

# Dominion Diamond Corporation

Developer's Assessment  
Report – Technical  
Sessions, April 2015

Fish and Fish Habitat



# Overview

- Review of DAR assessment approach and conclusions
- Common topics from Information Requests (IRs):
  - Direct effects to shoal habitat
  - 2014 supplemental baseline information for diverted streams
  - Sub-Basin B Diversion Channel design
  - Indirect effects from changes in water quality (e.g., to lower trophic levels, fish health)
  - Indirect effects during back-flooding (e.g., to flows and riparian habitat for Narrows)
  - Closure plans for dikes and pits
  - Conceptual/final offsetting plan
- Summary



# Assessment Approach

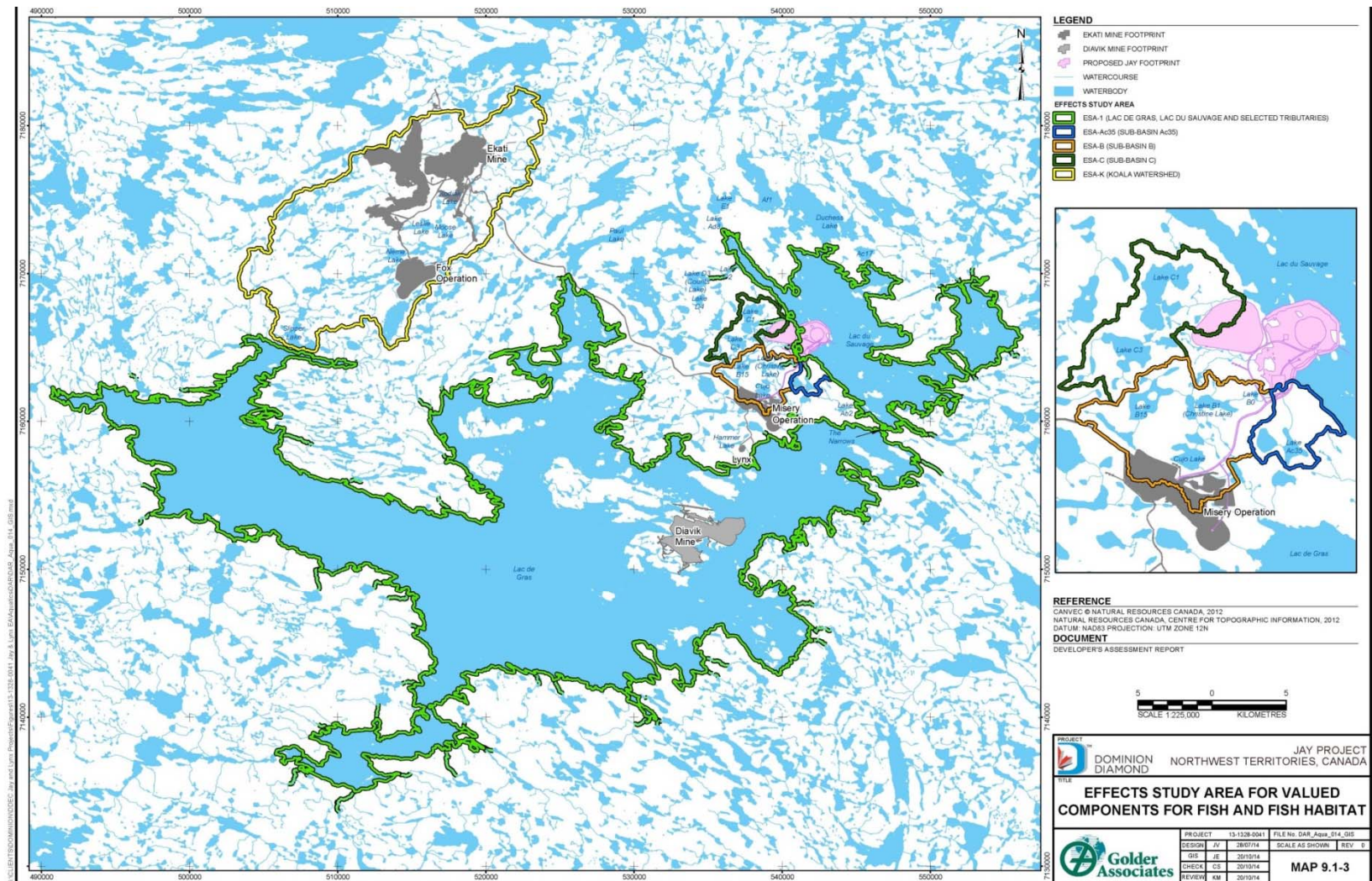
## Valued Components (VCs), Assessment Endpoints, and Measurement Indicators

- 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
- Species that support local fisheries, such as forage fish, were identified in the assessment and considered as a measurement indicator

Valued Component	Assessment Endpoint	Measurement Indicator
Arctic Grayling Lake Trout Lake Whitefish	<ul style="list-style-type: none"> <li>ongoing fisheries productivity</li> <li>self-sustaining and ecologically effective fish populations</li> </ul>	<ul style="list-style-type: none"> <li>habitat quantity (includes surface hydrology and water quality indicators)</li> <li>habitat arrangement and connectivity (fragmentation)</li> <li>habitat quality (includes surface hydrology and water quality indicators)</li> <li>survival and reproduction</li> <li>abundance and distribution of fish</li> </ul>
Aquatic life other than fish	<ul style="list-style-type: none"> <li>ongoing support of fisheries productivity</li> </ul>	<ul style="list-style-type: none"> <li>concentrations of chlorophyll <i>a</i>, nutrients</li> <li>phytoplankton species composition, abundance, and biomass</li> <li>zooplankton species composition, abundance, and biomass</li> <li>benthic invertebrate species composition, richness, abundance, and biomass</li> </ul>



# Effects Study Areas





## Review of Assessment Conclusion

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 Effects Study Area 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
- A final offsetting plan (based on the conceptual plan in the DAR and submitted during the permitting phase) will include an offsetting option(s) to counterbalance fishery losses in Lac du Sauvage

## IR Topic – Direct Effects to Shoals in Lac du Sauvage

No measurable cumulative effect from loss of shoals to population abundance and distribution for fish VCs. Effects, if any, would be a localized (or minor) change in the distribution of fish.

Detailed baseline data on shoal habitats in Lac du Sauvage are provided in the DAR

- Substrate habitat maps, spawning shoal survey data, Traditional Knowledge

2013 substrate maps presented in the DAR consistent with previous findings

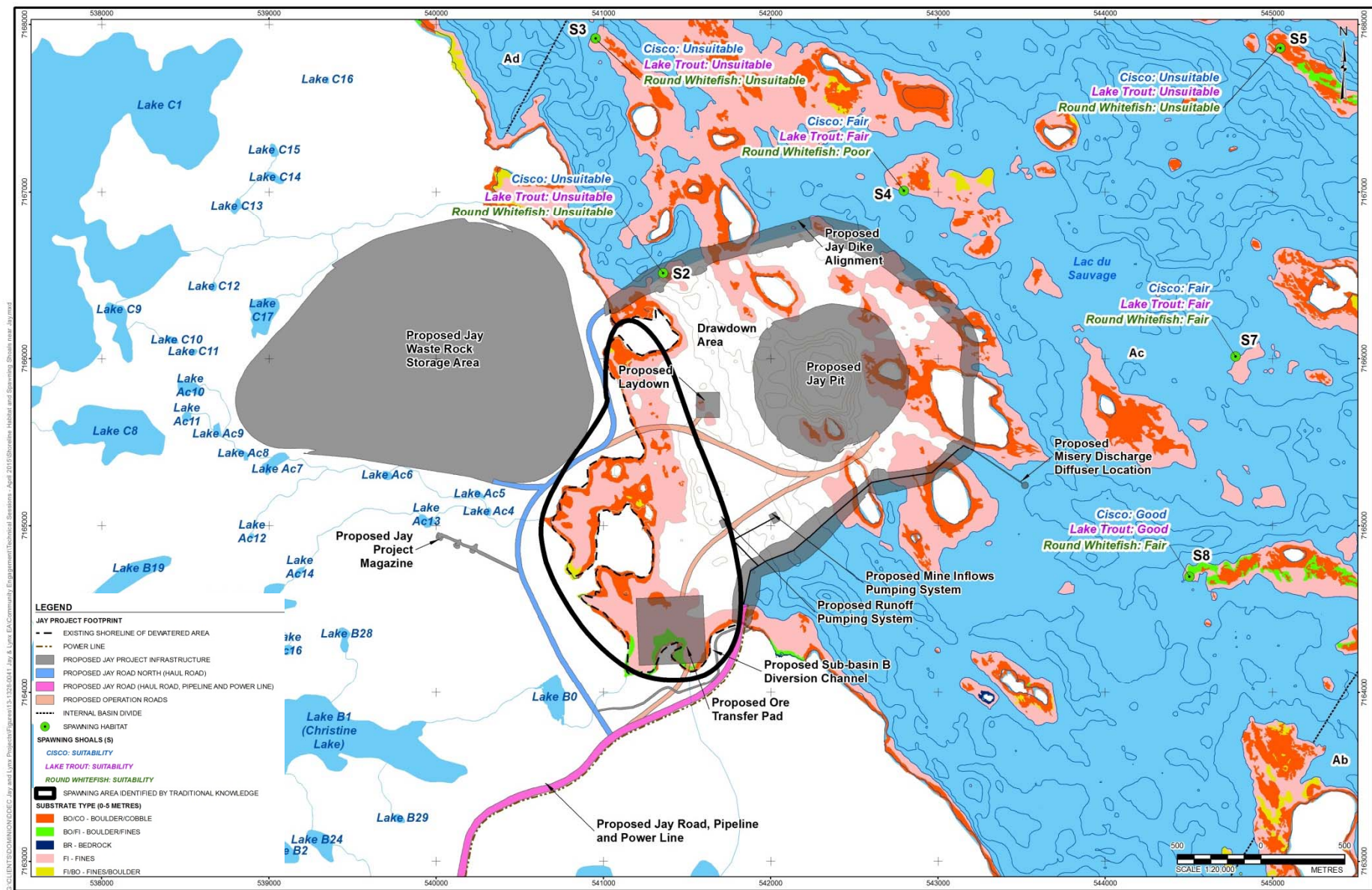
- Limited, mostly low quality shoal habitat will be directly affected by Project footprint (e.g., 5.9% change in coarse substrate at 2-6 m in Lac du Sauvage)
- All but one (shoal S2) of the 21 shoals previously identified in Lac du Sauvage fall outside of the proposed diked area (but unsuitable for spawning)

Preferred shoals likely lie east or south of diked area given prevailing winds from the northwest and the currents provided to remove silt from substrate

- Where wind action/currents would limit any algal growth during late operations

Any losses of shoal habitat will be considered in the Final Offsetting Plan

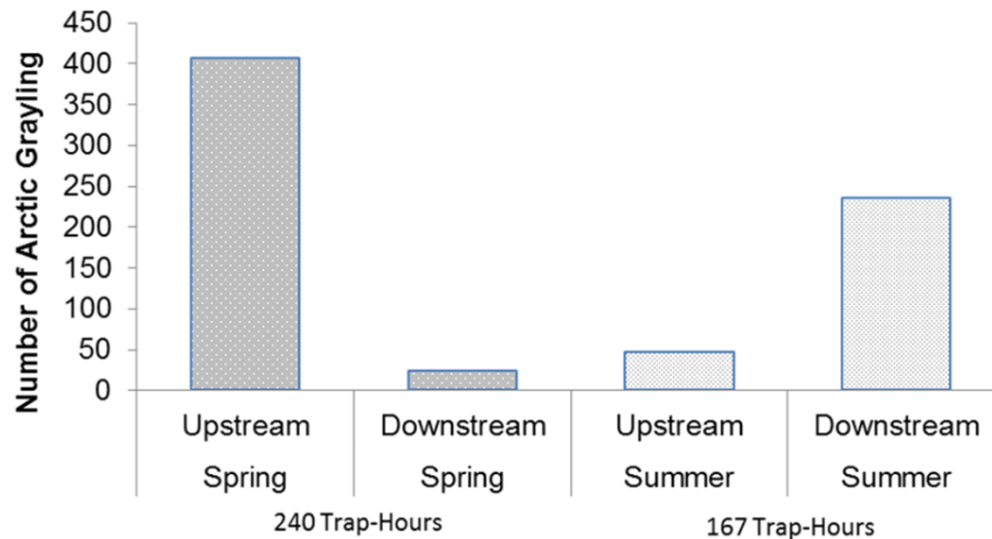






## IR Topic – 2014 Supplemental Baseline / Diversion Channel

- Sub-Basin B Channel Diversion will be a temporary diversion of small streams to outside the diked area
- 2014 Supplemental Baseline Report
  - Stream Ac4 = non-fish bearing
  - Stream Ac35 = Arctic Grayling (100% of catch)
  - Stream B0 = Arctic Grayling (95% of catch)
    - with smaller numbers of migratory Burbot, Lake Trout. and Northern Pike



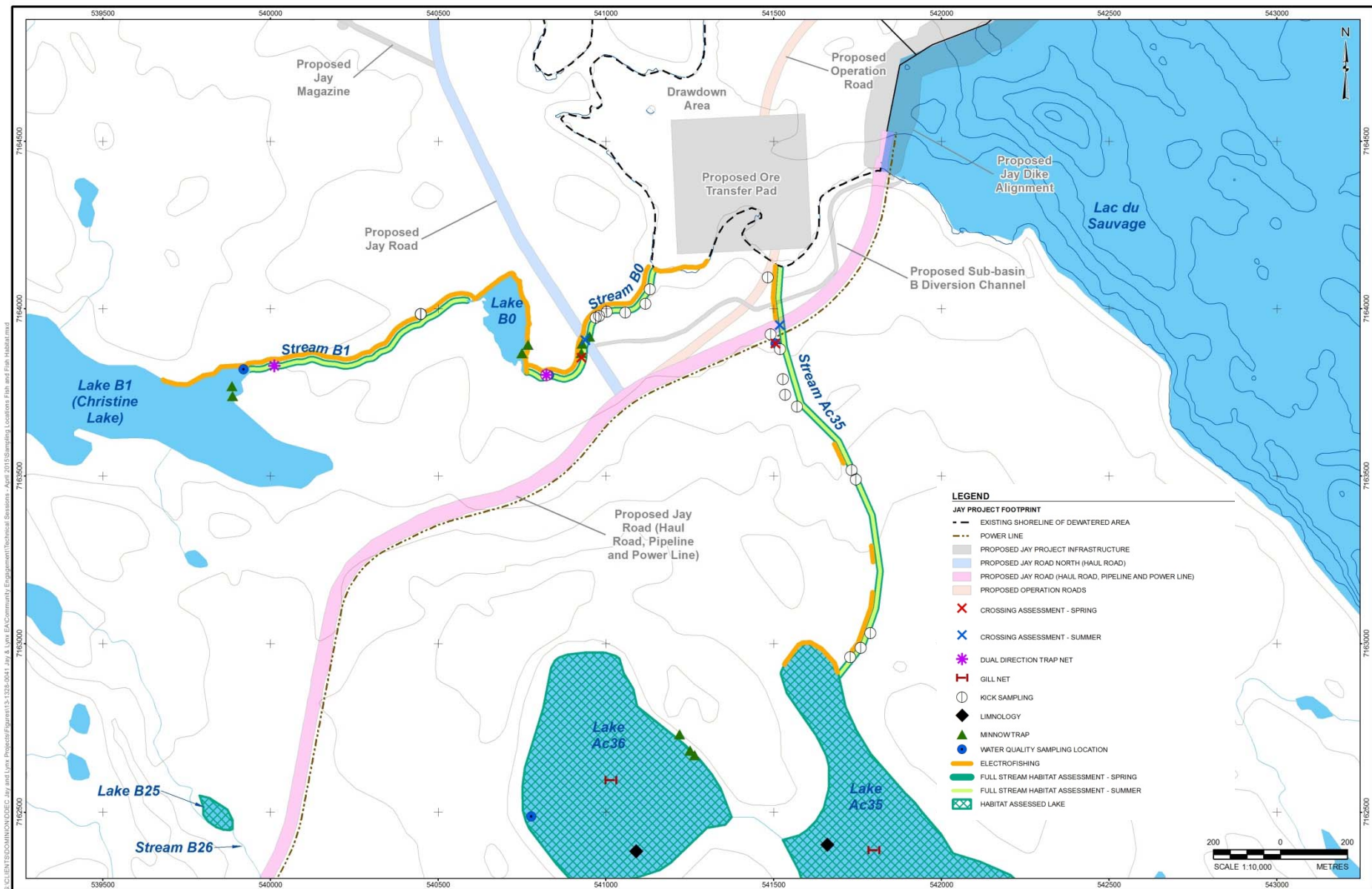
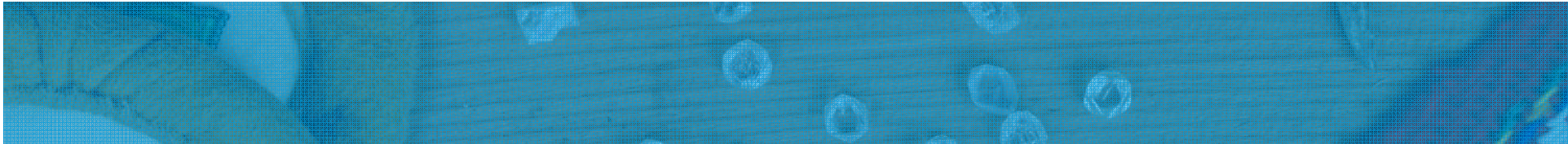


## IR Topic – 2014 Supplemental Baseline / Diversion Channel

- Effects of the diversion channel on fish use of streams B0 and Ac35 are expected to be minor and short-duration
- Sub-Basin B Diversion Channel
  - A temporary corridor that will move spawning Arctic Grayling upstream from Lac du Sauvage
  - Designed with slopes similar to natural streams in the area, and water velocities within swimming capabilities of target species
- Operational monitoring of fish use of the channel will inform any new mitigation strategies









## IR Topic – Indirect Effects from Changes in Water Quality

TP concentrations and phytoplankton biomass (primary production) are predicted to increase in Lac du Sauvage during late operations (i.e., during Misery Pit discharge, 2024 to 2029), peak at the end of late operations, and decrease through closure.

Any increases in primary production are expected to result in minor and temporary changes in habitat, including shoals:

- Wind and wave action will limit algal growth on preferred shoals in Lac du Sauvage to a similar extent as observed under baseline
- Water quality models used to generate predictions in TP and phytoplankton include conservatism directed towards overestimating projected concentrations

*Predicted changes in water quality are not expected to adversely affect fish or aquatic biota in the effects study area.*

The potential for fish eggs or fry to be affected by contaminants within the interstitial spaces of the dike is predicted to be negligible for Lake Trout and Whitefish.

- Dike material will be granite
- Similar material used at the Diavik Mine where metal concentrations in water within the interstitial space of the dike are not elevated
- Use of dike material by spawning fish is expected to be low (abundance of preferred shoal habitats exist elsewhere in Lac du Sauvage and Lac de Gras)
- Previous study at Diavik Mine reported minimal use of dikes by spawning fish

## IR Topic - Indirect Effects During Back-flooding

Changes to downstream flows and water levels will result in no measurable effects, or a minor residual effect on fish habitat (flows or riparian habitat)

- Effects will be temporary (four years of back-flooding)
- Navigability of waters will be maintained (i.e., the Narrows)

Predicted change in water levels within the natural range of observed variability

- Seasonal timing and patterns of water level fluctuation will be maintained

Riparian habitats account for < 1% of the landscape; no riparian habitat adjacent to the Narrows

As part of a back-flooding pumping plan to be developed through water licence and prior to closure, Dominion Diamond will implement mitigation, as required, through an adaptive management plan





## IR Topic – Dike and Dewatered Area at Closure

The permanent change to habitat (e.g., dike footprints) is expected to result in less than a 1% loss in habitat area at post-closure and no measurable cumulative effects to population abundance and distribution for Arctic Grayling, Lake Trout, and Lake Whitefish.

The dewatered area of Lac du Sauvage will be back-flooded at closure and approximately 338 hectares (ha) of aquatic habitat will be reconnected

- Localized breaching will occur when water within back-flooded area meets acceptable criteria
- There will be multiple breach locations to allow for fish movement
- There will be a dike breaching plan that will include sediment control measures (e.g., silt curtains)

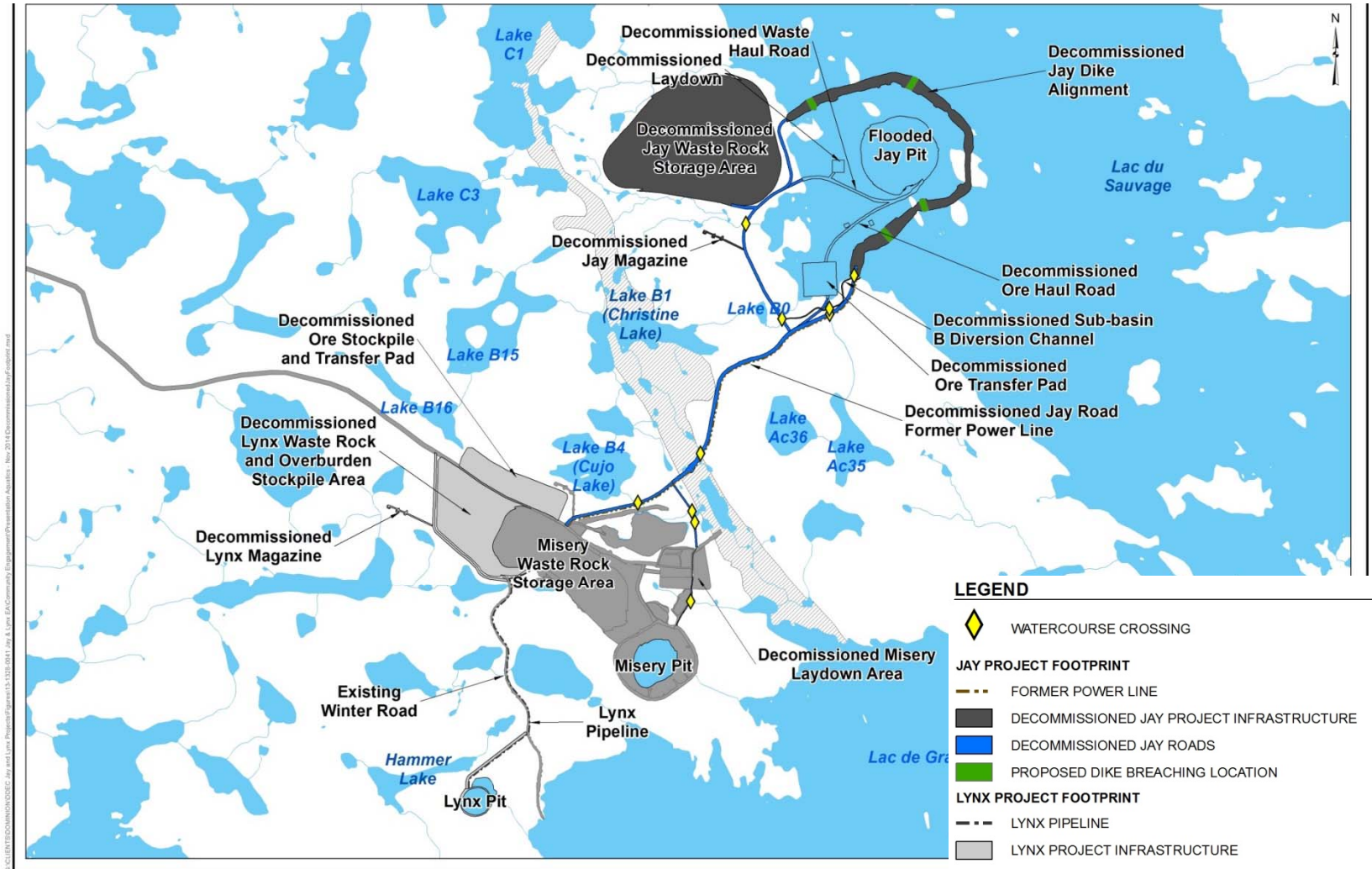
The physical and chemical environment of the back-flooded area will be similar to conditions in Lac du Sauvage and allow re-establishment of a healthy functioning ecosystem

- The outer edges of the dike remnants may provide cover for species of fish
- Rapid “recolonization” of aquatic life (including fish species from Lac du Sauvage) is expected

The Jay Pit represents a permanent loss of lake bottom habitat for bottom dwelling species, but will include an extended water column as habitat for pelagic species

- Any losses of lake bottom habitat will be considered in the Final Offsetting Plan

# Project Footprint During Post-Closure





## IR Topic – Conceptual/Final Offsetting Plan

- Conceptual plan summarizes potential effects to fish that require offsetting under the *Fisheries Act*
  - Jay dike and dewatered area footprint (393 ha)
  - Loss of fish during fish-out (7,100 fish)
  - Diverted stream habitat (467 m)
- Plan includes preliminary options for offsetting
  - These were identified during community meetings
  - Multiple options are likely, in combination with research programs as complementary measures
- Potential options have been investigated
  - to increase production of fisheries
  - to satisfy objectives in DFO's Fisheries Policy
- Community/regulatory engagement will continue to advance the plan which will be submitted with the application for *Fisheries Act* authorization, in parallel to the MVEIRB process



## IR Topic – Summary

Any potential losses of shoal habitat from the Jay dike and dewatered area are not expected to measurably affect the abundance of fish Valued Components

Sub-Basin B Channel Diversion will be a temporary diversion of small streams to outside the diked area, designed to move spawning Arctic Grayling upstream from Lac du Sauvage

Predicted changes in water quality are not expected to adversely affect fish or aquatic biota in the effects study area

Adverse effects to fish habitat in the Narrows will be avoided during back-flooding by implementing mitigation, when needed

The physical/chemical environment of the back-flooded area will be similar to Lac du Sauvage, allowing for the re-establishment of a healthy functioning ecosystem post-closure

Any temporary and permanent losses of stream and lake habitats will be considered in the Final Offsetting Plan (where the permanent change to habitat is expected to result in less than a 1% loss in habitat area at post-closure)





# Questions?

