KINROSS Great Bear

Great Bear Gold Project
Impact Statement

Section 8: Analysis of Changes to Fish and Fish Habitat

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Acronyms and Abbreviations

AEX	Advanced Exploration
ANA	Asubpeeschoseewagong Netum Anishinabek
CPUE	Catch per unit effort
CWP	Collection water pond
DFO	Fisheries and Oceans Canada
ESCP	Erosion and sediment control plan
FHOCP	Fish habitat offset and compensation plan
FMZ	Fisheries management zone
fVC	Valued component under federal jurisdiction
GIS	Geographic information system
Great Bear Resources	Great Bear Resources Ltd.
HADD	Harmful alteration disruption or destruction
HEP	Habitat evaluation procedure
ICI	Fish species identified as of Indigenous community importance
K	Condition factor
LGO	Low grade ore stockpile
LSA	Local Study Area
LSFN	Lac Seul First Nation
MDMER	Metal and Diamond Mine Effluent Regulations
MNR	Ministry of Natural Resources
MRS	Mine rock stockpile
MWP	Mine water pond
na	Not applicable
NWOMC	Northwestern Ontario Métis Community
OVB	Overburden stockpile
PA	Project Area
PoE	Pathway of Effects
Project	Great Bear Gold Project
pVC	Pathway valued component
RSA	Regional study area
SAR	Species at risk
TMF	Tailings management facility
VMF	Viggo management facility
WFN	Wabauskang First Nation

8.0 Analysis of Changes to Fish and Fish Habitat

Fish and fish habitat is included as a federal Valued Component (fVC) for the Great Bear Project (Project) because of the identified importance of fish as a resource to Indigenous and non-Indigenous land users; and the established federal regulatory jurisdiction over fish and fish habitat under the *Fisheries Act*. Fish and their habitats are key endpoints to assess and monitor the overall health of the aquatic ecosystem as they reflect potential interactions with other supporting pathway components such as surface water, groundwater, and lower trophic biotic communities. This fVC includes fish, the habitat that supports these fish, and the health of these fish populations.

8.1 Pathway Linkages to other Valued Components

8.1.1 Pathway Linkages to Fish and Fish Habitat

Pathways of effects to fish and fish habitats are listed in the related sections of the Impact Statement, and summarized as follows:

- Vibration (Section 7.4)
- Groundwater (Section 7.5)
- Surface water flows and levels (Section 7.6)
- Water quality (Section 7.7)
- Land and resource use (Section 7.13).

8.1.2 Pathway Linkages from Fish and Fish Habitat to fVCs

Changes to fish and fish habitat may have a linkage and informs the analysis of potential effects to migratory birds and Indigenous Peoples:

- Some migratory birds consume fish and as such may interact with fish populations within the Local Study Area (LSA). Changes to fish habitat, fish communities and fish health and mortality may interact with food availability and quality to migratory birds depending on their reliance to fish as a food source at a localized scale. Migratory birds are assessed in Section 9.
- Fish and fish habitat will interact with Indigenous Peoples, through traditional land and resource use (Sections 10.6, 11.6, 12.6, 13.6 and 14.6), and health (Sections 10.9, 11.9, 12.9, 13.9 and 14.9), as fish are a traditional food for Indigenous Peoples.

8.2 Assessment Approach

The approach to the assessment of potential changes to fish and fish habitat includes:

- Description of the relevant regulatory and policy setting (Section 8.2.1)
- Description of the spatial and temporal boundaries used for fish and fish habitat (Section 8.2.2).
- Identification of criteria and indicators along with the associated rationale (Section 8.2.3)
- An outline of the analytical methodology conducted for the assessment and the key assumptions and use of the conservative approach (Section 8.2.4 and Section 8.2.5)
- Description of the approach to determining significance for fish and fish habitat (Section 8.2.6).
- Influence of consultation and engagement (Section 8.3).

The assessment of potential effects is supported by a description of the existing conditions for fish and fish habitat (Section 8.4), the identification and description of applicable pathways of potential effects (Section 8.5) and a description of applicable mitigation measures (Section 8.6). With the application of mitigation measures to the potential effects on fish and fish habitat, the residual effects are then characterized in Section 8.7.

8.2.1 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 fish and fish habitat are summarized below. Further information regarding anticipated approval requirements is provided in Section 19.

8.2.1.1 Federal

8.2.1.1.1 Fisheries Act

The management of fisheries resources in Canada is under the *Fisheries Act* and is administered primarily by Fisheries and Oceans Canada (DFO). Under Section 34.4(1), the *Fisheries Act* prohibits the carrying on of any work, undertaking or activity, other than fishing, that results in the death of fish. Section 35(1) prohibits any work, undertaking or activity that results in the harmful alteration, disruption or destruction (HADD) of fish habitat. The pollution prevention provisions of the *Fisheries Act* (Section 36) are administered by Environment and Climate Change Canada. The fish and fish habitat protection provisions apply to all fish and fish habitat throughout Canada. Fish habitat as defined in Subsection 2(1) of the *Fisheries Act* includes all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. The types of areas that can directly or indirectly support life processes include but are not limited to spawning grounds and nursery, rearing, food supply and migration areas. Standards and codes of practice developed by DFO under Section 34.2 of the *Fisheries Act* specify procedures, minimum requirements and measures that can be implemented to support the protection of fish and fish habitat. To the extent feasible, proponents are responsible for planning and implementing works, undertakings or activities in a manner that avoids and minimizes impacts to fish and fish habitat.

When impacts to fish and fish habitat cannot be fully mitigated, the works, undertakings or activities may be authorized by the Minister of DFO and the Canadian Coast Guard under Subsection 34.4(2) or 35(2) of the *Fisheries Act*. The authorization includes conditions to mitigate impacts to fish and fish habitat and may include the requirement to offset residual impacts that have not been fully mitigated. The offsetting measures counterbalance impacts to fish and fish habitat due to the work, undertaking or activity with the goal of protecting and conserving fish and fish habitat.

8.2.1.1.2 Metal and Diamond Mining Effluent Regulations

The Metal and Diamond Mining Effluent Regulations (MDMER), developed under Section 36 of the *Fisheries Act* and administered by Environment and Climate Change Canada, regulates the deposit of mine effluent into natural waters frequented by fish. Schedule 4 of the regulations define the authorized limits for discharging effluent from mining operations. The requirements for an environmental effects monitoring program for mining operations are specified in Schedule 5. A natural waterbody frequented by fish may be listed under Schedule 2 for use as a tailings impoundment, and would require fish habitat compensation for the loss of fish habitat.

8.2.1.1.3 Species at Risk Act

The responsibility for aquatic species under the federal *Species at Risk Act* is delegated to the DFO and the Canadian Coast Guard by the Minister of Environment and Climate Change. The *Species at Risk Act* prohibits killing, harming, capturing or harassing species listed as endangered, threatened or extirpated and provides protection for habitat that supports these species. There are no federally designated aquatic species at risk (SAR) identified as present at the Project Area (PA) and none occur in the LSA or Regional Study Area (RSA).

8.2.1.1.4 Fish and Fish Habitat Protection Policy Statement

The Fish and Fish Habitat Protection Policy Statement (DFO 2019) outlines how DFO will implement the fish and fish habitat protection provisions of the *Fisheries Act*. In particular, the statement sets out how DFO interprets and will apply the regulatory and non-regulatory tools available to support the effective and efficient conservation and protection of fish and fish habitat.

8.2.1.1.5 Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat

The Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat (DFO 2025a) provides guidance on the use of offsetting measures to counterbalance the death of fish or the harmful alteration, disruption or destruction of fish habitat. The Policy expands upon the information provided on offsetting measures in DFO's fish and fish habitat protection policy statement, and provides a hierarchy of measures as follows:

- Avoid: Temporary or permanent changes to fish and fish habitat are to be avoided whenever possible
- Mitigate: When pressures on fish and fish habitat cannot be avoided, apply mitigation measures to reduce their spatial scale, duration and intensity

- Offset: Consider opportunities to counterbalance harmful impacts to fish and fish habitat through the implementation of offsetting measures) only after options to avoid and mitigate have been exhausted.

8.2.1.2 Provincial

8.2.1.2.1 Endangered Species Act

The provincial *Endangered Species Act* is administered by the Ministry of the Environment, Conservation and Parks and has provisions for the protection of provincially listed SAR. On June 5, 2025, the Province of Ontario passed Bill 5: Protecting Ontario by Unleashing our Economy Act, 2025, which included amendments to the *Endangered Species Act* that are now in force, and the creation of the *Species Conservation Act* which is not yet in effect. There are no provincially designated aquatic SAR identified as present at the Project site, and none occur in the PA, LSA or RSA.

8.2.1.2.2 Lakes and Rivers Improvement Act

The provincial *Lakes and Rivers Improvement Act* is administered by the Ministry of Natural Resources (MNR) and the Ministry of Energy and Mines and has provisions for the protection of the management, protection, preservation and use of the waters of the lakes and rivers of Ontario and the land under them. Approval under the Act is required for the construction of structures that hold back or divert water, including tailings dams, dikes and culverts. An approval issued under the *Lakes and Rivers Improvement Act* may include conditions related to the management and use of fish dependent on the natural amenities of the lakes and rivers and their shores and banks.

8.2.1.2.3 Ontario Provincial Fish Strategy

The management of fisheries in Ontario has been delegated to the Provincial government under the *Fisheries Act*. The Ontario Provincial Fish Strategy is a guiding document for managing fisheries resources in Ontario (MNR 2025). It identifies provincial fisheries goals, objectives and tactics to achieve them. The main purposes of the strategy are to improve the conservation and management of Ontario's fisheries resources; and to promote, facilitate and encourage fishing as an activity that contributes to the nutritional needs, and the social, cultural and economic well-being of individuals and communities in Ontario. The strategy provides management direction to MNR staff and will better position the ministry to respond to evolving environmental, economic, social, technological and policy challenges facing fisheries in Ontario.

8.2.2 Spatial and Temporal Boundaries

The spatial boundaries used for the assessment of the potential effects on fish and fish habitat are defined as follows:

- PA: is the Project footprint including all temporary and permanent areas associated with the mine site development, as well as an outside buffer of approximately 250 m, in order to allow for flexibility for design optimizations prior to construction and over the mine life (Figure 6.4-1).
- LSA: is defined as the area beyond the Project footprint where project direct and indirect effects may extend, taking into account the Project footprint, drainage patterns, potential changes to flow, groundwater systems, and the known fish species present in the area

with consideration of their habitat needs and movements. The LSA for fish and fish habitat is shown in Figure 8.2-1 and includes sub-watersheds of Dixie Creek that intersect with the PA. The north boundary of the LSA is defined as the southern edge of Highway 105 as the linear corridor and associated ditching dictates drainage patterns and flow direction. The LSA also includes the Chukuni River upstream to the Snowshoe Rapids Dam, which is a barrier to fish movement, and downstream to Pakwash Lake.

- RSA: encompasses the PA and LSA and where appropriate, extends further to support a regional context in the assessment of potential Project effects. It is the maximum geographical extent or zone of influence in which potential effects from the Project are assessed. The RSA for fish and fish habitat includes the LSA with an extension within the Dixie Creek watershed to include Dixie Lake and Hiewall Lake and an upstream extension along the Chukuni River to include Two-Island Lake, Gull Rock Lake, Keg Lake and Red Lake, as well as a downstream extension to include Pakwash Lake and the Chukuni River to its confluence with the English River (Figure 8.2-2).

Potential methylmercury contamination of fish and water has been identified as a concern for human health by Indigenous communities. The study areas for the fVC fish and fish habitat account for potential Project interactions, including effluent discharge that could result in changes to fish and fish habitat including fish health. In recognition of the concerns expressed by Indigenous people a Mercury Study Plan was developed to monitor total mercury and methylmercury from a more extensive area that extends along the downstream flow pathway through the English River system (Appendix T). Potential changes to human health including consideration of mercury are assessed in Appendix N.

Potential effects were assessed for each Project phase (i.e., construction, operations and closure). 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
- Operations phase:
  - Years 1 to 26, during Year 1 the Project will transition from construction into operations and will not be at full capacity
- 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 and site waters are acceptable for passive release to the environment.

8.2.3 Assessment Criteria

In undertaking the assessment of potential effects to fish and fish habitat, changes to the following criteria were used:

- Fish habitat
- Fish communities
- Fish health and mortality.

The specific criteria, indicators and the rationale for the selection of criteria are described in Table 8.2-1.

8.2.4 Analytical Methods

The assessment of the potential effects on fish and fish habitat from the Project has been completed in accordance with commonly used industry standard methods. Methods include the use of geographic information systems (GIS) to compare existing spatial conditions to proposed conditions, models to predict changes to important attributes such as stream flow and water elevations; and lab analysis to measure and monitor chemical composition of media such as water, sediments and fish tissue. Methods used for the assessment of fish and fish habitat included the following:

- The areal extent of fish habitat affected by the Project was determined using GIS mapping of disturbed or overprinted areas compared to existing conditions. The existing watercourse and waterbodies were delineated from the current Ontario hydro network databases layers available through Geospatial Ontario (Appendix L-1).
- Field surveys provided fine scale measurements such as creek dimensions, water depth, substrate compositions, habitat morphologies and vegetations. Habitat areas were then either calculated by GIS for waterbodies, and or calculated by multiplying the GIS measured creek length by the field determined width (e.g., bankfull width; Appendix L-1).
- Flow reductions to watercourses and waterbodies were estimated based on the calculated changes to the drainage areas and reduction to baseflow using modelled groundwater interactions as reported in the receiver water balance report (Appendix I-3). Runoff generated from the natural watersheds were estimated by prorating flows from long-term flow statistics from representative Water Survey of Canada gauges. A three-dimensional groundwater flow model for the site was developed and calibrated to the site current conditions using steady-state baseline data (Appendix H-2). The calibrated model was then used to predict the effects of Project development on local groundwater and surface water.
- Fish communities and abundance were determined using fish sampling surveys that were completed in waterbodies potentially affected by the Project (Appendix L-1). Fish sampling was completed over multiple years and seasons to evaluate fish species, relative abundance and health. Fish abundance, biomass and health (condition factor) were calculated from the localized project area sampling, and from provincial standard Broadscale Monitoring data for Pakwash Lake and Gullrock Lake and used in the assessment of potential effects on fish and fish habitat.
- To provide a standardized, quantifiable approach to the assessment of fish habitat, a habitat evaluation procedure (HEP) was used and converted habitat types of variable

quality and quantity into standardized habitat units, based on habitat suitability indices for species within the local waterbodies (Appendix L-2).

- Fish tissue contaminant levels were sampled and analyzed using industry standard procedures and accredited qualified laboratories with concentrations expressed in mg/kg wet weight except for selenium which is expressed in mg/kg dry weight (Appendix L-1), including but not limited to methylmercury. The change in fish tissue contaminant levels during the Project is determined with the human health and ecological health risk assessment (Appendix N-1) and compared to baseline conditions.
- Sediment and surface water quality was sampled and analyzed using industry standard approaches and qualified laboratories (Appendix L-1). Potential changes in water quality were modelled and compared the results to the applicable regulatory guidelines for the protection of aquatic life (e.g., Canadian Water Quality Guidelines for the protection of aquatic life and Provincial Water Quality Objectives for the protection of aquatic life); (Appendix K-3).
- Potential effects of using explosives near fish frequented waters was determined through calculating the instantaneous pressure change (overpressure kPa) and vibration (peak particle velocity in mm/s) on fish from the use of explosives within the PA (Appendix F).

8.2.5 Assumptions and the Use of the Conservative Approach

A conservative approach was used to support the assessment of potential effects for fish and fish habitat including the following assumptions:

- The PA considers the maximum footprint of the mine site for the evaluation of fish habitat effects as well as an outside buffer to allow flexibility for design optimizations prior to construction and over the mine life.
- All areas within the PA that are overprinted were assumed to have a complete loss of fish habitat and areas require offsetting measures even if remnant channel sections may persist through the Project.
- Fish have been assumed to be present throughout the entire habitat area if identified elsewhere in any one portion of the watercourse.
- As a precautionary measure, watercourses and waterbodies that were originally considered not fish occupied (no fish captured or habitat unlikely to support fish), were reclassified as potentially fish frequented in baseline study (see addendum in Appendix L-1) and assumed as fish frequented in the effects assessment, such that all watercourses and waterbodies are included for authorization under Paragraph 34 and 35 of the *Fisheries Act* or for listing on Schedule 2 of the MDMER.
- Changes to streamflow greater than 10% to 15% of the natural flow were assumed to have alteration effects on fish and fish habitat unless additional detailed assessment predicts otherwise. This approach is consistent with Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada (DFO 2013).
- A threshold value of 50 kPa for overpressure (Cott and Hanna 2005) was used in the assessment potential blasting effects to fish compared to the 100 kPa value referenced in previous DFO effects guidance (Wright and Hopky 1998).

- Where there is uncertainty in the potential effects on fish habitat, a precautionary approach was taken, and it was assumed that effects would occur and mitigation measures were developed.

Additional conservative assumptions related to groundwater, surface water flows and levels, and water quality pVCs are detailed in Section 7.5, Section 7.6 and Section 7.7 respectively.

8.2.6 Approach to the Determination of Significance

The residual effects for fish and fish habitat if applicable, are characterized in terms of the following attributes:

- Magnitude
- Geographic extent
- Duration
- Frequency
- Reversibility
- Timing.

These attributes along with the rankings are further described in Table 8.2-2.

In addition, the residual effects for fish and fish habitat are characterized according to the ecological and / or social context within which the fVC is found. This is a qualitative measure of the sensitivity and / or resilience of the fVC is to potential change. The following ranking is applicable:

- Level I: the fVC may or may not be sensitive but is capable of supporting the predicted change with typical mitigation measures
- Level II: the fVC is sensitive and requires special measures to support the predicted change
- Level III: the fVC is sensitive and unable to support the predicted change even with special measures.

As noted in Section 6.6, a residual effect is defined as significant if both of the following criteria are satisfied:

- A Level II or III rating is attained for all of the attributes involving magnitude, extent, duration, frequency and reversibility
- A Level II or III rating is attained for ecological and / or social context.

Conversely, if a Level I rating is achieved for any of the attributes involving magnitude, extent, duration, frequency or reversibility; or, if a Level I rating is achieved for the ecological and / or social context, then the residual effect is considered to be not significant.

In the event there is a significant adverse effect, the likelihood of occurrence is further described.

Table 8.2-1: Criteria and Indicators for Fish and Fish Habitat

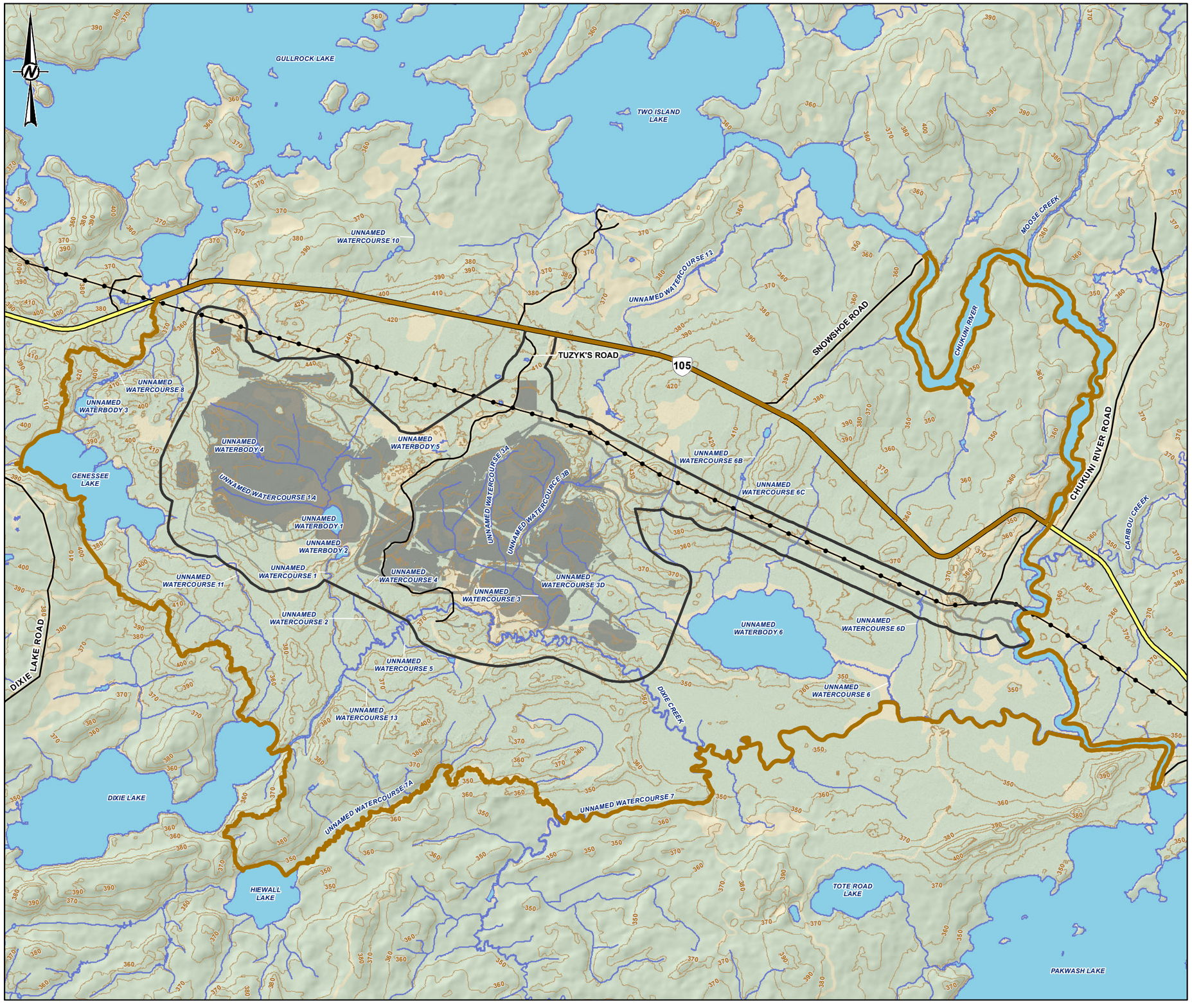
Criteria [1]	Indicator	Rationale
Changes to Fish Habitat	• Change in area of waters frequented by fish (measured in m^2 and / or ha) • Change in flow from baseline condition (measured in percent reduction), or water level change from baseline condition (measured in m)	• Fish habitat is a quantitative measure (e.g., hectares or habitat units) of the available habitat that fish rely on for their life cycle and was selected as a criterion because project works have the potential to cause a decrease in existing fish habitat through direct or indirect means. The potential loss of habitat area can occur from direct overprinting, such as the development of the open pits and stockpiles, or the indirect loss of area from a reduction in flow or access that alters the habitat to an extent that the resident fish can no longer use it for their required life functions.
Changes to Fish Communities	• Change in relative abundance of fish species • Change in fish community structure measured as number of species and percent species composition	• The selection of fish communities as a criterion reflects potential changes to the environments in which the fish live that may alter the relative abundance and species composition of the fish community. Although health of the individual fish remains constant, the fish community may change to reflect differences in overall carrying capacity or species-specific factors. Work in or around water can cause direct mortality of fish. The use of explosives can cause lethal or sub-lethal effects on fish eggs and larval fish. In addition, water intakes may impinge or entrain fish during operation. As well, the movement of fish from isolated areas to existing fish habitat may result in changes in fish communities.
Changes to Fish Health [2]	• Change in water quality, measured in mg/L or µg/L • Change in fish tissue contaminants measured in mg/kg wwt with exception of selenium which is in mg/kg dwt) • Change in fish growth (measured as length and weight at age and condition factor)	• Fish health was selected as a criterion to account for potential changes to the quality of fish habitat which could result in an increase to contaminants in fish including methylmercury identified of particular Indigenous interest; and or affect the condition of fish such as growth metric (length and weight at age).

Notes:
1. Change is considered as values beyond the natural variation and / or baseline conditions.
2. Water samples were collected and analysed for baseline methylmercury concentrations within PA as well as an extended downstream flow pathway through the English River system during 2025. The results are reported within the dedicated mercury study (Appendix T) and / or future monitoring reporting.

Table 8.2-2: Significance Determination Attributes and Rankings

Attribute	Description	Category
Magnitude (See also Table 6.6-3)	A qualitative or quantitative measure to describe the size or degree of the residual effects relative to baseline conditions	• Level I: Measurable residual effect on fish habitat, fish community or fish health that would be offset with measures implemented in an approved offset plan as required under the *Fisheries Act* • Level II: Measurable residual effect on fish habitat, fish community or fish health that would not be offset with measures implemented in an approved offset plan as required under the *Fisheries Act* and / or may affect the sustainability of local fish populations • Level III: Measurable residual effect on fish habitat, fish community or fish health that would not be offset with measures implemented in an approved offset plan as required under the *Fisheries Act* and / or may affect the sustainability of regional fish populations
Geographic Extent	The spatial extent over which the residual effect will take place	• Level I: Effect is restricted to the LSA • Level II: Effect extends beyond the LSA but within the RSA • Level III: Effect extends beyond the RSA
Duration	The time period over which the residual effect will or is expected to occur	• Level I: Effect occurs over the short term: less than or equal to 3 years (1) • Level II: Effect occurs over the medium term: more than 3 years but less than 32 years (1) • Level III: Effect occurs over the long term: greater than 32 years (1)
Frequency	The rate of occurrence of the residual effect	• Level I: Effect occurs once, infrequently (or not at all) • Level II: Effect occurs intermittently or regularly • Level III: Effect occurs frequently or continuously
Reversibility	The extent to which the residual effect can be reversed	• Level I: Effect is fully reversible during the Project phases • Level II: Effect is partially reversible during the Project phases • Level III: Effect is not reversible during the Project phases
Timing	A measure of whether the residual effect occurs during a sensitive period of the year	• Level I: Effects do not occur during a sensitive period or related effects are fully mitigated • Level II: Effects occur during a sensitive period and are partially mitigated • Level III: Effects occur during a sensitive period and are not mitigated

Note:
1. These timelines approximately align with the Project: construction phase is approximately 3 years, operations phase is approximately 26 years and the active closure period is an additional 3 years.



LEGEND

- GREAT BEAR PROJECT FOOTPRINT
- PROJECT AREA
- LOCAL STUDY AREA FOR FISH AND FISH HABITAT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- CONTOURS (10 M INTERVAL)
- WATERCOURSE
- WATERBODY

0 0.75 1.5 3

1:61,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. CONTOURS ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF), 2022 AND DERIVED FROM 2022 LIDAR PROVIDED BY GREAT BEAR RESOURCES
3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
4. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
LOCAL STUDY AREA FOR FISH AND FISH HABITAT

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.2-1

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

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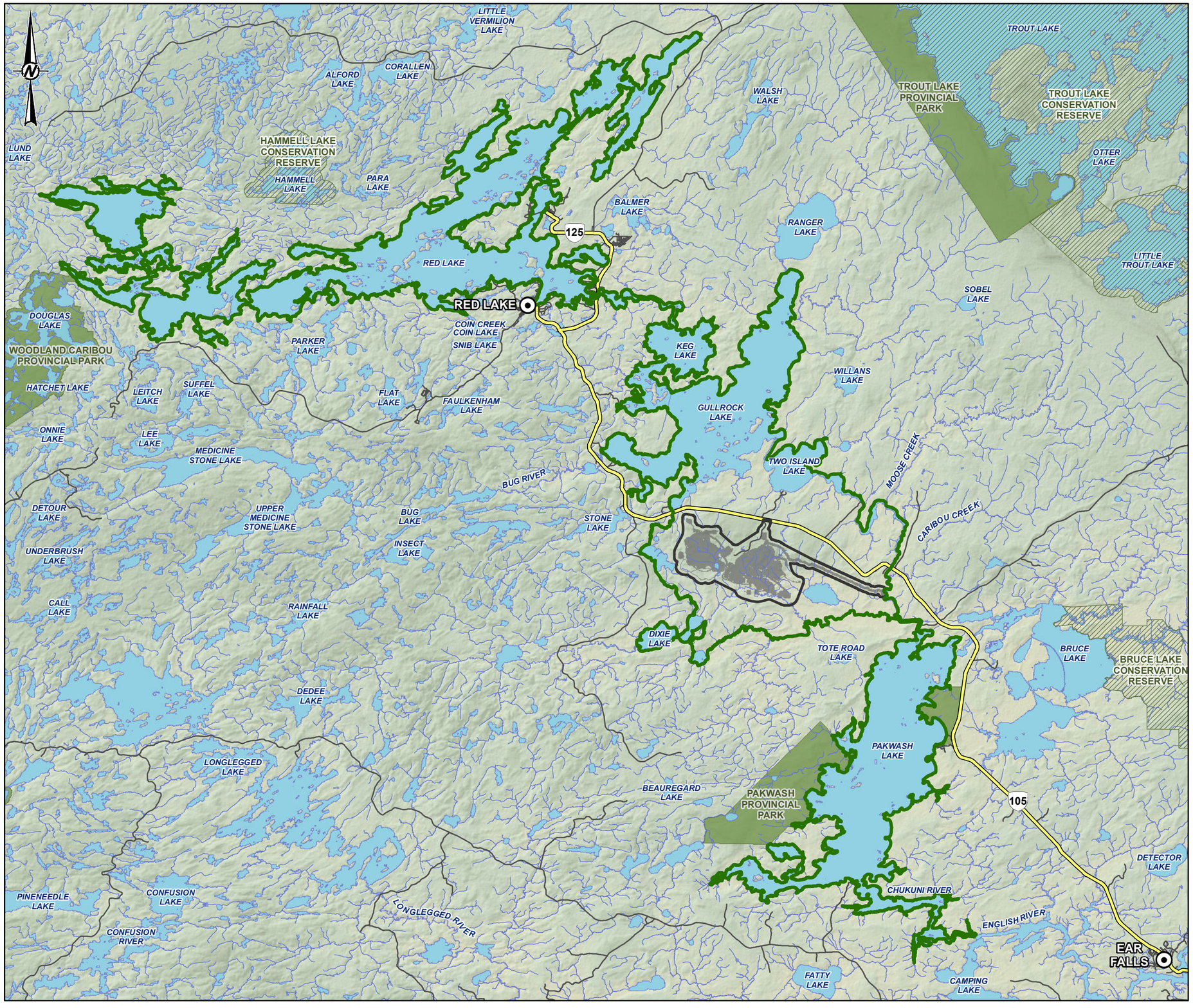

LEGEND

- GREAT BEAR PROJECT FOOTPRINT
- PROJECT AREA
- REGIONAL STUDY AREA FOR FISH AND FISH HABITAT
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

0 2.5 5 10

1:250,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

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

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
REGIONAL STUDY AREA FOR FISH AND FISH HABITAT

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.2-2

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8.3 Influence of Consultation and Engagement

Consultation and engagement have been ongoing for several years prior to and throughout the preparation of the Impact Statement and will continue over the life of the Project. Section 3 provides a summary of the extensive consultation and engagement process to date. The record of consultation (Appendix C) includes detailed comments received, and responses provided, during the development of the Impact Statement. Feedback received through consultation regarding fish and fish habitat has been addressed through direct responses (in writing and follow-up meetings) and incorporated into the Impact Statement, including this section as appropriate.

Great Bear Resources Ltd. (Great Bear Resources) has continued to engage with stakeholders as the Project progresses, to gather information needed to determine potential impacts to fish and fish habitat (positive and negative) of the Project on the interests of stakeholders that may be affected. Comments received through engagement and consultation has been addressed through direct responses (in writing and follow-up meetings) and incorporated into the Impact Statement as appropriate. Key comments and messaging that influenced the assessment for fish and fish habitat are provided below, organized by topic with a description of how the comment influenced the assessment and where the information can be found in the Impact Statement.

Focused workshops to inform mitigation (i.e., fish habitat offset and compensation) were held with Lac Seul First Nation (LSFN) and Wabauskang First Nation (WFN) between February 18 to 20, 2025 to provide information to participants and receive ideas regarding the preferred type and locations of fish habitat offsets. Information that was used during these workshops was also shared with the Asubpeeschoseewagong Netum Anishinabek (ANA) Lands Protection Team for review and comment, however no response has been received to date. Great Bear Resources also offered a focused workshop to the Northwestern Ontario Métis Community (NWOMC); however, they were unable to accommodate the request, although provided input via a confidential report prepared on behalf of NWOMC. This knowledge gained through the workshops and confidential Indigenous knowledge and land use reports, were incorporated in the draft Fish Habitat Offsetting and Compensation Plan (FHOCP; Appendix L-2).

Attendees from WFN at the February 18 to 20, 2025 workshops expressed concern and comments regarding the following topics:

- Trout populations and potential declines in current populations, identified a potentially the result of water temperatures, climate change and vegetation removals. These topics are addressed in Section 8.4.2, Section 8.5.3, Section 8.6 and Section 8.7.2. Lake Trout distribution is discussed in Section 8.4.
- Presence of Sturgeon in Red Lake historically with a follow up study was suggested to determine ancestral fish distribution. Lake Sturgeon distribution is discussed in Section 8.4.
- Fish spawning potential in Dixie Creek. WSP confirmed three known spawning locations in Dixie Creek with suitable conditions for Walleye and Lake Whitefish; and that Chukuni River at Snowshoe Dam, is a known area for spawning during the workshop.
- Would DFO be in favour of a restocking effort to meet compensation requirements, if it was to support subsistence lifestyles of Indigenous people. Potential compensation measures are presented in the FHOCP (Appendix L-2).

- Current Lake Trout retention restrictions. WSP clarified that there are currently fishing restrictions for Lake Trout.
- Interest from the community on fishing the area post remediation, if it was sustainable. The Lake Trout revitalization program and populations lag times are discussed within the FHOCP (Appendix L-2).
- A community member commented that Walleye is getting harder to find on Wabauskang Lake. WSP provided relevant information and data regarding Walleye catch results and Walleye stocking is considered as a complimentary measure within the FHOCP (Appendix L-2).
- Indigenous knowledge and land use has identified the following species as long being harvested by WFN: Walleye, Whitefish, Lake Trout, Muskie (Muskellunge), Bass, Pike, Sucker, Jackfish and Perch across the region.
- Fishing for harvest is practiced year-round and includes watercourses and waterbodies such as: Gullrock Lake, Two Island Lake, Dixie Lake, Chukuni River, Wabauskang Lake, Perrault Lake, Wegg Lake, Oak Lake, Maynard Lake, Tide Lake and Indian Lake.

Community members from LSFN expressed concerns and comments during a workshop held on February 20, 2025 regarding the following:

- Clarity was sought on the differences between compensation and offsetting. This was discussed in person at the event and is also presented in Appendix L-2.
- Impacts to waterways through overprinting of the Project. These impacts are detailed in Sections 8.5 to 8.8.
- Regarding discharge water quality. Impacts to water quality are presented within Section 7.7 and changes in water quality in relation to fish is presented in Section 8.5 to Section 8.8.
- Confirmation sought if Unnamed Waterbody 6 would be impacted by the Project. Unnamed Waterbody 6 is outside of the PA, no material effects are anticipated to Unnamed Waterbody 6 as detailed in Section 8.7, Table 8.7-1 to Table 8-7.3.
- Concern regarding the environmental conditions, location of proposed ponds and water quality at closure. As discussed in the workshop, the remediation will not bring watercourses and waterbodies back to original condition, but the approach will return the environment to a naturalized state, including through the mitigation and enhancements presented in Section 8.6 and Section 8.7, and approach to closure presented in Section 5.19 and Appendix S.
- Concern regarding the location of potential compensation measures and how the compensation pond may impact flows to Unnamed Waterbody 6. Impacts to flows are presented in Section 8.7 and Table 8.7-2.
- A confidential Indigenous knowledge and land use study prepared for LSFN has identified the following species as species of importance: Trout (from Red Lake), Sucker, Bass and Shiner Minnows. Waterbodies and watercourses of importance include: Red Lake, Chukuni River, Trout Lake, Unnamed Waterbody 6, Pakwash Lake and Dixie Lake.

Representatives of the LSFN and WFN requested mapping showing sampling locations (pers. comm 2025). This information was provided by email and is presented in Figure 8.4-5.

Additional workshops were held on October 22 and 24, 2025 with LSFN and WFN community members to obtain feedback on the proposed fisheries offsetting and contingency measures. Feedback was incorporated into the Impact Statement and FHOCP as appropriate.

Concerns were received from the ANA Lands Protection Team and community (pers. comm. 2025), that included concern regarding changes to harvesting practices and potential production of methylmercury from associated with the Project, including from the treated effluent discharge to the Chukuni River. Changes to fish production and fish tissues are presented in Sections 8.7 and Appendix L-2. Additional information on methylmercury is presented in Section 8.2.2, Section 8.3.1 and Section 8.4.3. A mercury bioaccumulation study is provided in Appendix T, that was prepared in response to the Tailored Impact Statement Guidelines.

From the confidential report on Indigenous knowledge and land use prepared for NWOMC, the Métis peoples shared the following information:

- Aquatics land use resources include but are not limited to: Bass, Pike, Perch and Walleye
- Fishing includes non-commercial harvesting in areas such as Dixie Lake and Pakwash Lake
- Water including lakes, rivers and streams have been used by NWOMC peoples for generations as a means of travel and trade
- Waterways are indicated as an important network for hunting, fishing, trapping, travel and overnight stays.

These spatial boundaries include watercourses and waterbodies that were noted to be of Indigenous community concern including: Gullrock Lake, Two Island Lake, Pakwash Lake, Chukuni River, Waterbody 6 and Dixie Lake. No Project-related effects are predicted to Red Lake and / or Trout Lake also identified of concern, both of which are outside of the PA and flow pathway.

8.4 Existing Conditions

A description of the baseline conditions is presented below to characterize the existing conditions for fish and fish habitat and is based on secondary source information and robust field studies conducted between 2022 and 2025, including as summarized in Table 8.4-1 and Table 8.4-2. The existing conditions are used to support the assessment of potential effects from the Project on fish and fish habitat and will support long-term monitoring for the Project. Further baseline information on fish and fish habitat, including a detailed description of the methods used, can be found in the technical support documentation (Appendix L-1 and Appendix L-3).

The Project is primarily situated within the Dixie Creek watershed which feeds into the Chukuni River and eventually drains into Pakwash Lake. The proposed Project footprint (approximately 18 km^2) comprises of roughly 0.4% of the Chukuni River watershed (4,801 km^2), upstream of Pakwash Lake. The Chukuni River drains to the larger English River downstream of the RSA and ultimately into Hudson Bay as part of the Nelson River primary watershed (MNR 2014a). Both the Chukuni river and the English River are regulated by dams in the vicinity of the Project. The Snowshoe Rapids Dam, managed by the MNR, is located on the Chukuni River, upstream of the Project at the northern extent of the LSA. This dam regulates water levels upstream to Red Lake. The Ear Falls generating station is located on the English River, approximately 20 km upstream the Chukuni River confluence, while the Manitou Falls generating station is located approximately 14 km downstream of the confluence. Both generating stations and the Snowshoe Rapids dam are considered complete barriers to upstream fish movement (Figure 8.4-1).

The Project is within the MNR Fisheries Management Zone 4 (FMZ4; MNR 2014a). There are over 22,500 lakes and 44,315 km of rivers and streams which cover more than 17% of the total area in permanent water within FMZ4. The most common sport fish species within FMZ4 include Walleye, Northern Pike, Lake Trout, Yellow Perch, Smallmouth Bass, Muskellunge, and Lake Whitefish (MNR 2014a). Lakes in FMZ4 are generally characterized as having intermediate depth; medium mean surface area; stained water; and warm thermal regime (Cano and Parker 2007, as cited by MNR 2014a). These characteristics of FMZ4 lakes indicate a higher productivity than lakes in the adjacent FMZ5 (to the south) and FMZ 6 (to the west; MNR 2014a).

The watercourses within the PA represent habitats ranging from diffuse flow paths to well defined permanent creeks to large regional rivers. Watercourses in the PA have been classified using the Strahler stream order system. Most of the smaller unnamed watercourses in the PA have stream orders of three or less. Dixie Creek is a larger system with stream orders of four and five. The Chukuni River is a large waterway and accordingly has a large stream order of seven. Figure 8.4-2 delineates the PA watercourses by stream order using the Strahler stream order classification system.

The relationship between the stream orders (Figure 8.4-2), habitat type (Figure 8.4-3) and fish presence (Figure 8.4-4) is illustrated in Table 8.4-2. Watercourses with larger stream orders provide more complex habitats that supports more fish species, whereas systems with a stream order of two or less typically have only a few resilient species present such as Central Mudminnow or Brook Stickleback. The sampling locations associated with Table 8.4-2 are provided in Figure 8.4-5.

The probability of fish being present and the number of species present increases with stream size to more complex multi trophic fish communities in habitats such as Dixie Creek and the

Chukuni River. The number of species present range from 16 to 35. Species present include Northern Pike, Walleye and Lake Whitefish which are species of interest to local Indigenous communities, along with White Sucker, Smallmouth Bass and shiner minnow species, according to confidential Indigenous knowledge information shared with Great Bear Resources. Figure 8.4-6 illustrates the typical trophic level of the Project area fish community and the typical presence by waterbody size. Although Muskellunge, Lake Trout and Lake Sturgeon are shown in Figure 8.4-6 for regional context they are not considered present in the PA or LSA.

Lake Whitefish and Walleye are common in the larger watercourses including the Chukuni River; and in larger waterbodies such as Genessee Lake, Gullrock Lake and Pakwash Lake. Lake Trout and Lake Sturgeon are not resident species within the PA or the LSA, although occasionally incidental Lake Trout do migrate downstream through the Chukuni River from Red Lake upstream (Red Lake community engagement pers. comm. 2025). Information shared by LSFN with Great Bear Resources through confidential Indigenous knowledge studies, stated that the aquatic ecosystem in the local and surrounding waterbodies include Walleye, Northern Pike, (Yellow) Perch, (Lake) Whitefish, Smallmouth Bass, Sucker, Rock Bass, Mooneye, Tullibee (Cisco) and shiner minnow species. Information shared by WFN with Great Bear Resources through confidential Indigenous knowledge studies indicated that communities have long harvested species such as Walleye, (Lake) Whitefish, Lake Trout, Muskie (Muskellunge), Bass, (Northern) Pike, Sucker, Jackfish (Northern Pike) and (Yellow) Perch across the region. Information shared by the NWOMC with Great Bear Resources through confidential Indigenous knowledge studies stated that fishing within the local area included Walleye, Perch, Bass, Northern Pike and Whitefish; and other species fished within a 100 km radius of the Project also included trout, minnows, crappie, sucker, Sauger, Muskie (Muskellunge) and other non-commercial fish. Based on comments from participants during the Planning Phase of the Impact Statement for the Project, Lake Whitefish, Walleye, Lake Trout, and Lake Sturgeon were identified as important considerations for the Project.

Lake Sturgeon have not been observed as present in the LSA or RSA waterbodies. Lake Sturgeon were not captured or observed during the baseline studies and were not detected within the 2023 baseline eDNA samples for the Project. The nearest population Management Unit (MU2; Lacho et al. 2021) is believed to exist in the English River downstream of the Manitou Falls Generating Station (location shown on Figure 8.2-2) which is approximately 14 km downstream of the confluence of the Chukuni River with the English River. Sturgeon was known to exist in Lake St. Joseph which was partially diverted to the Root River and English River system in the 1950s, however their population status is currently unknown.

8.4.1 Fish Habitat

A description of fish habitat in the Project waterbodies and watercourse is provided below and delineated by habitat type, as shown in Figure 8.4-3 and summarized in Table 8.4-3. Additional details for each individual waterbody and watercourses including channel dimensions are provided in Appendix L-1 and Appendix L-3. Confidential Indigenous knowledge study prepared for LSFN and shared with Great Bear Resources identified spawning areas for many of the surrounding lakes and watercourses outside of the LSA and RSA. Lake Whitefish, Walleye and White Sucker are known to spawn in the Chukuni River and Northern Pike spawning areas have been identified in Pakwash Lake.

8.4.1.1 Waterbodies

Pond and lake habitats have been delineated and classified within the LSA as one of three habitat types (A, B and C).

- Habitat type A: shallow waterbodies (less than 4 m total depth) within the PA area that are likely to support spawning, rearing, and foraging habitat for a variety of small-body species with the potential for large-body fish species such as Northern Pike and Yellow Perch. Substrate composition in habitat type A includes predominantly soft, fine-grained sediments with some localized boulder / bedrock and cobble / sand occurrences, as well as coarse woody debris with detritus. Vegetation in the upland zones is composed mainly of mixed coniferous and deciduous dominated by Black Spruce and Tamarack. Vegetation near the riparian zone includes wood shrub species such as alder, and a variety herbaceous species, including sedges and grasses. In general, two types of riparian zone vegetation were observed in habitat type A: a graminoid (grasses and sedges) floating mat with mosses (bryophytes), Sweetgale and herbaceous species; or a narrow riparian zone with overhanging shrubs and rushes, such as Hardstem Bulrush, that extended into the open water littoral zone covering a portion of the open water surface. Nearshore, shallow areas were also commonly populated by other emergent and submergent or floating aquatic macrophytes such as Yellow Pond Lily and pondweed. Waterbodies delineated as habitat type A vary in size, and are the most frequent waterbody type within the LSA and include Unnamed Waterbody 1, Unnamed Waterbody 4, Unnamed Waterbody 5, Unnamed Waterbody 6 and smaller inline ponds within the unnamed tributary flow paths commonly resulting from beaver activity.
- Habitat type B: small, deep (greater than 4 m total depth) inland waterbodies and include Unnamed Waterbody 2 and Unnamed Waterbody 3 within the LSA. The total depth is the primary difference between habitat types A and B, where habitat type B is characteristically deeper. The difference in depth can influence fish species community composition, vegetation, and thermal regime. Habitat type B is likely to support a variety of small-body and large-body species of varying life stages. Substrate composition in habitat type B is similar to habitat type A, being composed predominantly of soft, fine-grained sediments and a greater abundance of localized boulder, bedrock and cobble or sand occurrences, as well as coarse woody debris with detritus. Vegetation in the upland zones is mainly mixed coniferous and deciduous dominated by Black Spruce and White Spruce; while vegetation near to the riparian zone included woody shrub species such as alder, and a variety of herbaceous species, including sedges and grasses. In general, two types of riparian zone vegetation were observed in habitat type B; a graminoid floating mat with mosses and herbaceous species or a narrow riparian zone with overhanging shrubs and rushes, such as Hardstem Bulrush, that extended into the open water littoral zone covering a portion of the open water surface. Nearshore, shallow areas were also commonly populated by other emergent and submergent or floating aquatic macrophytes such as Yellow Pond Lily and pondweed species.
- Habitat type C: deep water lentic habitat characterizing the large lake environs in the LSA such as Genessee Lake, differing from habitat type B by surface area and habitat type A by depth. These lake habitats support a variety of forage fish and large-body / sport fish, such as Northern Pike and Walleye, indicative of deep water and rocky shoal habitat. Substrate composition nearshore is mainly comprised of exposed bedrock and boulder, with localized areas of soft, fine-grained sediments commonly associated with

tributary inflows and sheltered embayments. Coarse wood structure, such as driftwood, and some localized areas of aquatic macrophytes within the soft sediment substrate areas are present. Vegetation in the upland zones consists mainly of mixed coniferous and deciduous dominated by Black Spruce and White Spruce, while vegetation near to the riparian zone included woody shrub species such as alder and various herbaceous species.

8.4.1.2 Watercourses

Watercourse descriptions are provided below in order of increasing size and flow permanency, and include habitat type D to I. The habitat types define homogenous reaches of stream that share common attributes such as channel size and habitat characteristics. The existing watercourses as shown in Figure 8.4-2 through Figure 8.4-5 were extracted from the current Ontario hydro network databases layers available through Geospatial Ontario. Many watercourses delineated in the figures as habitat type D (first order streams) are computer interpretations of drainage segments during development of the provincial mapping. These virtual segments reflect land topography and likely drainage directions; however, based on ground truthing frequently do not represent actual channels or fish habitat. For consistency and to be conservative, the provincial base mapping has been retained unless site-specific analysis has demonstrated the absence of a watercourse.

- Habitat type D: ephemeral stream environments characterized as low-lying areas that may contain diffused pockets of standing water which only convey overland flow during periods of heavy rainfall or during spring freshet (snowmelt). Habitat type D environments are commonly associated with a complete loss of defined channel, transitioning into areas of muskeg drainage and underground seepage that are often not considered fish habitat. Some habitat type D sections support fish presence, likely as a result of the proximity to adjacent higher order streams or waterbodies (habitat types A, B and C) as this has been shown to be important in fish abundance and distribution where lower order streams are utilized by nearby and connected higher stream order fish communities (Hitt and Angermeier 2006). Habitat type D is characterized by subsurface flow paths typically observed in the headwater areas and was dominated by alder, grasses, and sedges, with some Black Spruce and various mosses.
- Habitat type E: riverine habitat that experiences intermittent flow or low year-round flow. The habitat includes little to no floodplain, steep banks and shrub riparian vegetation providing nearly complete canopy cover. The substrate is mostly exposed bedrock and boulder with some isolated pockets of fine-grained sediments. This habitat type supports fish communities, with increased usage during the higher flow periods (e.g., spring freshet and spawning season). Riparian vegetation is dense alder and willow, with some Balsam Fir, Black Spruce and various poplar. This habitat type commonly occurs within gradient changes of inland streams and habitat type C waterbodies.
- Habitat type F: riverine habitats with beaver dams and activity creating alternating series of pools and impoundments. These areas are characterized by side overflow channels formed during high flow events. The pool habitat has abundant coarse and fine woody debris, with soft, fine-grained sediments that support dense aquatic macrophytes. Riparian vegetation is mostly comprised of grasses and sedges (graminoids) with alder and willow species further upland adjacent to mixed conifer and deciduous forest. Habitat type F environments typically occur between inland waterbodies and at the

downstream extent of the habitat types G and H reaches, where beavers have utilized the natural narrow topography to construct dams. These pooled areas can support a variety of small-body fish species.

- Habitat type G: riverine habitat with a broad floodplain and extensive floating mats of herbaceous species typical of wetlands and beaver ponds. This habitat is primarily represented by flat channel morphology with occasional pools in the thalweg of meander bends and back bays of the channel and provides fish habitat for various small-body fish. The substrate is characterized by soft, fine-grained sediment with occasional boulders and localized areas of exposed bedrock. Dense aquatic macrophyte growth and coarse wood debris contribute most of the instream cover. Vegetation in the upland zones is mainly mixed coniferous and deciduous dominated by Black Spruce, poplar species, and Tamarack; while vegetation near to the riparian zone includes alder, willow, and herbaceous species.
- Habitat type H: riverine habitat with a moderate to broad floodplain like habitat type G, however wetted width of habitat type H is much wider (greater than 10 m). As with habitat type G, the type H habitat is characterized by U shaped channel morphology with occasional pools and provides fish habitat for various small-body and large-body fish. The substrate is characterized by soft, fine-grained sediment with small amount of boulder with the presence of sparse aquatic macrophytes and coarse woody debris. The riparian zone consists mostly of grasses and sedges. Upland areas are mainly mixed coniferous and deciduous dominated by Black Spruce, poplar species and Tamarack, while vegetation near to the riparian zone includes alder and herbaceous species.
- Habitat type I: the Chukuni River, or large river, habitat and is mostly characterized by reaches with moderate flow and occasional fast flowing sections consisting of cobble, boulder and bedrock riffle. This habitat type is characteristic of moderate gradients and generally deep channel cross sections. The substrate consists of soft, fine-grained sediments with some localized boulder / bedrock and cobble / sand occurrences, as well as coarse woody debris with detritus. The upland vegetation communities are mainly mixed coniferous and deciduous dominated by Black Spruce and poplar species while vegetation near to the riparian zone included alder, willow and herbaceous species. Nearshore, shallow areas are also commonly populated by emergent and submergent macrophytes such as Hardstem Bulrush, cattail and pondweed species.

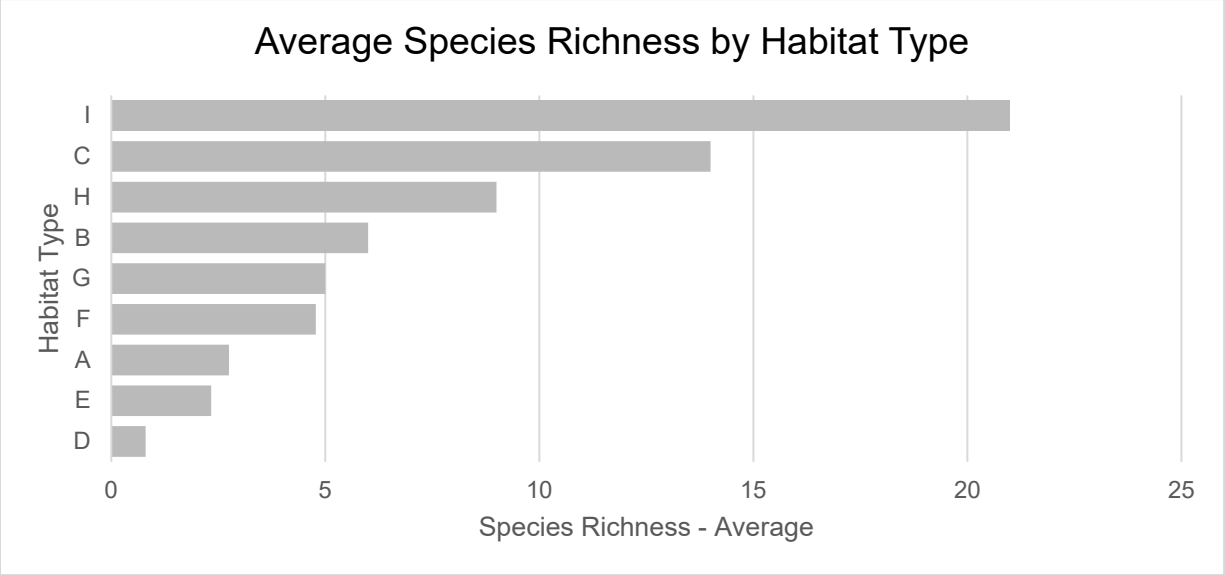
8.4.2 Fish Communities

Fish communities are largely dependent on the size, permanency and physical conditions of the habitats as described in Section 8.4.3. Measures of fish community used in the section include the following:

- Number of species (species richness)
- Fish abundance
- Percent species composition.

Species richness indicates how diverse a fish community is by counting the number of discrete species that are present in a defined area such as an individual watercourse or waterbody. Small headwater creeks (stream orders one and two) typically support only a few species with species richness values of one or two.

As the watercourses and waterbodies increase in size and habitat complexity the species richness increases as well, and larger fish and less resilient species of fish begin to occur as demonstrated in the graph that follows:



Fish communities in LSA waterbodies and watercourses are described in Table 8.4-1 to Table 8.4-3, including species, habitat and species richness.

Fish abundance has been described for the Project as catch per unit effort (CPUE) which is a measure of how many fish were captured over a specified unit of time. The CPUE is used as a metric to compare the relative abundance of fish in different locations or between time periods. Comprehensive sampling within the LSA is summarized with CPUE by waterbody, watercourse and by gear types in Appendix L-1 (Table B1-1 through Table B1-11). As with species richness described above, the relative abundance of fish varies between habitat types as a reflection of flow permanency, depth and habitat complexity. The CPUE also varies by capture method and as such is generally compared by gear type. A summary of average CPUE by habitat type and gear type is provided in Table 8.4-4. First Nations have reported concerns over declining Walleye populations in Wabauskang Lake and Lake Trout in Red Lake (located outside of the PA, LSA and RSA) in a confidential Indigenous knowledge report prepared for WFN.

Percent species composition is a measure of species diversity, and it compares the abundance of each species to the total fish community. This community structure will be largely dependant on the habitat types being considered and the life history of the individual species present. The unnamed watercourse habitats have conditions that only a few resilient species can exist in, such as habitat types D, E and F where flow can be intermittent, and the channels are small and discontinuous. In such habitats the species composition consists mainly of resilient small bodies species such as Central Mudminnow, Brook Stickleback and Chrosomus Spp. (Finescale Dace and Northern Redbelly Dace) as summarized in Table 8.4-5. Larger watercourses such as Dixie Creek and the Chukuni River, and lakes such as habitat Type C support fish communities with more evenly distributed species representation. Several watercourses and waterbodies had no fish captured or observed based on multi-season, multi-year field observations, and lacked

sufficient water or defined channel characteristics to contain fish at the time of survey. These waterbodies were classified as potentially fish frequented watercourses and waterbodies based on access, fishing effort and proximity to confirmed fish frequented water as precautionary approach (Figure 8.4-4).

Potentially fish frequented watercourses and waterbodies have been treated within the effects assessment (Section 8.7) as confirmed fish frequented waterbodies as a precautionary approach.

There are no aquatic SAR (including Lake Sturgeon) identified as occurring in the PA, LSA or RSA.

8.4.3 Fish Health

Fish health and mortality is described by metrics considered important in the overall health and well-being of the fish. These metrics include:

- Water quality, measured in mg/L or µg/L
- Fish tissue contaminants, measured mg/kg wet weight (mg/kg wwt with exception of selenium which is in mg/kg dwt)
- Fish growth (measured as length and weight at age and condition factor).

Water quality has been sampled in Project watercourses and waterbodies since 2020 with over 600 samples collected and analyzed for general parameters, nutrients and ions and metals. In situ field parameters including conductivity, pH, temperature and DO have also been recorded. Overall results indicate surface water quality of Dixie Creek and the Chukuni River is typical of northern Ontario. This includes a circumneutral pH, low concentrations of nutrients (nitrate, nitrite and ammonia), and low concentrations of total dissolved solids and major anions. Unnamed watercourses are highly seasonally variable as would be expected for shallow, ephemeral, wetland-influenced waters typical to this area of northern Ontario. A detailed description of water quality sampling and findings is provided in Appendix K-1.

Fish tissue has been collected and analysed for contaminants from species present in the LSA with detailed results provided in Appendix C of Appendix L-1. The results include descriptive summary statistics for several metals including: Al, As, Cd, Cr, Cu, Fe, Hg, MeHg, Mn, Ni, Pb, Se and Zn.

Mercury in fish has been identified as a concern and a focused topic within the planning stages of the Impact Statement with additional focus on valued species of fish that are present in the LSA and RSA (Walleye and Lake Whitefish), including as identified through confidential Indigenous knowledge reports. Accordingly, a dedicated mercury study was completed and is provided in Appendix T. Additional data records were secured from the provincial fish contaminants dataset (Ontario Data Catalogue) that have collected total mercury in tissue samples over a broader regional range for three species (Northern Pike, Walleye and Lake Whitefish). To compare and characterize existing mercury concentrations in fish tissue at the Project were characterized and compared to the broader area, the average mercury values have been plotted for the three species along with the PA and RSA for reference in Figure 8.4-7 (Northern Pike), Figure 8.4-8 (Walleye) and Figure 8.4-9 Lake Whitefish. As mercury increases with fish length, the data shown for Northern Pike and Walleye has been standardized between waterbodies by only using samples from fish within a common harvest size (55 +/- 15 cm for Northern Pike and 40 +/- 12 cm for Walleye). As Lake Whitefish samples were less numerous

and tend to accumulate less mercury than the other piscivorous (fish eating) species, all sizes are shown. At a broadscale comparison, mercury in fish is considerably lower in the Project RSA and Chukuni River drainage than adjacent drainages. This is also reflected in the data collected for the project from the LSA.

With respect to fish movement and contaminant exposure, Walleye are considered one of the more mobile species present in the LSA and RSA and are reflective of other large-bodied fish species present. Studies have shown that Walleye tend to have a high fidelity to their habitats. A study to track within-year and between-year movement of Walleyes in a chain of ten interconnected lakes in Vilas County, Wisconsin showed that most (76%) of Walleye remained in the same lake within and between years (Weeks and Hansen 2009). Similar to the RSA for the Project, a study of Walleye movement on the highly fragmented (due to dams) Ottawa River determined that Walleye movement was primarily upstream with limited downstream movement. As could be expected, movement among impounded reaches was not detected other than a few instances where fish were entrained through the dams (Haxton et al. 2015). Based on the studies, it is likely that the Walleye population at the site is largely confined by the known barriers including the Snowshoe Rapids on the Chukuni River, and the Manitou Generating Station and Ear Falls Generating Station on the English River.

Fish growth is measured as length at age and conditions factor. Length, weight and age data for common species within the LSA is provided in Appendix B of Appendix L-1. Condition factor (K), a relationship between length and weight of the fish, is a non-invasive assessment tool to help determine the well-being of a fish, as a proxy for a fish's body fat reserves, reflecting proper nourishment and overall health. Condition factor is commonly used in the aquaculture (MAFA 2024) and is an index value used in the assessment of fish health in environmental effects monitoring under the MDMER. As such, this value represents the general living conditions of the fish population including food availability and quality, and habitat suitability and stability. Condition factor has been calculated and provided in Table 8.4-6, for all species sampled in the LSA where length and weight were recorded. A decline in observable fish health in recent decades was noted in a confidential Indigenous knowledge report prepared for WFN, identifying abnormal skin conditions, deformities and change in smell.

Table 8.4-1: Fish Species Occurrence by Watercourse and Waterbody

Area	PA / LSA	PA / LSA	LSA	RSA	RSA	RSA	PA	PA	LSA	PA	PA	LSA	PA / LSA	PA	PA / LSA	LSA	PA	PA	PA / LSA	PA	PA	LSA	PA	PA	PA / LSA	PA / LSA	LSA	LSA	LSA	LSA	LSA	LSA	LSA	LSA	
Waterbody																																			
Fish	**Dixie Creek**	**Chukuni River** [ICI]	**Genessee Lake**	**Gullrock Lake** [ICI]	**Pakwash Lake** [ICI]	**Dixie Lake** [ICI]	**Unnamed Waterbody 1**	**Unnamed Waterbody 2**	**Unnamed Waterbody 3**	**Unnamed Waterbody 4**	**Unnamed Waterbody 5**	**Unnamed Waterbody 6** [IND]	**Unnamed Watercourse 1**	**Unnamed Watercourse 1A**	**Unnamed Watercourse 1B-03**	**Unnamed Watercourse 2**	**Unnamed Watercourse 3**	**Unnamed Watercourse 3A**	**Unnamed Watercourse 3B**	**Unnamed Watercourse 4**	**Unnamed Watercourse 4a**	**Unnamed Watercourse 5**	**Unnamed Watercourse 6A-1**	**Unnamed Watercourse 6A-2**	**Unnamed Watercourse 6B**	**Unnamed Watercourse 6B-01**	**Unnamed Watercourse 6B-02**	**Unnamed Watercourse 6C**	**Unnamed Watercourse 7**	**Unnamed Watercourse 7A-03**	**Unnamed Watercourse 7A-07**	**Unnamed Watercourse 7A-08**	**Unnamed Watercourse 8**	**Unnamed Watercourse 8B**	**Number of Waterbodies with Fish Captured**
Blackchin Shiner [ICI]	-	X	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**
Blacknose Shiner [ICI]	d	X[d]	X[d]	-	-	-	-	-	X		-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	**4**
Bluntnose Minnow	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Brook Stickleback	X	-	X	-	-	-	-	-	X	X	-		X	-		X	X	X	X	X		X	X		X	X	X	X			X	X	X	X	**19**
Central Mudminnow	X[d]	d	-	-	-	-	X	d		X	-	d	X	-	X	X	X[d]	X		X		X	X	X	X	X	X	X	d	X	X	X	X		**19**
Common Shiner [ICI]	X[d]	d	d	-	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**1**
Emerald Shiner [ICI]	X[d]	X[d]	-	Xi	Xi	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	**3**
Fathead Minnow	d	d	d	-	-	-	-	d	X	X	-	X[d]	-	-	-	-	-	-	-	X	-		-	-	-	-	-	-	d	-	-	-	X	-	**5**
Finescale Dace	X[d]	d	d	-	-	-	-		X	X	-	-	-	-	-	-	X	-	-	X	-	X	-	-	-	-	-	X	d	-	-	-	X	X	**7**
Golden Shiner [ICI]	d	d	X[d]	-	-	-	X	X[d]		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**3**
Iowa Darter	X[d]	d	X[d]	-	-	-	-	-	X	-	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**2**
Johnny Darter	X[d]	X[d]	X[d]	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**2**
Lake Chub	d	d	d	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**1**
Creek Chub	d	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Blacknose / Longnose Dace	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
Mimic Shiner [ICI]	d	d	-	-	Xi	-	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**1**
Northern Pearl Dace	Xi[d]	Xi[d]	d	-	-	-	-		X	-	-	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	d	-	-	-	X	X	**6**
Northern Redbelly Dace	d	d	d	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	X	-	X	-	-	-	-	-	X	-	-	-	-	X	X	**7**
Rainbow Smelt	-	Xi	-	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**
Slimy Sculpin	d	d	d			-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**0**
Spottail Shiner [ICI]	X[d]	X[d]	X[d]	Xi	Xi	-	-	d	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**5**
Trout Perch	d	d	d	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**2**
Mooneye	X[d]	X[d]	d	-	Xi	-	-	-	-	-	-	d	-	-	-	-	d	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**2**
Green Sunfish	d	d	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0**
Rock Bass	X[d]	X[d]	X[d]	Xi	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**6**

Area	PA / LSA	PA / LSA	LSA	RSA	RSA	RSA	PA	PA	LSA	PA	PA	LSA	PA / LSA	PA	PA / LSA	LSA	PA	PA	PA / LSA	PA	PA	LSA	PA	PA	PA / LSA	PA / LSA	LSA	LSA	LSA	LSA	LSA	LSA	LSA	LSA	
Waterbody **Fish**	**Dixie Creek**	**Chukuni River** [ICI]	**Genessee Lake**	**Gullrock Lake** [ICI]	**Pakwash Lake** [ICI]	**Dixie Lake** [ICI]	**Unnamed Waterbody 1**	**Unnamed Waterbody 2**	**Unnamed Waterbody 3**	**Unnamed Waterbody 4**	**Unnamed Waterbody 5**	**Unnamed Waterbody 6** [IND]	**Unnamed Watercourse 1**	**Unnamed Watercourse 1A**	**Unnamed Watercourse 1B-03**	**Unnamed Watercourse 2**	**Unnamed Watercourse 3**	**Unnamed Watercourse 3A**	**Unnamed Watercourse 3B**	**Unnamed Watercourse 4**	**Unnamed Watercourse 4a**	**Unnamed Watercourse 5**	**Unnamed Watercourse 6A-1**	**Unnamed Watercourse 6A-2**	**Unnamed Watercourse 6B**	**Unnamed Watercourse 6B-01**	**Unnamed Watercourse 6B-02**	**Unnamed Watercourse 6C**	**Unnamed Watercourse 7**	**Unnamed Watercourse 7A-03**	**Unnamed Watercourse 7A-07**	**Unnamed Watercourse 7A-08**	**Unnamed Watercourse 8**	**Unnamed Watercourse 8B**	**Number of Waterbodies with Fish Captured**
Silver Redhorse	d	X^d	d	-	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**2**
Shorthead Redhorse	d	X^d	d	Xi	Xi	-	-	-	-	-	-	d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**3**
White Sucker [ICI]	X^d	X^d	X^d	Xi	Xi	Xi	-	-	X	-	-	-	X	-	-	-	X^d	-	-	X	-	X	-	-	-	-	-	-	d	-	-	-	X	-	**11**
Yellow Perch [ICI]	X^d	X^d	X^d	Xi	Xi	Xi	-	-	X	-	-	X^d	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	X^d	-	-	-	-	-	**9**
Cisco [ICI]	-	Xi	X	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Burbot	X^d	X^d	d	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	-	-	-	-	-	-	d	-	-	X	X	-	**5**
Lake Whitefish [ICI]	d	X^d	d	Xi	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**4**
Muskellunge* / [ICI]	-	Xi	-	-	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Northern Pike [ICI]	X^d	X^d	X	Xi	Xi	Xi	-	X^d	-	-	-	X^d	X	-	-	-	d	X	-	X	-	-	-	-	-	-	-	-	X^d	X	-	X	-	-	**13**
Sauger	X^d	X^d	X^d	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**4**
Smallmouth Bass [ICI]	d	X^d	-	Xi	Xi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**3**
Walleye [ICI]	X^d	X^d	X^d	Xi	Xi	Xi	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	-	-	-	-	-	-	d	-	-	-	-	-	**5**
Species Richness - Captured	**16**	**21**	**15**	**15**	**20**	**6**	**2**	**2**	**10**	**4**	**0**	**5**	**5**	**0**	**1**	**2**	**5**	**3**	**1**	**10**	**0**	**6**	**2**	**1**	**2**	**2**	**2**	**4**	**2**	**2**	**2**	**4**	**8**	**4**	-
Species Richness – with DNA	**31**	**35**	**28**	-	-	-	-	**6**	-	-	-	**7**	-	-	-	-	**10**	-	-	-	-	-	-	-	-	-	-	-	**24**	-	-	-	-	-	-
Habitat Type	**H**	**I**	**C**	**C**	**C**	**C**	**A**	**B**	**B**	**A**	**A**	**A**	**F**	**D**	**D**	**F**	**G**	**E**	**E**	**F**	**D**	**F**	**D**	**D**	**E**	**E**	**F**	**F**	**H**	**F**	**E**	**E**	**F**	**F**	-

Notes:
- : not applicable; PA: Project Area; LSA: Local Study Area; RSA: Regional Study Area.
X : indicates species presence was confirmed during field studies.
Xi : indicates species occurrence is document by the MNR through Fish ON-line or broadscale monitoring surveys (MNR 2024).
d / ^{d} : indicate species identified in eDNA sampling.
* : Muskellunge were recorded in the online Fish ON-line records, which has disclaimers that accuracy of the records can not be assured (MNR 2024).
ICI : fish species and / or waterbodies identified of Indigenous community importance, including in confidential Indigenous knowledge reports provided to Great Bear Resources.

Table 8.4-2: Fish Habitat Type and Key Habitat Characteristics

Habitat Type Classification		Lake / Unnamed Waterbody			River / Creek / Unnamed Watercourse					
		Type A	Type B	Type C	Type D	Type E	Type F	Type G	Type H	Type I
General Habitat Attributes		• Shallow inland lake / pond habitat • Shoreline varies between extensive floating mats of herbaceous species • Consisting mostly of fine-grained sediment and localized sections with boulder, cobble and/or sand	• Small, deep inland lake habitat • Support a variety of forage fish and large body/sport fish • Shoreline varies between extensive floating mats of herbaceous species and localized sections with boulder, cobble and/or sand	• Large lake habitat • Shoreline mostly bedrock / boulder substrate, with some and shallow nearshore soft sediments commonly at tributary inflows	• Low lying area with diffuse pockets of standing water • Sections of complete loss of channel, can transition into muskeg drainage, overland drainage flow path or underground flow	• Little to no floodplain with dense shrub riparian vegetation • Steep banks • Bedrock, boulder and cobble substrate with coarse wood debris	• Moderate beaver activity creating alternating series of pools / impoundments • Side overflow channels created during high flow and stream stage events • Abundant coarse wood debris	• Broad floodplain with extensive floating mats of herbaceous species typical of muskeg and beaver ponds / impoundments • Primarily flat morphology with occasional pools in the thalweg of meander bends and back bays of the channel	• Moderate river with broad floodplain • Primarily flat morphology with occasional pools • Commonly occurring as main connecting channels between inland waterbodies	• Large river with moderate flow with occasional fast flowing riffle / rapids habitat and steep banks • Soft fine-grained substrate with some localized boulder and cobble, as well as exposed bedrock
Permanence		Permanent	Permanent	Permanent	Ephemeral	Intermittent	Permanent	Permanent	Permanent	Permanent
Characteristic Morphology Features	Bankfull Width (m)	na	na	na	0.10 to 0.57	1.0 to 3.4 m	1.0 to 5.1 m	>5 m	>5 m	>10 m
	Bankfull Depth (m)	Total depth <4 m	Total depth >4 m	Total depth >10 m	0.1 to 0.6 m	0.1 to 1.0 m	0.1 to 0.9 m	>1 m	>1 m	>2 m
	Channel Morphology	Pool: 100%	Pool: 100%	Pool: 100%	na	Slow Riffle: 5% Glide: 95%	Flat: 80% Pool: 20%	Flat: 98% Pool: 2%	Flat: 96% Pool: 2% Slow Riffle: 2%	Fast Riffle: 20% Slow Riffle: 30% Glide: 50%
Substrate Composition (approximate %)		Boulder: 2% Cobble: 2% Fines: 96%	Boulder: 5% Cobble: 5% Fines: 90%	Bedrock: 20% Boulder: 20% Fines: 60%	Bedrock: 20% Boulder: 20% Fines: 60%	Bedrock: 20% Boulder: 60% Fines: 10% Other: 10%	Bedrock: 5% Boulder: 15% Fines: 80%	Bedrock: 5% Boulder: 15% Fines: 80%	Bedrock: 5% Boulder: 5% Fines: 90%	Bedrock: 25% Boulder: 20% Cobble: 15% Fines: 40%
Instream Cover (approximate %)		Macrophytes: 80% Rock: 5% Wood: 15%	Macrophytes: 80% Rock: 10% Wood: 10%	Macrophytes: 15% Rock: 75% Wood: 10%	Rock: 60% Wood: 40%	Bank: 15% Macrophytes: 5% Rock: 40% Wood: 40%	Bank: 5% Macrophytes: 50% Rock: 10% Wood: 25% Other: 10%	Bank: 5% Macrophytes: 40% Rock: 10% Wood: 45%	Bank: 15% Macrophytes: 40% Rock: 10% Wood: 35%	Rock: 80% Wood: 20%
Dominant Riparian Types (approximate %)		Macrophytes: 10% Grasses and Sedges: 45% Shrubs: 35% Trees: 10%	Macrophytes: 10% Grasses and Sedges: 45% Shrubs: 35% Trees: 10%	Grasses and Sedges: 10% Shrubs: 65% Trees: 25%	Grasses and Sedges: 10% Shrubs: 60% Trees: 30%	Macrophytes: 5% Grasses and Sedges: 10% Shrubs: 40% Trees: 45%	Macrophytes: 15% Grasses and Sedges: 70% Shrubs: 10% Trees: 5%	Macrophytes: 10% Grasses and Sedges: 80% Shrubs: 5% Trees: 5%	Macrophytes: 10% Grasses and Sedges: 80% Shrubs: 5% Trees: 5%	Grasses and Sedges: 30% Shrubs: 60% Trees: 10%
Strahler Stream Order (Figure 8.4-2)		na	na	na	Mostly stream order 1 with some stream order 2	Stream order 1 and 2	Mostly stream order 1 and 2, with occasional stream order 3	Mostly stream order 3 and 4.	Mostly stream order 4 and 5.	Greater than stream order 5.

Note:
na : not applicable.

Table 8.4-3: Average Species Richness by Habitat Type

Habitat Type	Average of Species Richness
Type I	21.0
Type C	14.0
Type H	7.7
Type B	6.0
Type G	5.0
Type F	4.8
Type A	2.8
Type E	2.3
Type D	0.8

Table 8.4-4: CPUE by Gear and Habitat Type

Collection Gear	Habitat Type							
	Type A	Type B	Type C	Type D	Type E	Type F	Type G/H	Type I
Dip Net	0.643	0.333	-	-	-	-	0.033	-
Electrofishing	-	-	-	0.003	0.003	0.005	0.031	0.496
Gill Net	7.240	0.450	5.990	-	-	-	1.139	9.080
Minnow Trap	0.035	0.289	0.045	0.061	0.165	0.563	0.063	0.004
Seine Net	18.917	-	266.333	-	-	-	-	86.222

Notes:
- : not applicable.

Table 8.4-5: Percent Species Composition by Habitat Type

Habitat Type	Total Fish Captured	Blackchin Shiner (% Comp) [ICI]	Blacknose Shiner (% Comp) [ICI]	Bluntnose Minnow (% Comp)	Brook Stickleback (% Comp)	Burbot (% Comp)	Central Mudminnow (% Comp)	Cisco (% Comp) [ICI]	Common Shiner (% Comp) [ICI]	Emerald Shiner (% Comp) [ICI]	Fathead Minnow (% Comp)	Finescale Dace (% Comp)	Golden Shiner (% Comp) [ICI]	Iowa Darter (% Comp)	Johnny Darter (% Comp)	Lake Chub (% Comp)	Lake Whitefish (% Comp) [ICI]
A	475	10.95	3.79	-	0.42	-	2.32	-	-	-	5.47	2.74	1.68	-	-	-	-
B	1,286	-	3.11	-	0.86	-	0.08	-	-	-	0.70	63.37	1.48	1.87	-	6.77	-
C	975	3.79	1.23	0.10	1.74	-		0.21	-	0.82	-	-	0.72	6.77	0.10	-	-
D	115	-	-	-	6.09	-	93.04	-	-	-	-	0.87	-	-	-	-	-
E	1510	-	-	-	20.73	-	54.24	-	0.13	-	-	17.55	-	-	-	-	-
F	4,566	-	-	-	14.96	0.02	27.03	-	-	-	1.20	42.82	0.20	-	-	0.22	-
G	1,196	-	-	-	11.87	-	20.15	-	-	-	-	55.85	-	-	-	-	-
H	107	-	-	-	0.93	7.48		-	-	7.48	-	-	-	0.93	0.93	-	-
I	5,793	-	4.28	-	-	0.03	-	-	-	12.45	-	-	-	-	0.33	-	0.54

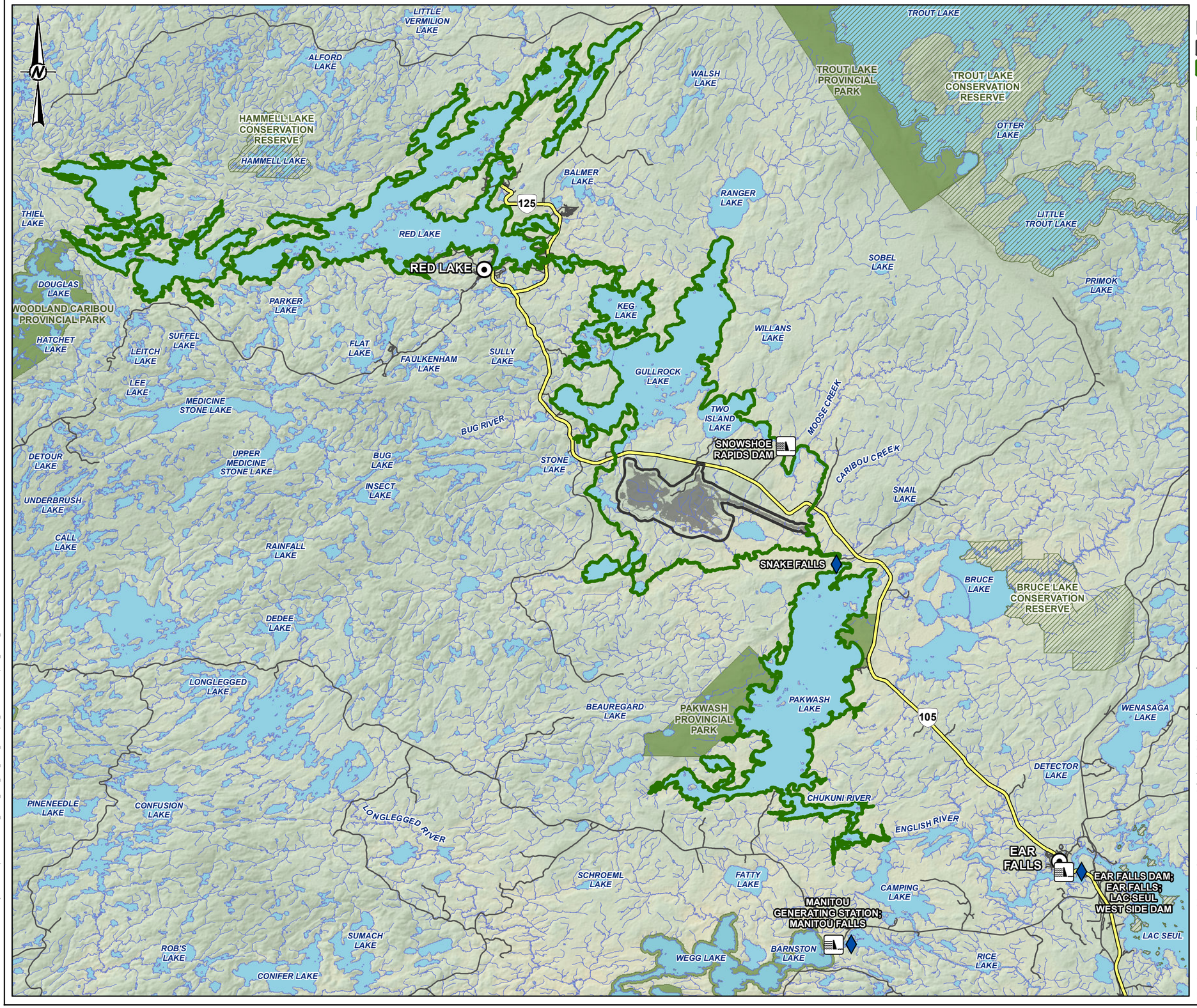
Habitat Type	Mooneye (% Comp)	Mottled Sculpin (% Comp)	Northern Pearl Dace (% Comp)	Northern Pike (% Comp) ICI	Northern Redbelly Dace (% Comp)	Phoxinus Hybrid (% Comp)	Rock Bass (% Comp)	Sauger (% Comp)	Shiner Sp. (% Comp) ICI	Shorthead Redhorse (% Comp)	Silver Redhorse (% Comp)	Slimy Sculpin (% Comp)	Smallmouth Bass (% Comp)	Spottail Shiner (% Comp) ICI	Walleye (% Comp) ICI	White Sucker (% Comp) ICI	Yellow Perch (% Comp) ICI
A	-	-	-	17.05	-	-	-	-	-	-	-	-	-	-	-	-	55.58
B	-	-	12.91	0.93	3.58	-	-	-	-	-	-	-	-	-	-	0.08	4.28
C	-	0.21	-	1.95	0.51	-	0.21	-	0.21	-	-	-	-	71.69	0.72	0.10	8.92
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	1.39	5.83	-	--	-	-	-	-	-	-	-	-	0.13	-
F	-	-	2.74	0.11	6.75	3.31	0.04	-	-	-	-	0.02	-	0.02	-	0.55	0.02
G	-	-	-	-	8.70	3.18	-	-	-	-	-	0.08	-	-	-	0.17	-
H	5.61	-	-	33.64	-	-	0.93	-	-	-	-	-	-	3.74	0.93	1.87	35.51
I	0.40	-	-	0.60	-	-	0.60	0.03	-	0.35	0.07	-	0.09	3.14	1.40	0.41	75.28

Notes:
- : not observed in habitat type.
ICI : Fish species identified as of Indigenous community importance.

Table 8.4-6: Condition Factor (K) by Species within the LSA

Species	Number of Samples	Condition Factor (K)		
		Minimum	Average	Maximum
Brook Stickleback	42	0.54	0.84	1.14
Central Mudminnow	101	0.72	1.03	2.60
Fathead Minnow	3	0.93	1.01	1.14
Finescale Dace	34	0.45	0.97	1.50
Lake Chub	14	0.79	1.15	1.61
Lake Whitefish [ICI]	2	1.40	1.70	2.00
Northern Pike [ICI]	71	0.18	0.63	0.85
Northern Redbelly Dace	9	0.87	0.96	1.04
Silver Redhorse	1	1.32	1.32	1.32
Slimy Sculpin	1	1.27	1.27	1.27
Walleye [ICI]	32	1.12	1.30	1.51
White Sucker [ICI]	28	1.08	1.32	1.53
Yellow Perch [ICI]	78	0.51	1.29	1.92

Note:
ICI : Fish species identified as of Indigenous community importance.



LEGEND

- GREAT BEAR PROJECT FOOTPRINT
- PROJECT AREA
- REGIONAL STUDY AREA FOR FISH AND FISH HABITAT
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

KNOWN AQUATIC BARRIER

- WATERFALL
- DAM / GENERATING STATION

0 2.5 5 10

1:275,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
3. KNOWN AQUATIC BARRIERS EXTRACTED FROM THE CANADIAN AQUATIC BARRIERS DATABASE (HTTPS://AQUATICBARRIERS.CA/EN)
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
KNOWN AQUATIC BARRIERS

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-1

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

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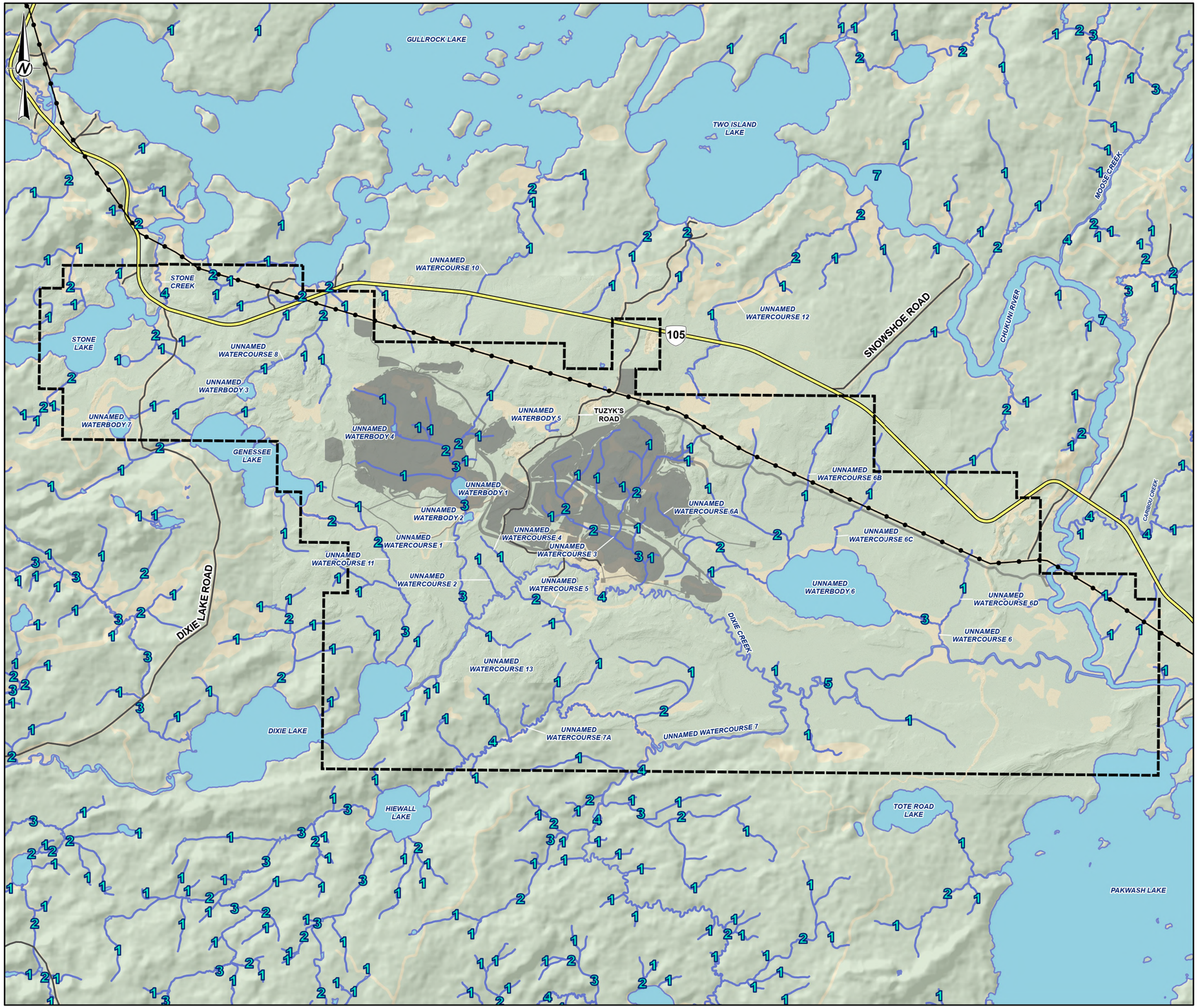

LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE – LABELLED WITH STREAM ORDER NUMBER (STRAHLER METHOD)
- WATERBODY

0 0.5 1 2

1:71,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
PROJECT WATERCOURSES BY STRAHLER STREAM ORDER CLASSIFICATION

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-2

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

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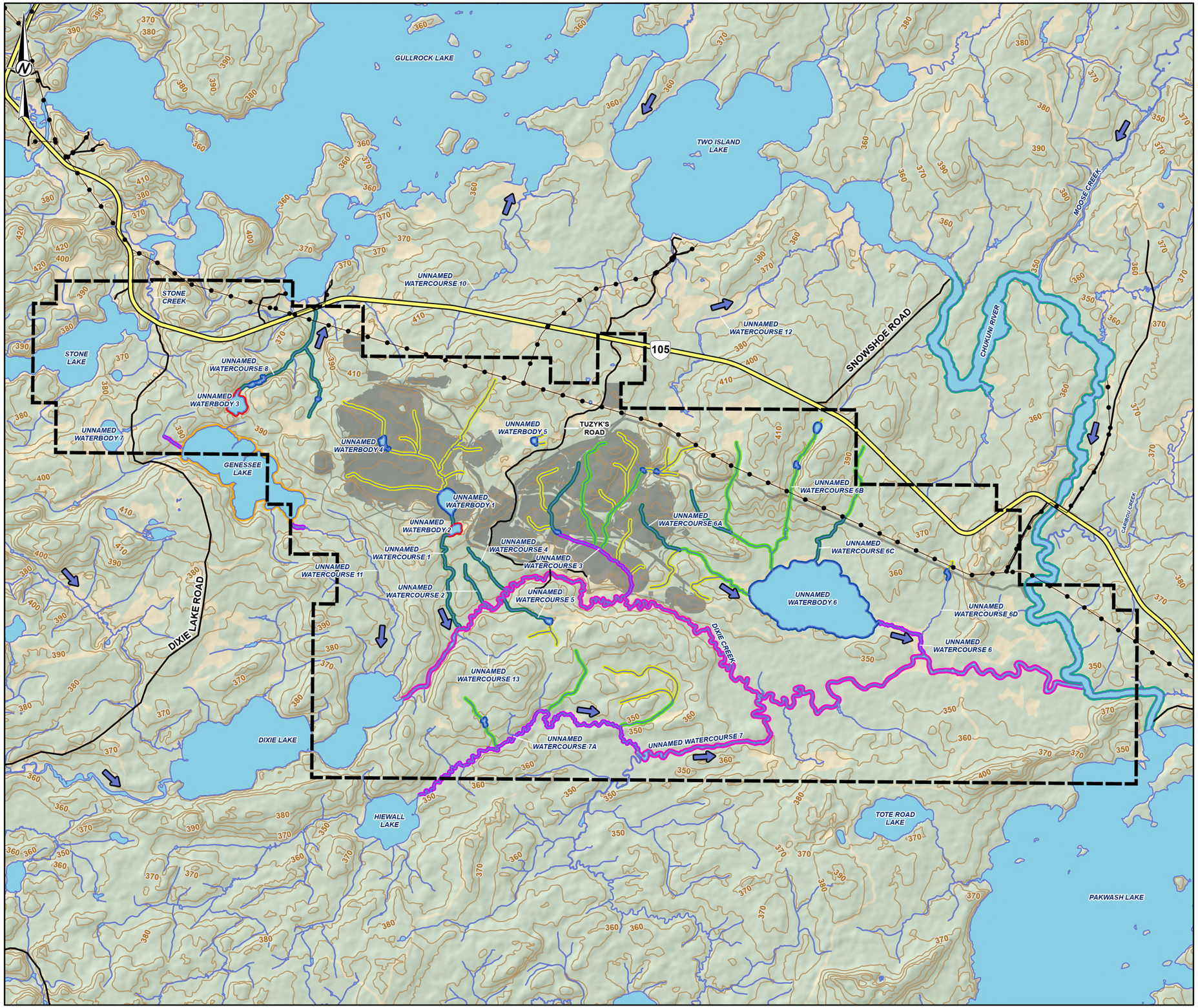


LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE (NOT ASSESSED FOR FISH HABITAT TYPE)
- WATERBODY (NOT ASSESSED FOR FISH HABITAT TYPE)
- CONTOURS (10 M INTERVAL)
- SURFACE WATER FLOW PATH

FISH HABITAT TYPE

- A
- B
- C
- D
- E
- F
- G
- H
- I

0 1,000 2,000 4,000

1:72,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
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
FISH HABITAT TYPE BY WATERBODY

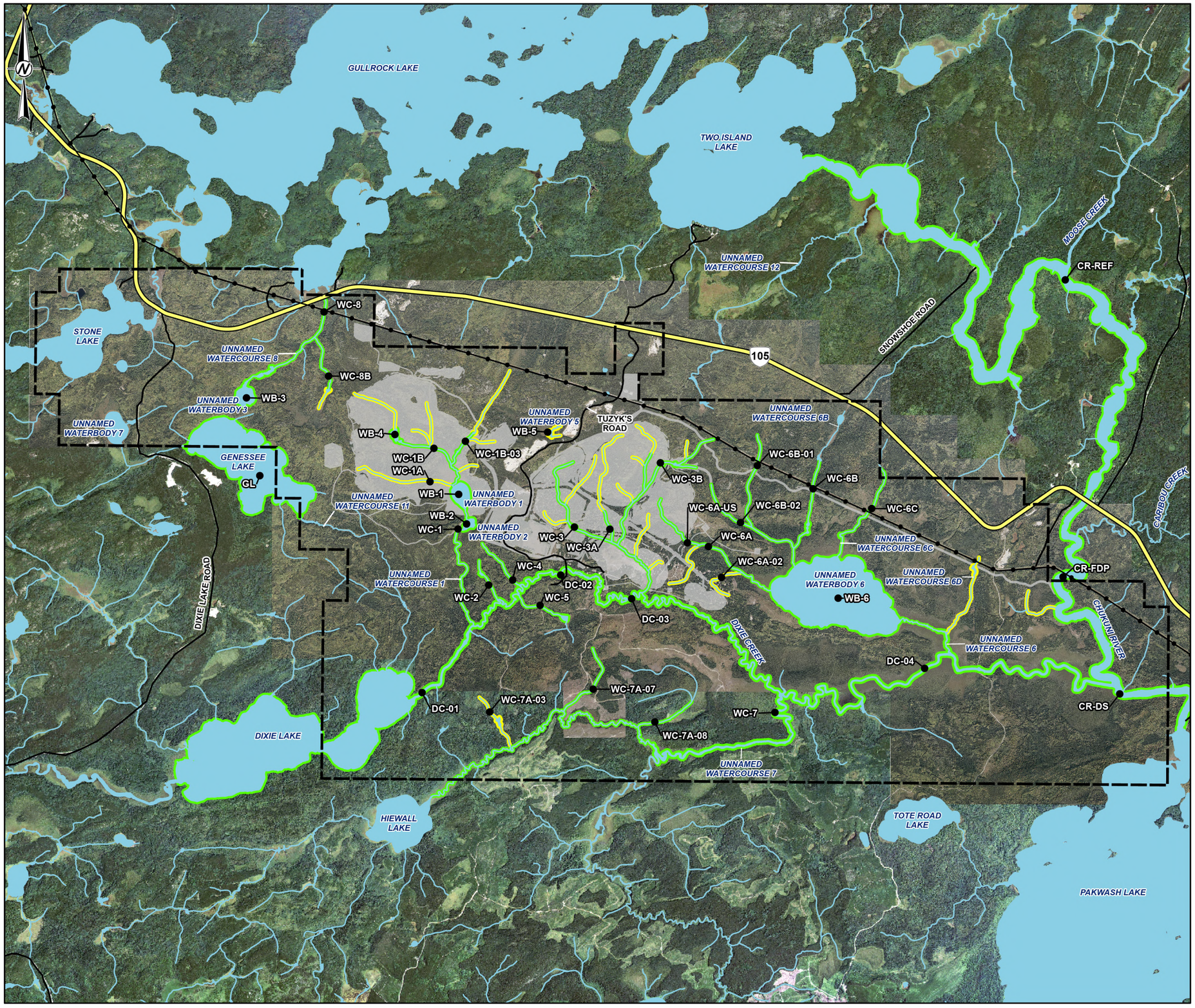
CONSULTANT

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-3

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

0 25mm



LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- FISHERIES RESOURCE ASSESSMENT LOCATION
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY

FISH FREQUENTED WATERCOURSES AND WATERBODIES

- CONFIRMED FISH FREQUENTED
- POTENTIALLY FISH FREQUENTED

0 1,000 2,000 4,000

1:70,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. PROPERTY BPUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2-24
3. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
4. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
FISH FREQUENTED WATERCOURSES AND WATERBODIES

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-4

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

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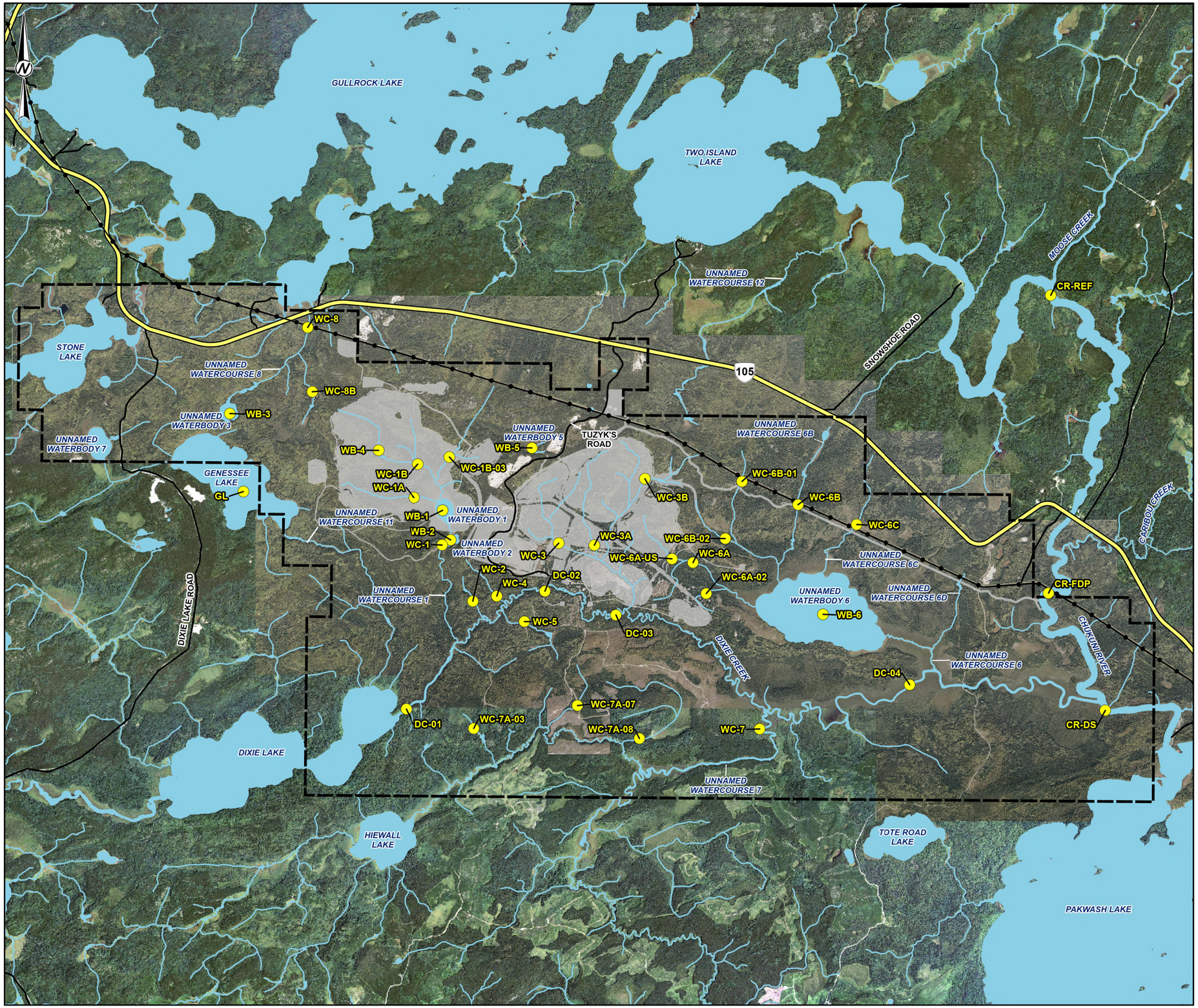

LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- STATION LOCATION
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY

0 1,000 2,000 4,000

1:70,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N.

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
AQUATIC BASELINE STATIONS

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-5

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

25mm

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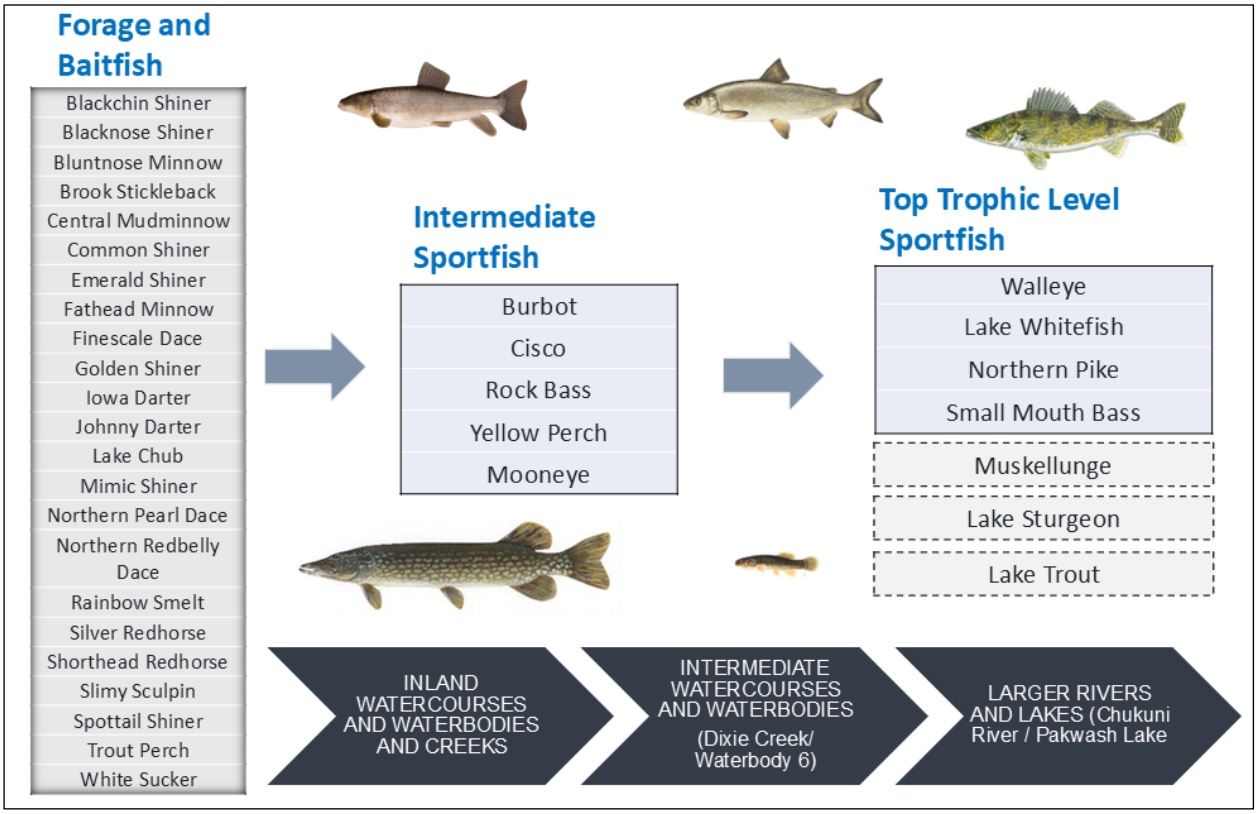
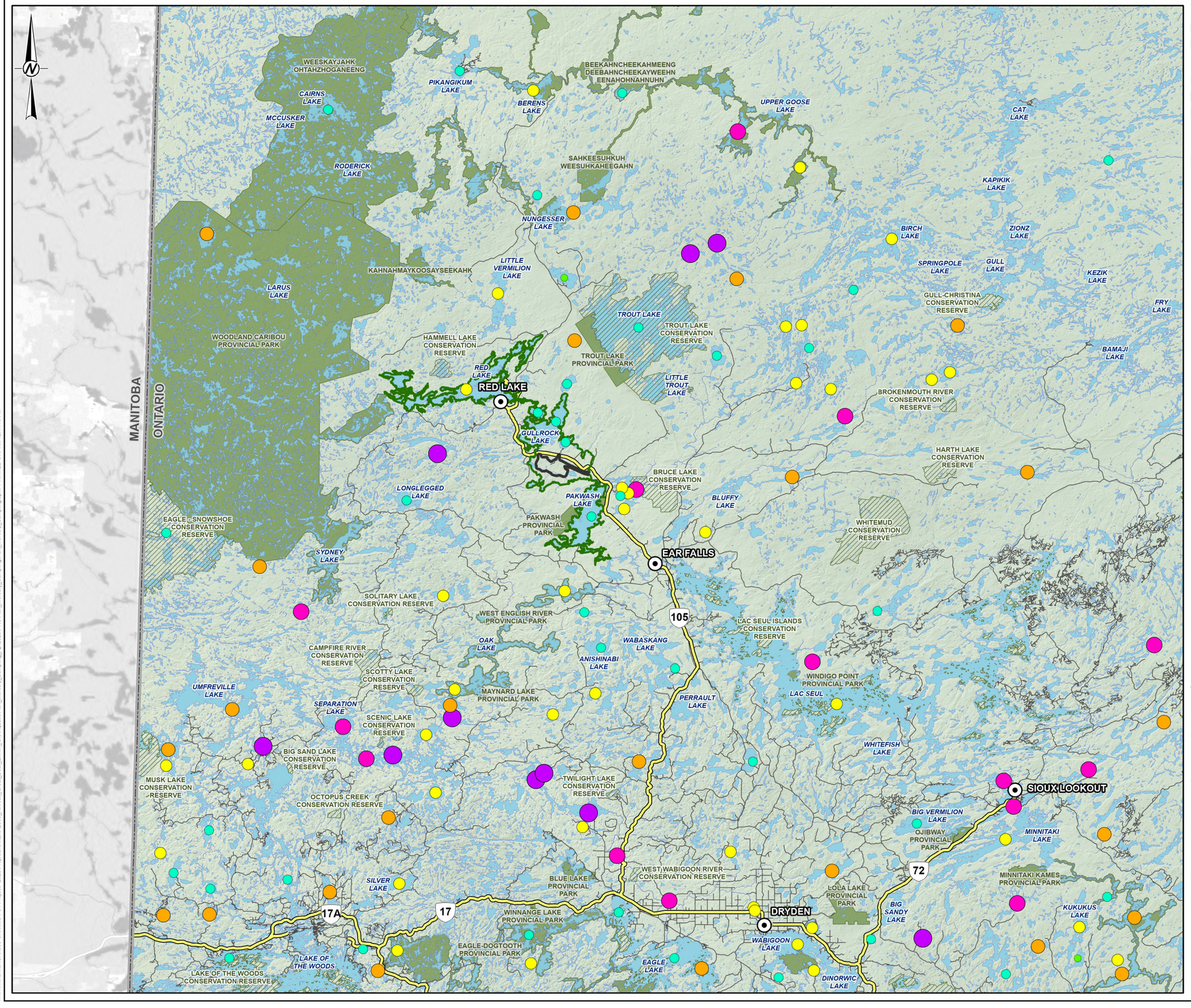
Figure 8.4-6: Project Fish Communities



Note:
Muskellunge, Lake Sturgeon and Lake Trout are considered regional fish species but are not considered to be resident species within the PA waterbodies.



LEGEND

- PROJECT AREA
- REGIONAL STUDY AREA FOR FISH AND FISH HABITAT
- TOWN
- PROVINCIAL BORDER
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERBODY

MERCURY CONCENTRATION (µg/g) SAMPLE LOCATION

- 0.01 - 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6- 0.8
- 0.8 - 1.0
- 1.0 - 2.0

0 12.5 25 50

1:1,000,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. MERCURY CONCENTRATION SAMPLE LOCATIONS SHOWN ARE RESTRICTED TO SAMPLES COMPLETED BETWEEN 2010-2018 AND FISH WITH A LENGTH OF 55 +/- 15 CM (40-70 CM RANGE)

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
NORTHERN PIKE MERCURY CONCENTRATIONS IN FISH WITH A TOTAL LENGTH OF 55 +/- 15 CM (40-70 CM RANGE)

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-7

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

0 25mm

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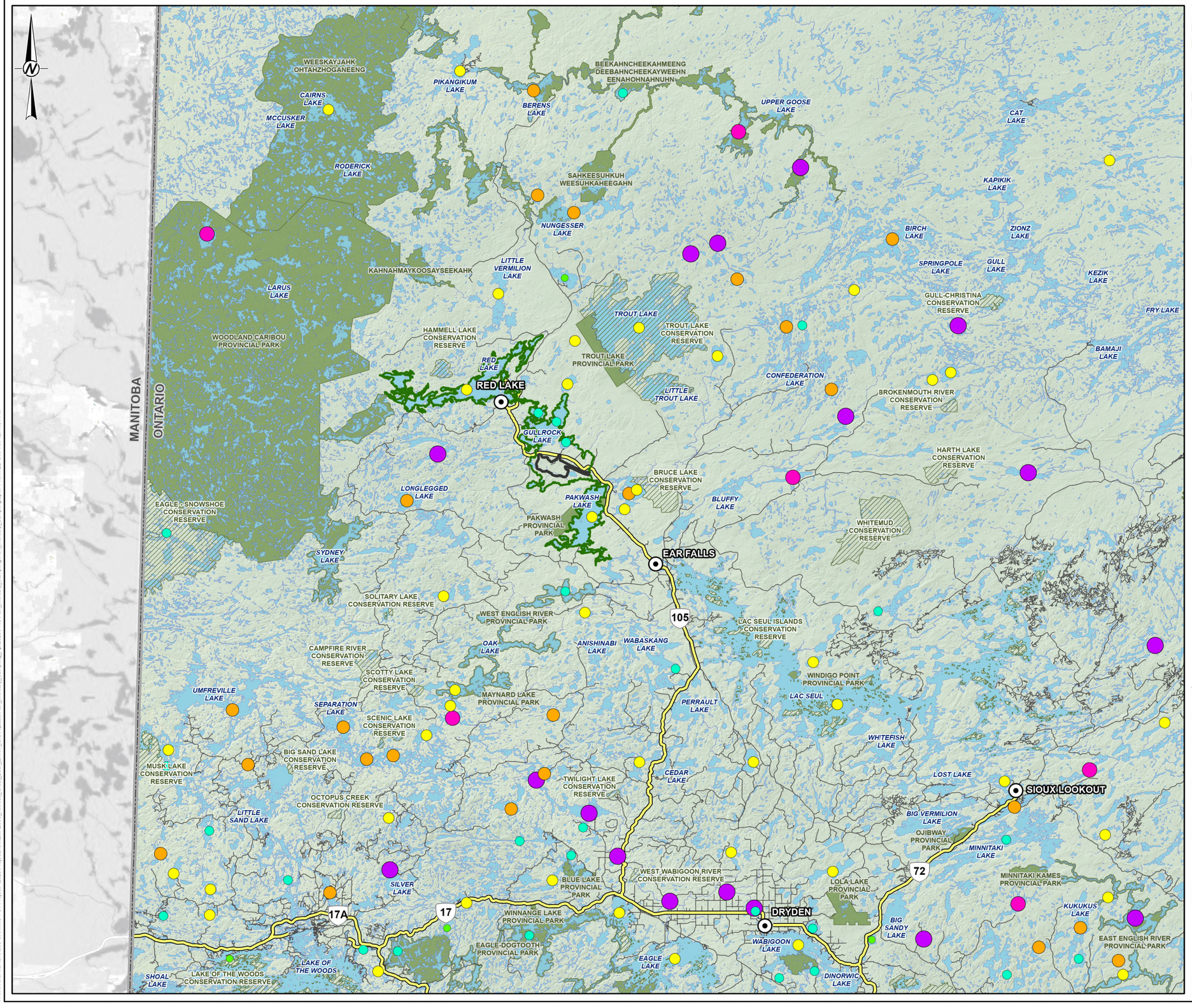

LEGEND

- PROJECT AREA
- REGIONAL STUDY AREA FOR FISH AND FISH HABITAT
- TOWN
- PROVINCIAL BORDER
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERBODY

MERCURY CONCENTRATION (µg/g) SAMPLE LOCATION

- 0.01- 0.2
- 0.2 - 0.4
- 0.4 - 0.6
- 0.6 - 0.8
- 0.8 - 1.0
- 1.0 - 2.0

0 12.5 25 50

1:1,000,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. MERCURY CONCENTRATION SAMPLE LOCATIONS SHOWN ARE RESTRICTED TO SAMPLES COMPLETED BETWEEN 2010-2018 AND FISH WITH A LENGTH OF 40 +/- 12 CM (28-52 CM RANGE)

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
WALLEYE MERCURY CONCENTRATIONS IN FISH WITH A TOTAL LENGTH OF 40 +/- 12 CM (28-52 CM RANGE)

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-8

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

25mm

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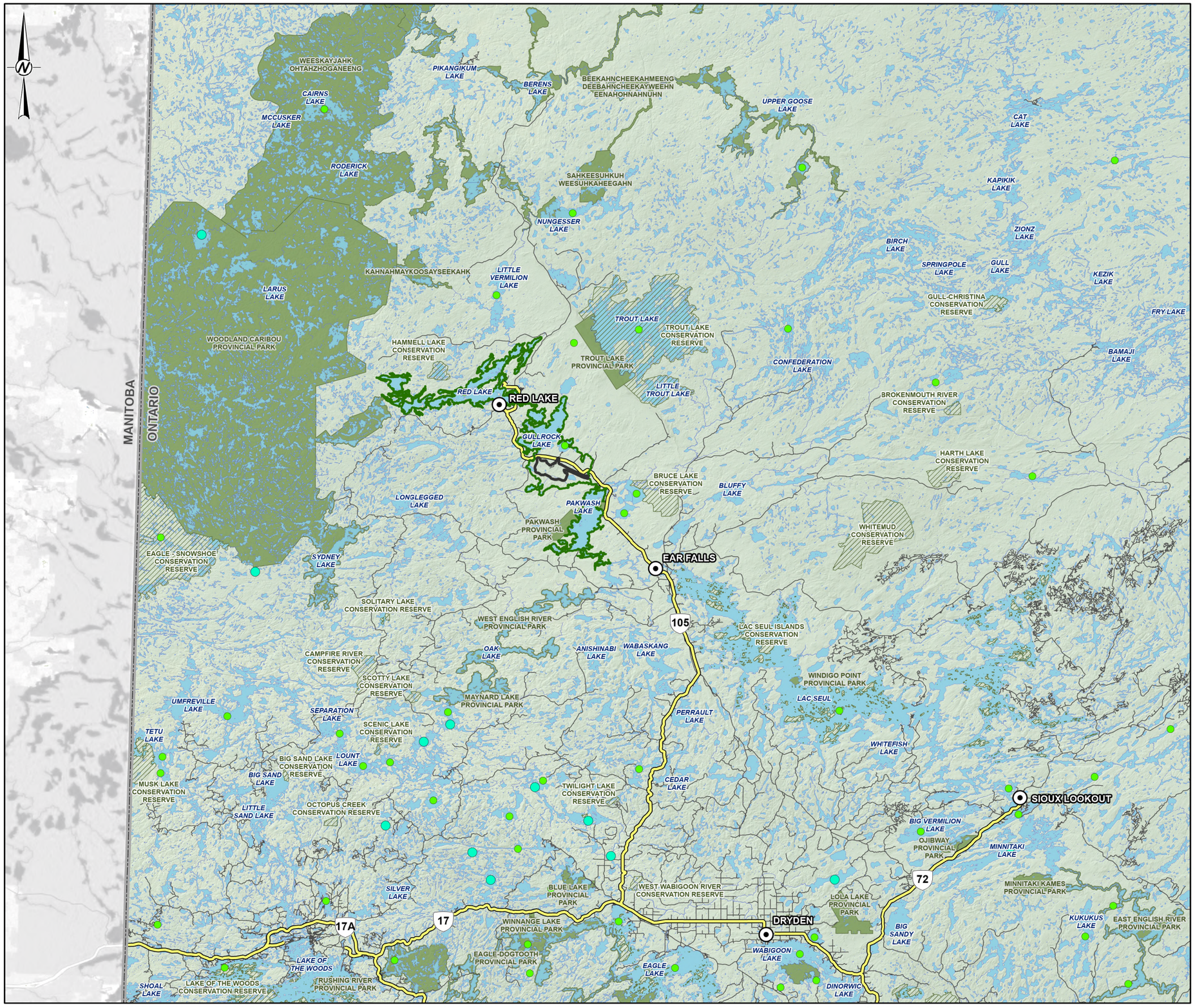

LEGEND

- PROJECT AREA
- REGIONAL STUDY AREA FOR FISH AND FISH HABITAT
- TOWN
- PROVINCIAL BORDER
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- WATERBODY

MERCURY CONCENTRATION (MG/G) SAMPLE LOCATION

- 0.01 - 0.2
- 0.2 - 4

0 12.5 25 50

1:1,000,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. MERCURY CONCENTRATION SAMPLE LOCATIONS SHOWN ARE RESTRICTED TO SAMPLES COMPLETED BETWEEN 2010-2018 AND FISH OF ALL SIZES

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
LAKE WHITEFISH MERCURY CONCENTRATIONS IN FISH OF ALL SIZES

CONSULTANT

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.4-9

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

25mm

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PATH: X:\CA\CA\AOMK300-OAKMNS-FS1-Project*2023\Projects\OMEMA2303_Kinross_Great_Bear_Env\7_GIS\Aquatic\Fish_Mercury_Sampling_Apr2023\PRO\Fish_Mercury_Sampling_Apr2023.aprx PRINTED ON: AT: 12:12:11 PM

8.5 Identification of Potential Effects

The initial step in the assessment process is to identify interactions between the Project and fish and fish habitat that can result in pathways to potential effects (DFO 2024a). These potential effects may be direct or indirect and may be negative or positive. Table 8.5-1 to Table 8.5-4 summarizes the potential interactions of the Project with fish and fish habitat, prior to the application of the mitigation measures (DFO 2021).

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 Project activities that may have a measurable change to fish and fish habitat. To support the identification of these interactions, detailed pathway of effects diagrams developed by DFO (2024a) were used (Table 8.5-2 to Table 8.5-4). These pathway of effects diagrams describe development proposals in terms of the activities that are involved, the type of cause-effect relationships that are known to exist and the mechanisms by which stressors ultimately lead to effects in the aquatic environment (DFO 2024a). These pathways to potential effects are further described in Section 8.5.1 to Section 8.5.3 for each phase of the Project, along with the rationale for those activities and interactions excluded from further assessment.

Section 8.6 and Table 8.6-1 provide a description of the mitigation measures applied to these pathways to potential effects during all phases of the Project. The residual effects, after the application of the mitigation measures, are then described and further evaluated in Section 8.7, using the criteria and indicators identified in Section 8.2.3.

8.5.1 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. Most of the land based and in water activities affecting fish and fish habitat will occur during the construction phase. Some facilities such as the tailing management facility (TMF) and stockpiles will undergo initial construction or starter phases but will continue to be built out throughout operations. However, the majority of the facility footprints and associated drainage alterations will be established during the construction phase.

The following interactions with the Project result in pathways to potential effects on fish and fish habitat as described below. After mitigation is applied to each pathway, as described in Table 8.6-1, the residual effects are assessed using the criteria identified for each pathway:

- Site preparation activities for the mine site area including clearing, grubbing, bulk earthworks and the establishment of onsite road infrastructure interacts with fish and fish habitat. These activities will result in overprinting (infilling or excavation) fish habitat in portions of Unnamed Watercourse 1, Unnamed Watercourse 3 and Unnamed Watercourse 6, which will have a direct effect on fish habitat and fish communities. These land and water based activities can result in pathways to potential effects due to a change in erosion from ground disturbance activities in the PA that could change concentrations of nutrients and suspended solids as well as changes in bank structure and thermal inputs in the surrounding waterbodies from vegetation clearing and ground disturbance which may affect fish habitat and fish health. The assessment of potential effects includes changes in fish habitat, fish communities and fish health from these pathways.

- The establishment and operation of water management and treatment facilities will be commenced and completed simultaneously with site preparation activities and will interact with fish and fish habitat. Although further direct and indirect changes to fish habitat will not occur, the operation of the water management and treatment facilities will result in treated effluent being discharged to the Chukuni River. This could result in a pathway to a potential effect due to potential erosion at the discharge location which may affect fish habitat and a change in water quality in the surrounding waterbodies from the treated effluent which may affect fish health. The assessment of potential effects includes changes in fish habitat and fish health from these pathways.
- The development and operation of the open pits (LP Central pit and Viggo pit) will interact with fish habitat and result in pathways to potential effects due to direct overprinting, groundwater management and the use of explosives. Mining of the LP Central pit will overprint fish habitat in the lower portion of Unnamed Watercourse 3 and will have a direct effect on fish habitat and fish communities. The development of the open pit basins will require groundwater management which will change groundwater inputs to Dixie Creek and a tributary to Unnamed Watercourse 6A that may affect fish habitat. The use of explosives within the open pit to excavate ore for processing may result in changes in instantaneous pressure and vibration levels that may affect fish communities in nearby fish habitat. The assessment of potential effects includes changes in fish habitat and fish communities from these pathways.
- The development of the underground mine will interact with fish and fish habitat and result in a pathway to a potential effect due to groundwater management. The underground mine works will be accessed through the portal and ramps established during the Advanced Exploration (AEX) Program. However, the management of groundwater will result in changes to the groundwater inputs to local waterbodies and watercourse and may affect fish habitat. The assessment of potential effects includes changes in fish habitat from this pathway.
- The development and management of stockpiles for rock and unconsolidated materials will interact with fish and fish habitat and result in pathways to potential effects due to the overprinting of fish habitat and the management of seepage and contact water. The stockpiles will overprint fish habitat in portions of Unnamed Watercourse 1 (OVB3), Unnamed Watercourse 3 (OVB2, LGO1, LGO2, the mine rock stockpile; MRS, and OVB3) and Unnamed Watercourse 6A (OVB3) and will have a direct effect on fish habitat and fish communities. Seepage and runoff from the stockpiles have the potential to change water quality in adjacent waterbodies and may affect fish health. The assessment of potential effects includes changes in fish habitat, fish communities and fish health from these pathways.
- The establishment of onsite fish habitat offsetting and compensation measures will interact with fish and fish habitat and result in pathways to potential effects due to direct overprinting and ground disturbance adjacent to fish habitat. The construction of a diversion embankment (east dam), excavation of a diversion pond (east pond) and construction of a new diversion channel will overprint or alter portions of Unnamed Watercourse 3B and Unnamed Watercourse 6B-02 and will have a direct effect on fish habitat and fish communities. Ground disturbance and inwater works associated with this measure could result in erosion and sedimentation that could lead to a change in water quality and have an effect on fish health. The operation of this measure will result

in increased flows to Unnamed Watercourse 6B-02 and will have a direct effect on fish habitat. In addition, the development of a pond complex in the floodplain of Dixie Creek that will be connected to Dixie Creek to provide alternate fish access to new habitat areas will require ground disturbance that could result in erosion and sedimentation leading to a change in water quality and an effect on fish health. The assessment of potential effects includes changes in fish habitat, fish communities and fish health from these pathways.

- The construction of the starter embankments for the TMF will interact with fish and fish habitat and result in pathways to potential effects due to direct overprinting, flow reductions and contact water. The starter embankments will overprint fish habitat in the upper reaches of Unnamed Watercourse 1 and a portion of Unnamed Waterbody 1, and have direct effect on fish habitat and fish communities. This activity will also result in a change in the catchment areas and the interception of surface water from local watercourses which could affect downstream fish habitat. Further, changes due to erosion from ground disturbance activities may change water quality in the surrounding waterbodies due to sedimentation, which may affect fish habitat and fish health. The assessment of potential effects includes changes in fish habitat, fish communities and fish health from these pathways.

Once the site preparation activities have been completed, the construction and operation of buildings and other onsite infrastructure will not lead to further interactions with fish and fish habitat. The establishment of onsite aggregate operations is not expected to interact with fish and fish habitat. Waste management for the Project is not expected to interact with fish and fish habitat. The power supply will be provided by continuation of power generation from natural gas and draw of available power from the regional grid (facilities established during the AEX Program) and is not expected to interact with fish and fish habitat. The commissioning of the process plant will include the establishment and initial operation to support functionality during operations, and as a result, there will be no interaction with fish and fish habitat. There is no plausible interaction between the employment and expenditures activities and fish and fish habitat during any Project phase.

8.5.2 Operations Phase

The operations phase is anticipated to occur over a 26-year period. Interactions with fish and fish habitat are largely associated with the ongoing development of the TMF, stockpiles and water management as most of the physical site footprint is completed during the construction phase. The following interactions with the Project result in pathways to potential effects on fish and fish habitat as described below.

After mitigation is applied to each pathway, as described in Table 8.6-1, the residual effects are assessed using the criteria identified for each pathway:

- The operation of the LP Central pit and underground mine may interact with fish and fish habitat and result in pathways to potential effects due to the use of explosives and ongoing groundwater management. The use of explosives in the LP Central pit to excavate ore for processing would result in a pathway to a potential effect on fish and fish habitat due to changes in instantaneous pressure and vibration levels that may affect fish communities in nearby fish habitat. The ongoing groundwater management in both the LP Central pit and the underground mine would result in a pathway to a potential effect on fish and fish habitat due to changes in groundwater inputs to local

waterbodies and watercourse that may continue to affect fish habitat. The assessment of potential effects includes changes in fish communities and fish habitat from these pathways.

- The construction of the mine water pond (MWP) will interact with fish and fish habitat and result in pathways to potential effects due to overprinting, flow reductions and contact waters. The establishment of a new MWP downstream of the TMF using heavy equipment with mine rock and / or aggregate for embankments will provide additional capacity for management of site contact waters. The construction of the MWP would result in a pathway to a potential effect on fish and fish habitat due to overprinting fish habitat in a portion of Unnamed Waterbody 1 and portions of Unnamed Watercourse 1. In addition, there would be changes in the catchment areas and the interception of surface water from local watercourses could affect downstream fish habitat. Ground disturbances during construction could result in erosion and sedimentation to the surrounding waterbodies which may affect fish habitat and fish health due to changes in water quality. The assessment of potential effects includes changes in fish habitat, fish communities and fish health from these pathways.
- The ongoing water management and treatment facilities will interact with fish and fish habitat and result in a pathway to a potential effect due to contact waters. Contact water from the mine site area, if not collected and managed with the integrated water management system, could affect fish health due to changes in water quality in adjacent fish habitat. The assessment of potential effects includes fish health from this pathway.
- Progressive reclamation activities could interact with fish and fish habitat and result in a pathway to a potential effect due to ground disturbances. The stabilization and reclamation of inactive disturbed areas where practical, could result in ground disturbance that could lead to erosion and sedimentation that may affect adjacent fish habitat. The assessment of potential effects includes changes in fish habitat and fish health from this pathway.
- The management of stockpiles for overburden, mine rock and ore, the management of desulphurized tailings in the TMF, and the management of concentrate tailings in the depleted Viggo pit, are not expected to have direct interactions with fish and fish habitat. The management of seepage and contact water from these facilities is addressed through the operation of the water management and treatment facilities. The operation of the process plant, the ongoing operation and maintenance of buildings and infrastructure, waste management activities and power supply are not expected to have any interactions with fish or fish habitat.

8.5.3 Closure Phase

The closure phase will consist of active closure, passive closure and final reclamation. The following interactions with the Project result in pathways to potential effects on fish and fish habitat as described below. After mitigation is applied to each pathway, as described in Table 8.6-1, the residual effects are assessed using the criteria identified for each pathway:

- Active closure which is expected to occur over a three-year period immediately after operations cease, involves activities similar to those during the construction phase. Similar mining and construction equipment are utilized during this period, but on a much smaller scale. These activities will interact with fish and fish habitat and result in

pathways to potential effects due to ground disturbances, contact waters and filling of the underground mine workings. Ground disturbances could occur from the use of machinery and changes in drainage patterns that could result in erosion and sedimentation to the surrounding waterbodies which may affect fish habitat and fish health due to changes in water quality. Contact water from the mine site area, if not collected and managed with the integrated water management system, could affect fish health due to changes in water quality in adjacent fish habitat. Active filling of the underground mine workings, LP Central pit and Viggo management facility (VMF) with fresh water from the Chukuni River could result in changes in flows that could affect fish habitat. The assessment of potential effects includes changes in fish habitat and fish health from this pathway.

- During passive closure, there will be a continuation and completion of the active and passive filling of the underground mine, VMF and the LP Central pit with fresh water These activities will interact with fish and fish habitat and result in pathways to potential effects due to contact waters and ongoing filling of the underground mine workings. Contact water from the mine site area, if not collected and managed with the integrated water management system, could affect fish health due to changes in water quality in adjacent fish habitat. The ongoing filling of the underground mine workings, LP Central pit and VMF with fresh water could continue to result in changes to flows in the Chukuni River that could affect fish habitat. The assessment of potential effects includes changes in fish habitat and fish health from this pathway.
- At the end of the closure phase, there will be additional modifications to the site drainage as the LP Central pit lake will be connected to the natural water system, after water quality meets regulatory requirements. The site will be fully reclaimed which includes the revegetation of surface features and reinstatement of natural drainage. Although there is some potential for erosion and sedimentation during reclamation the overall changes are expected to be positive as the site is restored to a more natural condition.

Table 8.5-1: Potential Interactions of Project Components with Fish and Fish Habitat

Project Component / Activity	Fish and Fish Habitat
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	No
Construction of the starter embankments for the TMF	Yes
Construction and operation of buildings and infrastructure	No
Waste management	No
Commissioning of the process plant	No
Power supply	No
Employment and expenditures	No
Operations Phase	
Underground mining	Yes
Mining of the LP Central pit	Yes
Management of rock and unconsolidated materials in stockpiles	No
Process plant operation	No
Management of desulphurized tailings in the TMF	No
Management of concentrate tailings and contact water in the VMF	No
Operation of water management and treatment facilities	Yes
Construction of a MWP	Yes
Operation and maintenance of buildings and infrastructure	No
Waste management	No
Power supply	No
Progressive reclamation activities	Yes
Employment and expenditures	No

Project Component / Activity	Fish and Fish Habitat
Closure Phase	
Active closure	Yes
Passive closure	Yes
Final reclamation	Yes
Employment and expenditures	No

Table 8.5-2: Key Project Components and Activities Pathways during Construction Phase

Project Component / Activity	Description	Potential Pathways of Effects (PoE) Interaction (DFO 2024a)									Other PoE
		Use of Machinery on Land / Alteration of Riparian Vegetation	Use of Machinery in Water	Placement of Materials in Water	Removal of Materials and Aquatic Vegetation from Water	Water Level / Flow Modification	Water Diversion	Dewatering	Detonation in or Near Water	Introduction of Underwater Noise	Water Quality Modification
Site preparation activities	• Clearing of vegetation, grubbing and movement of organics, soil and overburden with heavy equipment including within the open pit footprints • Establishment of onsite road infrastructure	●	●	●	●	●	-	●	-	-	-
Establishment and operation of water management and treatment facilities	• Establishment and operation of the integrated water management system and treatment facilities (water management ponds, ditches, sumps, water treatment plants and pipelines) in parallel with site preparation activities, potentially as temporary facilities to be replaced as permanent facilities for operations • Onsite treatment of domestic sewage	●	●	●	●	●	-	●	-	-	●
Open pit mining	• Blasting and extraction of mine rock and ore, and the use of haul trucks and construction equipment within the pits	-	-	-	-	-	-	●	●	●	●
Underground mining	• Blasting and extraction of mine rock from underground workings expanding on the advanced exploration workings, air transfer, and transport of the rock to the surface using trucks along the ramps	-	-	-	-	-	-	●	●	●	●
Management of rock and unconsolidated materials in stockpiles	• Transportation of ore, mine rock unconsolidated materials (overburden, and potentially organics and topsoil) to centralized stockpiles using haul trucks, and managing the stockpiles using heavy equipment	●	●	●	●	●	-	-	-	-	●
Establishment of onsite fish habitat and compensation measures	• Placement of a diversion dam (i.e., east dam), excavation of a pond and establishment of a diversion channel to Unnamed Watercourse 6B-02 (i.e., east pond and channel) • Establishment of additional fish habitat pond complex north of Dixie Creek	●	●	●	●	●	●	●	-	-	-
Establishment of onsite aggregate operations	• Excavation of sand and gravel, and blasting and quarrying of rock on the Property for Project use, with local stockpiling and the use of haul trucks to transport the material as needed for site construction	-	-	-	-	-	-	-	-	-	-
Construction of the starter embankments for the TMF	• Preparation of the foundation and the construction of the initial starter embankments of the TMF with mine rock from the Viggo pit and / or aggregate using heavy equipment	●	●	●	●	●	-	●	-	-	-
Construction and operation of buildings and infrastructure	• Construction of the temporary camp, permanent camp, process plant and other buildings, fuel supply and onsite infrastructure not identified in other activities • Relocation of AEX Program facilities and infrastructure to accommodate development if needed	-	-	-	-	●	-	-	-	-	-
Waste management	• Management of construction, industrial and domestic wastes, including operation of onsite landfill	-	-	-	-	-	-	-	-	-	-

Project Component / Activity	Description	Potential Pathways of Effects (PoE) Interaction (DFO 2024a)									Other PoE
		Use of Machinery on Land / Alteration of Riparian Vegetation	Use of Machinery in Water	Placement of Materials in Water	Removal of Materials and Aquatic Vegetation from Water	Water Level / Flow Modification	Water Diversion	Dewatering	Detonation in or Near Water	Introduction of Underwater Noise	Water Quality Modification
Commissioning of the process plant	• Continuation of power generation from natural gas and draw of available power from the regional grid (facilities established during the AEX Program)	-	-	-	-	-	-	-	-	-	-
Power supply	• Commissioning of the process plant including processing of ore and production of tailings	-	-	-	-	-	-	-	-	-	-
Employment and expenditures	• Employment of individuals and expenditures related to procurement and contracting	-	-	-	-	-	-	-	-	-	-

Notes:
1. DFO does not currently have a pathway of effects specific to water quality modification. A project specific pathway of effect has been prepared to reflect drainage and treated effluent discharge activities.
- : not applicable.
● : applicable.

Table 8.5-3: Key Project Components and Activities Pathways during Operations Phase

Project Component / Activity	Description	Potential Pathways of Effects (PoE) Interaction (DFO 2024a)									Other PoE [1]
		Use of Machinery on Land / Alteration of Riparian Vegetation	Use of Machinery in Water	Placement of Materials in Water	Removal of Materials and Aquatic Vegetation from Water	Water Level / Flow Modification	Water Diversion	Dewatering	Detonation in or Near Water	Introduction of Underwater Noise	Water Quality Modification
Underground mining	• Operation of the underground mine, including underground blasting, extraction of mine rock and ore for transport to surface by truck on the ramp and by shaft, ongoing dewatering and management of contact water to surface, and transport of cemented rock backfill and paste backfill underground	-	-	-	-	●	-	●	●	●	●
Open pit mining in the LP Central pit	• Operation of the open pit including removal of overburden, in-pit blasting, hauling of mine rock and ore, ongoing dewatering and management of contact water to surface	-	-	-	-	●	-	●	●	●	●
Management of overburden, mine rock and ore in designated facilities	• Ongoing development and management of stockpiles including the use of heavy equipment to haul and manage the materials on surface • Segregation of mine rock according to geochemical characteristics	-	-	-	-	●	-	-	-	-	●
Operation of the process plant	• Operation of the process plant, including the processing of ore, and production of desulphurized tailings and concentrate tailings	-	-	-	-	-	-	-	-	-	●
Management of desulphurized tailings in the TMF	• Ongoing operation of the TMF including the placement of mine rock and / or aggregate to periodically raise the TMF embankments using heavy equipment	-	-	-	-	-	-	-	-	-	●
Management of concentrate tailings in the depleted Viggo pit	• Ongoing operation of the VMF for sulphide tailings storage and site contact water management	-	-	-	-	-	-	-	-	-	●
Operation of water management and treatment facilities	• Operation of the integrated water management system for the mine site, including: the operation of the collection ditches, sumps and ponds, water treatment facilities (domestic sewage and effluent) and pipelines with discharge of treated effluent to the Chukuni River	-	-	-	-	●	-	-	-	-	●
Construction of a MWP	• Establishment of the pond downstream of the TMF using heavy equipment with mine rock and / or aggregate for embankments to provide additional capacity for management of site contact waters	●	●	●	●	●	-	●	-	-	●
Operation and maintenance of buildings and infrastructure	• Ongoing operation and maintenance of buildings and infrastructure (site roads, permanent camp, fuel supply and similar)	-	-	-	-	-	-	-	-	-	-
Waste management	• Management of industrial and domestic wastes, including operation of onsite domestic landfill	-	-	-	-	-	-	-	-	-	-
Power supply	• Continuation of power generation from natural gas and power draw from the regional electric grid	-	-	-	-	-	-	-	-	-	-
Progressive reclamation activities	• Progressive reclamation within the PA including the stabilization and reclamation of inactive disturbed areas where practical, such as when maximum extent is achieved	-	-	-	-	-	-	-	-	-	-
Employment and expenditures	• Employment of individuals and expenditures related to procurement and contracting	-	-	-	-	-	-	-	-	-	-

Notes:
1 DFO does not currently have a pathway of effects specific to water quality modification. A project specific pathway of effect has been prepared to reflect drainage and treated effluent discharge activities.
- : not applicable.
● : applicable.

Table 8.5-4: Key Project Components and Activities Pathways during Closure Phase

Project Component / Activity	Description	Potential Pathways of Effects (PoE) Interaction (DFO 2024a)									Other PoE
		Use of Machinery on Land / Alteration of Riparian Vegetation	Use of Machinery in Water	Placement of Materials in Water	Removal of Materials and Aquatic Vegetation from Water	Water Level / Flow Modification	Water Diversion	Dewatering	Detonation in or Near Water	Introduction of Underwater Noise	Water Quality Modification
Active closure	• Removal of assets that can be salvaged • Demolition and removal of site facilities, equipment and infrastructure excluding elements required during passive closure and disposal of related wastes in approved facilities off site • Stabilization and reclamation of disturbed areas not progressively reclaimed during operations, such as by regrading, placing of cover and revegetation in accordance with the provincial closure plan • Initiation of active filling of the underground mine workings, LP Central pit and VMF with fresh water pumped from the Chukuni River • Redirection of site runoff to the LP Central pit lake	●	-	-	-	●	●	-	-	-	●
Passive closure	• Continuation and completion of the active and passive filling of the underground mine, VMF and the LP Central pit with fresh water pumped from the Chukuni River • Monitoring and maintenance of the integrated water management system for the mine site including water levels with the VMF and the LP Central pit lake, with discharge of treated effluent to the Chukuni River, until site water quality meets regulatory requirements and passive discharge to the environment is allowed	-	-	-	-	●	●	-	-	-	●
Final reclamation	• Connection of LP Central pit lake to natural water system once the pit lake water meets all regulatory requirements • Demolition and removal of the limited water management and treatment facilities and infrastructure remaining on site, after regulatory approval received for passive site discharge	●	●	-	-	●	-	-	-	-	-
Employment and expenditures	• Employment of individuals to support the decommissioning and closure of the Project, and expenditures related to procurement and contracting for the closure phase	-	-	-	-	-	-	-	-	-	-

Notes:
1 DFO does not currently have a pathway of effects specific to water quality modification. A project specific pathway of effect has been prepared to reflect drainage and treated effluent discharge activities.
- not applicable; ● applicable

8.6 Mitigation and Enhancement

Measures to be implemented to avoid or minimize the effects of the Project on fish and fish habitat, or enhance fish and fish habitat include:

- Minimize the mine site footprint and avoid / minimize overprinting of waterbodies where practical.
- Prohibit fishing within the PA by site personnel while working or residing at site.
- During construction (and other phases as applicable), implement a site-specific erosion and sediment control plan (ESCP) to mitigate the entry of sediment into surrounding waterbodies. The Plan will outline the installation of suitable measures, maintenance and describe monitoring to assess the effectiveness of the measures.
- Undertake routine project work by following DFO (2025b) Standards and Codes of Practice.
- Undertake inwater construction activities outside of the fish spawning and egg incubation periods to reduce the potential for effect on fish as per Measures to Protect Fish and Fish Habitat (DFO 2025c) and the MNR inwater timing windows (MNR 2014b), unless exempt.
- Design culverts to provide fish passage (i.e., incorporate low flow channels and embed culverts at least 10%) and naturalized substrates to mitigate habitat impacts.
- Install isolation measures for inwater works associated with the construction of Project infrastructure following the guidance of the Interim Standard: In-water Site Isolation (DFO 2023a).
- Fish exclusion measures will be applied to waterbodies where remnant flow conditions are not capable of maintaining fish habitat or populations (e.g., Unnamed Watercourse 1).
- A Fish Rescue Plan will be prepared and submitted for approval with DFO and MNR prior to undertaking fish rescue and relocation activities. The Plan will outline the methodology to complete the fish rescue as well as the necessary collection licenses and approvals, location of the rescues and relocations, timing and qualified personnel requirements to complete the rescues. Fish will be relocated from the work areas prior to undertaking inwater works for the construction of Project infrastructure. For example, consideration will be given to the potential to relocate fish to the created offsetting habitats like east pond and Dixie Creek pond complex if available. Prior to dewatering Unnamed Waterbody 1, a comprehensive fish removal program (fish-out) will be conducted to minimize the unintentional death of fish. Great Bear Resources will look for opportunities for Indigenous communities to participate in the fish rescues and relocations to provide education, interaction and youth engagement as requested during consultation and engagement.
- Install screens or use other measures at water intakes to prevent entrainment or impingement of fish as per the DFO Code of Practice (DFO 2024b).

- Prior to construction, a spill and emergency response plan will be developed to describe procedures to minimize the impact of accidental spills or releases of hazardous or deleterious materials. It will include steps for containment, cleanup, reporting, and preventing future incidents. A draft plan is provided in Appendix U-2.
- Implement the measures to mitigate effects on surface water, as outlined in Section 7.6, including the treatment of mine effluent prior to discharging to the Chukuni River, and the collection and management of runoff and seepage water from the perimeter of the TMF and stockpiles.
- Prior to construction, develop a detailed blasting management plan for areas adjacent to fish habitat that meets DFO criteria or alternate values derived in consultation with DFO.
- Complete required maintenance of inwater structures following the guidance of the Interim Code of Practice: Repair and Maintenance of In-water Structures (DFO 2023b).
- Implement the measures in the proposed FHOCP that are shown in Figure 8.6-1 and Figure 8.6-2 (detailed in Figure 8-1 to Figure 8-3 of Appendix L-2) that includes:
    - Construction of east dam and pond (east dam and east pond) at the upper reaches of Unnamed Watercourse 3b (approximately 12.3 ha)
    - Excavation of an additional pond area to connect east pond and the east pond channel (approximately 3.58 ha)
    - Construction of the related east pond channel measuring approximately 200 m in length (approximately 0.04 ha)
    - Reconstruction of approximately 1.3 km of Unnamed Watercourse 6b2 to its confluence with Unnamed Waterbody 6b3 (approximately 0.33 ha)
    - Construction of the Dixie Creek pond complex, which includes the development of an excavated pond habitat complex (approximately 7 ha) adjacent to Dixie Creek with connections to Dixie Creek
    - Support the development of a Fisheries Management Plan for Wabauskang Lake through the implementation of a study to determine the existing populations abundance and diversity of the Walleye population in Wabauskang Lake and the ability to maintain a productive population of naturally reproducing Walleye; invasive species management will be considered for incorporation into the plan.

The application of mitigation measures to specific pathways and phases is illustrated in Table 8.6-1. The application of measures described in this section are expected to be effective in mitigating effects to fish and fish habitat given their effective implementation at similar projects.

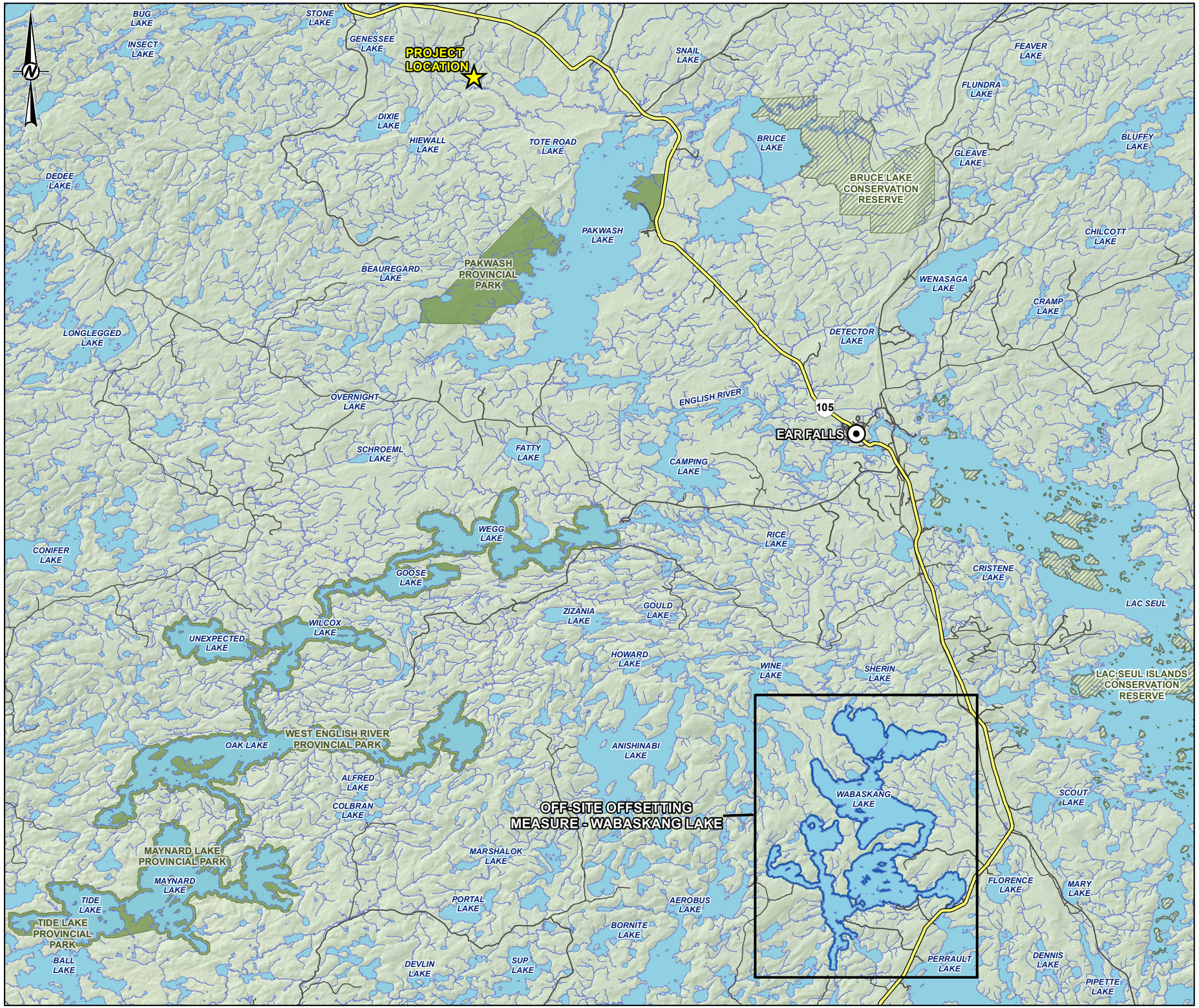
Monitoring programs will be implemented to verify the accuracy of the predicted effects and assess the effectiveness of the implemented mitigation measures and may be further optimized in response to monitoring data. Proposed follow-up monitoring described in Section 20 and will be refined during the permitting phase to incorporate conditions of approvals and permits. Consultation on the monitoring programs is expected to continue through all phases of the Project. Great Bear Resources will continue to look for opportunities for Indigenous communities to participate in the monitoring programs to support long term meaningful engagement and education.

Table 8.6-1: Mitigation Measures for Fish and Fish Habitat

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measures
	Con	Op	Cl	
Change to fish habitat	●	-	-	Minimize the mine site footprint and avoid / minimize overprinting of waterbodies where possible.
	●	●	●	During construction (and other phases as applicable), implement a site-specific ESCP to mitigate the entry of sediment into surrounding waterbodies. The ESCP will outline the installation of suitable measures, maintenance and describe monitoring to assess the effectiveness of the measures.
	●	●	●	Undertake inwater construction activities outside of the fish spawning and egg incubation periods to reduce the potential for effect on fish as per Measures to Protect Fish and Fish Habitat (DFO 2025c) and the inwater timing windows (MNR 2014b), unless exempt.
	●	-	-	Design culverts to provide fish passage and naturalized substrates to mitigate habitat impacts.
	●	●	●	Install isolation measures for inwater works associated with the construction of Project infrastructure following the guidance of Interim Standard: In-water Site Isolation (DFO 2023a).
	-	●	-	Complete required maintenance of inwater structures following the guidance of Interim Code of Practice: Repair and Maintenance of In-water Structures (DFO 2023b).
	●	-	-	Implement the measures in the FHOCP (Appendix L-2) including: • Development of the Fisheries east pond and channel. • Construction of the Dixie Creek pond complex, which includes the development of an excavated pond habitat complex adjacent to Dixie Creek with connections to the main Dixie Creek. • Support the development of a Fisheries Management Plan for Wabauskang Lake through the implementation of a study to determine the existing populations abundance and diversity of the Walleye population in Wabauskang Lake and the ability to maintain a productive population of naturally reproducing Walleye.
Change in fish communities	●	●	●	Undertake inwater construction activities outside of the fish spawning and egg incubation periods to reduce the potential for effect on fish as per Measures to Protect Fish and Fish Habitat (DFO 2025c) and inwater timing windows (MNR 2014b), unless exempt.
	●	●	●	Install isolation measures for inwater works associated with the construction of Project infrastructure following the guidance of Interim Standard: In-water Site Isolation (DFO 2023a).

Pathways To Potential Effect / Criteria	Phase			Proposed Mitigation Measures
	Con	Op	Cl	
	●	●	●	Relocate fish from the work area prior to undertaking inwater works for the construction of Project infrastructure.
	●	-	-	Prior to dewatering Unnamed Waterbody 1, a comprehensive fish removal program (fish-out) will be conducted to minimize the unintentional death of fish.
	●	●	●	Install screens or use other measures at water intakes to prevent entrainment or impingement of fish as per the Code of Practice (DFO 2024b).
	●	●	-	Prior to construction, develop a detailed blasting management plan for areas adjacent to fish habitat that meets DFO criteria or alternate values derived in consultation with DFO.
	-	●	-	Complete required maintenance of inwater structures following the guidance of Interim Code of Practice: Repair and Maintenance of In-water Structures (DFO 2023b).
Change in fish health	●	●	●	During construction (and other phases as applicable), implement a site-specific ESCP to mitigate the entry of sediment into surrounding waterbodies. The Plan will outline the installation of suitable measures, maintenance and describe monitoring to assess the effectiveness of the measures.
	●	●	●	Install isolation measures for inwater works associated with the construction of Project infrastructure following the guidance of Interim Standard: In-water Site Isolation (DFO 2023a).
	●	●	●	Prior to construction, a Spill and Emergency Response Plan will be developed to describe procedures to minimize the impact of accidental spills or releases of hazardous or deleterious materials. It will include steps for containment, cleanup, reporting, and preventing future incidents. A draft has been provided as Appendix U-2.
	●	●	●	Implement the measures to mitigate effects on surface water, as outlined in Section 7.6, including the treatment of mine effluent prior to discharging to the Chukuni River, and the collection and management of runoff and seepage water from the perimeter of the TMF and stockpiles.

Notes:
Con: construction; Op: operations; Cl: closure.
● : mitigation is applicable.
- : mitigation is not applicable.



LEGEND

- PROJECT LOCATION
- OFF-SITE OFFSETTING MEASURE - WABASKANG LAKE
- TOWN
- CONSERVATION RESERVE
- PROVINCIAL PARK
- HIGHWAY
- LOCAL ROAD
- RESOURCE/ RECREATION ROAD
- WATERCOURSE
- WATERBODY

0 2.5 5 10

1:265,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
PROPOSED OFF-SITE OFFSETTING MEASURE

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.6-1

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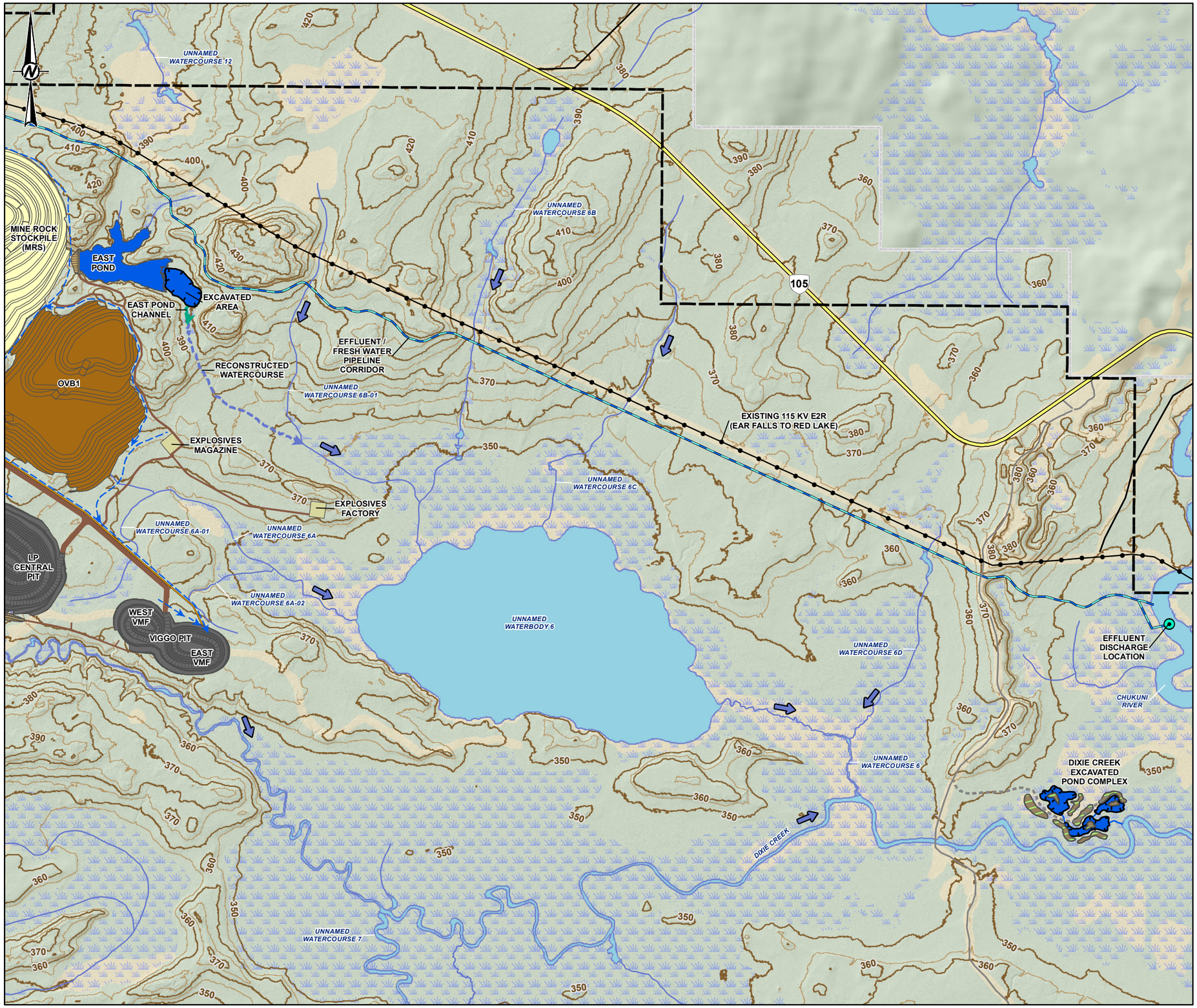
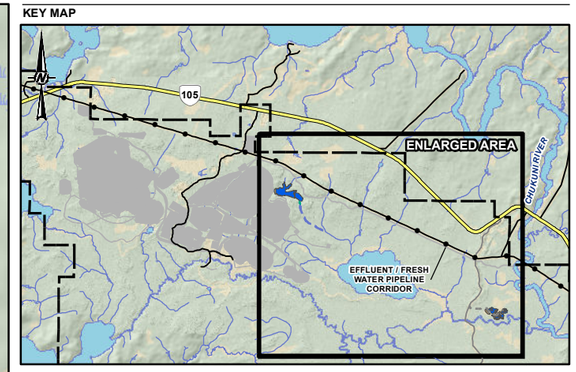


KEY MAP



SCALE 1:175,000

LEGEND

- PROPERTY BOUNDARY
- HIGHWAY (INCLUDING NATURAL GAS PIPELINE)
- LOCAL ROAD
- RESOURSE / RECREATION ROAD
- EXISTING TRANSMISSION LINE
- WETLAND AND LOW-LYING AREA
- WATERCOURSE
- WATERBODY
- EXTENT OF LIDAR SURVEY
- MAJOR CONTOUR (10 M INTERVAL)
- MINOR CONTOUR (5 M INTERVAL)
- FLOW DIRECTION

PROPOSED FISH HABITAT OFFSETTING MEASURES

- POND
- DAM
- EXCAVATED AREA
- EAST POND CHANNEL
- RECONSTRUCTED WATERCOURSE
- TREED EXCAVATED SOIL ISLAND
- ACCESS ROAD

PROPOSED MINE FEATURE

- OPEN PIT
- MINE ROCK STOCKPILE (PAG)
- OVERBURDEN STOCKPILE (OVB)
- COLLECTION DITCH
- MINE FACILITIES / INFRASTRUCTURE
- ROAD
- TAILINGS PIPELINE
- EFFLUENT / FRESH WATER PIPELINE CORRIDOR
- EFFLUENT DISCHARGE LOCATION

0 0.25 0.5 1

1:25,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. VMF: VIGGO MANAGEMENT FACILITY

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. CONTOURS ACQUIRED FROM 2022 LIDAR SURVEY.
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
PROPOSED ONSITE OFFSETTING MEASURES

CONSULTANT

wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.6-2

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8.7 Assessment of Residual Effects

8.7.1 Changes to Fish Habitat

8.7.1.1 Construction Phase

The majority of changes to fish habitat occur during the construction phase due to the initial site capture and mine development activity with the exception of construction of the MWP which is constructed during operations. Project components and activities that interact with fish and fish habitat, as described in Section 8.5.1, will result in a change of fish habitat due to direct overprinting and alteration of flows in downstream areas as delineated in Figure 8.7-1.

The construction of the TMF will result in a total loss of 12.75 ha of fish habitat due to overprinting, with 0.11 ha resulting during the initial construction of the starter embankments. The remaining loss of fish habitat associated with the TMF will be due to the deposition of tailings, including the loss of 10.44 ha of fish habitat in Unnamed Waterbody 1. The development of stockpiles for overburden, low grade ore and mine rock will also result in the loss of 1.32 ha of fish habitat. A collection water pond (CWP) will be constructed and result in the loss of 0.40 ha of fish habitat, with 0.35 ha associated with embankments. The development of the open pit will result in the loss of 0.12 ha of fish habitat, and other Project infrastructure will result in the loss of 0.33 ha. The total loss of fish habitat during construction is 14.92 ha. No direct loss of Lake Trout habitat (i.e., species of Indigenous community concern) is anticipated as a result of the Project, as they are not found within the PA. The majority of changes listed above resulted in no residual effects to the habitats of other species of Indigenous concern (i.e., White Sucker, Smallmouth Bass and shiner minnow species) identified to Great Bear Resources.

It was noted during engagement with Indigenous communities that there is fish spawning potential in Dixie Creek. WSP confirmed three to five potential spawning locations in Dixie Creek with suitable conditions for Walleye and Lake Whitefish (Appendix L-3); and that Chukuni River at Snowshoe Dam, is a known area for spawning. It is anticipated that no residual effects will be observed to the potential fish spawning locations of Dixie Creek (Appendix L-3).

Based on the results of the receiver water balance (Appendix I-3), the predicted changes in fish habitat from the reduction of flows in the downstream reach of Unnamed Waterbodies 1, 2, 6A, 8 and 6B-02 is 4.34 ha. The changes due to flow reductions are predicted to be a loss of 0.69 ha of fish habitat in Unnamed Watercourse 1, a loss of 0.21 ha in Unnamed Watercourse 6A, a loss of 0.02 ha in Unnamed Watercourse 3 and a loss of 2.76 ha in Unnamed Waterbody 2. The effects are generally not predicted to significantly extend to the receiving Dixie Creek which has a large drainage area of 202 km^2 at the Project site (Tuzyk's Road bridge) and not impact the 363 km^2 at its confluence with the Chukuni River (Appendix I-1).

During construction, the mean annual flow reductions are predicted to be 6% at the most affected node (DIX-3) within Dixie Creek. Using a conservative method of modeling, the most severe years for flow reduction at the most affected node (DIX-3) will occur in the operations and closure phase which are predicted to be approximately 10% using a mean annual comparison (Appendix I-3). A more detailed assessment of the existing flow regime of Dixie Creek and potential effects of flow reduction was completed at a monthly and weekly time step in Appendix L-3 as requested by DFO. At a monthly timestep model node DIX-3 was

calculated to have minor increases in flow reduction above 10% during the spring and fall with a maximum flow reduction of 13.6% in April.

This maximum flow reduction represents a less than 3 cm difference in water level during spring and fall spawning windows at potential spawning riffles which is considered minor in comparison to the modelled natural variation (difference between 25th and 75th percentiles) of approximately 1 m. Appendix L-3 determined that the existing Dixie Creek flow conditions had a reduced risk of impacts from the proposed flow reductions based on federal guidelines using the 30% mean annual discharge criteria (DFO 2013), was considered stable to highly stable using the Ontario Ecological Flow Classification (Jones et al. 2024), and had a management risk to the proposed flow reduction using the British Columbia Environmental Flow Needs Policy (British Columbia 2022). Overall, the combined flow reduction to Dixie Creek has low probability of ecologically detectible effects and therefore no residual effects to the Dixie Creek fish habitats including the potential spawning areas are predicted.

Unnamed Watercourse 8B and Unnamed Watercourse 6B are predicted to have increased flows by 11% due to redirected overland drainage north of the TMF and north of the MRS and OVB-1. This is not expected to result in rapid channel movement or sediment mobilization that would affect fish communities based on geomorphological assessment. However, this will affect 0.66 ha of fish habitat and has been included as a change to fish habitat thus requiring offsetting measures in the FHOCP (Appendix L-2).

The predicted changes to fish habitat due to the deposition of mine waste are listed in Table 8.7-1 and areas overprinted or altered (HADD under paragraph 35 of the *Fisheries Act*) are included in Table 8.7-2. The combined area of fish habitat affected is shown in Table 8.7-3 as 21.74 ha, most of which is associated with overprinting of Unnamed Waterbody 1 and Unnamed Waterbody 2 (13.2 ha).

The loss of fish habitat will be fully mitigated through implementation of the FHOCP (Appendix L-2) as described in Section 8.6. These measures include the development of the Fisheries East Pond and Channel, which will result in a gain of 15.94 ha of fish habitat. This will include 12.3 ha from the construction of a diversion pond at the upper reaches of Unnamed Watercourse 3b, an area of 3.6 ha from the excavation of additional pond area, the construction of a diversion channel that will provide 0.04 ha of fish habitat, and the reconstruction of approximately 1.3 km of Unnamed Watercourse 6b2 (0.33 ha of fish habitat). In addition, the construction of the Dixie Creek Pond Complex will provide a gain of 5 ha of fish habitat. The complimentary measure to support the development of a Fisheries Management Plan for Wabauskang Lake has been assumed to provide 2 ha of fish habitat. Overall, the FHOCP will be completed during the construction phase and provide approximately 25.2 ha of similar replacement habitat to those changed by the Project. This equates to 1.2 ha of replacement habitat for every 1 ha of habitat lost, or a ratio of 1:1.2. The mitigation measures proposed are scalable (can be enlarged as needed) allowing for flexibility in the event that additional habitat ratios are required during approvals.

With the implementation of mitigation identified in Section 8.6, specifically those measures targeted at changes to fish habitat (Table 8.6-1) including the FHOCP, there are no residual effects on fish habitat predicted due to changes in fish habitat during construction.

8.7.1.2 Operations Phase

During the operations phase the only additional effect on fish habitat area is associated with the construction of the MWP which overprints a portion of Unnamed Waterbody 1 (Figure 8.7-1 and

Table 8.7-2). The construction of the MWP will result in a total loss of 0.17 ha of fish habitat due to overprinting, with 0.06 ha resulting from the construction of the embankments. The remaining loss of fish habitat associated with the MWP will be due to the management of mine water. The ongoing dewatering of the open pits and the underground workings along with contact water collection and management will continue to result in flow reductions to Unnamed Watercourses 1, 3, and 6A, but the change was assessed in Section 8.7.1.1 and fully mitigated by implementation of the FHOCP (Appendix L-2). As a result, there are no residual effects on fish habitat predicted due to changes in fish habitat during operations.

8.7.1.3 Closure Phase

There are no additional negative effects to fish habitat predicted during the closure phase. The water diversion from the Chukuni River to actively fill the LP Central pit, VMF and underground mine accounts for less than 2% of the Chukuni River flows (Appendix I-3) and has low probability of ecologically detectible effects to fish habitat (DFO 2013).

During final reclamation the LP Central pit, VMF, and underground mine will have been actively filled to restore groundwater levels at the site (Appendix H-2). Surface reclamation will restore drainage patterns back to natural conditions to the extent practicable (Appendix I-3). The reclamation measures will result in the flow contributions to the remaining reaches of Unnamed Watercourses 1 and 6 returning to within 10% of baseline conditions. Flow to Unnamed Watercourse 8 will increase to 24% greater than baseline and may increase the effect of increased flow on fish community, however the extent of habitat over which the change to fish community may occur is unchanged from the habitat assessed and mitigated by the FHOCP. Flow within all nodes of Dixie Creek are anticipated to return to within 1% of baseline conditions.

The changes to fish habitat during closure will be positive, and remaining changes will be fully mitigated by the FHOCP. As a result, there are no residual effects on fish habitat predicted due to changes in fish habitat during operations.

8.7.2 Changes to Fish Communities

8.7.2.1 Construction Phase and Operations Phases

During construction, there may be changes to fish whereby the reductions in flow predicted in Unnamed Watercourse 1, Unnamed Watercourse 3 and Unnamed Watercourse 6A are expected to alter the available habitat area, nutrient supply, food supply and physicochemical parameters such as water temperature and oxygen. Species assemblages including species richness and abundance are expected to shift in favor of species that are more adaptable and resilient to the reduced flow conditions such as Central Mudminnow and Brook Stickleback. The changes in fish communities will occur within the small unnamed watercourses and waterbodies where flow reductions are predicted and will not extend into Dixie Creek. As such no population level changes are predicted to the identified fish of Indigenous community concern (i.e., Walleye, Lake Whitefish, White Sucker, Smallmouth Bass and shiner minnow species).

As the maximum extents of habitat effects will occur during Project development, further effects on fish communities are not anticipated to occur in operations phase.

During construction and operations, fish communities may be affected by the construction and operation of Project infrastructure located in fish habitat. This could include areas where embankments will be constructed for the TMF, CWP and MWP, watercourse crossings, as well as the deposition of mine waste in the TMF, overburden stockpile, MRS, CWP and MWP.

Isolation measures will be implemented to protect fish, where feasible, however the removal of fish from these areas will be required. In particular, the use of Unnamed Waterbody 1 for the deposition of tailings in the TMF will require a comprehensive fish removal program (fish-out) to minimize the unintentional death of fish. Fish removals are a common mitigation measure for projects impacting waterbodies, including water diversions, and each project requires individual consideration as to the best methods and preferred objectives.

During construction and operations, the detonation of explosives near waterbodies can produce post-detonation shock waves which result in a pressure deficit referred to as overpressure that can cause impacts in fish (Wright and Hopky 1998). According to Wright and Hopky (1998), an overpressure in excess of 100 kPa can result in effects on fish. Vibrations can also harm fish eggs and larvae, and a limit of a peak particle velocity no greater than 13 mm/s is allowed in a spawning bed during the period of egg incubation. Consultation has resulted in DFO requesting the Project consider the use of a more protective overpressure value of 50 kPa per Cott and Hanna (2005).

A site-specific blasting assessment has been completed for the Project (Appendix F) to calculate the potential extent of blasting effects based on a typical explosive charge, the updated site plan and the more protective overpressure value. The blasting analysis determined that although there is potential for blasting operations to exceed the vibration threshold of 13 mm/s during spawning in some waterbodies, the effects of the blasting is expected to be mitigatable using measures such as fish exclusion and or reducing charges per delay as needed. Charge per delay values presented in the blasting assessment are not to be considered a fixed limit but are meant to be representative of typical open pit blasting and used by the Project team to develop a blasting plan that meets the DFO criteria, or alternate values derived in consultation with DFO. Smaller charges may be used near water or during sensitive periods to reduce the predicted extent of impact. With the implementation of the blasting plan that meets DFO criteria, no residual effects on fish communities due to the use of explosives are anticipated.

During the operations phase, a water intake structure will be constructed to provide freshwater for the process plant. To mitigate the potential effects on fish communities due to entrainment or impingement from the operation of water intakes during all phases, a screen or other deterrents at the pump intakes will be implemented per DFO (2024b) Code of Practice or equivalent review and assessment. As a result, no residual effects on fish communities are anticipated due to entrainment or impingement.

Given the relatively small changes to fish habitats, the mitigations proposed (including fish rescues and blasting management), the residual effects to fish communities, including those of Indigenous community concern, are not predicted during the construction and operation phase of the Project.

8.7.2.2 Closure Phase

During final reclamation, the LP Central pit, VMF, and underground mine will have been actively filled and groundwater levels and drainage patterns will be reestablished back to natural conditions as practicable (Appendix I-3). This will result in the flow contributions to the remaining reaches of Unnamed Watercourse 1 and Unnamed Watercourse 6 returning to within 10% of baseline conditions. This may result in fish communities transitioning closer to baseline conditions with respect to species' richness and abundance. Although flows to Unnamed Watercourse 8 will increase to 24% greater than baseline, the extent of these changes was

considered in the assessment of changes in fish habitat and mitigated by the measures in the FHOCP. As a result, the effects on fish communities are fully mitigated. Flows in Dixie Creek are anticipated to return to within 1% of baseline conditions at closure, and changes in fish communities are not predicted. Although some positive shifts in species richness and fish abundance may occur in the unnamed watercourses during final reclamation there are no residual effects to fish communities predicted.

Given the relatively small reduction, infrequent occurrence and limited extent of the flow reduction, residual effects to fish communities are not predicted during any phase of the Project.

8.7.3 Changes to Fish Health

The assessment of changes to fish health is supported by analysis for other sections, including the surface water quality models (Appendix K-2 and Appendix K-3) and the human and ecological health assessment are reported in Sections 10.9, 11.9, 12.9, 13.9 and 14.9, as well as the mercury study report (Appendix T).

8.7.3.1 Construction Phase

Activities during the construction phase (Table 8.5-2) will largely involve earth movement and the blasting of construction rock. This can lead to the mobilization of suspended solids as well as blast residue and other contaminants entering nearby waters. A detailed description of water quality and potential effects is provided in Section 7.7.

Suspended solids can result in both chronic and acute lethality to fish, but generally only in relatively high concentrations. Lethal concentrations vary and can be as low as several hundred mg/L but are typically in the range of several thousand mg/L (Kjelland et.al. 2015; Birtwell 1999). Suspended solids also have the potential for chronic effects such as reduced feeding behavior and rates, predator avoidance, decreased spawning success, reduced swim performance and overall environmental stress requiring more energy and resources (Kjelland et.al. 2015, Robertson et.al 2006; Birtwell 1999). An ESCP will be prepared and actioned during construction phase to aid in the implementation of mitigation measures for effects resulting from suspended solids.

Blasting residuals contain nutrifying elements such as nitrogen and phosphorus which can result in increased growth of aquatic plants and algae; as well as other components such as ammonia, nitrates, nitrites and orthophosphates (DFO 2024a). Components such as un-ionized ammonia and nitrates can be toxic to fish when present in sufficient quantities.

The Project has been designed to avoid or mitigate direct and indirect effects to the local unnamed waterbodies and Dixie Creek. An integrated site water management will be implemented for the Project that includes the collection and management of contact water (Section 4.12). Excess water will be treated with a water treatment plant before discharge to the Chukuni River. This will continue throughout all phases until monitoring demonstrates that contact water is suitable to be released to the environment.

As the potential effects to fish health are mitigated by effective implementation of the integrated water management and treatment system, there are no predicted residual effects to fish health during construction, including those identified of Indigenous community concern to Great Bear Resources (i.e., Lake Trout, White Sucker, Smallmouth Bass and shiner minnow species).

8.7.3.2 Operations Phase

Operation of the mine includes the ongoing open pit and underground mine workings, operation of the process plant, and continued development and operation of the TMF and stockpiles which will generate contact water that could affect fish health due to changes in water quality. An assessment of the changes in water quality is provided in Section 7.7, supported by the mine site water quality model (Appendix K-2) and surface water quality model (Appendix K-3).

Changes to water quality associated with operations may include an increase to contaminants such as nutrients which may affect productivity, and heavy metals including mercury, which can have chronic and lethal effects on fish. The effect of nutrient additions can result in changes to food supply, oxygen concentrations, water clarity and other environmental conditions that may affect the growth rates and condition factor of fish and may favour some species of fish over others. Other contaminants such as heavy metals can have a more toxic effect and damage organs such as the nervous system, liver and lungs, kidneys and stomach, skin, and reproductive systems (Saravanan et. al. 2024; Khushbu et al. 2022). The concentrations at which lethal effects occur are generally quite high compared to typical background conditions and industry standard effluent guidelines. For example, acute toxicity (24-h to 96-h) concentration of inorganic mercury to fish ranges from 150 to 900 µg $Hg \cdot L^{-1}$ with acute toxicity concentrations for methylmercury ranging from 24 to 125 µg $Hg \cdot L^{-1}$ (CCME 1999, 2003); while background mean conditions in the Chukuni River are in the order of 0.003 to 0.006 µg $Hg \cdot L^{-1}$ for inorganic mercury and 0.00004 to 0.00008 µg $Hg \cdot L^{-1}$ for methylmercury (Appendix K-1). Although chronic effects can occur at lower concentrations, they are still considerably higher than typical background conditions industry standard effluent guidelines. Using mercury as an example again, chronic values in fish for inorganic mercury range from 0.26 to >64 µg $Hg \cdot L^{-1}$ in 5-d to 60-d tests; and from 0.93 to 63 µg $Hg \cdot L^{-1}$ for methylmercury.

The lethal and chronic concentrations of other metals are also generally well understood and are used to develop criteria and guidelines for the protection of aquatic life. These criteria and guidelines such as the federal Canadian Water Quality Guidelines, and the Provincial Water Quality Objectives for the protection of aquatic life, are subsequently used to determine site specific discharge requirements that are considered fully protective of aquatic life at both chronic and lethal endpoints.

The integrated site water management will be fully established including the collection and treatment of site contact water during operations. There is no additional potential effect to adjacent watercourses from sediment release from those described in the construction phase. All dewatering and process water not recycled will be directed to the water treatment facility prior to discharge to the Chukuni River. The final discharge will meet or exceed the site specific discharge criteria.

As the changes to water quality will be effectively mitigated by the implementation of the integrated water management and treatment system, there are no predicted residual effects to fish health during operations.

8.7.3.3 Closure Phase

During the closure phase, the process plant will be decommissioned, and deposition of tailings and process water will be discontinued. The integrated site water management system and water treatment plant will continue to operate until monitoring demonstrates that contact water is suitable to be released to the environment. The site will be progressively rehabilitated, thereby reducing the potential for localized drainage to mobilize residual contaminants to the local

unnamed watercourses. The LP Central pit, VMF and underground mine will be actively filled with water from the Chukuni River and dewatering of these features will cease.

As the changes to water quality will be effectively mitigated by the implementation of the integrated water management and treatment system until contact water is suitable for release to the environment, there are no predicted residual effects to fish health during closure.

Table 8.7-1: Fish Habitat Effects to Watercourses and Waterbodies, Schedule 2

Impact Segment ID (Figure 8.7-1)	Watercourse / Waterbody Name	Mine Feature	Length (m)	Bankfull Width (m)	Predicted Schedule 2 Surface Area (ha)
IS-1	Unnamed Watercourse 1A	TMF	1,155.4	2.1	0.24
IS-3	Unnamed Watercourse 1A	TMF Pond	426.5	2.1	0.09
IS-5	Unnamed Watercourse 1B	TMF	1,038.1	1.2	0.12
IS-6	Unnamed Waterbody 4	TMF	-	-	1.21
IS-7	Unnamed Watercourse 1B	TMF	-	-	0.19
IS-8	Unnamed Watercourse 1B	TMF	-	-	0.07
IS-9	Unnamed Watercourse 1B	TMF	1,044.7	1.2	0.13
IS-11	Unnamed Watercourse 1B	TMF	526.0	1.2	0.06
IS-12	Unnamed Watercourse 1B-02	TMF	449.9	1.2	0.05
IS-13	Unnamed Watercourse 1B-01	TMF	827.2	1.2	0.10
IS-15	Unnamed Watercourse 1B-03	TMF	-	-	0.09
IS-16	Unnamed Watercourse 1B-03	TMF	215.4	1.2	0.03
IS-17	Unnamed Watercourse 1B-03	TMF	-	-	0.04
IS-18	Unnamed Watercourse 1B-03	TMF	207.1	1.2	0.02
IS-19	Unnamed Watercourse 1B-03	TMF	-	-	0.04
IS-21	Unnamed Watercourse 1B-04	OVB3	241.4	2.1	0.05
IS-23	Unnamed Watercourse 1B-04	TMF	154.9	2.1	0.03
IS-24	Unnamed Watercourse 1B-05	TMF	399.7	1.2	0.05
IS-25	Unnamed Waterbody 1	TMF	-	-	10.44
IS-29	Unnamed Watercourse 3	MWP	593.0	1.8	0.11
IS-31	Unnamed Watercourse 3	OVB2	767.3	1.8	0.14
IS-32	Unnamed Watercourse 3	LGO	-	-	0.26
IS-33	Unnamed Watercourse 3	CWP	111.6	1.8	0.02
I-36	Unnamed Watercourse 3A	MRS	1,410.8	1.4	0.20
IS-42	Unnamed Watercourse 3B	CWP	130.3	2.2	0.03
IS-43	Unnamed Watercourse 3B	MRS	-	-	0.14
IS-44	Unnamed Watercourse 3B	MRS	919.6	2.2	0.20
IS-48	Unnamed Watercourse 3B-03	MRS	1,399.1	2.2	0.31
IS-49	Unnamed Watercourse 3B-04	MRS	295.2	2.2	0.06

Impact Segment ID (Figure 8.7-1)	Watercourse / Waterbody Name	Mine Feature	Length (m)	Bankfull Width (m)	Predicted Schedule 2 Surface Area (ha)
IS-50	Unnamed Watercourse 3B-05	MRS	460.4	2.2	0.10
IS-51	Unnamed Watercourse 3C	LGO1	551.0	1.2	0.07
IS-52	Unnamed Watercourse 3D	MRS	300.6	2.5	0.08
IS-55	Unnamed Watercourse 3F	MRS	595.3	1.2	0.07
IS-57	Unnamed Watercourse 3F	LGO2	296.3	1.2	0.04
IS-58	Unnamed Watercourse 6A	OVB1	917.0	1.4	0.13
Schedule 2 Total			**15,433.8**	**-**	**15.01**

Notes:
- : not applicable
TMF: tailings management facility, LGO: low grade ore stockpile, OVB: overburden stockpile, MRS: mine rock stockpile, MWP: mine water pond, CWP: collection water pond.
Schedule 2 waterbodies are those expected to require listing on Schedule 2 of the MDMER. Anticipated impacts summarized in this table are subject to change with additional regulatory discussions / consultation.
Watercourses or waterbodies with no fish captured or limiting physical conditions for fish presence were classified as potentially fish frequented in Appendix L-1, and included in this assessment as fish frequented for listing on Schedule 2 of the MDMER as a precautionary measure.

Table 8.7-2: Fish Habitat Effects to Watercourses and Waterbodies, Paragraph 35

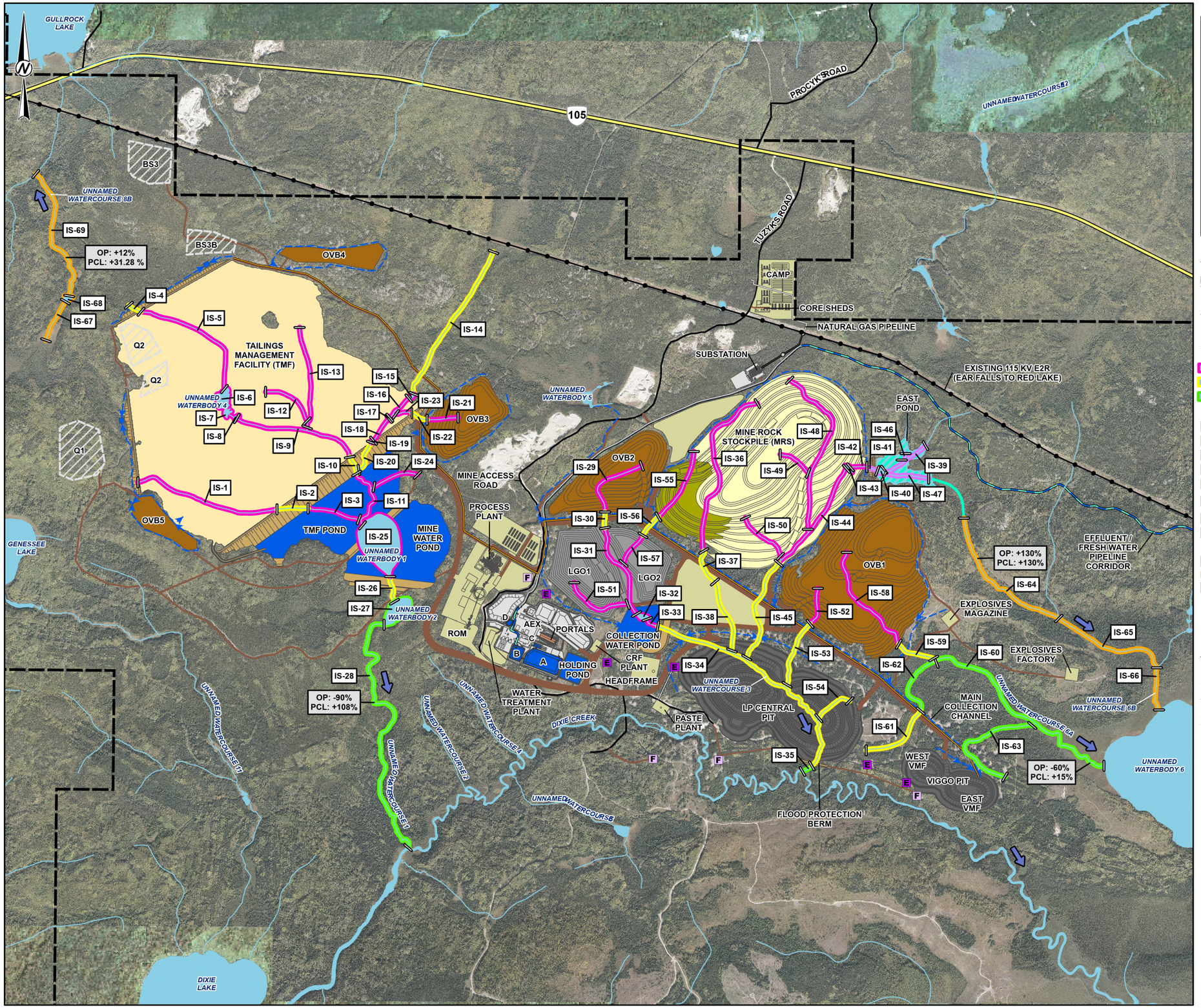
Impact Segment ID (Figure 8.7-1)	Watercourse / Waterbody	Mine Feature	Length (m)	Bankfull (m)	Predicted HADD Surface Area (ha)
IS-39	Unnamed Watercourse 3B	East pond	385.3	2.2	0.08
IS-40	Unnamed Watercourse 3B	East pond	-	-	0.21
IS-41	Unnamed Watercourse 3B	East pond dam	86.3	2.2	0.02
IS-46	Unnamed Watercourse 3B-01	East pond	48.5	2.2	0.01
IS-47	Unnamed Watercourse 3B-02	East pond	342.8	2.2	0.08
IS-2	Unnamed Watercourse 1A	TMF dam	242.3	2.1	0.05
IS-4	Unnamed Watercourse 1B	TMF dam	107.5	2.1	0.02
IS-10	Unnamed Watercourse 1B	TMF dam	141.1	2.1	0.03
IS-14	Unnamed Watercourse 1B-03	Support infrastructure	1289.1	2.1	0.27
IS-20	Unnamed Watercourse 1B-03	TMF dam	275.2	2.1	0.06
IS-22	Unnamed Watercourse 1B-04	Support infrastructure and TMF dam	133.5	2.1	0.03
IS-26	Unnamed Watercourse 1	MWP dam	207.2	3.0	0.06
IS-30	Unnamed Watercourse 3	Support infrastructure	124.6	1.8	0.02
IS-34	Unnamed Watercourse 3	Open pit / CWP dam	1922.1	1.8	0.35
IS-37	Unnamed Watercourse 3A	Support infrastructure	284.4	1.4	0.04
IS-38	Unnamed Watercourse 3A	Support infrastructure / open pit	594.0	1.4	0.08
IS-45	Unnamed Watercourse 3B	Support infrastructure / open pit	864.5	2.2	0.19
IS-53	Unnamed Watercourse 3D	Support infrastructure / open pit	553.0	2.2	0.12
IS-54	Unnamed Watercourse 3E	Open pit	323.5	2.2	0.07
IS-56	Unnamed Watercourse 3F	Support infrastructure	188.5	1.2	0.02
IS-59	Unnamed Watercourse 6A	Support infrastructure	329.1	1.2	0.04
IS-27	Unnamed Waterbody 2	Flow reduction	-	-	2.76
IS-28	Unnamed Watercourse 1	Flow reduction	2,297.1	3.0	0.69
IS-35	Unnamed Watercourse 3	Flow reduction	86.0	1.8	0.02
IS-60	Unnamed Watercourse 6A	Flow reduction	1,730.1	1.2	0.21

Impact Segment ID (Figure 8.7-1)	Watercourse / Waterbody	Mine Feature	Length (m)	Bankfull (m)	Predicted HADD Surface Area (ha)
IS-61	Unnamed Watercourse 6A-1	Flow reduction and support infrastructure	578.5	1.2	0.07
IS-62	Unnamed Watercourse 6A-1	Flow reduction	545.7	1.2	0.07
IS-63	Unnamed Watercourse 6A-2	Flow reduction and support infrastructure	1,026.9	1.2	0.12
IS-64	Unnamed Watercourse 6B-02	Flow increase	1,165.2	1.2	0.14
IS-65	Unnamed Watercourse 6B-01	Flow increase	923.6	2.2	0.20
IS-66	Unnamed Watercourse 6B	Flow increase	342.5	2.2	0.08
IS-67	Unnamed Watercourse 8B	Flow increase	339.8	2.2	0.07
IS-68	Unnamed Watercourse 8B	Flow increase	-	-	0.21
IS-69	Unnamed Watercourse 8B	Flow increase	1,092.0	2.2	0.24
Paragraph 35 Total			**18,569.9**	**-**	**6.73**

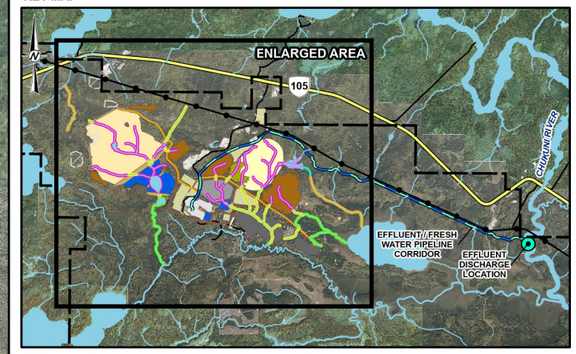
Notes:
- : is not applicable.
TMF: tailings management facility; MWP: mine water pond; CWP: collection water pond.
Paragraph 35 waterbodies are those expected to require authorization or review under Paragraphs 34.4(2)(b) and 35(2)(b) of the *Fisheries Act*. Anticipated impacts summarized in this table are subject to change with additional regulatory discussions / consultation.
Watercourses or waterbodies with no fish captured or limiting physical conditions for fish presence were classified as potentially fish frequented in Appendix L-2, and included in this assessment as fish frequented for authorization or review under Paragraphs 34.4(2)(b) and 35(2)(b) of the *Fisheries Act* as a precautionary measure.

Table 8.7-3: Summary of Fish Habitat Effects to Watercourses and Waterbodies

Effect Type	Predicted Schedule 2 and Paragraph 35 Surface Area (ha)
Schedule 2 Total	15.01
Paragraph 35 Total	6.73
Combined Schedule 2 and Paragraph 35 Total	**21.74**



KEY MAP



SCALE: 1:175,000

LEGEND

- PROPERTY BOUNDARY
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY
- FLOW DIRECTION

ANTICIPATED FISHERIES IMPACTS (LABELLED WITH IMPACT SEGMENT ID AND PERCENT FLOW INCREASE/DECREASE)

- SCHEDULE 2
- PARAGRAPH 35 (DIRECT IMPACT)
- PARAGRAPH 35 (FLOW REDUCTION)
- PARAGRAPH 35 (FLOW INCREASE)
- PARAGRAPH 35 (ALTERED HABITAT)

PROPOSED MINE FEATURE

- OPEN PIT
- MINE ROCK STOCKPILE (NPAG)
- MINE ROCK STOCKPILE (PAG)
- LOW GRADE ORE STOCKPILE (LGO)
- OVERBURDEN STOCKPILE (OVB)
- TAILINGS MANAGEMENT FACILITY (TMF)
- DAM
- POND
- COLLECTION DITCH
- MINE FACILITIES / INFRASTRUCTURE
- ROAD
- PORTAL
- ADVANCED EXPLORATION SITE (AEX)
- ROCK QUARRY (Q) / SAND AND GRAVEL PIT (B)
- FISH HABITAT OFFSETTING WATERBODY
- DIVERSION CHANNEL
- FRESH AIR VENT RAISE
- EXHAUST VENT RAISE
- TRANSMISSION LINE
- TAILINGS PIPELINE
- PASTE PLANT PIPELINE
- EFFLUENT / FRESH WATER PIPELINE CORRIDOR
- EFFLUENT DISCHARGE LOCATION

0 0.25 0.5 1
1:30,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. VMF: VIGGO MANAGEMENT FACILITY
3. ROM: RUN OF MINE ORE
4. AEX PONDS: A-AEX MINE WATER POND, B-AEX TREATED WATER POND, C-AEX SETTLING POND, D-AEX SEDIMENT POND
5. OP: OPERATIONS, PCL: POST-CLOSURE
6. +: FLOW INCREASE, -: FLOW DECREASE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N.

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
ANTICIPATED FISHERIES IMPACTS

CONSULTANT
wsp

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

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	8.7-1

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

25mm
0

PATH: X:\CA\CA04300-OAK\MIS-FS1-Project\P2023\Projects\OMEMA2303_Kinross_Great_Bear_Env\7_GIS\Arcpro\GIS_Section\PROJ\CA0031271_9255-0001-G-0000\CA0031271_9255-0001-G-0000.aprx, PRINTED ON: AT 4:12:41 PM

8.8 Determination of Significance and Confidence

As required by federal legislation and policy, the change to 21.74 ha of fish habitat will be counterbalanced with 25.21 ha of fish habitat offsetting and compensation measures (considered mitigation in the context of the Impact Assessment) as a component of the Project. Therefore, with the implementation of mitigation measures, including the site wide integrated water management and treatments system and the FHOCP, residual effects to fish and fish habitat are not predicted and a determination of significance is not required.

The level of confidence in the prediction is considered to be high. Predicted potential effects are based on previous experience, in which the potential effects and mitigation measures are well understood. Effects predictions are based on measured values and areas using GIS applications, provincial mapping, site specific field studies and a conservative approach to delineating effects such as assuming a 100% impact to waterbodies only partially affected. The proposed mitigation measures are well understood. Constructed pond habitats are relatively simple in concept and construction for similar projects has proven success in past application. The proposed mitigation measures replace each 1 ha of affected habitat with 1.2 ha of similar replacement habitat. These and other conservative assumptions have contributed to increase the level of confidence in the conclusions.

8.9 Change Outcome

8.9.1 Zone of Changes

The changes to fish and fish habitat are illustrated in Figure 8.7-1. The extent of change is determined by the physical overprinting of habitat by project facilities, associated flow reductions to downstream areas, and the implementation of an integrated water management system. The zone of change is delimited by the unnamed watercourses and waterbodies is not predicted to extend into Dixie Creek due to its large drainage area and associated resilience to the relatively small Project footprint. No changes to fish and fish habitat are predicted within the Chukuni River based on its large drainage area and the ability to treat water to appropriate site specific criteria.

8.9.2 Change Management

These changes to fish and fish habitat are managed through regulatory mechanisms including:

- *Fisheries Act* Authorization (federal)
- Schedule 2 listing under the MDMER (federal)
- *Lakes and Rivers Improvement Act* approval (provincial)
- Permit to Take Water (provincial)
- Environmental Compliance Approval - Industrial Sewage Works (provincial).

Requirements and conditions of federal approvals, including:

- Listing of waterbodies on Schedule 2 of the MDMER and Authorization under Paragraph 35 of the *Fisheries Act*. These approvals require an approved FHOCP which specifies site specific mitigation and avoidance measures, offset and compensation measures and the scheduled monitoring requirements to confirm the plan is implemented as designed.
- Monitoring associated with the approvals as specified timelines and endpoints that must be met and are backed by financial assurance.
- All metal mines in Canada must comply with the MDMER which includes ongoing effluent quality monitoring and cyclic environmental effects monitoring. If effects are observed a sequence of cause and effect sampling and analysis occurs.

Requirements and conditions of provincial approval:

- Permit to Take Water: needed to protect the natural ecosystem including habitat that depends on water flows and levels
- Environmental Compliance Approval – Industrial Sewage Works: needed to protect the natural ecosystem including surface water and groundwater (i.e., fish habitat and aquatic life).

Activities associated with the mine that may affect fish and fish habitat are considered in provincial permits and approval, including: Permits to Take Water, and *Lakes and Rivers Improvement Act* approvals (Section 19). These permits and approvals include conditions to confirm effects to fish and habitat are mitigated, and compliance monitoring to verify the effectiveness of the conditions. If predictions are not met, a sequence of review, adaptive management and amendments to the permits may occur.

8.10 References

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