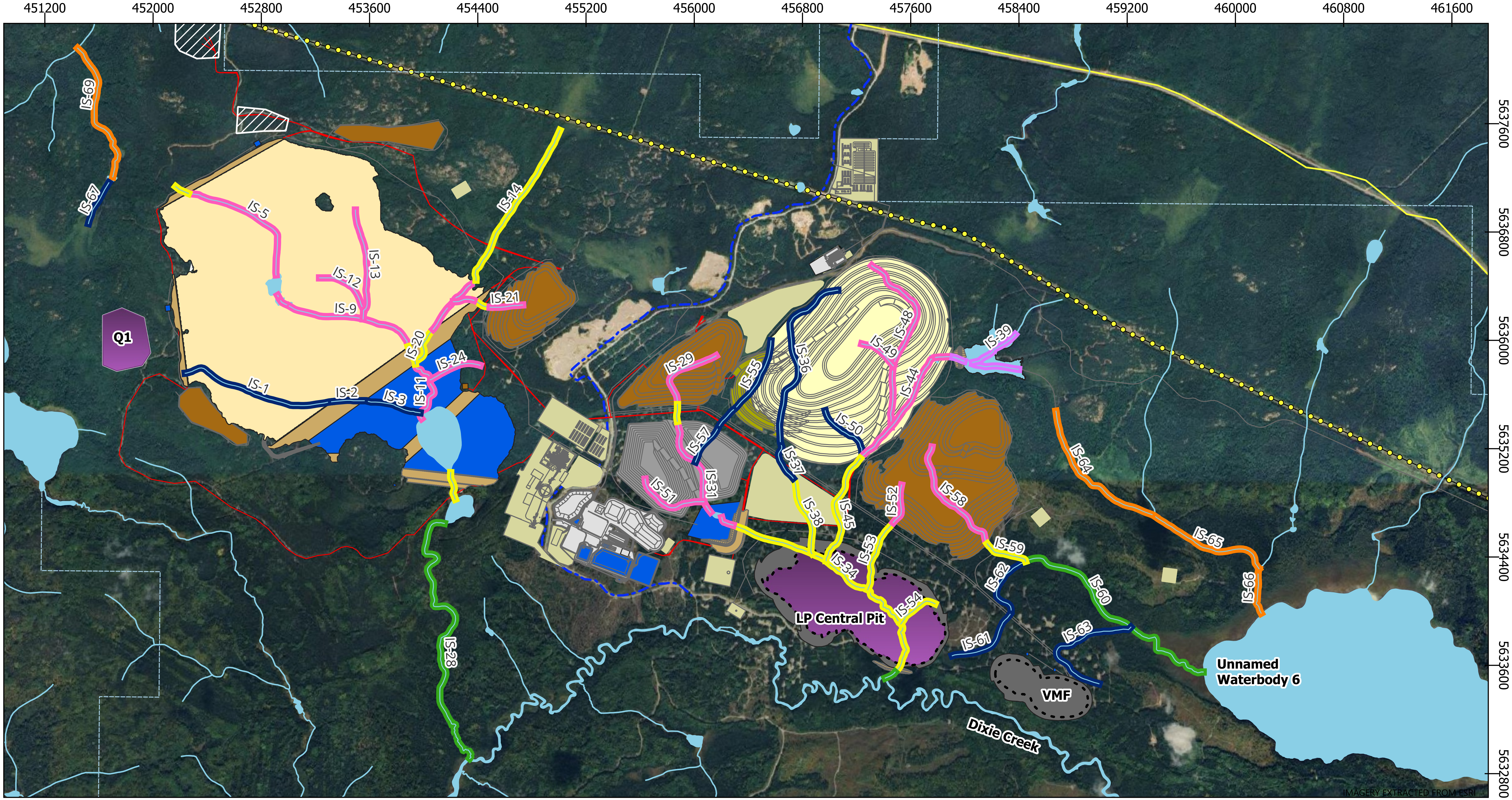
Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Mine**
**Blasting Impact Assessment**

General Blast Locations for Construction Phase

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.4-3 |
| SCALE: 1:26815 | DATE: October 2025 |




**LEGEND**

- Tuzyks Road
- Truck Haul Route
- Property Boundary
- Redirected Watercourses
- Redirected Watercourses
- Flow Reduction Watercourses
- Not Fish Frequented
- Flow Increased Watercourse
- Overburden/Bedrock Interface
- General Blast Location

0 5 10 km

Notes:
-Site plan provided by Great Bear Resources June 2025
-Fisheries Impacted Watercourses provided by WSP April 2025

Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Mine**
**Blasting Impact Assessment**

General Blast Locations

| | |
|---|---|
| PROJECT NO: CA03912 | FIGURE 7.4-4 |
| SCALE: 1:26815 | DATE: October 2025 |

**Figure 7.4-5: Ground Vibration Propagation Curve – Open Pits**

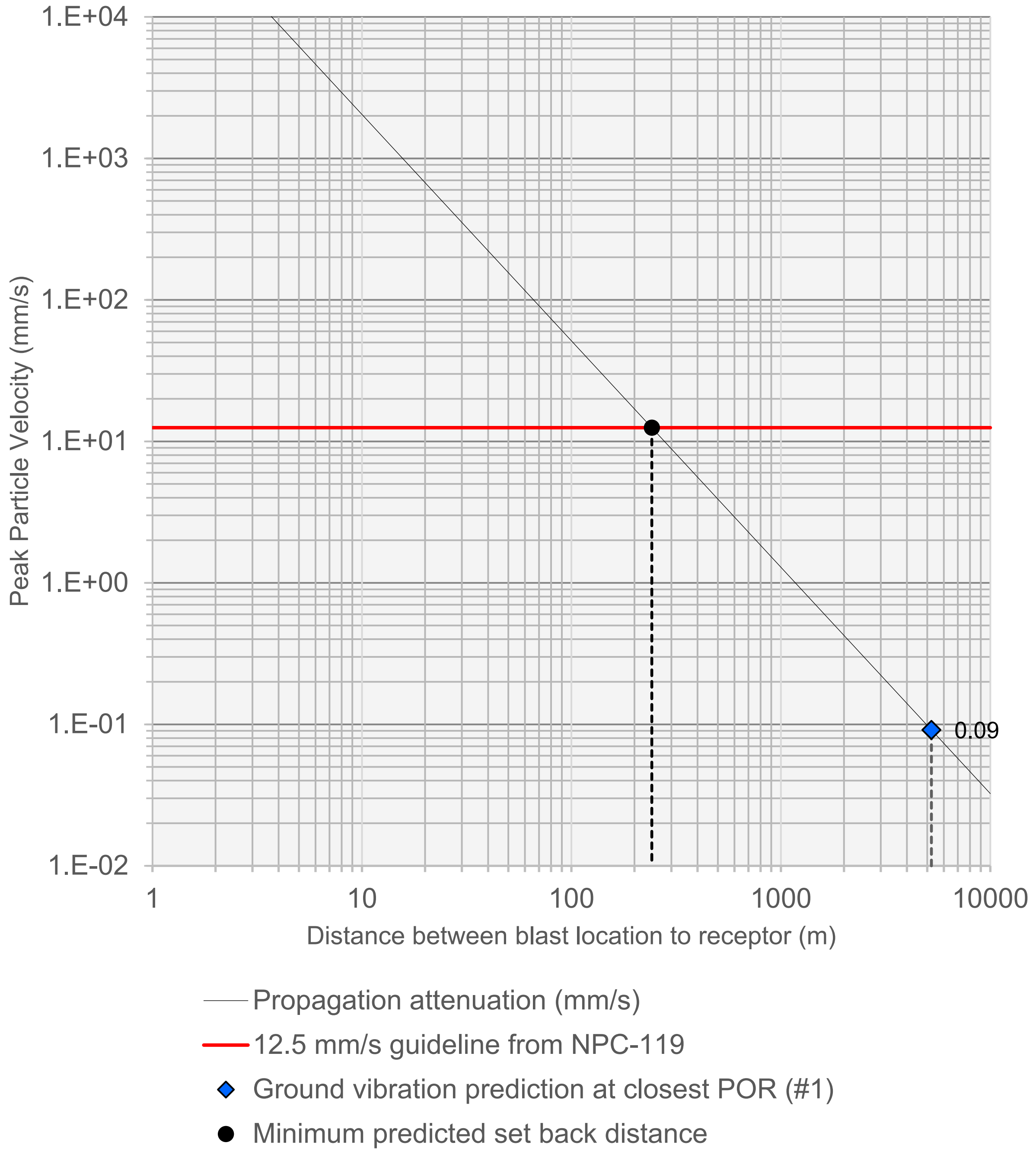
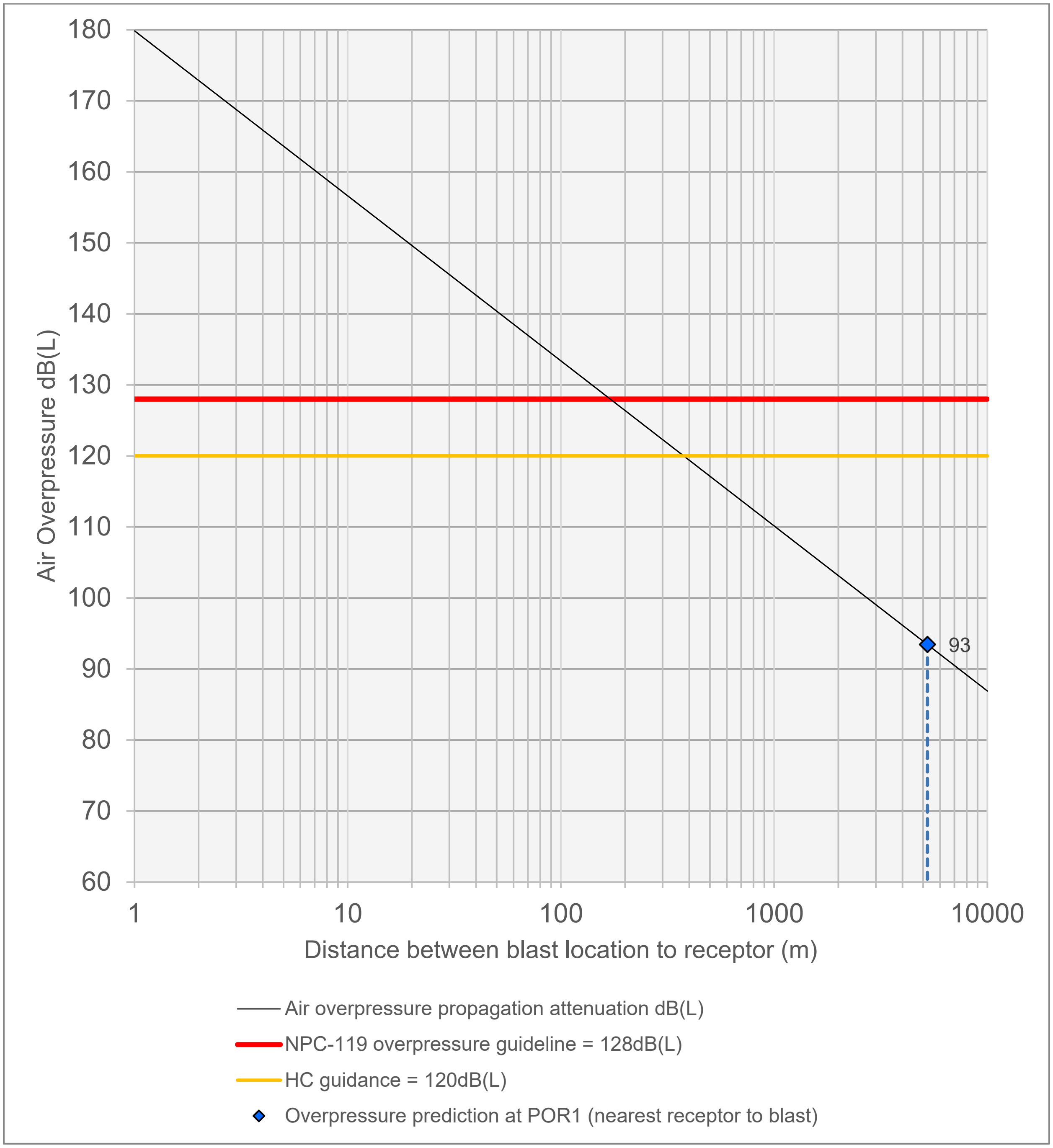
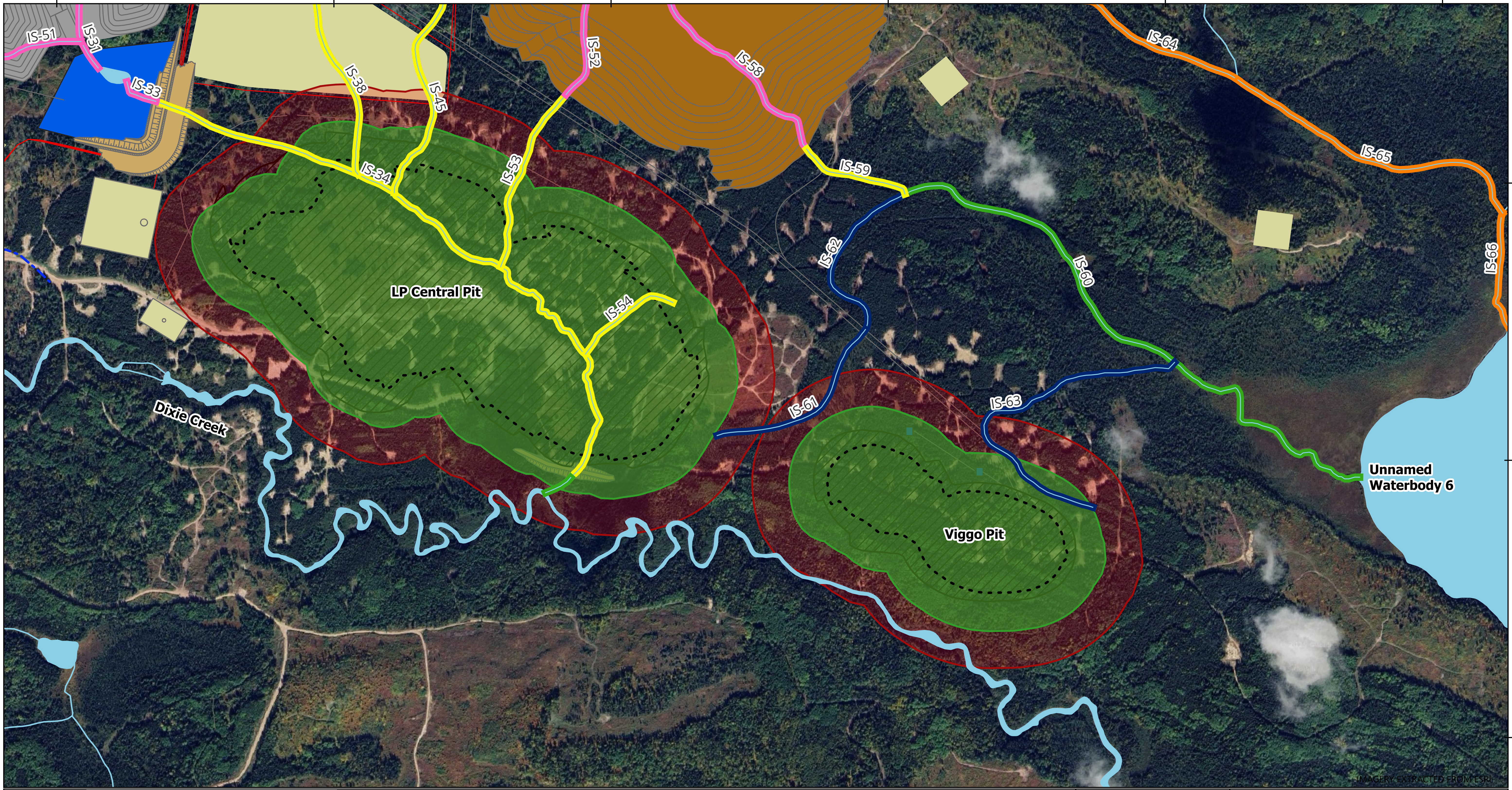


**Figure 7.4-6: Air Overpressure Propagation Curve – Open Pits**






**LEGEND**

- Tuzyks Road
- Redirected Watercourses
- Redirected Watercourses
- Flow Reduction Watercourses
- Flow Increased Watercourse
- Not Fish Frequented
- Truck Haul Route
- Open Pit Footprint
- Overburden/Bedrock Interface
- Blast Impact Area for Non Spawning Periods (Limig = 50 kPa, Charge = 207.6 kg/delay)
- Blast Impact Area for Spawning Periods (Limit = 13 mm/s, Charge = 207.6 kg/delay)

0 250 500 750 1,000 m

Notes:
- Blast Impact Area is calculated using the elevation of the top of Bedrock
- Site Plan provided by Kinross June 2025
-Fisheries Impacted Watercourses provided by WSP April 2025

Datum & Projection:
NAD83 / UTM zone 15N

wood.

**Great Bear Mine**
**Blasting Impact Assessment**

Vibration (Blasting) Zone of Influence

| | |
|---|---|
| PROJECT NO: CA04440 | FIGURE 7.4-7 |
| SCALE: 1:10611 | DATE: October 2025 |