TECHNICAL MEMORANDUM

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GAHCHO KUÉ FISH HABITAT COMPENSATION PLAN – UPDATE

1.0 INTRODUCTION

De Beers Canada Inc. (De Beers) is proposing to construct and operate a diamond mine, the Gahcho Kué Project (the Project), located at Kennady Lake, Northwest Territories (NWT), approximately 280 kilometres (km) northeast of Yellowknife. The construction and operation of the Gahcho Kué mine will cause harmful alteration, disruption, or destruction (HADD) of fish habitat in the Kennady Lake watershed. The affected habitat areas include portions of Kennady Lake and adjacent lakes within the Kennady Lake watershed that will bepermanently lost, physically altered after dewatering and later submerged in the refilled Kennady Lake, and disrupted following dewatering (or partial dewatering) but otherwise physically unaltered before submerged in the refilled Kennady Lake. Where prevention of harmful habitat alteration, disruption and destruction is not feasible, fish habitat of equivalent or higher productive capacity will be developed.

A Conceptual Compensation Plan (CCP) was included in Section 3, Appendix 3.II of the 2010 Environmental Impact Statement (EIS) (De Beers 2010). The CCP described the various options considered for providing fish habitat compensation, and presented a proposed fish habitat conceptual compensation plan to achieve no net loss of fish habitat according to the Fisheries and Oceans Canada (DFO) *Policy for Management of Fish Habitat* (DFO 1986).

Since the submission of the CCP, the development of the compensation plan to achieve no net loss has been ongoing. As part of this process, several meetings have occurred with local and regional DFO staff to further the compensation planning and allow for DFO feedback (e.g., 16 June 2010, 26 May 2011, 16 September 2011, 24 November 2011, 21 February 2012, 9 May 2012, and 27 June 2012). As well, based on the updated footprint of the Project related to the supplemental mitigation associated with the Fine PKC Facility (2012 EIS Supplement [De Beers 2012]), the areas of habitat losses presented in the CCP have been recalculated.

The following memorandum summarizes the progress related to the compensation planning since the submission of the CCP and includes the following topics: compensation options; Habitat Suitability Index (HSI) models; and the quantification of the losses and gains. This updated compensation plan provides an opportunity for feedback and will be finalized in September 2012 into a No Net Loss Plan (NNLP) with additional details that will show the accounting of habitat losses and gains to achieve no net loss. De Beers will continue to consult on

the plan during the planned August workshops with Aboriginal communities as well as additional meetings with DFO. Fundamentals of the plan are included in this document and the NNLP will provide additional details (i.e., detailed accounting of habitat gains and losses) of how the different compensation options will result in no net loss of fish habitat. The NNLP is expected to continue to evolve and be refined as feedback is received through the environmental review as well as the permitting/regulatory phase of the Project.

2.0 FISH HABITAT COMPENSATION OPTIONS

2.1 Approach

The selection of the habitat compensation approach included consideration of the hierarchy of compensation preferences as outlined in the DFO *Policy for Management of Fish Habitat* (DFO 1986), *Habitat Conservation and Protection Guidelines* (DFO 1998), and *Practitioner's Guide to Habitat Compensation* (DFO 2006).

These preferences for habitat compensation are summarized in the following points, in declining order of priority:

1) Create similar habitat at or near the development site within the same ecological unit; that is, replace natural habitat with the same type of habitat at or near the site.

2) Create similar habitat in a different ecological unit that supports the same stock or species.

3) Increase the productive capacity of existing habitat at or near the development site and within the same ecological unit.

4) Increase the productive capacity of a different ecological unit that supports the same stock or species.

5) Increase the productive capacity of existing habitat for a different species of fish either on or off site.

6) Where it is not technically feasible to compensate for the habitat itself, use artificial production techniques, such as maintaining a stock of fish, deferring compensation, or restoring other sites.

The current updated compensation plan consists of the following options:

1) Habitat development (or creation) (Priority 1 in Hierarchy). This includes the construction of impounding dykes to increase the lake depth and surface area (forms the majority of the proposed habitat compensation), and widening top bench of pits to create shelf areas where the pits extend onto land.

2) Habitat enhancement structures (Priority 3 in Hierarchy). This includes the construction of finger reefs in Kennady Lake, and construction of habitat structures on the decommissioned mine pits/dykes.

As the proposed project activities will result in permanent loss or alteration of primarily lake habitats, the proposed compensation options involve creating additional lake habitat and habitat enhancement features in existing lake habitats. The options selected are also located at site, which allows for the effective use of equipment and personnel for the construction of the compensation habitats, as well as for monitoring (i.e., evaluating the physical and biological characteristics of the habitats, as well as fish use of the habitats). The habitat compensation developed for the Project will be permanent and not require ongoing maintenance once established.

2.2 Fish Habitat Compensation Plan

Compensation options were identified in the CCP (De Beers 2010) and have been discussed with local and regional DFO at several meetings over the past two years (e.g., 16 June 2010, 26 May 2011, 16 September 2011, 24 November 2011, 21 February 2012, 9 May 2012, and 27 June 2012). The current updated compensation plan includes the primary compensation option of habitat development in the form of a compensation lake and expanded habitat areas within Kennady Lake around the refilled mine pits, and habitat enhancement in the form of creating higher quality habitat features within Kennady Lake at closure. Should contingency options for compensation be required in the event that the primary compensation option does not achieve the level of compensation that is anticipated, then those will be determined as part of the water licence and permitting phase.

2.2.1 Habitat Development

2.2.1.1 Operations

During operations, the compensation plan involves raising the water level of some lakes west of Kennady Lake (in D, E, N watersheds) to a level greater than required only for the Project. This involves the construction of impounding dykes to raise Lakes D2, D3, E1, and N14 during operations, which will increase the maximum depths of these lakes, i.e., Lake D2 by 3.8 m (from 1.0 to 4.8 m), Lake D3 by 2.6 m (2.5 to 5.1 m), Lake E1 by 2.8 m (3.4 to 6.2 m), and Lake N14 by 2.7 m (2.8 to 5.5 m). It is expected that the increased depths will improve overwintering habitat and provide conditions for a more diverse fish community. The total compensation habitat provided by this component of the plan is 149.7 ha of newly created habitat and connection of three non-fish-bearing lakes, which will become useable fish habitat. Specific habitat enhancement features, including the creation of rocky shoal habitat and vegetated bays and shorelines, will be developed within the newly created habitat. The design of these habitat enhancement features in the compensation lake would focus on two areas:

1) developing rocky reef habitats by placing appropriately sized mine rock in areas to be flooded, selecting the size and position of these reef habitats such that they would likely remain free of sediment accumulation through wave action; and

2) establishing vegetated bays to provide spawning and rearing habitat for northern pike.

These habitat enhancements will not only provide specific habitat that fish species in the compensation lake will target, but they will also improve the littoral productivity in the lake, providing an overall positive gain for the entire lake.

During operations, species occurring in the D-E-N watershed are expected to expand from their current distribution to occupy the new habitat areas and the habitat enhancement features, which will provide for timely compensation relative to when habitat will be affected during the Project development. Monitoring of the compensation habitats will occur through the operations period, which will help to reduce the uncertainty of the success of the proposed habitat compensation approach prior to closure. Results of monitoring can also identify if other issues associated with flooding terrestrial landscapes, such as the potential for increases in mercury, become an issue that may require additional mitigation prior to closure.

2.2.1.2 Closure

At closure, additional raising of the water level above the operational compensation lake will create additional new habitat area. This would involve a further increase in water level in Lakes D2, D3, E1, N14 and surrounding area at closure, which will additionally create new and enhanced habitat and further improve overwintering conditions in the compensation lake.

Habitat categories in the flooded landscape were assigned based on the landforms to be flooded, with a narrow band of vegetated habitat assigned along the shoreline similar to other lakes in the region. The newly developed habitat area (D-E-N lakes) would be reconnected to the refilled Kennady Lake through Lake D1 at closure. It is expected that this component of the plan would provide spawning and rearing habitat for the re-established fish populations in Kennedy Lake at closure, as well as additional overwintering habitat outside of Kennady Lake through connection to the compensation lake. The total compensation habitat provided by this component of the plan is 184.4 ha, which includes newly developed habitat area and connection of four non-fish-bearing lakes to fish-bearing waters. Habitat enhancement features installed during the operational phase will be expanded, such that approximately 37.5 ha of the newly created habitat will be enhanced at closure, representing approximately 20% of the newly created habitat area. For the conceptual plan, about 50% of this area would be targeted for creating rocky shoals and the other 50% for creating vegetated habitat.

The habitat developed by the compensation lake will be assessed using HSI modelling by first determining the current habitat value within the habitats to be flooded and subtracting the HUs present under baseline conditions from the HUs created by the large, connected compensation lake. Increases in fish habitat will be generated through both the creation of new habitat areas, as well as increased species diversity and improved overwintering within the existing habitats.

In addition to the compensation lake, the compensation plan also involves the development of habitat in Kennady Lake near the pits. This involves the widening of the top bench of the Tuzo and 5034 pits to create shelf areas where they extend onto land, i.e., alterations to southeast edge of Tuzo/5034 joined pit edge, north end of Tuzo Pit, and northwest edge of 5034 Pit. At closure, this will create additional aquatic habitat within Kennady Lake on areas that are currently land, which would create additional littoral area (rearing, foraging habitat), and therefore, be expected to increase fish production. At each of these new habitat areas, specific habitat enhancements will be provided.

Based on the revised footprint of the Project associated with supplemental mitigation of the Fine PKC Facility, additional habitat area will also be created within the A watershed due to the raising of the water level in Lakes A1 and A2, with specific habitat enhancements targeted within the newly created lake area. Similar to the compensation lake, habitat gains will be calculated as the net gain in HUs relative to the pre-development conditions.

2.2.2 Habitat Enhancement Structures

Habitat enhancement structures will be constructed in Kennady Lake to improve habitat conditions at closure. These structures will be designed and constructed to maximize habitat in the 2 to 4 m depth range, which will be kept clean of silt and fine organic debris by wave-generated currents. Reef areas are currently limited within Kennady Lake; as well, some shoreline reef areas will be lost due to the placement of Project facilities (e.g., mine rock piles, pits, etc.). The habitat enhancement structures will be designed to provide spawning, rearing and/or foraging habitat for the fish community that will re-establish in Kennady Lake after closure, and may in fact help with the re-establishment of species, such as lake trout and round whitefish. These habitat enhancement structures also will help offset losses/alterations of shoreline habitat associated with the Project. The structures will be built in dewatered areas prior to re-filling, allowing for more effective implementation of design and placement of material.

The first component of the compensation plan for habitat enhancement includes the construction of finger reefs in Areas 6 and 7 during dewatered period. This involves the placement of appropriately-sized mine rock to create finger reefs. The reefs would extend to within 2 m of normal refilled lake level, be aligned to maximize

exposure to wind-generated waves, and be designed to provide rocky reef habitats suitable for fish species expected to inhabit refilled Kennady Lake (i.e., spawning, rearing habitat for fish species, such as lake trout and round whitefish). The finger reefs would be available for use by fish immediately after refilling is complete. For the purpose of preliminary habitat design, it has been assumed that approximately 8 ha of habitat enhancement features will be created.

An additional habitat enhancement feature of the compensation plan is the development of a Dyke B habitat structure within Kennady Lake during closure. After operations, Dyke B will be lowered to below the expected restored lake level and enhanced. This involves the placement of boulder and cobble sized mine rock to maximize suitability as rocky reef habitat for fish species expected to inhabit refilled Kennady Lake (e.g., lake trout and round whitefish). The habitat created by this feature will be included as part of the calculation of HUs in Kennady Lake at closure.

2.3 Research Opportunities

The dewatering associated with the Project will result in the harmful disruption of fish habitat in Kennady Lake and a few adjacent waterbodies. At closure, these areas will be refilled and will once again provide functional habitat with equivalent area and habitat suitability as pre-development conditions, which would represent a 1:1 compensation ratio. To offset the compensation ratio for the temporal disruption to the habitat, address temporal lag of when compensation habitat would be available and reduce potential uncertainty of the compensation plan, a number of research opportunities that De Beers would support are being explored.

The extent of the research requirements for the compensation plan will, in part, be dependant on the compensation that can be achieved from the built habitat compensation and how the research programs will contribute to reducing uncertainty and temporal lag such that no net loss of fish habitat will be achieved. A discussion regarding potential research options was held during the meeting with DFO on 27 June 2012. Additional details of the research program component of the NNLP will be provided in the September 2012 submission.

3.0 HABITAT SUITABILITY INDEX (HSI) MODELS

3.1 Approach

To assess the losses associated with the Project on fish habitat and the relative gain in habitat developed through habitat compensation, Habitat Suitability Index (HSI) models were used to evaluate the quantity and quality of habitat both lost and gained to help determine if no net loss if fish habitat has been conceptually achieved.

As described in Section 3.II.4.2 of the CCP, the HSI models used for the Project were updated versions of the HSI models developed for northern fish populations by Diavik (1998), which were originally based on a modified Habitat Evaluation Procedure (HEP) method developed by US Fish and Wildlife. The HSI models were developed from literature and professional judgement regarding habitat preferences and life-history requirements. The models were updated with more recent published information for northern fish species (e.g., Richardson et al. 2001; Evans et al. 2002; Stewart et al. 2007) and with modifications made in more recent fish habitat compensation plans. Similar models have been used at other mining projects in NWT and Nunavut, including the Lac De Gras (Diavik 1998), Snap Lake (De Beers 2002), Jericho (Mainstream Aquatics 2004), Doris North (Golder 2005) and Meadowbank (Cumberland Resources 2005) mines, although each project has developed models specific to their application and no two projects have used exactly the same set of models.

In the North, there are no established and uniformly accepted regional HSI models. For each Project, existing models are adjusted as required for the specific habitats and fish species to be affected. Part of the process for the development of the compensation plan is the consultation with DFO on the models to be used for the Project. The models currently applied for the Project have been updated primarily from the models developed for Snap Lake. Some habitats and species assessed for Gahcho Kué were not included in the Snap Lake assessment, and new curves were developed based on general life history requirements for fish species in the north (Richardson et al. 2001). In moving forward from the CCP to the NNLP, it is important that there is technical agreement on the models to provide a level of confidence amongst parties that the proposed compensation will adequately offset the habitat losses associated with the Project. Adjustments to the HSI models might still occur at the planning stage, and are likely to be revisited and revised in the future with results from compensation monitoring; however, any changes would be applied equally to habitat losses and gains.

3.1.1 Project HSI Models

Lakes

The HSI models were used to quantify the suitability of habitat categories for various life-history stages, and for each fish species present on a scale of 0 (unsuitable) to 1 (optimal). The habitat suitability values assigned by the models are based on the following rating system:

- unsuitable: 0.00;
- below average: 0.25;
- average: 0.50;
- above average: 0.75; and
- optimal: 1.00.

The HSI models were used to determine habitat suitability for the following life-history stages of species present:

- spawning/nursery stage, considering the suitability of habitat used by fish for spawning and embryo development;
- rearing stage, considering the suitability of habitat used by young-of-the-year and small-bodied juveniles for foraging and refuge from predators;
- foraging stage, considering the suitability of habitat used by adult fish for feeding; and
- overwintering stage, considering the suitability of habitat used by all fish during the winter.

Habitat suitability indices were determined for all permanently lost, physically altered or dewatered waterbodies and for the eight fish species known to occur in the Project area, which include lake trout, round whitefish, Arctic grayling, northern pike, burbot, lake chub, slimy sculpin, and ninespine stickleback. Some habitat categories did not have a suitability value, and a new value was assigned based on similar habitat conditions. The models that are currently being applied for the Project are presented in Tables 1 through 8.

Watercourse Segments

The watercourse areas lost are relatively small compared to the lake areas, with fewer species that are dependant on stream habitat for a portion of their life history, and will form a minor component of the overall compensation requirements. The approach for watercourse segments will be based on methods used for other

northern projects, and developed in consultation with DFO. Additional field surveys are being conducted in the spring and summer of 2012 to support the assessment of stream habitat quantity and quality affected by the Project to support the Plan.

Fish Distribution in Kennady Lake

For Kennady Lake, suitability indices were determined for all eight species. For lakes in the A watershed, suitability indices were not determined for lake chub, since it has not been documented in that watershed. For lakes in the N watershed within the Project or compensation habitat footprint, suitability indices were not determined for northern pike, since this species has only been documented in the lower portion of the watershed, downstream from areas affected by the compensation footprint of the Project. Within the area of the N watershed to be used for compensation, there are three small lakes with no fish and other lakes with a limited fish distribution. As part of the compensation development, these lakes will have enhanced fish habitat and will have the capability to support all eight species found in Kennady Lake at closure. While a single longnose sucker has been observed near the outlet of Kennady Lake, it is believed this single fish was a stray from downstream habitats and that Kennady Lake does not support a population of longnose sucker (De Beers 2010, Section 3.II.3.1, Annex J). Because of this, longnose sucker were not included in the calculations of habitat suitability. A summary of the fish distribution in Kennady Lake and the waterbodies affected by the Project or within the compensation footprint is provided in Table 9. The sampling date and methods used for each waterbody are summarized in Table 10.

Fish Distribution in Compensation Habitats

It is expected that the species composition for all of the compensation habitats will consist of the eight species currently documented within Kennady Lake. The compensation lake will be connected back to Kennady Lake at closure and will be accessible to all of the species that would inhabit Kennady Lake, and provides a community that is similar to the fish community found in the affected habitats. As a result, this will expand the species community currently found within the lakes to be flooded to create the compensation lake; however, it will not introduce new species into the N watershed. By increasing the species diversity through development of improved habitat connectivity and improved overwintering capabilities, a relative gain in HUs is achieved.

3.1.2 Calculation of Habitat Units

The area of habitat losses and gains, as well as the habitat suitability based on the HSI models, are integrated into Habitat Units (HUs). For each fish species, HUs are calculated as the product of the area lost for each habitat category and suitability of that habitat category for each life-history stage present. Similarly, HUs for the areas of enhanced habitat or newly developed habitat are calculated for each habitat category and suitability of that habitat category for each life-history stage present. The HUs lost are compared to the HUs gained to determine the compensation ratio achieved. The method for integrating HUs across species and at different locations is currently being developed in consultation with DFO.

Table 1: Draft Habitat Suitability Index Model for Arctic Grayling

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.75	1	0	0
	Boulder	0.75	1	0	0
	Bedrock	0.25	0.25	0	0
	Bedrock/Boulder	0.25	0.5	0	0
	Bedrock/Cobble	0.25	0.5	0	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.5	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.75	0.75	0	0
	Boulder/Fines	0.5	0.5	0	0
	Cobble/Fines	0.5	0.5	0	0
	Boulder/Gravel	0.75	0.75	0	0
2 - 4 m	Boulder/Cobble	1	0.75	0	0.75
	Boulder	1	0.75	0	0.75
	Bedrock	0.25	0	0	0.25
	Bedrock/Boulder	0.25	0.25	0	0.75
	Bedrock/Cobble	0.25	0.25	0	0.5
	Vegetation/Organics	0.25	0	0	0.75
	Vegetation/Boulder	0.5	0.25	0	0.75
	Fines/Organics	0.25	0	0	0.25
	Cobble/Gravel	0.75	0.5	0	0.5
	Boulder/Fines	0.5	0.25	0	0.75
	Cobble/Fines	0.5	0.25	0	0.5
	Boulder/Gravel	1	0.5	0	0.75
> 4 m	Boulder/Cobble	0.5	0.25	0	1
	Boulder	0.5	0.25	0	1
	Bedrock	0.25	0	0	0.5
	Bedrock/Boulder	0.25	0	0	1
	Fines/Organics	0.25	0	0	0.5
	Cobble/Gravel	0.5	0	0	0.75
	Boulder/Fines	0.25	0	0	1
	Cobble/Fines	0.25	0	0	0.75
	Boulder/Gravel	0.5	0	0	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than

Table 2: Draft Habitat Suitability Index Model for Burbot

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.75	1	0	0
	Boulder	0.75	1	0	0
	Bedrock	0	0	0	0
	Bedrock/Boulder	0	0	0	0
	Bedrock/Cobble	0	0	0	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.5	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.5	0.75	0	0
	Boulder/Fines	0.25	0.75	0	0
	Cobble/Fines	0.25	0.75	0	0
	Boulder/Gravel	0.75	1	0	0
2 - 4 m	Boulder/Cobble	0.75	0.75	1	0.75
	Boulder	0.75	0.75	0.75	0.75
	Bedrock	0	0	0	0.25
	Bedrock/Boulder	0	0	0	0.75
	Bedrock/Cobble	0	0	0	0.5
	Vegetation/Organics	0.25	0	0	0.75
	Vegetation/Boulder	0.25	0.25	0	0.75
	Fines/Organics	0.25	0	0	0.25
	Cobble/Gravel	0.5	0.5	1	0.5
	Boulder/Fines	0.25	0.5	0.25	0.75
	Cobble/Fines	0.25	0.5	0.5	0.5
	Boulder/Gravel	0.75	0.75	1	0.75
> 4 m	Boulder/Cobble	1	0.5	0.75	1
	Boulder	1	0.5	0.5	1
	Bedrock	0	0	0	0.5
	Bedrock/Boulder	0	0	0	1
	Fines/Organics	0.25	0	0	0.5
	Cobble/Gravel	0.75	0.25	0.75	0.75
	Boulder/Fines	1	0.25	0	1
	Cobble/Fines	0.5	0.25	0.25	0.75
	Boulder/Gravel	1	0.5	0.75	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 3: Draft Habitat Suitability Index Model for Lake Chub

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	1	1	1	0
	Boulder	1	1	0.5	0
	Bedrock	0	0	0	0
	Bedrock/Boulder	1	1	0.25	0
	Bedrock/Cobble	1	1	0.25	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.25	0.5	0
	Fines/Organics	0	0	0	0
	Cobble/Gravel	1	1	1	0
	Boulder/Fines	0.5	0.5	0.5	0
	Cobble/Fines	0.5	0.5	0.75	0
	Boulder/Gravel	0.5	0.5	1	0
2 - 4 m	Boulder/Cobble	1	1	0.5	1
	Boulder	1	1	0.25	1
	Bedrock	0	0	0	0.5
	Bedrock/Boulder	0.25	0.25	0	0.5
	Bedrock/Cobble	0.25	0.25	0	0.5
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.5	0.5	0.25	0
	Fines/Organics	0	0	0	0.5
	Cobble/Gravel	1	1	0.5	1
	Boulder/Fines	0.5	0.5	0.25	0.5
	Cobble/Fines	0.5	0.5	0.5	0.5
	Boulder/Gravel	0.5	0.5	0.5	0.5
> 4 m	Boulder/Cobble	0.5	0.5	0.25	0.75
	Boulder	0.5	0.5	0.25	0.75
	Bedrock	0	0	0	0.25
	Bedrock/Boulder	0.25	0.25	0	0.25
	Fines/Organics	0	0	0	0.25
	Cobble/Gravel	1	1	0.25	0.75
	Boulder/Fines	0.5	0.5	0	0.25
	Cobble/Fines	0.5	0.5	0.25	0.25
	Boulder/Gravel	0.5	0.5	0.25	0.25

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 4: Draft Habitat Suitability Index Model for Lake Trout

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.75	0.75	0	0
	Boulder	0.75	0.75	0	0
	Bedrock	0.25	0	0	0
	Bedrock/Boulder	0.25	0.25	0	0
	Bedrock/Cobble	0.25	0.25	0	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.25	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.5	0.5	0	0
	Boulder/Fines	0.25	0.25	0	0
	Cobble/Fines	0.25	0.25	0	0
	Boulder/Gravel	0.25	0.5	0	0
2 - 4 m	Boulder/Cobble	1	1	0.75	0.75
	Boulder	1	1	0.5	0.75
	Bedrock	0.25	0.25	0	0.25
	Bedrock/Boulder	0.25	0.25	0	0.75
	Bedrock/Cobble	0.25	0.25	0	0.5
	Vegetation/Organics	0.25	0.25	0	0.75
	Vegetation/Boulder	0.25	0.25	0	0.75
	Fines/Organics	0.25	0.25	0	0.25
	Cobble/Gravel	0.5	0.75	0.25	0.5
	Boulder/Fines	0.25	0.25	0	0.75
	Cobble/Fines	0.25	0.25	0	0.5
	Boulder/Gravel	0.5	0.75	0.5	0.75
> 4 m	Boulder/Cobble	1	0.75	1	1
	Boulder	1	0.75	0.75	1
	Bedrock	0.25	0.25	0	0.5
	Bedrock/Boulder	0.25	0.25	0	1
	Fines/Organics	0.25	0.25	0	0.5
	Cobble/Gravel	0.5	0.5	0.5	0.75
	Boulder/Fines	0.25	0.25	0	1
	Cobble/Fines	0.25	0.25	0	0.75
	Boulder/Gravel	0.5	0.5	0.75	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 5: Draft Habitat Suitability Index Models for Northern Pike

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.25	0	0	0
	Boulder	0.25	0	0	0
	Bedrock	0	0	0	0
	Bedrock/Boulder	0	0	0	0
	Bedrock/Cobble	0	0	0	0
	Vegetation/Organics	1	1	1	0
	Vegetation/Boulder	1	0.75	0.75	0
	Fines/Organics	1	0.5	0	0
	Cobble/Gravel	0.5	0	0	0
	Boulder/Fines	0.25	0	0	0
	Cobble/Fines	0.5	0	0	0
	Boulder/Gravel	0.25	0	0	0
2 - 4 m	Boulder/Cobble	0.25	0	0	1
	Boulder	0.25	0	0	1
	Bedrock	0	0	0	0.5
	Bedrock/Boulder	0	0	0	0.5
	Bedrock/Cobble	0	0	0	0.5
	Vegetation/Organics	1	0.75	0.5	1
	Vegetation/Boulder	1	0.5	0.25	1
	Fines/Organics	1	0.25	0	0.5
	Cobble/Gravel	0.5	0	0	0.5
	Boulder/Fines	0.25	0	0	1
	Cobble/Fines	0.5	0	0	0.5
	Boulder/Gravel	0.25	0	0	1
> 4 m	Boulder/Cobble	0	0	0	0.75
	Boulder	0	0	0	0.75
	Bedrock	0	0	0	0.25
	Bedrock/Boulder	0	0	0	0.25
	Fines/Organics	0.25	0	0	0.25
	Cobble/Gravel	0	0	0	0.5
	Boulder/Fines	0.25	0	0	0.75
	Cobble/Fines	0	0	0	0.5
	Boulder/Gravel	0	0	0	0.75

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 6: Draft Habitat Suitability Index for Ninespine Stickleback

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.5	0.25	0	0
	Boulder	0.5	0.25	0	0
	Bedrock	0	0	0	0
	Bedrock/Boulder	0	0	0	0
	Bedrock/Cobble	0	0	0	0
	Vegetation/Organics	1	1	1	0
	Vegetation/Boulder	1	0.75	0.75	0
	Fines/Organics	1	0.75	0.5	0
	Cobble/Gravel	0.5	0.25	0	0
	Boulder/Fines	0.5	0.25	0	0
	Cobble/Fines	0.5	0.25	0	0
	Boulder/Gravel	0.5	0.25	0	0
2 - 4 m	Boulder/Cobble	0.25	0	0	0.5
	Boulder	0.25	0	0	0.5
	Bedrock	0	0	0	0
	Bedrock/Boulder	0	0	0	0
	Bedrock/Cobble	0	0	0	0
	Vegetation/Organics	0.75	0.75	0.5	0.5
	Vegetation/Boulder	0.75	0.5	0.25	0.5
	Fines/Organics	0.75	0.5	0	0.5
	Cobble/Gravel	0.25	0	0	0.5
	Boulder/Fines	0.25	0	0	0.5
	Cobble/Fines	0.25	0	0	0.5
	Boulder/Gravel	0.25	0	0	0.5
> 4 m	Boulder/Cobble	0	0	0	1
	Boulder	0	0	0	1
	Bedrock	0	0	0	0
	Bedrock/Boulder	0	0	0	0
	Fines/Organics	0	0	0	1
	Cobble/Gravel	0	0	0	1
	Boulder/Fines	0	0	0	1
	Cobble/Fines	0	0	0	1
	Boulder/Gravel	0	0	0	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 7: Draft Habitat Suitability Index Model for Round Whitefish

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	0.75	0.75	0	0
	Boulder	0.75	0.5	0	0
	Bedrock	0.25	0	0	0
	Bedrock/Boulder	0.25	0.25	0	0
	Bedrock/Cobble	0.25	0.25	0	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.25	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.75	0.75	0	0
	Boulder/Fines	0.25	0.25	0	0
	Cobble/Fines	0.25	0.25	0	0
	Boulder/Gravel	0.75	0.75	0	0
2 - 4 m	Boulder/Cobble	1	1	0.75	0.75
	Boulder	1	0.75	0.25	0.75
	Bedrock	0.25	0	0	0.25
	Bedrock/Boulder	0.25	0.25	0	0.75
	Bedrock/Cobble	0.25	0.25	0	0.5
	Vegetation/Organics	0.25	0.25	0	0.75
	Vegetation/Boulder	0.25	0.25	0	0.75
	Fines/Organics	0.25	0.25	0	0.25
	Cobble/Gravel	1	1	0.75	0.5
	Boulder/Fines	0.25	0.5	0.25	0.75
	Cobble/Fines	0.25	0.5	0.25	0.5
	Boulder/Gravel	1	1	0.75	0.75
> 4 m	Boulder/Cobble	0.5	0.5	1	1
	Boulder	0.5	0.25	0.5	1
	Bedrock	0.25	0	0	0.5
	Bedrock/Boulder	0.25	0.25	0	1
	Fines/Organics	0.25	0.25	0	0.5
	Cobble/Gravel	0.5	0.5	1	0.75
	Boulder/Fines	0.25	0.25	0.25	1
	Cobble/Fines	0.25	0.25	0.25	0.75
	Boulder/Gravel	0.5	0.5	1	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 8: Draft Habitat Suitability Index Model for Slimy Sculpin

Depth	Substrate	Foraging	Rearing	Spawning	Wintering
0-2 m	Boulder/Cobble	1	1	1	0
	Boulder	1	1	1	0
	Bedrock	0.25	0	0	0
	Bedrock/Boulder	0.5	0.25	0.5	0
	Bedrock/Cobble	0.5	0.25	0.5	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.25	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.75	1	1	0
	Boulder/Fines	0.5	0.5	0.5	0
	Cobble/Fines	0.5	0.5	0.5	0
	Boulder/Gravel	1	0.5	1	0
2 - 4 m	Boulder/Cobble	1	0.75	0.5	0.5
	Boulder	1	0.75	0.5	0.5
	Bedrock	0.25	0	0	0
	Bedrock/Boulder	0.5	0.25	0.25	0
	Bedrock/Cobble	0.5	0.25	0.25	0
	Vegetation/Organics	0.25	0.25	0	0
	Vegetation/Boulder	0.25	0.25	0	0
	Fines/Organics	0.25	0.25	0	0
	Cobble/Gravel	0.75	0.75	0.5	0.5
	Boulder/Fines	0.5	0.25	0.25	0.25
	Cobble/Fines	0.5	0.25	0.25	0.25
	Boulder/Gravel	1	0.25	0.5	0.5
> 4 m	Boulder/Cobble	1	0.5	0	1
	Boulder	1	0.5	0	1
	Bedrock	0.25	0	0	0
	Bedrock/Boulder	0.5	0.25	0	0
	Fines/Organics	0.5	0.25	0	0
	Cobble/Gravel	0.75	0.5	0	1
	Boulder/Fines	0.5	0.25	0	0.5
	Cobble/Fines	0.5	0.25	0	0.5
	Boulder/Gravel	1	0.25	0	1

Note: HSI = Habitat Suitability Index m; = metre; > = greater than;

Table 9: Species Distribution within Affected Habitats and Compensation Footprint

Species	Waterbody												
	Kennady Lake	Lake D2	Lake D3	Lake D4	Lake D5	Lake D10	Lake E1	Lake E2	Lake Ka1	Lake Kb1	Lake N14	Lake N14a	Lake N14b
Arctic grayling	■	◊	◊	◊							■	■	◊
Burbot	■	◊	■	◊									
Lake chub	■										■	■	◊
Lake trout	■	◊	■								■		◊
Ninespine stickleback	■										■	■	◊
Northern pike	■	■	■	◊			■						
Round whitefish	■												
Slimy sculpin	■	◊	◊				■				■	■	◊

Note: ■ – documented occurence; ◊ - assumed occurrence; Shaded cells indicate species not captured and assumed to be absent.

Table 10: Fish Species Captured and Sampling Date/Method for Waterbodies within Affected Habitats and Compensation Footprint

Waterbody	Fish Species Captured	Sampling Date (Sampling Method)
Kennady Lake	ARGR, BURB, LKCH, LKTR, NNST, NRPK, RNWH, SLSC	Summer 1996 (AN, GN, MT, OB), Fall 1996 (AN, GN) Summer 1999 (GN, MT) Winter 2004 (AN), Summer 2004 (AN, EF, ES, GN, MT), Fall 2004 (AN, EF, GN) Spring 2005 (FF), Summer 2005 (EF) Summer 2010 (GN)
Lake D2	NRPK	Spring 2004 (FF), Summer 2004 (GN), Fall 2004 (EF) Summer 2007 (EF, GN, MT) Summer 2010 (GB, MT)
Lake D3	BURB, LKTR, NRPK	Summer 2004 (GN), Fall 2004 (EF) Summer 2007 (EF, GN, MT) Summer 2010 (GN, MT)
Lake D4	not sampled	not sampled
Lake D5	no fish captured	Summer 2011 (EF, MT)
Lake D10	no fish captured	Summer 2003 (MT) Summer 2005 (EF, GN)
Lake E1	NRPK, SLSC	Summer 2004 (GN), Fall 2004 (EF) Summer 2007 (EF, GN, MT) Summer 2010 (GN, MT)
Lake E2	no fish captured	Summer 2003 (MT) Summer 2005 (EF)
Lake Ka1	no fish captured	Summer 2003 (MT) Summer 2005 (EF)
Lake Kb1	no fish captured	Summer 2005 (EF)
Lake N14	ARGR, LKCH, LKTR, LNSC, NNST, SLSC	Summer 2005 (EF, GN) Summer 2010 (GN, MT) Summer 2011 (GN, MT)
Lake N14a	ARGR, LKCH, LNSC, NNST, SLSC	Summer 2010 (GN, MT) Summer 2011 (EF, GN, MT)
Lake N14b	no fish captured	Summer 2010 (GN, MT) Summer 2011 (EF, MT)

Fish species: ARGR = Arctic grayling, BURB = burbot, LKCH = lake chub, LKTR = lake trout, LNSC = longnose sucker, NNST = ninespine stickleback, NRPK = northern pike, RNWH = round whitefish, SLSC = slimy sculpin

Method: AN = angling, EF = backpack electrofishing, ES = boat electrofishing, FF = fish fence, GN = gill net, MT = minnow trap, OB = observed

4.0 QUANTIFICATION OF LOSSES AND GAINS

4.1 Habitat Loss Categories

Due to supplemental mitigation associated with the Fine Processed Kimberlite Containment (PKC) Facility, there have been changes to the footprint of the facility. The footprint of the Fine PKC Facility (mitigated) has been confined to Area 2 of Kennady Lake and does not directly affect Lakes A1, A2, A5, A6, and A7, and the associated streams (EIS Supplement 2012). As described in the CCP, the affected habitat areas include the following:

- **Habitat Destruction –** portions of Kennady Lake and adjacent lakes within the Kennady Lake watershed that will be permanently lost by mine rock, Fine PKC Facility, coarse PK pile, dykes, and roads;

- **Habitat Alteration –** portions of Kennady Lake that will be physically altered after dewatering and later submerged in the refilled Kennady Lake (e.g., pit areas, roads on the lake bottom); and
- **Habitat Disruption –** portions of Kennady Lake that will be dewatered (or partially dewatered) but not otherwise physically altered before being submerged in the refilled Kennady Lake.

Based on the updated footprint of the Project related to the supplemental mitigation associated with the Fine PKC Facility, the areas of habitat losses have been recalculated.

4.1.1 Lake Habitat Loss Areas

The areas affected by the Project categorized by the type of loss category is provided in Table 11 and summarized below.

Table 11: Areas of Habitat Loss by Loss Category

	Area (ha)		
Loss Category	**Kennady Lake**	**Adjacent Waterbodies**	**Total**
Habitat Destruction	156.9	2.0	**158.9**
Habitat Alteration	84.1	0.0	**84.1**
Habitat Disruption	427.5	1.9	**429.4**
Total	**668.5**	**3.9**	**672.4**

Habitat Destruction

The Project will result in the permanent loss of approximately 158.9 ha of lake area (Figure 1). Most of the losses will occur in Kennady Lake (156.9 ha), representing about 19% of the total pre-development Kennady Lake area of 813.6 ha. The remainder of the permanently lost areas includes the complete loss of Lakes Ka1, and Kb4 associated with mine rock piles, and partial losses of small portions of Lakes N7 and E1 associated with roads and dykes (Figure 1).

Habitat Alteration

The Project will affect an additional 84.1 ha of lake area that will be dewatered and physically altered, but will be re-submerged at closure. These habitat alterations occur within Kennady Lake through the development of mine pits, roads, dykes, and water containment ponds on the lake bed (Figure 1), representing about 10% of the total pre-development Kennady Lake area of 813.6 ha. At closure, these areas will become re-submerged to provide fish habitat, although the physical attributes of the habitat at these locations will have been altered.

Habitat Disruption

The Project will result in disruption to approximately 429.3 ha of lake area being dewatered and unavailable as habitat during the operational and refilling periods, but will be re-submerged at closure and will remain otherwise unaltered by Project activities. This area includes 427.5 ha in Kennady Lake, which represents about 53% of the total pre-development Kennady Lake area, as well as 1.9 ha in Lake D1. At closure, these areas will become re-submerged to provide fish habitat, with physical attributes and suitability of the habitat being effectively the same as pre-development conditions.

4.2 Habitat Gain Categories

Habitat gains at closure are achieved through four mechanisms: the development of new habitat, enhancement of existing habitat, alteration of existing habitat such that the characteristics of the habitat may have changed, and the recovery of unaltered habitats through refilling of dewatered areas (Figure 2).

4.2.1 Lake Habitat Gain Areas

The areas developed through habitat compensation categorized by the type of habitat developed are provided in Table 12 and summarized below.

Table 12: Areas of Habitat Gains by Gain Category

	Area (ha)		
Gain Category	**Kennady Lake**	**Flooded Area (429 masl)**	**Total**
Newly Developed Habitat	56.6	184.4	**241.0**
Enhanced Habitat	61.6	107.2	**160.8**
Altered Habitat	68.1	0.0	**68.1**
Unaltered Habitat	419.5	1.9	**429.4**
Total	**605.8**	**293.5**	**899.3**

Note: the area of unaltered habitat has been reduced by 8 ha from the loss category due to the installation of habitat enhancement features within Areas 6 and 7 of Kennady Lake, which are accounted for in the enhanced habitat category

Newly Developed Habitat

This category of habitat gain is through the development of new fish habitat from areas that were previously not fish habitat in the pre-development landscape. In all cases, this results from lake areas at closure extending onto what was previously land, either through flooding within the compensation lake and Area 1, or extension of the mine pit onto land that will be filled with water at closure. This category also includes additional habitat enhancements, such as the widening and enhancement of the top bench of the mine pits, and installation of habitat enhancements features (e.g., rocky shoals or vegetated shoreline) within flooded areas.

Enhanced Habitat

This category of habitat gain includes areas that provided fish habitat under pre-development conditions, but have been enhanced at closure to provide specific habitat features to benefit the fish species in the lake. Examples of this category include the enhancement of Dyke B at closure, and the installation of finger reefs in Areas 6 and 7. This category also includes existing areas that provided fish habitat under pre-development conditions that have been enhanced through increased overwintering capacity via increased depth, or increased connectivity to a more diverse fish community.

Altered Habitat

This category of habitat gain includes areas that provided fish habitat under pre-development conditions, but have been altered due to Project developments, and as such, provide a different quality of habitat at closure. These areas include reclaimed habitat areas associated with road and dykes that are decommissioned. It is assumed that these areas will largely provide similar substrate conditions as the surrounding habitats over time and will provide useable fish habitat.

Unaltered Habitat

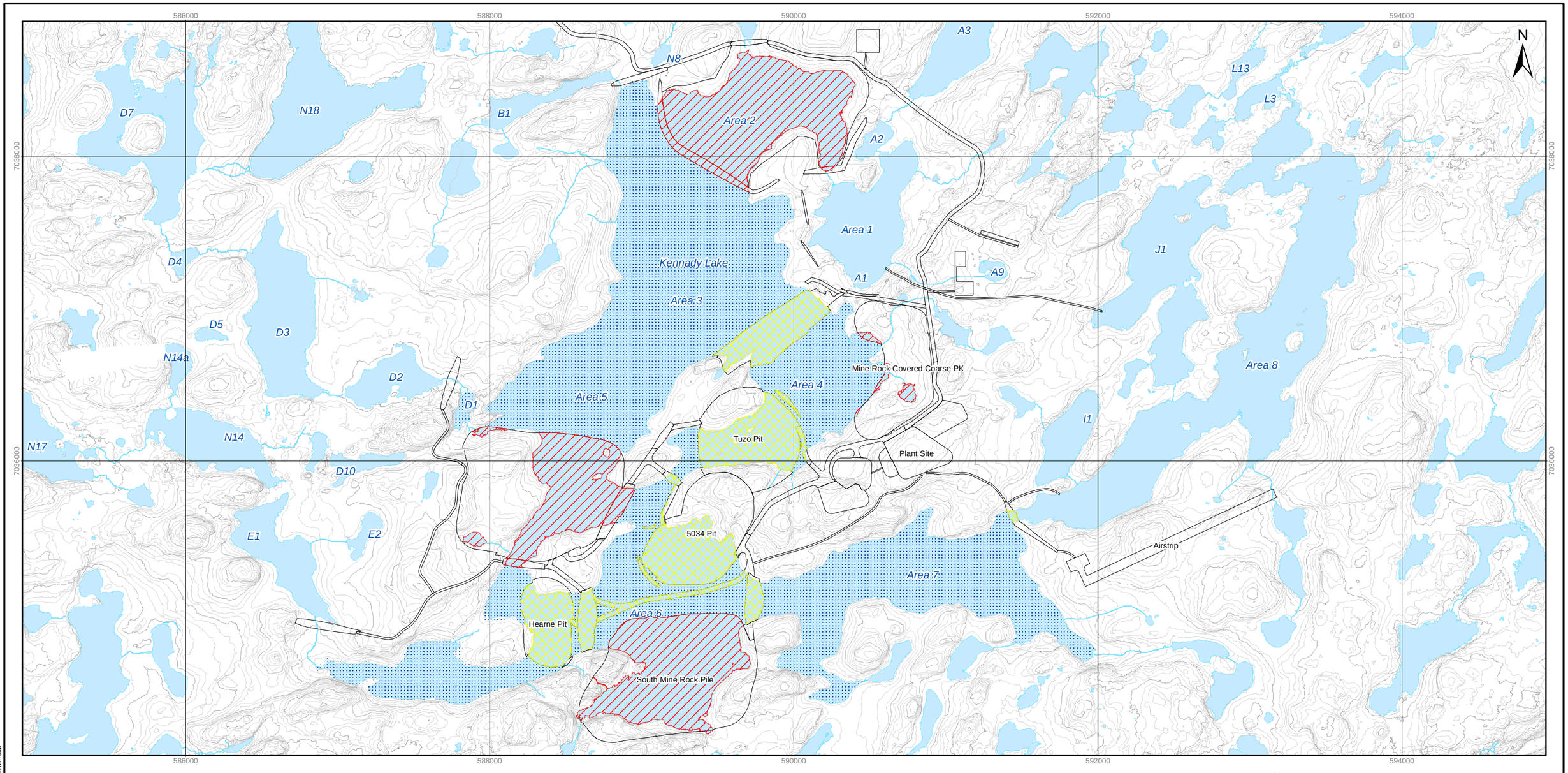
This category of habitat gain includes areas that were dewatered during the operations phase but are refilled at closure, and otherwise remain unaltered from pre-development conditions in terms of substrate and depth characteristics. This category does not include the areas targeted for habitat enhancements identified above. This also includes the reconnection of Lake D1 via outlet channels as a corridor between the compensation lake and Kennady Lake.

4.3 Stream Habitat

For stream habitats, the Project will result in permanent losses due to project infrastructure, alterations due to flooding or realignment, and disruptions due to dewatering that will be restored at closure but are otherwise unaltered. The total stream habitat area affected across all categories of loss is approximately 0.6 ha. Stream habitat will also be created at closure and enhanced to provide suitable spawning habitat to support the compensation habitat development. Details of the losses and gains for streams are still being assessed.

5.0 PATH FORWARD

A NNLP will be submitted to the Board in September 2012, which will provide detailed HU calculations, research options and additional supporting information. A conceptual monitoring plan will be developed as part of the Aquatic Effects Monitoring Program (AEMP), which will be undertaken during the permitting phase of the Project.



LEGEND

- Watercourse
- Index Contour (5m interval)
- Intermediate Contour (1m interval)
- Waterbody
- A1 Lake Identifier
- Project Footprint

Fish Habitat

- Altered Fish Habitat
- Permanently Lost Fish Habitat
- Temporary Disruption

NOTES

Base Data Source: Eagle Mapping Ltd.

DRAFT

GAHCHO KUÉ PROJECT

Permanently Lost or Altered Fish Habitat Areas - Waterbodies

PROJECTION: UTM Zone 12	DATUM: NAD83	De Beers Canada
Scale: 1:25,000 (250 125 0 250 500 Meters)		
FILE No: E2011-Fish-009-GIS		DATE: June 28, 2012
JOB NO: 11-1365-0012	REVISION NO: 1	Figure 1
OFFICE: GOLD-CAL	DRAWN: AB / CHECK: XX	

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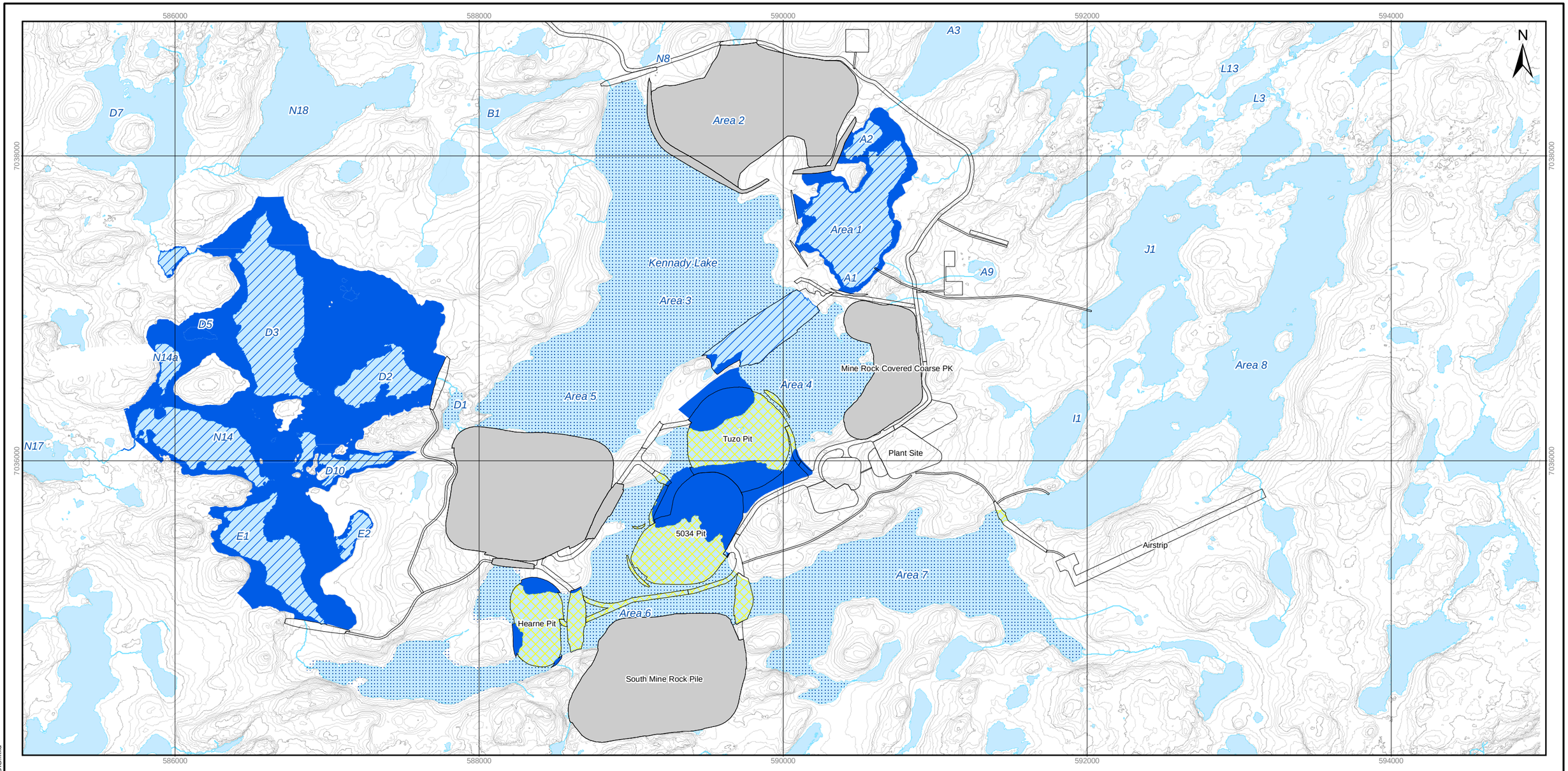

LEGEND

- Watercourse
- Index Contour (5m interval)
- Intermediate Contour (1m interval)
- Waterbody
- A1 Lake Identifier
- Project Footprint
- Project Footprint - Permanently Lost Fish Habitat

Fish Habitat

- Altered Fish Habitat
- Enhanced Fish Habitat
- Newly Developed Fish Habitat
- Temporary Disruption

NOTES

Base Data Source: Eagle Mapping Ltd.

DRAFT

GAHCHO KUÉ PROJECT

Kennady Lake and Compensation Fish Habitat at Closure

PROJECTION: UTM Zone 12	DATUM: NAD83	
Scale: 1:25,000 (250 125 0 250 500 Meters)		
FILE No: E2011-Fish-010-GIS		DATE: June 28, 2012
JOB NO: 11-1365-0012	REVISION NO: 1	
OFFICE: GOLD-CAL	DRAWN: AB / CHECK: XX	

De Beers Canada

Figure 2

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6.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

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