Dominion Diamond Corporation

Jay Project Developer's Assessment Report

Fish and Fish Habitat

Overview

- General overview of presentation
  - Introduction
  - DAR sections for the fish and fish habitat discipline
  - Assessment approach for the fish and fish habitat discipline
  - Existing Environment
    - Methods
    - Results
  - Assessment
    - Methods
    - Results
  - Summary

Assessment Approach – Section 9.1

Valued Components (VCs), Assessment Endpoints, and Measurement Indicators

- VCs represent physical, biological, cultural, social, and economic properties of the environment that are considered important to society
- VCs included fish species identified as part of local Aboriginal fisheries
- Assessment endpoints are used to assess the significance of effects on the VCs, and represent the key properties of these VCs that should be protected

Valued Component	Assessment Endpoint	Measurement Indicator
Arctic Grayling Lake Trout Lake Whitefish	• ongoing fisheries productivity • self-sustaining and ecologically effective fish populations	• habitat quantity (includes surface hydrology and water quality indicators) • habitat arrangement and connectivity (fragmentation) • habitat quality (includes surface hydrology and water quality indicators) • survival and reproduction • abundance and distribution of fish
Aquatic life other than fish	• ongoing support of fisheries productivity	• concentrations of chlorophyll *a*, nutrients • phytoplankton species composition, abundance, and biomass • zooplankton species composition, abundance, and biomass • benthic invertebrate species composition, richness, abundance, and biomass

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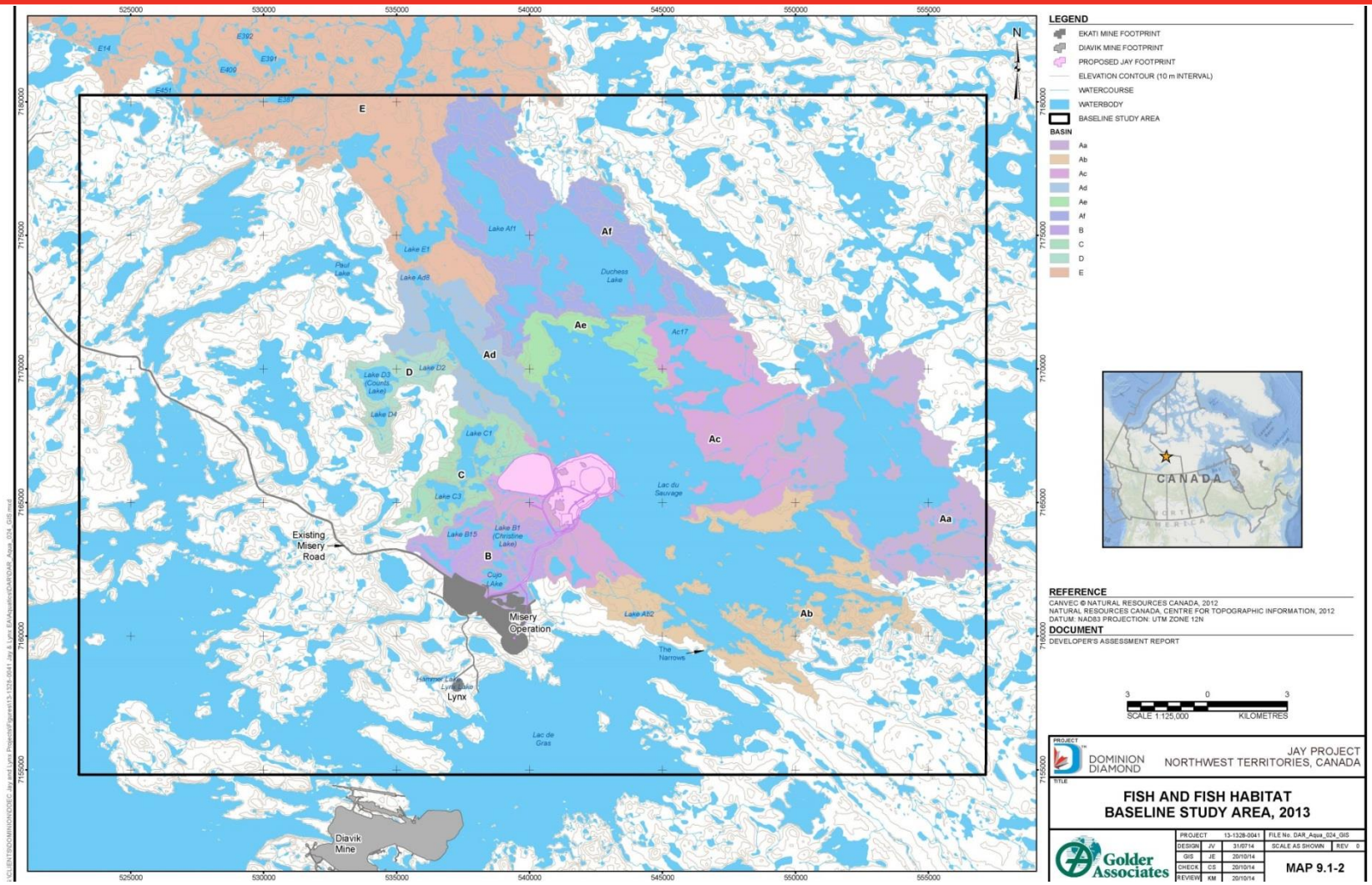
Existing Environment– Baseline Study Area



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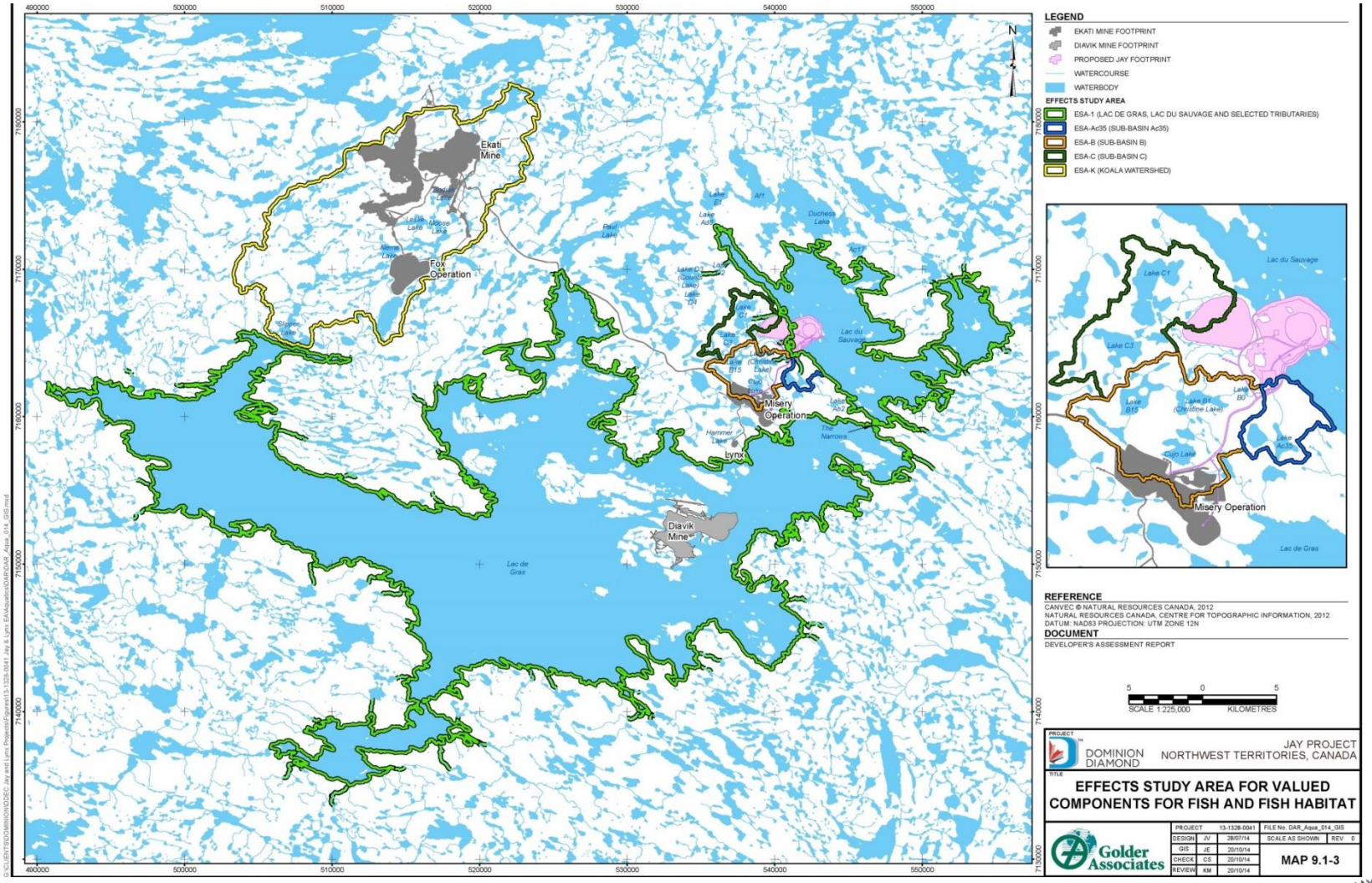
Existing Environment

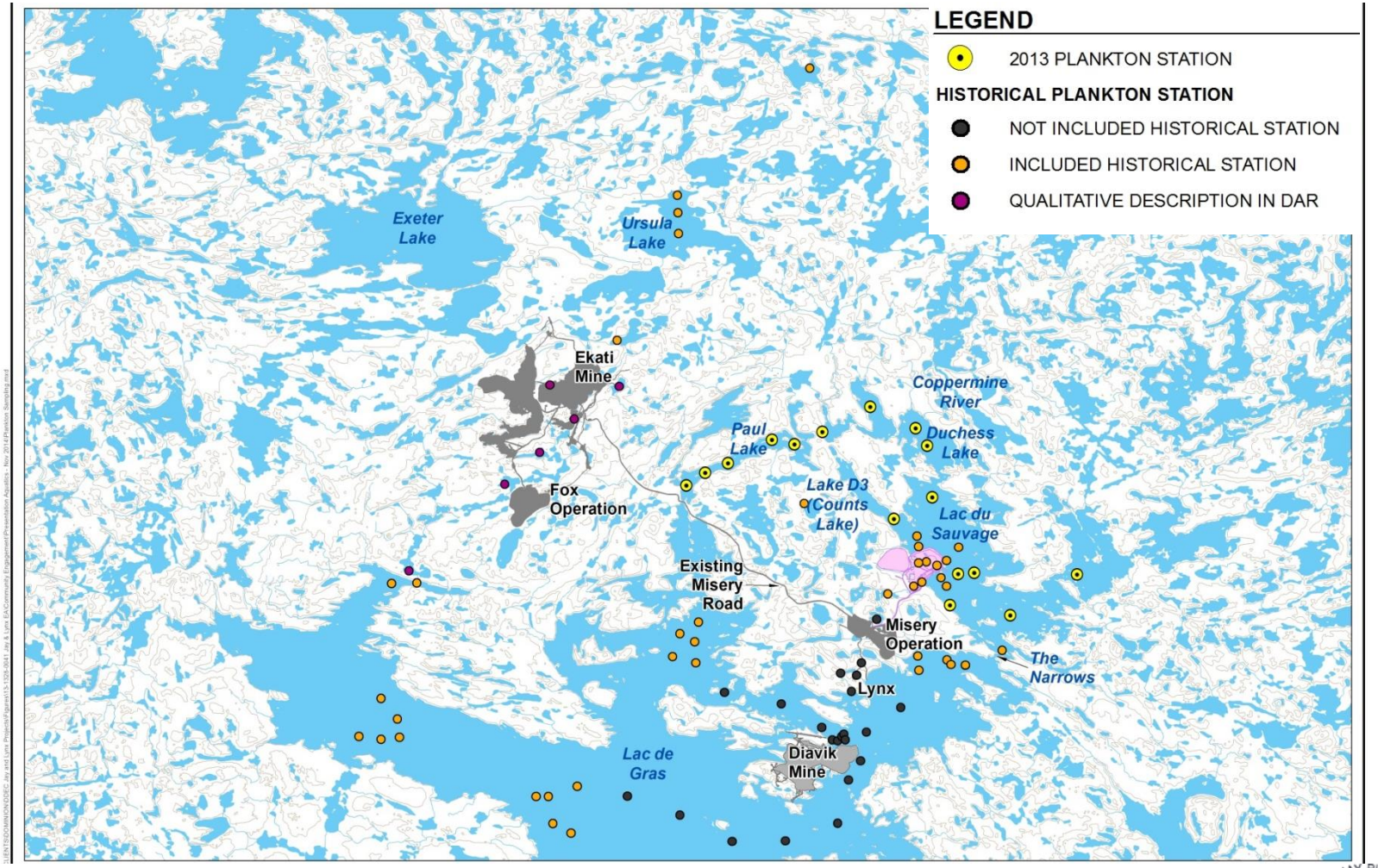


Existing Environment – Methods

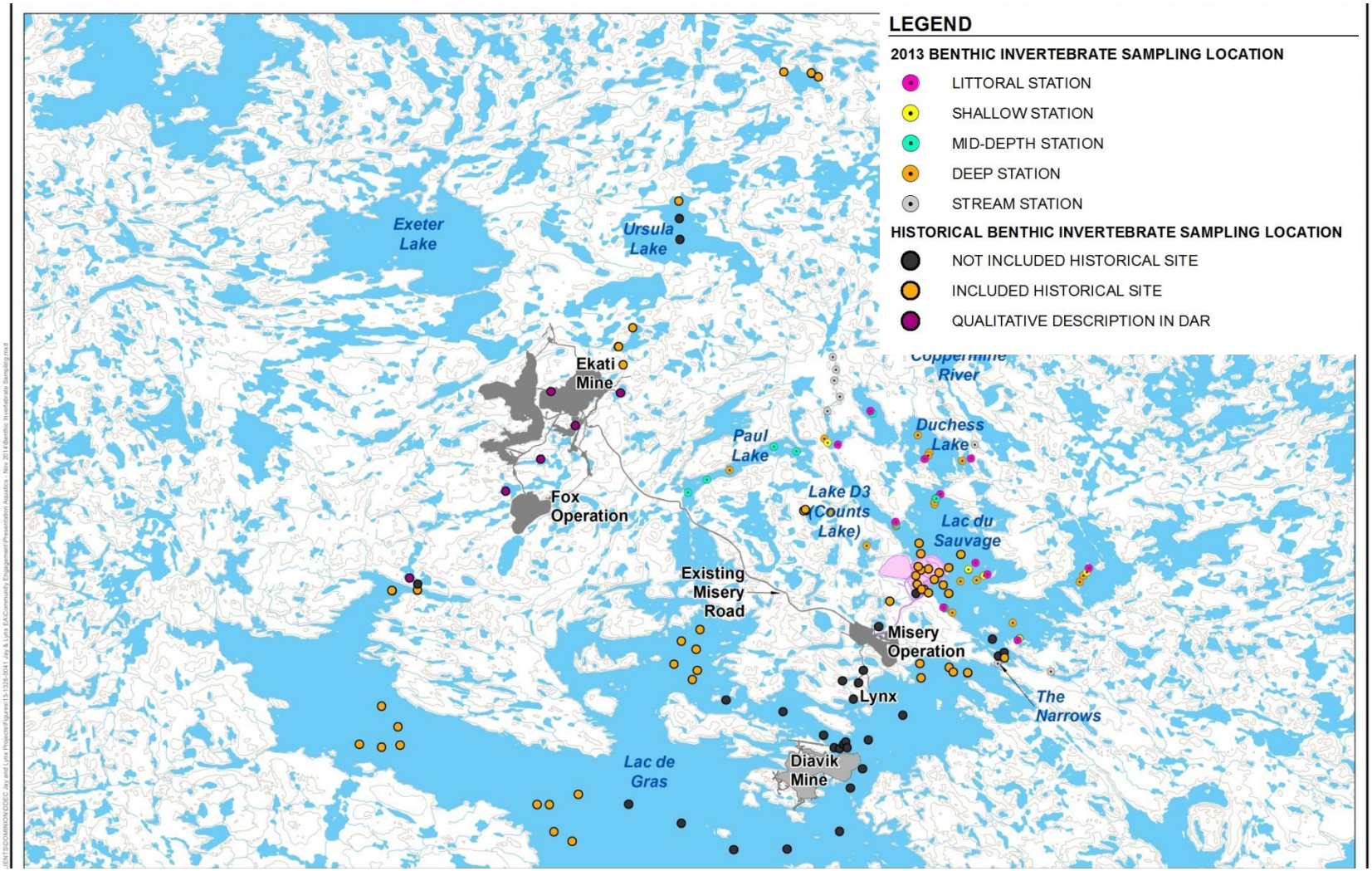
Existing data and baseline sampling program – Section 9.2

- Existing baseline and long-term monitoring data from Ekati and Diavik 1995-2012
  - plankton and benthic invertebrate community data
  - fish and fish habitat data
- 2013 baseline studies for:
  - plankton community (3 open-water periods)
    - zooplankton and phytoplankton samples
    - 4 lakes in Lac du Sauvage basin and 1 lake in Lac de Gras basin
  - benthic invertebrate community (fall sampling)
    - 5 lakes in Lac du Sauvage basin, 1 lake in Lac de Gras basin, 4 streams
    - lake stations included littoral, shallow, mid-depth, and deep habitat
  - fish and fish habitat data
    - fish sampling (18 lakes and 6 streams)
    - habitat assessments (18 lakes and 12 streams)
  - Hydroacoustic surveys of fish and substrate in Lac du Sauvage
    - two night surveys
- 2014 baseline sampling to be reported in 2015

Existing Environment – Plankton Sampling



Existing Environment – Benthic Invertebrate Sampling



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Existing Environment – Fish and Fish Habitat Sampling

LEGEND

- ANGLING LOCATION, 2013
- ELECTROFISHING LOCATION, 2013
- GILL NET LOCATION, 2013
- MINNOW TRAP LOCATION, 2013
- GENERAL HISTORICAL REPORT LOCATION

REPORT NUMBER	REPORT CITATION
1	BHP 1995a
2	Golder 1997a
3	Golder 1997b
4	Golder 1997c
5	Golder 1997d
6	Golder 1997e
7	Golder 1997f
8	CEAA 1998
9	DDMI 1998a
10	DDMI 1998b
11	Golder 1998a
12	Golder 1998b
13	Jacques Whitford 2001
14	Dillion 20002a
15	Dillion 20002b
16	Golder 2002
17	Jacques Whitford 2002
18	Rescan 2002
19	DDMI 2003
20	Rescan 2003
21	DDMI 2004
22	Gray e t al. 2005
23	CRI 2006
24	DDMI 2006
25	Rescan 2007
26	Thistle and Tonn 2007
27	DDMI 2008
28	Golder 2008
29	Rescan 2008
30	Golder 2009
31	Rescan 2009
32	Rio Tin to 2009
33	Golder 2010
34	Rio Tin to 2010
35	Rio Tin to 2011
36	Golder 2012
37	Rio Tin to 2012
38	Rescan 2013

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Existing Environment - Results

Fish Habitat – Section 9.2.4

- Lac du Sauvage almost 8,700 ha in size, mean depth = 6.8 m, max depth = 40.4 m

Substrate Type	Depth Stratum				Total %
	0 to 2 m %	2 to 6 m %	6 to 10 m %	>10 m %	
Coarse	34.0	5.2	0.7	0	***8.4***
Mixed	15.2	3.7	1.8	0	***4.5***
Fines	50.8	91.2	97.6	100	***87.1***
Total	100	100	100	100	***100***

- 21 shoals in Lac du Sauvage
  - 43% of shoals were “good” or “fair” spawning habitat for Lake Trout and Cisco, and 10% for Round Whitefish
  - 160 shoals in Lac de Gras

- Traditional knowledge identifies the “Narrows” as a good fishing location, and also as an area for spawning habitat

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Existing Environment – Lower Trophic Results (Section 9.2.4)

- **Lac du Sauvage assemblage typical for an oligotrophic sub-Arctic lake**

	Phytoplankton	Zooplankton	Benthic Invertebrates
Abundance & Biomass	Densities lowest in spring; no obvious seasonal trend in biomass	Highest in summer, some spatial variability	Highest at shallow locations but only 'moderate' densities
Community indices	Highest richness observed in fall, but seasonal trends were variable across stations	Richness increases over summer for all stations	Diverse assemblage, consistent across stations
Dominant Taxa	Chrysophytes	Rotifers	Chironomidae

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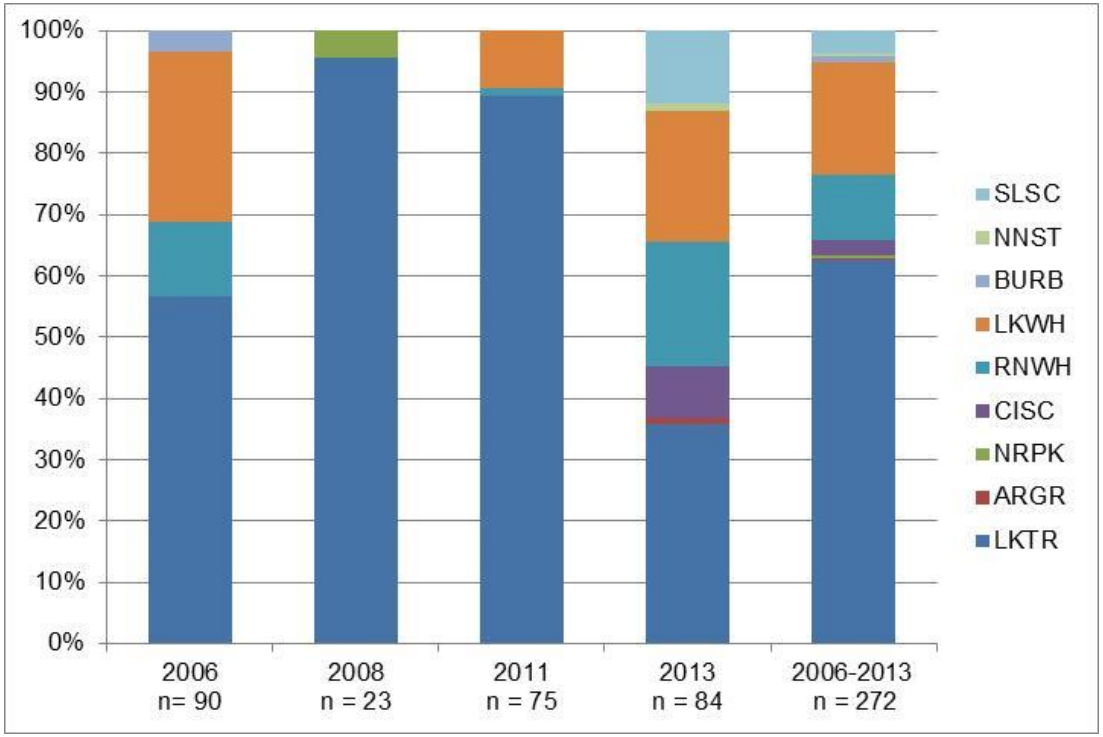
Existing Environment – Results

Fish Community and Abundance – Section 9.2.4

- 9 fish species confirmed in Lac du Sauvage
  - Lake Trout most abundant species (63%), followed by Lake Whitefish (18%), Round Whitefish (11%), others (<5%)
- The predicted population estimate from hydroacoustics was 197,000 fish in Lac du Sauvage
- Lac de Gras and Narrows are known to be a traditional source of large, fat fish



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Assessment – Pathway Analysis (Section 9.3)

- Classification of effects pathways (no linkage, secondary, and primary) to fish and fish habitat VCs are summarized in Table 9.3-1 in the DAR
- 12 pathways classified as no linkage pathways
- 16 pathways classified as secondary pathways
- 7 pathways classified as primary pathways

Assessment – Key Mitigation Methods

Section 9.3.2.1

- **Blasting**
  - Follow DFO recommended measures to avoid causing serious harm to fish
  - Guidelines include a maximum recommended limit for blast-induced overpressure, peak particle velocity, setback distance

- **Fish screens**
  - Follow DFO recommended guidelines to avoid causing serious harm to fish
  - Used on water intake pipes in fish-bearing waterbodies to reduce entrainment or impingement from the intake pipe

- **Diversion channel**
  - Low-gradient design to facilitate fish passage to upstream spawning locations (1.3 km channel)
  - Design will permit upstream movement of target species (adult Arctic Grayling)
  - Culverts designed and installed to maintain adequate flows and velocities for fish passage at proposed road crossings

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Assessment – Primary Pathways (Section 9.4)

"Direct Effects"

- The construction of the horseshoe dike and Jay Pit within Lac du Sauvage will result in the direct loss or alteration of habitat, affecting fish and other aquatic life within Lac du Sauvage and Lac de Gras
- The dewatering of the diked area will result in the direct loss or alteration of habitat in Lac du Sauvage, affecting fish and other aquatic life
- Dewatering Lac du Sauvage within the diked area will require a fish-out of the area
- The construction of the horseshoe dike and diversion channel may alter access to tributary stream habitats to Lac du Sauvage, resulting in habitat loss for fish VCs

Assessment – Primary Pathways (Section 9.4)

"Indirect Effects"

- Operational activities and discharge may change surface water quality and affect fish and other aquatic life

- Pumping water to back-flood the diked area may affect water levels and riparian habitat in Lac du Sauvage, the Narrows, and Lac de Gras, affecting fish and other aquatic life

- Reconnection of the back-flooded area of Lac du Sauvage to the remaining watershed and post-closure releases of water may change long-term water quality in Lac du Sauvage and Lac de Gras, affecting fish and other aquatic life

Assessment – Residual Effects Analysis (Section 9.4)

Assessment Cases (Section 9.4.1)

- Base Case – range of conditions over time within the ESA before application
- Application Case – predictions of the cumulative effects of the Project and existing and approved projects
- Reasonably Foreseeable Development Case

Base Case		Application Case	Reasonably Foreseeable Development Case
Reference Condition	2014 Baseline Conditions		
No or minimal human development	Conditions from all previous, existing, and approved developments before the Project	Base Case plus the Project	Application Case plus reasonably foreseeable developments

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Assessment – Residual Effects Analysis Results

“Direct Effects to Habitat” (Section 9.4.3)

- Residual effects to fish will primarily be a result of habitat losses from the Jay horseshoe dike and the dewatering of the diked area in Lac du Sauvage
  - The cumulative direct loss of lake habitat is expected to be 586 ha or less than 1% of the lake habitat in the ESA relative to the reference condition
  - The cumulative direct loss of stream habitat is expected to be approx. 877 m or 1.6% of streams in the ESA relative to the reference condition
- At closure, the dewatered area will be back-flooded and the dike will be breached when water quality is suitable (i.e., expected that habitat functions will recover)
- Dominion Diamond will continue to work with DFO and local Aboriginal communities on developing an offsetting plan to counterbalance for losses in fish habitat

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Assessment – Residual Effects Analysis Results

“Fish-Out”

- The predicted abundance estimate in the dewatered area was approximately 7,100 fish (or less than 1% of population in ESA)

- Before dewatering, a detailed fish-out plan will be developed in discussion with local Aboriginal groups and DFO

Assessment – Residual Effects Analysis Results

“Indirect Effects to Habitat”

- The flow depth, channel widths, and riparian conditions of the Narrows will remain within the range of natural variability for the duration of back-flooding

- The effect of increased nutrient concentrations to Lac du Sauvage during operations may increase productivity at lower trophic levels in Lac du Sauvage

- However, following closure, plankton and benthic invertebrate communities are expected to return to baseline conditions

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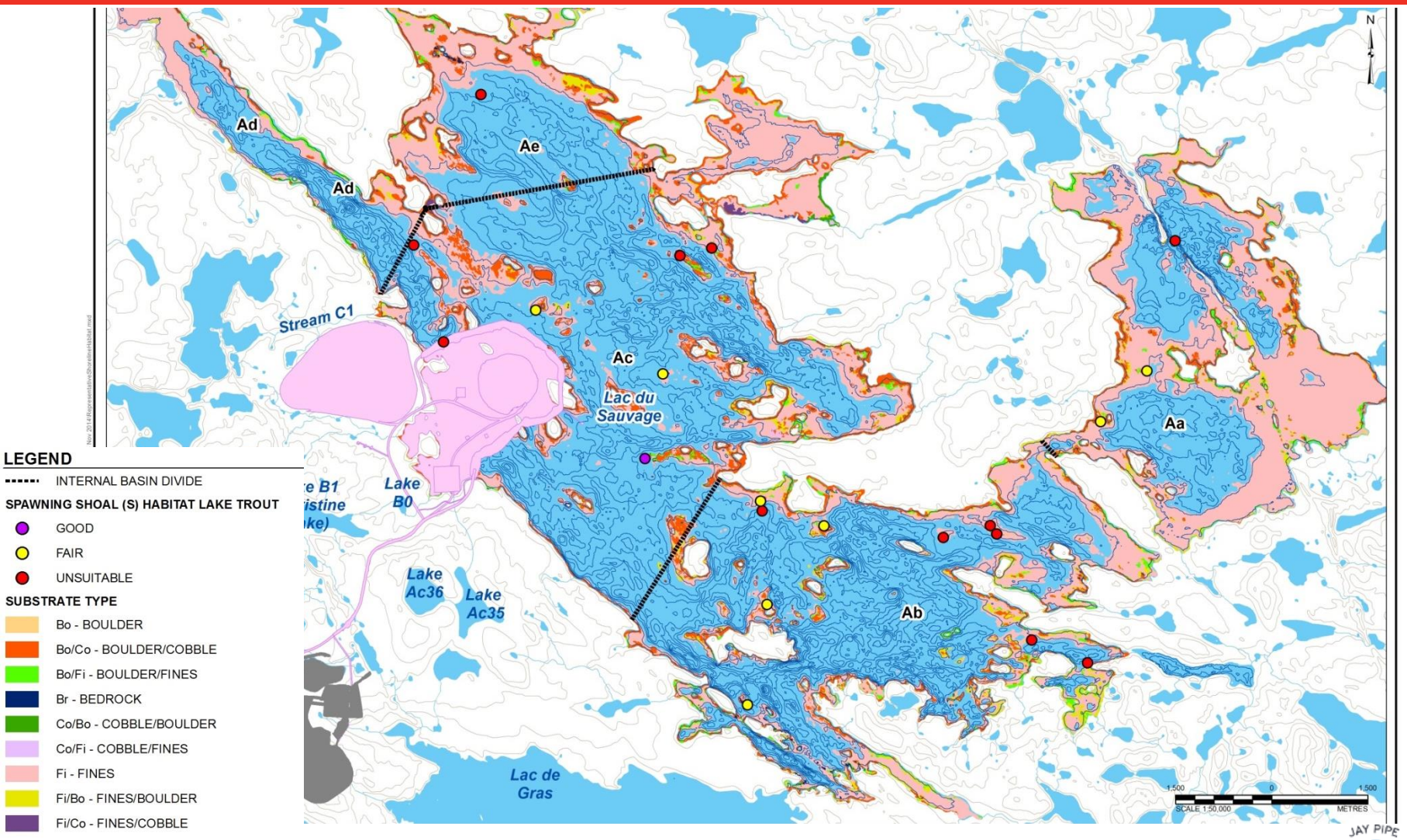
Project Footprint During Operations



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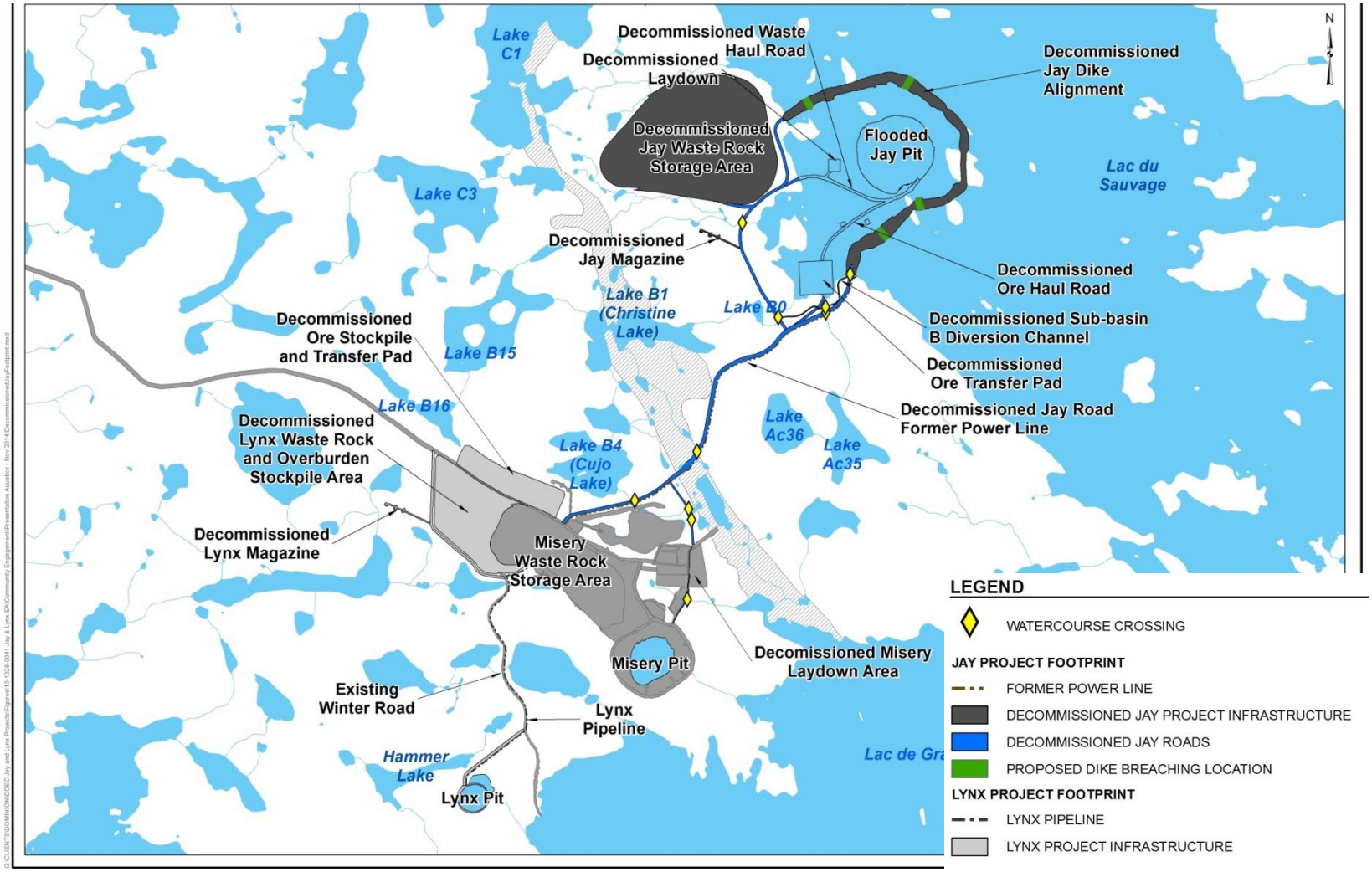
Project Footprint During Post-Closure



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Conceptual Fish-Out Plan – Appendix 9B

- The current plan is conceptual
- The objective will be to remove fish in a manner that minimizes the waste of fish caused by the dewatering of diked area
- Plan to be finalized through continued engagement with communities and DFO
- Based on hydroacoustics, 7,100 fish may be in the diked area
  - Most fish will be < 30 cm in length

Ideas from community meetings included, but were not limited to, the following:

- *Involve the community (including youth) in the capture, processing, distribution, and data collection where possible*
- *Fish waste and small fish can be provided to trappers and dog handlers*
- *If possible, plan to transfer live small fish to main body of Lac du Sauvage*

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Offsetting Plan – Appendix 9A

- The plans remain conceptual at this stage
- Includes offsetting options to counterbalance habitat losses in Lac du Sauvage
  - Potential options identified during meetings with communities and DFO
- Multiple offsetting options are likely, in combination with research programs as complementary measures
- Potential options have been investigated (e.g., a fish stocking in the Yellowknife River)
  - Options will increase production of traditional fisheries
  - Options will satisfy offsetting objectives outlined in DFO's Fisheries Policy

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Summary - Section 9.6

Cumulative effects from the Project are predicted to not have a significant adverse impact on fisheries productivity or the ability of other aquatic life (e.g., plankton, benthic invertebrates) to support ongoing fisheries productivity

- The cumulative direct loss of lake habitat will be less than 1% of the ESA relative to the reference condition
- Most impacts, including those from changes in water quality, will be reversible
- Monitoring programs will be developed and aligned with existing Ekati Mine monitoring programs

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Thank You

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