Côté Gold Project
Offsetting Plan

Prepared for:
IAMGOLD Corporation
Toronto, Ontario

Prepared by:
Minnow Environmental Inc.
Georgetown, Ontario

May 2020

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A Trinity Consultants Company

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ACRONYMS AND ABBREVIATIONS

BMP - Best Management Practices

CAD - Computer-Aided Design

CSP - Corrugated Steel Pipe

DFO - Department of Fisheries and Oceans

EA - Environmental Assessment

eDNA- Environmental Deoxyribonucleic Acid

EEM - Environmental Effects Monitoring

EER - Environmental Effects Review

EMP - Environmental Monitoring Plans

FAA - *Fisheries Act* Authorization

GIS - Geographic Information Systems

HEP - Habitat Evaluation Procedure

HSI - Habitat Suitability Index

HU - Habitat Unit

IFC - Issued for Construction

km - kilometer

m - meter

MDMER - Metal and Diamond Mining Effluent Regulations

MNO - Métis Nation of Ontario

MRA - Mine Rock Area

NSERC- National Sciences and Engineering Research Council

TMF - Tailings Management Facility

WRC - Water Realignment Channel

1 INTRODUCTION

1.1 Project Background

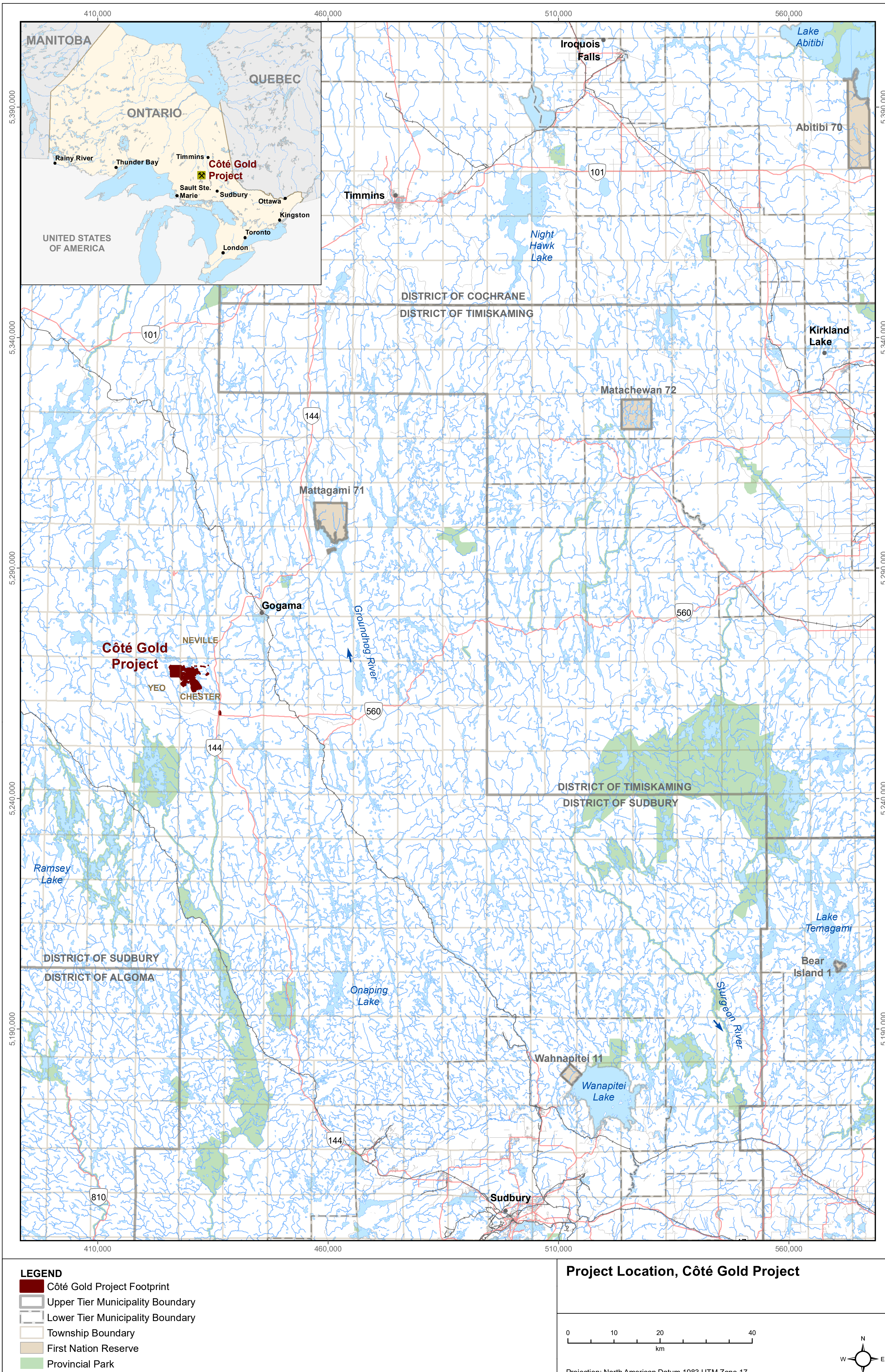
IAMGOLD Corporation (IAMGOLD) proposes to construct, operate, and eventually rehabilitate a new open pit gold mine in the Chester and Yeo Townships in the District of Sudbury, in northeastern Ontario. The development of the Côté Gold Project (the Project) is approximately 20 kilometers (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury (Figure 1.1).

IAMGOLD received the Federal Environmental Assessment (EA) decision statement of approval issued by the Federal Minister of Environment and Climate Change Canada on April 13, 2016 and received a statement of approval from the Ontario Ministry of the Environment and Climate Change on December 22, 2016. Following the receipt of the EA approvals for the Project, IAMGOLD identified various opportunities to optimize the Project. To ensure these changes to the Project were well communicated to government regulators, the public and Indigenous communities, and in accordance with Federal and Provincial EA Conditions of Approval, IAMGOLD undertook an Environmental Effects Review (EER; IAMGOLD 2018) to evaluate the potential effects of changes resulting from the optimization of the Project compared to the approved EA. Two key refinements were made to the Project during the optimization process that pertain to fish and fish habitat losses:

- A reduction in the Project footprint, specifically the Open Pit, Mine Rock Area (MRA), and the Tailings Management Facility (TMF).
- Relocation of the TMF closer to the Open Pit, no longer overprinting Bagsverd Creek.

The aquatic biology EER summary demonstrated that the effects of the optimized Project are similar or reduced compared to the EA (IAMGOLD 2015, 2018). Fewer potential effects to the aquatic environment are predicted as a result of the smaller footprint, the reduced disruption, and loss of aquatic habitat, and maintenance of watershed boundaries (IAMGOLD 2018). The overall results of the EER confirmed that the predicted environmental effects of the Project are similar or reduced compared to the EA and concluded that the optimized Project is an overall improvement compared to the EA (IAMGOLD 2018).

The optimized Project site layout places the required mine-related facilities in close proximity to the Open Pit, to the extent practicable (Figure 1.2). Ore processing will occur up to a rate of approximately 36,000 tonnes per day. Overburden, mine rock, and ore extracted from the Open Pit will be stockpiled in the overburden stockpile, MRA and ore stockpile, respectively (Figure 1.2).



Project Location, Côté Gold Project

Projection: North American Datum 1983 UTM Zone 17
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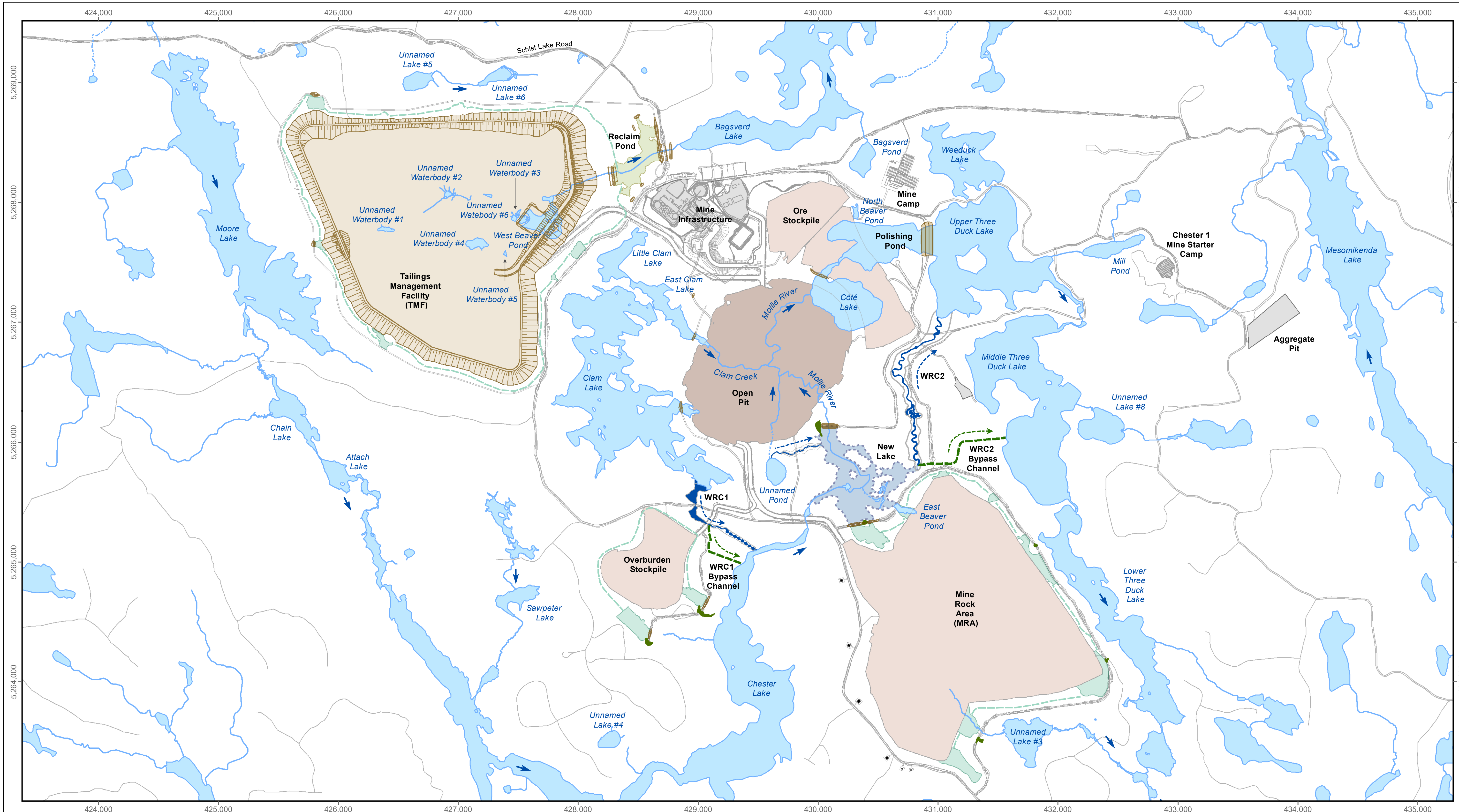
Date: March 2020
Project 187202.0015

minnow environmental inc.

Figure 1.1

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 1.1 Project Location.mxd



LEGEND

Bypass Channel	Realignment Channel	Seepage Collection Pond	Bypass Flow During Construction
Ditch	TMF	Reclaim Pond	Future Flow Direction
Dam	Stockpile	Spillway	Mine Site Road
New Lake	OpenPit		Existing Road/Trail

Note: WRC - Water Realignment Channel

0 0.5 1 2
Kilometers

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N E S W

Current Site Layout, Côté Gold Project

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Figure 1.2

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 1.2 Site Overview-NEW.mxd

As part of the optimized development of the Project, several water features will be fully or partially overprinted. To accommodate the Open Pit and MRA, Côté Lake, the Mollie River, two small portions of Clam Lake, and several small tributaries and ponds will be lost (Figure 1.2). The Mollie River will be realigned, flowing around the south east site of the Open Pit to Upper Three Duck (Figure 1.2). To accommodate the TMF, several small unnamed waterbodies, West Beaver Pond, and their associated tributaries will be lost. Following site closure and the filling of the Open Pit, the Open Pit Lake will be connected to the existing water systems and the remaining subwatersheds will be returned to their pre-mining conditions, as much as practicable.

The removal of Côté Lake, a portion of Upper Three Duck Lake, a section of the Mollie River and other smaller waterbodies will result in a loss of fish habitat and potential harm to fish within these areas.

1.2 Section 35 vs Section 36 of the Fisheries Act

Section 35 (1) of the *Fisheries Act* states "The Minister may designate, as a work, undertaking or activity that is associated with a designated project, any work, undertaking or activity that the Minister considers likely to result in the death of fish or harmful alteration, disruption, or destruction of fish habitat"; (2) "The Minister shall designate any work, undertaking or activity that is part of a designated project and that the Minister considers likely to result in the death of fish or the harmful alteration, disruption or destruction of fish habitat." When proponents are unable to avoid or mitigate the death of fish or harmful alteration, disruption, or destruction of fish habitat, the project requires an authorization (e.g., a *Fisheries Act* Authorization [FAA]) under Subsection 35(3) of the *Fisheries Act* in order for the project to proceed.

Section 36 (3) of the *Fisheries Act* states "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water." A deleterious substance can be any substance that, if added to water, would degrade or alter its quality such that it could be harmful to fish, fish habitat or the use of fish by people. Proponents may require an amendment of Schedule 2 of the Metal and Diamond Mining Effluent Regulations (MDMER) under Section 36 in order deposit deleterious substances of any type (i.e., mine waste) in water frequented by fish.

Affected habitats (lost or altered) for the Project were identified as requiring a Section 35(2) authorization under the *Fisheries Act* if:

- The habitat is affected by mine site infrastructure and not mine waste (e.g., the Open Pit, mine roads, ditching, dams).
- The habitat was modified to allow for the offsetting plan and realignments to be realized.

Habitat was identified as requiring a Schedule 2 authorization (Section 36) under the MDMER if the habitat is going to be overprinted by mine waste and cannot be realigned. For the purposes of this report the loss of fish habitat includes any death of fish or harmful alteration, disruption, or destruction of fish habitat.

1.3 Offsetting Approach

In 2019, the *Fisheries Act* was amended to offer protection for all fish and fish habitat. As described in the policy entitled, Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act* (the Policy), dated December 2019, if there is likely to be adverse effects on fish and fish habitat, and if those adverse effects on fish and fish habitat are unavoidable, Fisheries and Oceans Canada must consider if there are measures to mitigate that would reduce or minimize those adverse effects and the proponent must develop a plan to offset the residual effects. The avoidance and mitigation of effects to fish habitat has and will be an integral part of the design and engineering of the Project, but as noted above, the Project is anticipated to permanently alter or destroy some existing fish habitat. Based on the Project design an FAA and Schedule 2 amendment under MDMER will be required. To obtain a FAA and a Schedule 2 Amendment, IAMGOLD has developed a habitat “offsetting plan,” pursuant to Part 2 and 3 of the Policy and the Applicants Guide to Supporting the Authorizations Concerning Fish and Fish Habitat Protection Regulations that will counterbalance unavoidable adverse residual effects to fish and fish habitat and, where possible, improve the productivity of the existing fish habitat. This offsetting plan addresses habitat losses under both Section 35 and Section 36 in a single comprehensive plan.

The proposed offsetting plan has been developed to comply with the Policy and Applicants Guide; to support the conservation and protection of fish and fish habitat by counterbalancing the residual death of fish and/or harmful alteration, disruption or destruction of fish habitat associated with the Project. This will be accomplished in several ways:

1. implementation of a fish salvage and relocation program to reduce the number of fish harmed;
2. schedule offset plan to limit the duration and spatial extent of fish habitat being affected;
3. developing an “in-kind” approach to offsetting that will be incorporated into a New Lake and channel realignment plans (habitat that is destroyed or permanently altered is replaced by similar or improved quality of the same type of habitat, with consideration of uncertainty and time lags);

4. measures to offset will incorporate the restoration of degraded fish habitat through the reconnection of lakes by the removal of culverts/roads and improve connectivity through the watershed; and

5. additional complementary offsetting to contribute to the improvement of Environmental Effect Monitoring programs which monitor for the protection of fish and fish habitat (the aquatic environment) and support the environmental management of mine effluents.

As noted within the Policy and Applicants Guide, by developing in-kind habitat and balancing the losses to fish and fish habitat caused by the Project, the benefits that result from offsetting measures can be a straight-forward calculation.

In order to assess the predicted loss of fish habitat associated with the Project relative to the planned habitat to be created through the offsetting plan, IAMGOLD has developed an assessment approach, to allow for the current and post development fish productivity to be quantified. A habitat units (HU) approach was employed as a surrogate for fish productivity which incorporated the habitat quality and quantity of pre- and post-development conditions such that the net change in productive fish capacity could be considered. This method is consistent with the approach applied during the federal EA process and was developed in consultation with Department of Fisheries and Oceans' (DFO) habitat management program. The balance of habitat losses versus gains were considered together with other factors that can influence fish productivity (i.e., connectivity or access to better overwintering habitat) to provide for an overall assessment of change in fish productivity associated with the proposed undertaking. Furthermore, the proposed offsetting plan integrates abiotic and biotic features which have been incorporated to minimize lag times and promote fish productivity.

Extensive First Nations, public and government consultation has been conducted in support of the Côté Gold Project and specifically this offsetting plan. A description of the consultation conducted, the comments and responses provided and the materials presented is provided in Appendix D.

1.4 Objective

The objective of this report is to document and assess the residual death of fish and/or harmful alteration, disruption or destruction of fish habitat as a surrogate to assessing changes in fish productivity that may occur as a result of the Project. The document will support an Application for Authorization under Paragraph 35(2) (b) of the *Fisheries Act* and outlines a single offsetting plan that will apply to Section 35 and the Schedule 2 Amendment of the MDMER (Section 36). This report clearly documents the quality and quantity of habitat to be lost versus gained under both approvals and considers the implications to fish productivity for key large-bodied fish species as well as small-bodied fish species within the affected watersheds. In addition, this report will identify mitigation measures to be conducted during the project, outline monitoring post-construction, and review total costs of carrying out the offsetting plan.

2 METHODS

2.1 Fish Species Considered in Assessment

The fish communities within stream and lake habitats of the study area were generally dominated by northern pike (*Esox lucius*) and yellow perch (*Perca flavenscens*; Table 2.1). Walleye (*Sander vitreus*), white sucker (*Catostomus commersonii*), and lake whitefish (*Coregonus clupeaformis*) were also common and varied in abundance depending on habitat. Smallmouth bass (*Micropterus dolomieu*) and burbot (*Lota lota*) were only present in low abundance in a few lakes (Table 2.1). In addition to these species, fifteen small-bodied species were also identified. No endangered, threatened, or special concern fish species (COSEWIC 2019) were captured during baseline studies (AMEC 2011, Minnow 2014, 2017a).

Based on the existing fish community composition, the habitat assessment was conducted for five key large-bodied fish: northern pike, yellow perch, lake whitefish, walleye, and smallmouth bass. The habitat requirements of these five species represent the range of conditions required to support all fish species found within the affected areas (Appendix A; Table 2.2). For example, lake whitefish and burbot have similar life history requirements; both species typically prefer to spawn in shallow (i.e., less than 10 m), littoral areas of lakes over gravel or cobble substrate. After hatching, young-of-the-year burbot and lake whitefish continue to inhabit shallow lake waters using debris and emergent vegetation as cover but eventually move to deeper water during the summer to take advantage of cooler temperatures. Adults of both species occupy hypolimnetic habitat during summer and likely prefer dissolved oxygen levels of 6 mg/L or greater for overwintering. Thus, due to overlap in habitat preferences, the assessed fish serve as surrogates for the expected changes in productivity of all fish species found in the affected waterbodies. It is assumed that all fish species and life stages being evaluated have equal weighting and therefore were not ranked (i.e., no fish species or life history stage was considered more important than others). In addition to considering the five main large-bodied fish species found within the project site, several waterbodies only contain small-bodied forage fish species, therefore an additional category was developed for these areas. The loss of habitat and the offsetting habitat being proposed are to be similar, therefore, the goal is to maintain or enhance the productivity of the fish community as a whole, and not any particular species found within the project area.

2.2 Habitat Evaluation Procedure (HEP)

Ultimately, the Project will result in the harmful alteration of fish habitat, which has the potential to affect fish under Section 35 of the *Fisheries Act* and under Section 36 of the *Fisheries Act*, and therefore an accounting of habitat losses relative to the proposed increases in habitat is required.

Table 2.1: Summary of Fish Species Presence/Absence in Côté Gold Project Area[a]

	Watershed	Mollie River Watershed																					Neville Lake Watershed											
	Species																Three Duck Lakes							West Beaver Pond Watershed										
		Moore Lake	Chain Lake	Attach Lake	Chester Pond	Unnamed Lake #4	Sawpeter Lake[b]	Chester Lake	East Beaver Pond	Unnamed Pond	Little Clam	Clam Lake	Clam Creek	Cote Lake	North Beaver Pond	Weeduck Lake	Upper	Middle	Lower	Unnamed Lake #3	Mollie River	Dividing Lake	Schist Lake	Unnamed Waterbody #1[d]	Unnamed Waterbody #2	Unnamed Waterbody #3	Unnamed Waterbody #4	Unnamed Waterbody #5	West Beaver Pond	Bagsverd Pond	Bagsverd Lake	Bagsverd Creek	Unnamed Lake #5	Unnamed Lake #6
Large-bodied Fish Species	Burbot *Lota lota*											✔		✔																		✔		
	Lake whitefish *Coregonus clupeaformis*			✔				✔						✔		✔	✔	✔	✔			✔	✔								✔			
	Northern pike *Esox lucius*	✔	✔	✔		✔	✔	✔		✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔								✔	✔		
	Smallmouth bass *Micropterus dolomieu*											✔						✔ [c]																
	Walleye *Sander vitreus*													✔ [c]			✔	✔	✔			✔	✔								✔			
	White sucker *Catostomus commersonii*		✔				✔	✔		✔				✔		✔	✔	✔	✔		✔	✔	✔						✔	✔	✔	✔		
	Yellow perch *Perca flavescens*	✔	✔	✔			✔	✔		✔	✔	✔		✔		✔	✔	✔	✔	✔	✔	✔	✔								✔	✔		
Small-bodied Fish Species	Blacknose shiner *Notropis heterolepis*							✔			✔	✔		✔		✔	✔	✔	✔		✔		✔								✔	✔		
	Central mudminnow *Umbra limi*																								✔				✔	✔		✔		
	Common shiner *Luxilus cornutus*																	✔																
	Fathead minnow *Pimephales promelas*								✔																✔				✔	✔	✔		✔	✔
	Finescale dace *Chrosomus neogaeus*	✔					✔		✔						✔								✔		✔	✔	✔	✔	✔	✔			✔	✔
	Longnose dace *Rhinichthys cataractae*																															✔		
	Golden shiner *Notemigonus crysoleucas*	✔		✔			✔	✔			✔	✔		✔		✔				✔	✔		✔						✔		✔	✔		
	Iowa Darter *Etheostoma exile*	✔	✔	✔			✔	✔		✔	✔	✔				✔	✔	✔	✔	✔	✔		✔						✔	✔	✔	✔	✔	
	Johnny darter *Etheostoma nigrum*						✔					✔																						
	Northern redbelly dace *Chrosomus eos*						✔		✔						✔										✔	✔			✔	✔		✔	✔	✔
	Pearl dace *Margariscus nachtriebi*																								✔	✔			✔				✔	✔
	Sculpin sp. *Cottus bairdii*															✔			✔															
	Spottail shiner *Notropis hudsonius*							✔				✔				✔	✔	✔					✔								✔			
	Trout-perch *Percopsis omiscomaycus*							✔																										

Note: ✔ = Species Present

[a] This table reflects fish species absence/presence in the current configurations of the Mollie River and Neville Lake watersheds.

[b] Includes North Complex, Sawpeter Lake, and South Outlet.

[c] AMEC 2011.

[d] Fish were observed in Waterbody #1 but not captured for identification.

Table 2.2: Summary of Waterbodies Affected by the Côté Gold Project Relative to the Requirement for a FAA Under Section 35 versus a Section 36 Schedule 2 MDMER Amendment

Mine Infrastructure	Section 35 or Schedule 2	Change	Affected Areas	Rationale for Approval
Open Pit	Section 35	Habitat Lost	Côté Lake	Lost due to development of the Open Pit.
Open Pit	Section 35	Habitat Lost	Mollie River (portion of river from Chester to Côte)	Lost due to development of the Open Pit. Dam on Mollie River required to create New Lake and flow realigned to Upper Three Duck Lake.
Open Pit	Section 35	Habitat Lost	Clam Creek	Lost due to development of the Open Pit.
Open Pit	Section 35	Habitat Lost	Unnamed tributary downstream of Unnamed Pond to Mollie River	Lost due to development of the Open Pit.
Open Pit	Section 35	Habitat Lost	Clam Lake (East Clam Lake - eastern section lost)	Lost to isolate East Clam Lake from Open Pit. Required to provide safe operating conditions for the Open Pit.
Open Pit	Section 35	Habitat Lost	Clam Lake (eastern section lost)	Lost to isolate Clam Lake from Open Pit. Required to provide safe operating conditions for the Open Pit.
Open Pit	Section 35	Habitat Lost	North Beaver Pond	Lost due to the development of the Open Pit and watercourse realignments around the Open Pit. The mine access road will remove upstream drainage to North Beaver Pond.
Open Pit	Section 35	Habitat Lost	Upper Three Duck Lake (west arm lost)	Lost to isolate Upper Three Duck Lake from the Open Pit. Note the dam location is based on engineering requirements and a safe setback distance and condemnation drilling that suggest a closer dam alignment may limit future pit expansion. The location of the Low Grade Ore Stockpile was identified after the requirement for the dam made this land available.
Open Pit	Section 35	Habitat Alteration	Mollie River (downstream of Chester Lake)	Habitat altered due to the creation of New Lake.
Open Pit	Section 35	Habitat Alteration	Portion of East Beaver Pond	Habitat altered due to the creation of New Lake.
Mine Rock Area	Section 35	Habitat Lost	Portion of Unnamed Tributary to Unnamed Lake 3	Dam for seepage collection pond and for the MRA will be constructed over a two portions of the Unnamed Tributary to Unnamed Lake 3.
Mine Rock Area	Schedule 2	Habitat Lost	Inlet Unnamed Lake #3 (upstream portion)	Lost due to MRA (overprinted) and seepage collection pond. Headwater stream that cannot be realigned.
Mine Rock Area	Schedule 2	Habitat Lost	Portion of East Beaver Pond (southeast section lost)	Lost due to MRA (overprinted) and seepage collection pond.
Tailings Management Facility	Section 35	Habitat Lost	Portions of Unnamed Tributary to south arm of Bagsverd Lake	Construction of TMF dam will be required as infrastructure prior to the deposit of tailings. The portion of the creek lost to the overprinting of dams will be included in the FAA.
Tailings Management Facility	Section 35	Habitat Lost	Portion of West Beaver Pond	Construction of the TMF starter dam will be required as infrastructure prior to the deposit of tailings. A portion of the waterbody lost to the overprinting of the dam will be included in the FAA.
Tailings Management Facility	Section 35	Habitat Lost	Portion of Unnamed Tributary to South Arm of Bagsverd Lake	Construction of Polishing Pond dam will be required as infrastructure prior to the operation of the pond. The portion of the creek lost to the over printing of the dam will be included in the FAA.
Tailings Management Facility	Schedule 2	Habitat Lost	Unnamed Waterbody #1 to 6	Lost due to TMF (overprinted).
Tailings Management Facility	Schedule 2	Habitat Lost	Unnamed Tributaries connecting Unnamed Waterbodies	Lost due to TMF (overprinted).
Tailings Management Facility	Schedule 2	Habitat Lost	Portion of West Beaver Pond	Lost due to TMF (overprinted).
Tailings Management Facility	Schedule 2	Habitat Lost	Portion of Unnamed Tributary from West Beaver Pond to South Arm of Bagsverd Lake	Lost due to the TMF and TMF Reclaim Pond (overprinted). Small tributary that cannot be realigned due the TMF overprinting the watershed upstream.

A Habitat Evaluation Procedure (HEP) was used to assess habitat losses and gains for the Project (Terrell et al. 1982). This approach calculates a habitat unit by multiplying the habitat quality for each species by the spatial area of the habitat type affected (e.g., m^2). This was calculated for all the habitat that will be lost as well as the habitat gained (created or enhanced) through offsetting. These habitat units were used to calculate the expected net change in habitat attributed to the Project. The following outlines the general approach used to calculate habitat units.

1. **Habitat Quantity** – The quantity of stream and lake habitat was predicted before and after development as areal coverage (i.e., per m^2).

2. **Habitat Quality** – Habitat quality was assessed for five key large-bodied fish species and four life history stages. A habitat suitability score was assigned for each species and life history stage. Small-bodied fish species were grouped together and habitat quality was assessed for the complete life history.

3. **Habitat Units** – Habitat units were calculated using the numeric quality of habitat multiplied by the quantity of habitat before and after development to assess the net change in habitat.

Both the quantity and quality of fish habitat for each species at each life history stage was incorporated into the habitat unit's assessment such that the resulting metric accounts for both quantity and quality of all habitat types lost and gained, and therefore is a reasonable substitute for the net change in productive capacity.

The HEP developed by the US Fish and Wildlife Service (1981) follows:

$$\text{Habitat Units} = (\text{HSI}) \times (\text{Area of available habitat})$$

Where HSI (Habitat Suitability Index) is defined as a numerical index that represents the capacity of a given habitat to support a selected fish species, and the area of available habitat is defined as the total area of all habitat types used by the evaluation species (US Fish and Wildlife Service 1981).

$$\text{HSI} = \text{Study area habitat conditions/Optimum habitat conditions}$$

Where HSI can have a minimum value of 0.0 and a maximum value of 1.0, representing unsuitable and optimal habitat, respectively. This can also be applied to word rankings where habitat can be rated by word descriptors such as "excellent", "good", "moderate," or "poor". If these descriptors are clearly defined, they can be converted to a numerical ranking with the following equation:

$$\text{HSI} = \text{Output Rank for the area of interest / 4}$$

The numerical ranking used for the following habitat quality descriptors are outlined in Table 2.3.

Table 2.3: HSI Word, Numerical and Value According to Habitat Conditions

Word Ranking	Numerical Ranking	HSI Value
Excellent	4	1.00
Good	3	0.75
Moderate	2	0.50
Poor	1	0.25
None	0	0.00

Note: HSI = Habitat Suitability Index.

2.2.1 Habitat Quantity

The quantity of stream and lake habitat were measured separately. Lake habitat was measured (quantified) for three habitat areas within each lake based surface areas (m^2). These areas corresponded to depths of 0 to 2 m, 2 m to the end of the littoral zone, and the end of the littoral zone to maximum depth of the lake (limnetic zone), if present. The littoral zone was divided into two different areas to account for overwintering habitat (i.e., areas less than 2 m in depth would not provide good overwintering habitat) and/or the potential for spawning habitat (i.e., northern pike spawning generally occurs in less than 2 m). Streams were classified into low (1.5%), medium (1.5 to 2%), and high (3 to 5%) gradient areas, as well as, permanently flowing versus intermittent. The area of the stream was calculated by multiplying stream width and length (m^2) for each gradient type.

To calculate habitat quantity, the spatial area of each habitat type affected by the Project was calculated using both Geographic Information System (GIS) and reconnaissance data collected in baseline surveys. Reference water level data was used for all streams and lakes in order to standardize comparisons among locations. Average stream channel widths were determined using aerial photographs and reconnaissance data (for smaller streams). Intermittent streams were given a stream width of 0.5 m, which is very conservative since some of these streams had sections of undefined channel for various lengths. Stream channel lengths were rounded up to the nearest 10 m. Similarly, the spatial area of each habitat type to be created was also calculated either in GIS or Computer-Aided Design (CAD) after design drawings. Proposed waterbody or watercourse habitat sizes were based on Issued for Construction (IFC) drawings.

2.2.2 Habitat Quality

Fish habitat quality (HSI value) for each species was based on habitat requirements found in key literature sources and existing habitat suitability models to document optimal habitat for all life stages of each species. Published information on habitat suitability for the assessed fish species was taken from sources including Inskip (1982), Scott and Crossman (1998), Coker et al. (2001), Craig (1996), Holmes et al. (2010), and United States Fish and Wildlife Service Habitat Suitability Indices (e.g., Krieger et al. 1983, Twomey et al. 1984, McMahon et al. 1984, Edwards et al. 1983). The habitat characteristics required for each life history stage is provided for each species (Appendix A) and formed the basis for numerical ranking of habitat quality. Existing fish habitat quality was based on habitat observed during baseline studies (AMEC 2011, Minnow 2014, 2017a), and characterized using standard protocols (e.g., Dodge et al. 1989). Fish abundance was taken into consideration; however presence/absence was given priority in assigning HSI values for existing habitat. This approach was conservative as it assigned value if the habitat was present for a given target species, even though they were not captured or were present in very low abundance. Only in areas where species were not observed and it was known that there was no access for these species to the given area, were values not assigned if habitat was present (e.g., isolated waterbodies within the TMF). This approach acknowledged that the species may have access to all the habitat but were not necessarily caught in all areas. The quality of habitat associated with the proposed offsetting plan was based on the characteristics of the habitat to be created (i.e., gradient, substrate, vegetation, depth) and the habitat requirements established for each species (Appendix A). Based on expert knowledge and the local conditions of the study area, a HSI value was applied to each habitat type (lakes and streams) that will be lost, altered, or created by the Project for each fish species and life stage assumed to utilize the habitat.

For each habitat area, habitat suitability (quality) was assessed for four life stages of the key large-bodied fish species:

- spawning and incubation,
- juvenile rearing,
- adult foraging, and
- overwintering (all life stages).

The exception being small-bodied fish species habitat, where only one value was assigned for each waterbody/watercourse. Habitat characteristics for each habitat area were then evaluated relative to habitat preferences to estimate a suitability score between 0 (unsuitable/none) and 1 (excellent) for each life stage of each species. Both aquatic and riparian habitat was noted during reconnaissance surveys and was considered when evaluating specific life stages for each species (e.g., anticipating habitat conditions in the spring when water levels are higher and northern pike spawn). Habitat types were ranked equally so that no single habitat type was considered more important than another.

2.2.3 Calculation of Habitat Units Lost and Gained

Habitat units lost and gained were calculated by multiplying life stage-specific habitat quality ratings for each habitat type (e.g., low gradient stream) by the area (m^2) of the habitat before and after mine development. Total habitat units were then calculated as the sum of all life-stage specific habitat units existing (before) and the sum of all life-stage specific habitat units enhanced or created (after).

Habitat within each area affected by the Project is described briefly (detailed descriptions are presented in Minnow 2014 and 2017a), focusing on the habitat requirements for each life stage of the five key large-bodied fish species. While portions of existing habitat may present excellent or poor habitat for the species assessed, the value assigned to the habitat unit is based on the proportion of habitat quality within the habitat unit as a whole (i.e., if a small portion of the littoral zone is excellent spawning habitat but the rest of the habitat is average, the assigned quality may be good). Although a species may not be found within a waterbody, habitat was evaluated based on the potential for that species to live within the waterbody. Discussion focusses on habitat losses and gains separately.

2.3 Lag Times

Lag times, the period between the construction of habitat and its ability to functionally support the fishery, have been considered in the habitat offsetting plan (Minns 2006, Fisheries and Oceans Canada 2013). Measures to reduce lags times have been described, as well as the expected outcome of each measure incorporated.

2.4 Quantifying Net Change

The change in habitat units for each species and life stage was summarized for both stream and waterbody habitat. The quantified change in habitat units was considered to be a measure of expected changed to fish productivity. The net change in habitat units was also considered in light of other factors which may influence fish productivity, including habitat connectivity and type (i.e., stream versus waterbody habitat).

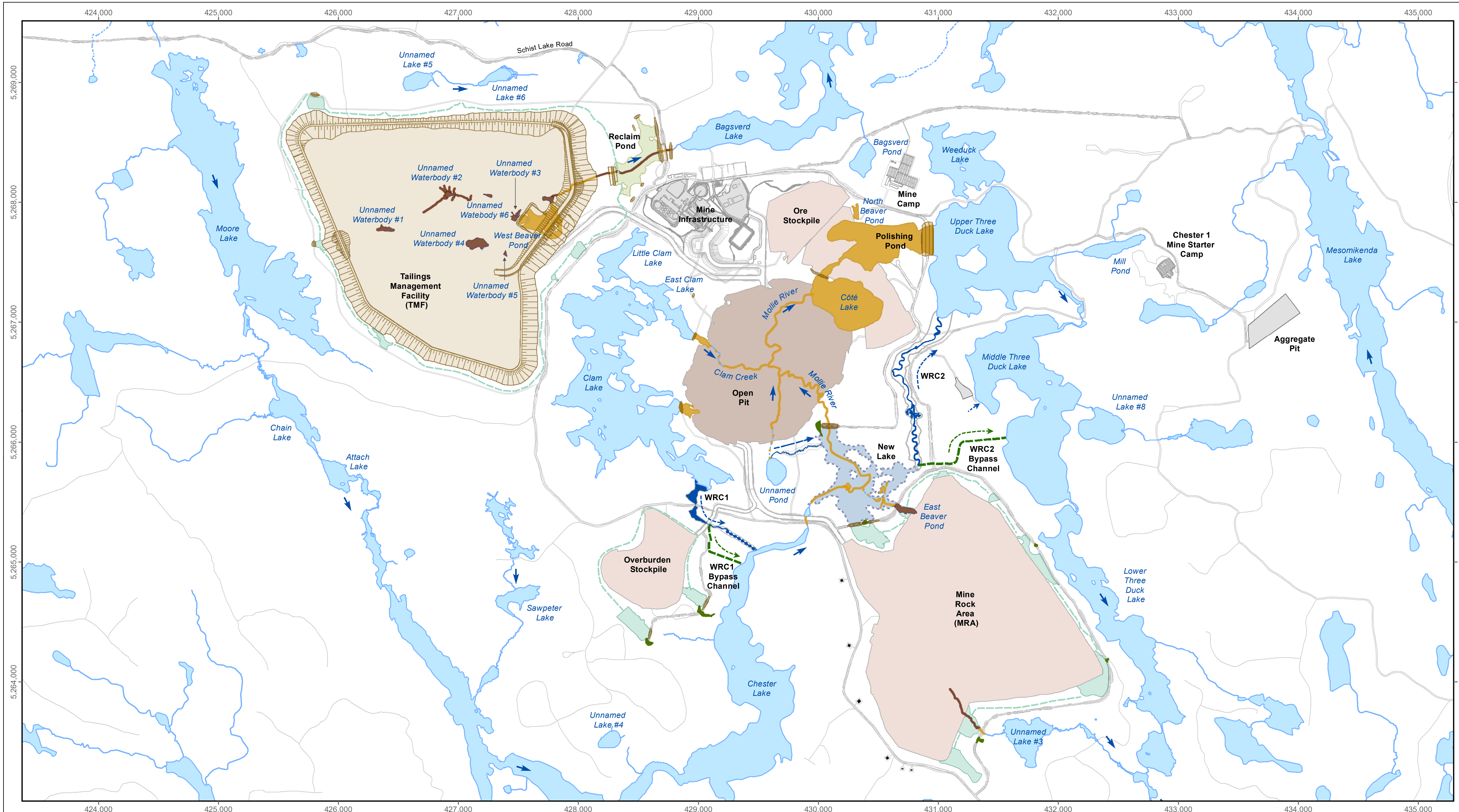
3 EXPECTED LOSS IN FISH HABITAT AND PROPOSED OFFSETTING

3.1 Overview

As part of the proposed Project, several water features will be fully or partially overprinted (Figure 3.1 and Table 2.2). These include Côté Lake, portion of Upper Three Duck Lake, two portions of Clam Lake, and the Mollie River within the Mollie River watershed, and ponds and connecting streams flowing into the south arm of Bagsverd Lake in the Neville Lake watershed. Realignments will be constructed to maintain flow out of Clam Lake and in the Mollie River system. Flow from Clam Lake will be directed south to Chester Lake (Clam Creek realignment; WRC1 [Water Realignment Channel]). Downstream of Chester Lake, a New Lake will be created over portions of the Mollie River and East Beaver Pond. The outlet of the New Lake will flow north to the southwest corner of Upper Three Duck Lake around the Open Pit (Mollie River realignment; WRC2). Following operations and pit filling (expected to take approximately 30 year) most of the watercourse realignments will be left as wetland habitat and the watersheds will be returned to their original configuration. The Open Pit will be remediated into a lake and the polishing pond will be restored (the low grade ore stockpile and the polishing pond dam will be removed) to the arm of Upper Three Duck. The New Lake will remain, as requested by First Nations during consultation on the approved mine closure plan (Appendix D).

A description of the loss of existing fish habitat and expected habitat gains associated with the offsetting plan are provided in Sections 3.2 and 3.3, respectively. The description of existing habitat is based on information compiled during aquatic baseline surveys (AMEC 2011, Minnow 2014, 2017a). The quality of this habitat has been based on the habitat suitability indices and literature sources for each life stage assessed (Appendix A). The quantity of habitat is based on GIS mapping, bathymetric maps, and field verification. The habitat quality, quantity, and resulting habitat units of the existing habitat to be lost is provided in Appendix B (Appendix Tables B.1 to B.13). Similarly, the habitat to be developed for the offsetting plan has been accounted for in the same tables in Appendix B based engineering drawings (IFC drawings) and anticipated habitat conditions relative to the habitat requirements for the various life history stages of the key large-bodied fish and small-bodied fish species (Appendix A).

Fish habitat will be lost as part of the Project, specifically associated with the Open Pit, the MRA, and the TMF (Figure 3.1, Table 2.2 and 3.1). Habitat losses discussed below are generally grouped by the construction activity and are expected to result in the death of fish and/or harmful alteration, disruption or destruction of fish habitat (the habitat units attributed to these losses are provided in Appendix B; Appendix Tables B.1 to B.13).



LEGEND

- Section 35 Authorization
- Schedule 2
- Section 35 Authorization, Stream
- Section 35 Authorization, Intermittent
- Schedule 2, Stream
- Schedule 2, Intermittent
- New Lake
- Realignment Channel
- Seepage Collection Pond
- Reclaim Pond
- Spillway
- Bypass Channel
- Dam
- Ditch
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail

Note: WRC - Water Realignment Channel

0 0.5 1 2
Kilometers

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N E S W

Overview of Habitat Loss, Côté Gold Project

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Figure 3.1

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.1 Habitat Loss Overview.mxd

Table 3.1: Summary of Lost Habitat Area, Côté Gold Project

Location of Impact		Fisheries Act Authorization (FAA) or Schedule 2	Area	Max Depth (m)	Depth (m)	Area (m^2)
Waterbody		FAA	North Beaver Pond	<0.5	0-max	4,076
		FAA	East Clam Lake (south end)	2.4	0-max	5,961
		FAA	Clam Lake (east arm)	3.0	0-2	7,365
					2-max	2,727
		FAA	Côté Lake	4.3	0-2	69,798
					2-max	118,748
		FAA	Upper Three Duck Lake (western arm)	4.1	0-2	60,346
					2-max	154,132
	New Lake	FAA - Alteration of Habitat	East Beaver Pond	<1	0-max	2,981
	Mine Rock Area (MRA)	Schedule 2	East Beaver Pond (small arm)	<2	0-max	7,758
	Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	Unnamed Waterbody #1	1.0	0-max	4,478
			Unnamed Waterbody #2	0.6	0-max	2,903
			Unnamed Waterbody #3	1.1	0-max	3,036
			Unnamed Waterbody #4	<1	0-max	11,574
			Unnamed Waterbody #5	<2	0-max	642
			Unnamed Waterbody #6	unknown	0-max	846
			West Beaver Pond	<2	0-max	3,178
		FAA (TMF Dam)	West Beaver Pond	3.0	0-max	49,265
					FAA Losses	**475,399**
					Schedule 2 Losses	**34,415**
					Lake Habitat Total	**509,814**

Location of Impact		FAA or Schedule 2	Area	Habitat Type	Length (m)	Area (m^2)
Stream	Open Pit	FAA	Mollie River (from New Lake Dam North to Côté Lake)	High-gradient	472	7,083
				Pool	66	1,990
				Low-gradient	373	3,952
				High-gradient	55	1,044
				Low-gradient	2,518	35,749
		FAA	Clam Creek (from East Clam Lake to the Mollie River)	Low-gradient	491	1,105
				Intermittent	243	121
		FAA - Alteration of Habitat	Tributary from Unnamed Pond to Mollie River	Intermittent	276	138
				Low-gradient	468	842
	New Lake	FAA - Alteration of Habitat	Tributary from East Beaver Pond	Intermittent	139	70
			Tributary between East Beaver Ponds	Intermittent	113	57
	Mine Rock Area (MRA)	FAA (Dam)	Tributary of Unnamed Lake #3	Low-gradient	76	38
		Schedule 2		Low-gradient	217	109
				Intermittent	104	52
				Low-gradient	22	11
				Low-gradient	162	81
	Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	Unnamed Stream from West Beaver Pond to Bagsverd South Arm	Low-gradient	41	104
		FAA (TMF Dam)			381	2,286
		Schedule 2 (between dams)			107	642
		FAA (Dam)			65	390
		Schedule 2 (Reclaim Pond)			404	3,474
		FAA (Dam)			73	896
		Schedule 2 (between dams)			23	248
		FAA (Dam)			25	302
		Schedule 2	Unnamed Waterbody #2 Tributaries	Low-gradient	267	400
				Low-gradient	244	110
				Low-gradient	161	290
	Chester Lake Road Crossing	FAA - Alteration of Habitat	Mollie River	Low-gradient	35	152
				Culverts (3)	20	108
				High-gradient	10	108
					FAA Losses	**56,430**
					Schedule 2 Losses	**5,520**
					Stream Habitat Total	**61,950**

Extensive First Nations, public and government consultation has been conducted in support of the Côté Gold Project and specifically this offsetting plan. A description of the consultation conducted, the comments and responses provided and the materials presented is provided in Appendix D. This offsetting plan has been developed in light of the comments and received by various stakeholders and First Nations partners.

3.2 Habitat Lost

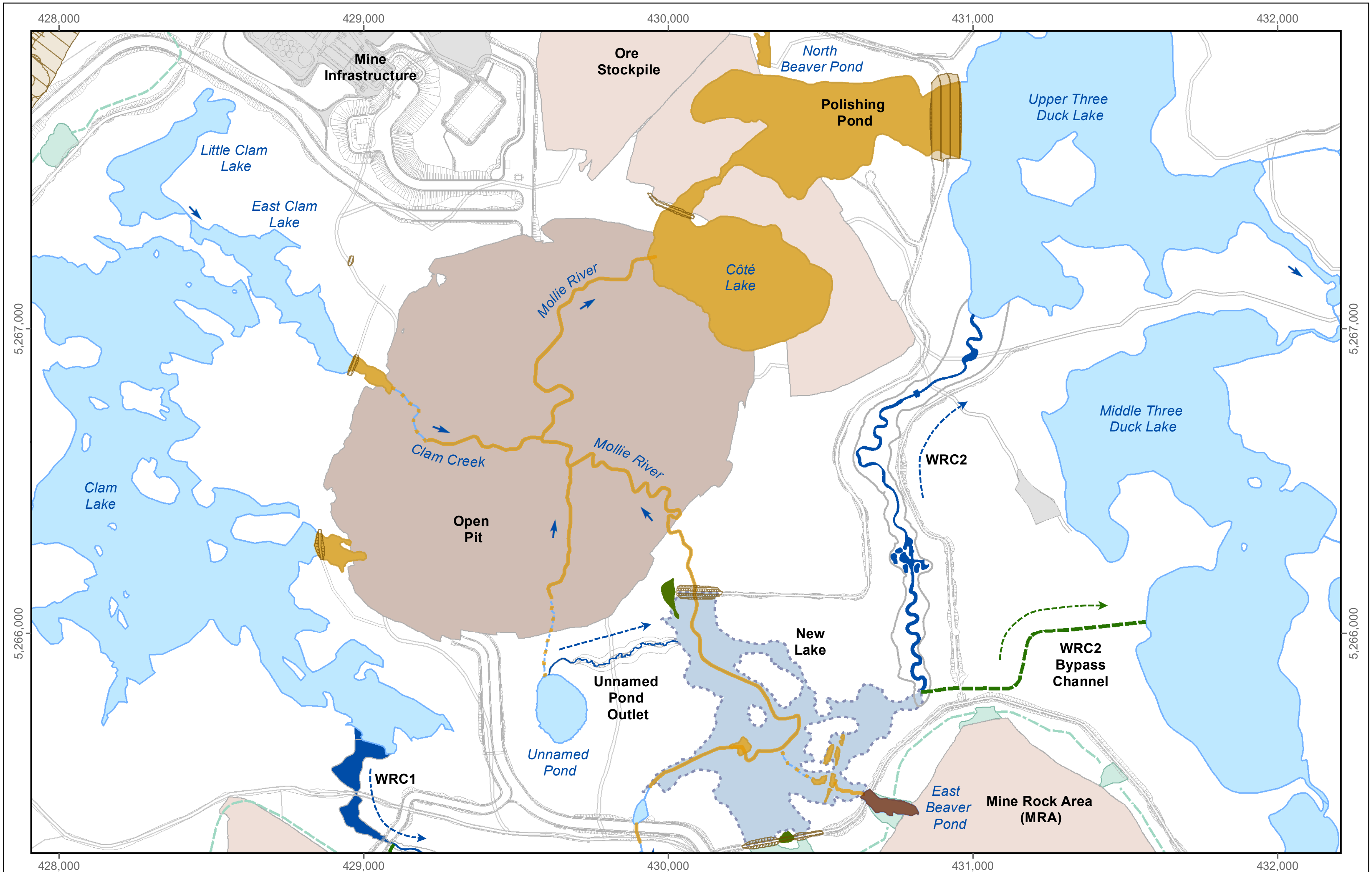
3.2.1 Open Pit

All of the fish habitat lost to the construction of the Open Pit will fall under Section 35 of the *Fisheries Act*. Several habitats will be lost due to the development of the Open Pit including (Figure 3.2):

- a portion of the Mollie River;
- Unnamed Pond tributary to the Mollie River;
- Clam Creek;
- portions of Clam Lake;
- Côté Lake; and
- the east arm of Upper Three Duck Lake.

A brief description of the quality and quantity of these habitats is provided below.

The Mollie River currently connects Chester Lake to Côté Lake, with three small tributaries flowing into the river within this reach, including drainage from East Beaver Pond, Unnamed Pond, and Clam Creek. The majority of the reach of the Mollie River downstream of Chester Lake will be either lost or altered due to construction of the Open Pit and the New Lake, respectively (Figure 3.2 and Table 3.1). The Mollie River will be realigned from Chester Lake to flow through a New Lake created over a portion of the Mollie River, and connecting with Upper Three Duck Lake to rejoin the original watershed (see Section 3.3.2 and 3.3.3). As a result of these changes, approximately 3.5 km of the Mollie River, 745 m of intermittent and low-gradient stream habitat between Unnamed Pond and the Mollie River, and approximately 730 m of Clam Creek will be lost (Figure 3.2). The outlet tributary flowing north of Unnamed Pond will be relocated as part of the Open Pit construction to drain into the New Lake (see Section 3.3.6). It is acknowledged that Unnamed Pond will have seepage to the Open Pit at some point during operations (Wood 2020). However, following consultation with Métis Nation of Ontario (MNO), IAMGOLD has committed to monitoring and maintaining Unnamed Pond and the outlet channel to ensure its proper biological functioning and therefore is not included as a lost in the offsetting plan (Appendix Table D-5).



LEGEND

- Section 35 Authorization
- Schedule 2
- Section 35 Authorization, Stream
- Section 35 Authorization, Intermittent
- Spillway
- Realignment Channel
- Bypass Channel
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail
- Ditch
- Dam

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Meters

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Affected Areas in the Open Pit, Côté Gold Project

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Figure 3.2

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.2 Habitat Loss - Pit.mxd

If monitoring indicates that seepage loss has affected habitat functioning, then additional offsetting measures will be pursued. Dams will be constructed along the eastern boundary of Clam Lake to allow for the safe operation of the Open Pit. Therefore, small areas of Clam Lake and East Clam Lake (total of 16,000 m^2) will also be lost.

The majority of the Mollie River within the affected reach is low gradient with abundant instream vegetation bordered by wetland habitat. High gradient areas (as defined as 3 to 5% slope) occur downstream of Chester Lake and a small area downstream of the confluence of the drainage of East Beaver Pond, which has large cobble and boulder substrate. Clam Creek originates at the outlet of East Clam Lake and flows intermittently to the Mollie River. The upper portion had no identifiable channel and no flow during the baseline survey (Minnow 2014). The lower portion of the creek is low gradient with dense vegetation and adjacent wetland habitat, with water levels reflecting those of the Mollie River. Similarly, the lower 150 m of the tributary entering the Mollie River from Unnamed Pond is low gradient with habitat similar to that found in the Mollie River. The upper portions of the Unnamed Pond outlet flows intermittently with extremely poor habitat for target fish species. However, suitable habitat does exist for small-bodied fish species although overwintering habitat is limited (Appendix Table B.12). Within the low gradient areas of the Mollie River and lower portions of Unnamed Pond tributary and Clam Creek, wetland vegetation and instream macrophytes provide good spawning and rearing habitat for northern pike (Appendix Table B.8). Those features also provide excellent habitat for yellow perch spawning, rearing, and foraging (Appendix Table B.9). High gradient areas on the Mollie River provide moderate habitat for walleye spawning (Appendix Table B.10). The general lack of rocky structure and shallow nature of the river throughout this reach provides poor habitat for juvenile and adult walleye (Appendix Table B.10).

Côté Lake, which covers approximately 188,500 m^2 will be completely lost with the construction of the Open Pit (Figure 3.2 and Table 3.1). Moderately dense vegetation is present throughout the areas of the lake with depths less than 1 m. Wetland habitat bordered much of the lake, including floating mats of vegetation. The wetland vegetation likely provides moderate to good spawning habitat for northern pike, while the submerged aquatic vegetation provides excellent juvenile rearing and good adult foraging habitat (Appendix Table B.1). A general lack of cobble, gravel, and sand substrate suggests very limited habitat for walleye and whitefish spawning, although the submergent vegetation and open water provide moderate rearing/foraging for walleye (Appendix Table B.3). Habitat within Côté Lake is poor for lake whitefish, although the presence of this species indicates some suitable foraging habitat exists (Appendix Table B.4).

The inlet arm to Upper Three Duck Lake (214,478 m^2), which receives flow from Côté Lake via the Mollie River, will be lost due to construction of a dam required to keep water out of the Open

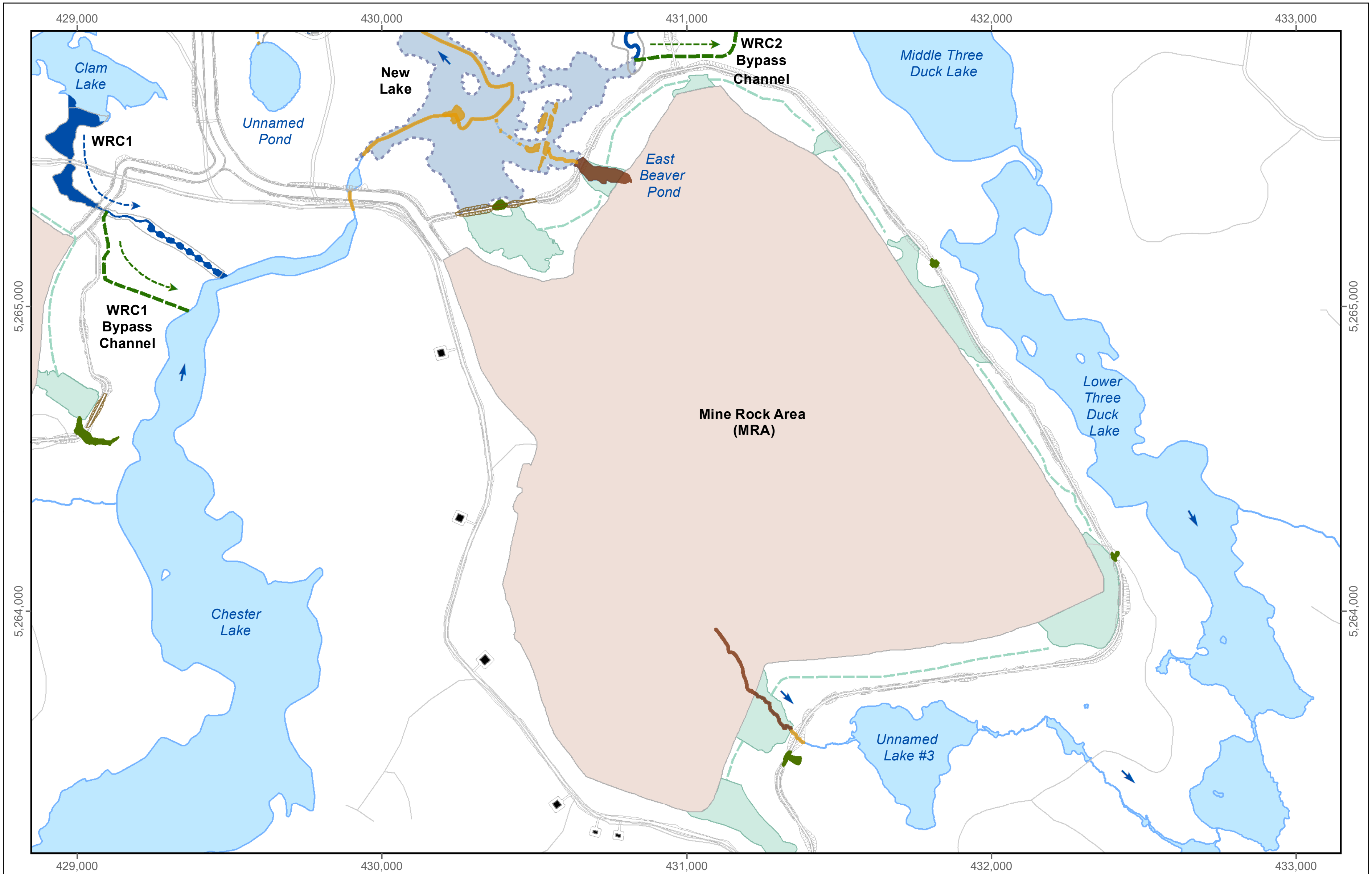
Pit and provide safe work conditions (Figure 3.2 and Table 3.1). Extensive vegetation beds were present within the inlet arm and the shoreline consists of a combination of sand, cobble, and organics. Moderate spawning habitat was present for northern pike due to limited wetland areas, although the aquatic vegetation would provide excellent rearing and foraging habitat (Appendix Table B.1). The vegetation would also provide excellent spawning, rearing, and foraging habitat for yellow perch (Appendix Table B.2). The combination of vegetation and open water provide good rearing and foraging habitat for walleye and lake whitefish (Appendix Tables B.3 and B.4). The sandy-silt and gravel substrate along the shoreline provides excellent spawning habitat for smallmouth bass, while rocky shorelines and shoals provide good juvenile rearing and adult foraging habitat for bass (Appendix Table B.5).

Clam Lake, located to the west of the proposed Open Pit, will have dams installed at two locations to secure the pit for safe operations, including East Clam Lake and the east arm of Clam Lake (Figure 3.2). As a result, 5,961 m^2 will be lost from East Clam Lake and 10,092 m^2 will be lost from the east arm of Clam Lake (Table 3.1). East Clam Lake provides wetland vegetation, representing good spawning, rearing, and adult foraging habitat for northern pike and yellow perch (Appendix Tables B.1 and B.2). No spawning habitat is available for walleye or lake whitefish, while available habitat is considered poor for smallmouth bass (Appendix Tables B.3 to B.5). Juvenile rearing and adult foraging habitat is generally poor, and no overwintering habitat is available for walleye, lake whitefish, or smallmouth bass (Appendix Tables B.3 to B.5) in this area. The east arm of Clam Lake has patches of vegetation along the shoreline and predominantly organic substrate. A small area of the lost bay (2,727 m^2) has depths greater than 2 m. Moderate spawning, rearing, foraging, and overwintering habitat is available for northern pike and yellow perch within the bay (Appendix Tables B.1 and B.2). No spawning habitat is present for walleye, lake whitefish, or smallmouth bass within the bay, and the habitat is poor for rearing, foraging, and overwintering for these species (Appendix Tables B.3 to B.5).

3.2.2 Mine Rock Area

Fish habitat lost to the MRA will fall under Section 35 and 36 of the *Fisheries Act* and Schedule 2 of the MDMER; East Beaver Pond and a portion of a tributary to Unnamed Lake #3 (Figure 3.3).

East Beaver Pond, which covers approximately 10,740 m^2, will be lost or altered to allow for the development of the MRA and the construction of the New Lake (Figure 3.3 and Table 3.1). A portion of East Beaver Pond will be overprinted by the MRA and a seepage collection pond (7,758 m^2) which will fall under Schedule 2 (Table 3.1). The remainder of the area (2,981 m^2) will be altered with the construction of the New Lake and fall under Section 35 (Figure 3.3 and Table 3.1). The area consists of number of shallow ponds created by the road and beaver activity that drains intermittently to the Mollie River downstream of Chester Lake (Figure 3.3).



LEGEND

- Section 35
- Schedule 2
- Section 35 Authorization, Stream
- Section 35 Authorization, Intermittent
- Schedule 2, Stream
- Schedule 2, Intermittent
- Realignment Channel
- Seepage Collection Pond
- Bypass Flow During Construction
- Future Flow Direction
- Existing Road/Trail
- Mine Site Road
- Spillway
- Ditch
- Dam

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Affected Areas in the Mine Rock Area, Côté Gold Project

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Figure 3.3

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Sparse vegetation occurs within the pond. Only small-bodied forage fish species are observed within East Beaver Pond. The area has very limited connectivity to the Mollie River with poor to no habitat (e.g., overwintering habitat) for large-bodied fish species (Appendix Tables B.1 to B.6).

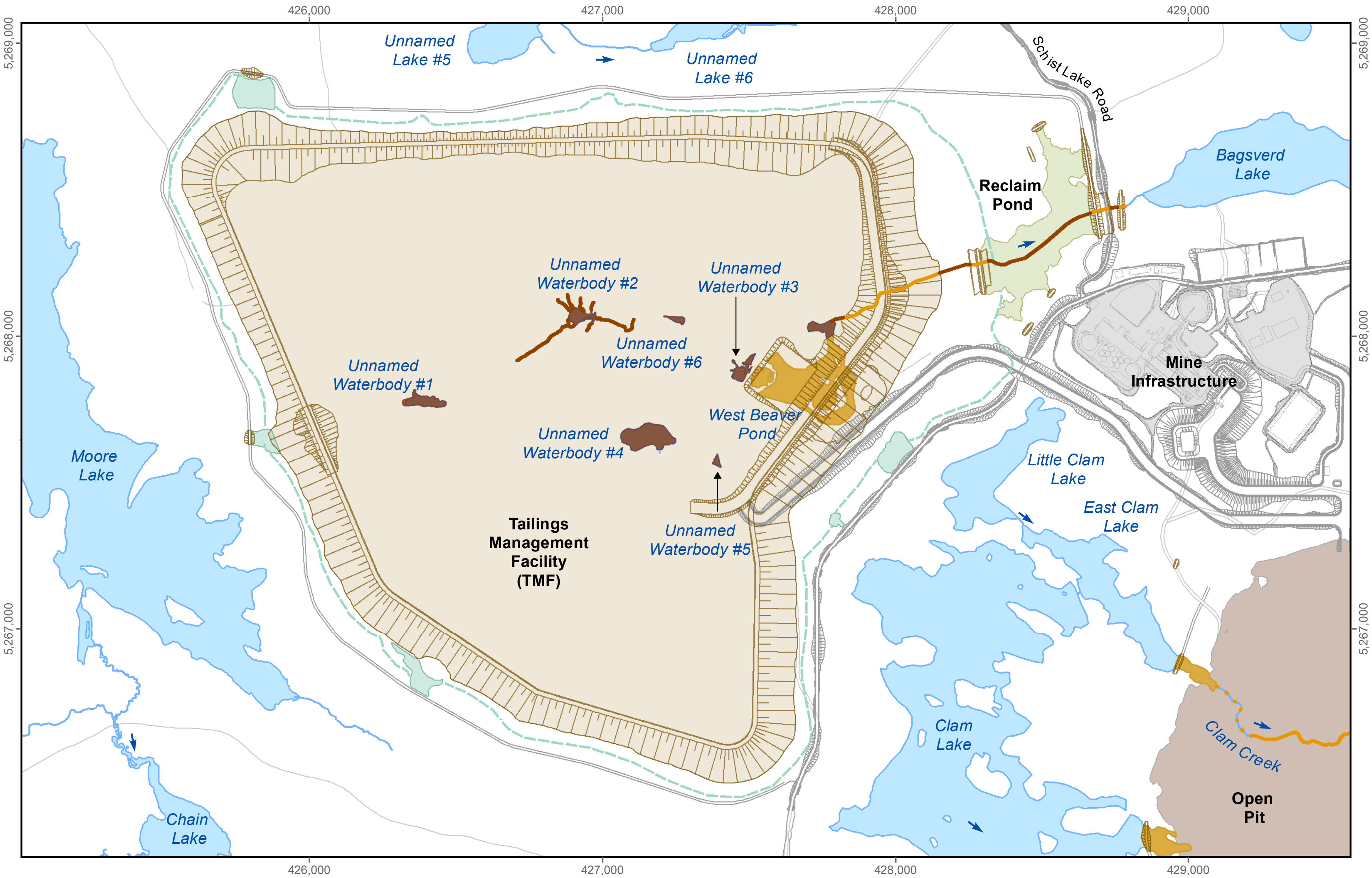
Approximately 580 m of an inlet to Unnamed Lake #3 will be lost under Schedule 2 as part of the MRA and seepage pond collection construction (Figure 3.3 and Table 3.1). Only 76 m of this will fall under a FAA for the construction of the associated dam (Table 3.1). The upper reaches are narrow and shallow (<0.3 m) before reaching a wetland area with slightly greater widths and depths, with sedges and grasses along the banks. Large-bodied fish habitat is limited to proximity of the lake (the first 250 m) with very poor overwintering habitat for any species since water depths rarely exceed one meter (Appendix Tables B.7 to B.11).

3.2.3 Tailings Management Facility and Reclaim Pond

Fish habitat may be altered or potentially lost if development of the TMF and Reclaim Pond is ultimately approved and the waterbodies listed as Tailings Impoundment Areas within the Schedule 2 of the MDMER (Figure 3.4). Six small unnamed waterbodies (Unnamed Waterbody #1, 2, 3, 4, 5, and 6; 23,479 m^2), West Beaver Pond (52,442 m^2), and connecting streams (0.672 km) will be lost due to the creation of the TMF (Figure 3.4 and Table 3.1). In addition, 1.12 km of the outlet of West Beaver Pond will be lost to the TMF and construction of the Reclaim Pond (Figure 3.4). Any fish habitat overlaying mine infrastructure (e.g., dams) has been accounted for under Section 35, and any lost due to the actual deposition of deleterious substances has been accounted for under the Schedule 2 Amendment (Figure 3.4 and Table 3.1).

Each of the unnamed waterbodies (#1 through #6) have abundant vegetation and littoral and shoreline zones composed of organic material. Only small-bodied forage fish species were identified within these waterbodies. These waterbodies are not connected, however, a few small inlets exist surrounding waterbody #2 (Figure 3.4). Waterbody #3 is only connected to West Beaver Pond during high water events when water flows over Chester Lake Road. All habitat was less than one meter in water depth providing poor overwintering conditions except for Unnamed Waterbody #5 which had a maximum depth of 1.5 to 2 m; however, very few fish were caught in Unnamed Waterbody #5 despite extensive multi-season sampling using a range of gear. Generally, water drains easterly towards West Beaver Pond. While the habitat does support small-bodied fish species, there is no access for large-bodied fish species (Appendix Tables B.6 and B.12).

West Beaver Pond has been formed as a result of a beaver dam at its northeast end, and Chester Lake Road at its western end, forming a body of water approximately 52,442 m^2. Littoral and shoreline substrate between the road and the gravel berm is generally dominated by gravel



LEGEND

- Section 35 Authorization
- Schedule 2
- Section 35 Authorization, Stream
- Section 35 Authorization, Intermittent
- Schedule 2, Stream
- Ditch
- Dam
- Seepage Collection Pond
- Reclaim Pond

Note: Unnamed Waterbody #5 did not contan Fin Fish.

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Meters

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Affected Areas in the Tailings Management Facility, Côté Gold Project

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Figure 3.4

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.4 Habitat Loss - TMF.mxd overlain by a variable thickness layer of organic material, whereas organic silt, muck/or root wad vegetation are the dominate substrate in the main pond. Dense aquatic vegetation occurs throughout the pond. Although excellent spawning and rearing habitat for northern pike and excellent rearing and foraging habitat for yellow perch was found in the pond based on the presence of abundant shallow wetland areas adjacent to the shoreline and/or shallow vegetated areas within the pond, no key large-bodied fish species were observed (Minnow 2014).

A large portion of the outlet of West Beaver Pond (1.1 km), which flows to the south arm of Bagsverd Lake, will be lost due to construction of the TMF, associated dams and the Reclaim Pond (Figure 3.4 and Table 3.1). The habitat loss will fall under both Section 35 and the Schedule 2 Amendment (Figure 3.4 and Table 3.1). Average wetted width for this stream are 3 to 12 m, with depths ranging from 0.5 to 1.2 m. The reach is characterized by low-gradient, slow flow, deep glide habitat. Small beaver dams are located close to the outlet of West Beaver Pond. Moderate coverage of instream vegetation was present, and a narrow band of wetland bordered each bank for most of the reach, with the exception of the most upstream 50 m providing average to poor habitat for northern pike and yellow perch. Northern pike foraging habitat is limited within this stream because water depths tend to be shallow and high summer water temperatures may seasonally reduce the quality of habitat for larger adults. No walleye spawning habitat is present. Shallow water depths and general clarity of water within this reach limit any juvenile and adult walleye habitat. Poor habitat for smallmouth bass is present.

3.2.4 Chester Lake Outlet Road Crossing

The current road crossing at the outlet of Chester Lake will be updated to accommodate both the public access road and the Haul Road (Figure 3.3). This habitat alteration will fall under Section 35 of the *Fisheries Act*.

A total of 35 m upstream of the current culverts will be lost and approximately 10 m of downstream habitat (Table 3.1). The Mollie River in this area is high-gradient habitat with a channel width of approximately 2 m and a mean depth of about 0.2 m during the summer months. Substrate consists of large cobble and boulder that is embedded in sand. Aquatic vegetation includes aquatic mosses and sparse periphytic algae. More vascular plants exist upstream of the current culverts (set of 3 to 1830 mm diameter corrugated steel pipe culverts [CSP] 20 m in length). Large woody debris and overhanging vegetation provide considerable amount of instream cover. The area near the Chester lake outlet provide good habitat for white sucker and walleye spawning (Appendix Table B.10).

3.2.5 Summary of Lost Fish Habitat

The development of the Project will result in the loss of stream and lake fish habitat in order to accommodate the development of the Open Pit, Polishing Pond, MRA, the TMF, and Reclaim Pond. The total area of lake habitat to be lost is estimated to be 509,814 m^2 (~51 ha) of which 475,399 m^2 will be lost under Section 35 and 34,415 m^2 will be lost under a Schedule 2 (Table 3.1). The total length of stream habitat lost is 7,651 m, which based on measured stream widths is equal to 61,950 m^2, of which 56,430 m^2 falls under Section 35 and 5,520 m^2 falls under Schedule 2 (Table 3.1).

Based on habitat characteristics measured during baseline studies relative to the habitat requirements for the various life history stages of the fish species assessed habitat quality values were assigned (none to excellent as described above; Appendix Tables B.1 to B.13). The habitat quality and quantity was used to calculate the habitat units lost. The total habitat units for the project to be lost is equal to 2,828,674 lake HU and 303,764 stream HU (Table 3.2, Appendix Tables B.7 and B.13). Of these units, 2,816,611 lake and 294,148 stream HU will be lost under Section 35 and 12,064 lake and 9,615 stream HU will be lost under the Schedule 2 Amendment (Table 3.2).

3.3 Proposed Fish Habitat

3.3.1 Summary of Key Design Considerations

To accommodate the Open Pit, MRA and the TMF, fish habitat within the Mollie River and Neville Lake watershed will be lost (Section 3.2). In order to offset the loss of fish habitat, water course realignments and habitat development are planned (GeoProcess 2019a,b,c; Appendix C). The proposed realignments were developed such that key design considerations included:

- maintenance of hydrologic connectivity;
- maintenance of aquatic habitat of the hydrologic features (lakes connected through short sections of river);
- use of natural channel design principles to create functional channels that persist in the existing natural processes of the larger hydrologic system;
- designed to maximize available habitat potential, matching or enhancing the existing habitat conditions of both Clam Creek and the Mollie River;
- promote connectivity within watershed and between habitats; and
- the maintenance of existing watersheds.

Table 3.2: Summary of Section 35 Habitat Loss, Schedule 2 Habitat Lost, and Habitat Created for the Côté Gold Project

Waterbody											
	Species	Section 35					Schedule 2				
		Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost	Northern pike	104,271	174,663	279,117	274,778	832,829	0	0	0	0	0
	Yellow perch	105,761	174,663	310,295	274,778	865,497	0	0	0	0	0
	Walleye	0	205,525	169,658	136,440	511,623	0	0	0	0	0
	Lake whitefish	0	103,279	101,438	68,220	272,937	0	0	0	0	0
	Smallmouth bass	32,536	50,954	143,302	68,220	295,012	0	0	0	0	0
	Small-bodied Fish	-	-	-	-	38,713	-	-	-	-	12,064
Total Habitat Units Lost		242,568	709,084	1,003,810	822,436	2,816,611	0	0	0	0	12,064
Habitat Created	Northern pike	181,248	211,182	214,841	329,893	937,163	1,800	1,800	1,275	0	4,875
	Yellow perch	181,248	216,544	297,096	297,913	992,802	1,800	2,325	2,325	0	6,450
	Walleye	0	139,741	109,764	114,319	363,824	0	950	525	0	1,475
	Lake whitefish	66,296	71,658	104,402	114,319	356,674	1,050	1,475	950	0	3,475
	Smallmouth bass	61,898	100,685	180,214	127,337	470,134	2,425	2,425	1,900	0	6,750
	Small-bodied Fish	-	-	-	-	124,950	-	-	-	-	0
Total Habitat Units Gained		490,690	739,810	906,317	983,781	3,245,547	7,075	8,975	6,975	0	23,025
Balance	Northern pike	76,977	36,519	-64,277	55,115	104,334	1,800	1,800	1,275	0	4,875
	Yellow perch	75,487	41,881	-13,198	23,135	127,305	1,800	2,325	2,325	0	6,450
	Walleye	0	-65,785	-59,894	-22,121	-147,799	0	950	525	0	1,475
	Lake whitefish	66,296	-31,621	2,964	46,099	83,737	1,050	1,475	950	0	3,475
	Smallmouth bass	29,362	49,731	36,912	59,117	175,121	2,425	2,425	1,900	0	6,750
	Small-bodied Fish	-	-	-	-	86,237	-	-	-	-	-12,064
Net Waterbody Habitat Units		248,122	30,725	-97,493	161,345	428,936	7,075	8,975	6,975	0	10,962
Stream											
	Species	Section 35					Schedule 2				
		Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost	Northern pike	32,328	32,887	31,844	20,924	117,984	1,091	2,047	930	62	4,131
	Yellow perch	33,137	33,137	21,496	21,145	108,914	2,047	2,047	930	62	5,087
	Walleye	4,117	10,450	10,423	9,925	34,915	0	0	0	0	0
	Smallmouth bass	38	10,825	10,563	10,423	31,849	0	62	0	0	62
	Non-CRA	-	-	-	-	487	-	-	-	-	335
Total Habitat Units Lost		69,620	87,298	74,326	62,417	294,148	3,138	4,157	1,861	124	9,615
Habitat Created	Northern pike	11,492	10,926	9,010	6,523	37,951	2,255	3,423	1,038	0	6,715
	Yellow perch	14,075	11,973	9,837	6,523	42,408	2,385	3,423	1,088	0	6,895
	Walleye	2,625	8,061	2,136	3,261	16,084	0	1,088	0	0	1,088
	Smallmouth bass	3,261	7,682	6,207	3,261	20,412	0	1,088	0	0	1,088
	Non-CRA	-	-	-	-	704	-	-	-	-	0
	Connectivity Weeduck Lake [a]	-	-	-	-	47,665	-	-	-	-	0
	Connectivity Little and East Clam [a]	-	-	-	-	41,789	-	-	-	-	0
Total Habitat Units Gained		31,454	38,642	27,191	19,568	207,013	4,640	9,020	2,125	0	15,785
Balance	Northern pike	-20,836	-21,961	-22,834	-14,401	-80,032	1,164	1,375	107	-62	2,584
	Yellow perch	-19,062	-21,163	-11,659	-14,623	-66,506	338	1,375	157	-62	1,808
	Walleye	-1,492	-2,389	-8,287	-6,664	-18,831	0	1,088	0	0	1,088
	Smallmouth bass	3,223	-3,143	-4,356	-7,162	-11,437	0	1,026	0	0	1,026
	Small-bodied Fish	-	-	-	-	217	-	-	-	-	-335
Net Stream Habitat Units		-38,166	-48,656	-47,135	-42,850	-87,136	1,502	4,863	264	-124	6,170

[a] Connectivity was determined by calculating 10% of the total area gained for access to habitat (e.g., 10% of total surface area for Upper Three Duck Lake and Clam Lake) by the suitability of the habitat gained (i.e.., Upper Three Duck was assigned an HSI of 0.75, Clam Lake 0.5 as fish from Little Clam and East Clam had partial access to this area).

Through this approach, the habitat offsetting measures will provide sustainable and functional habitat to support key resident fish species.

The development of the realignments will result in the creation of fish habitat. This habitat has been incorporated into the assessment as habitat gains to offset the habitat losses described above. The habitat realignment plan will result in the creation of additional lotic (stream) and lentic (lake/pond) habitat (Table 3.3 and Figure 3.5). The created and alteration of habitats will include:

- the relocation of Clam Creek,
- Chester Lake outlet road crossing,
- the creation of a New Lake,
- the relocation of the Mollie River from the New Lake to Upper Three Duck Lake,
- the relocation of the outlet stream of Unnamed Pond to the New Lake,
- the connection of Weeduck Lake to Upper Three Duck Lake,
- the connection of Little Clam to Clam Lake,
- the remediation of the Aggregate Pit #3 and connection to Middle Three Duck Lake, and
- the remediation of the Aggregate Pit North (Bagsverd Lake) and connection to the drainage to Bagsverd Creek.

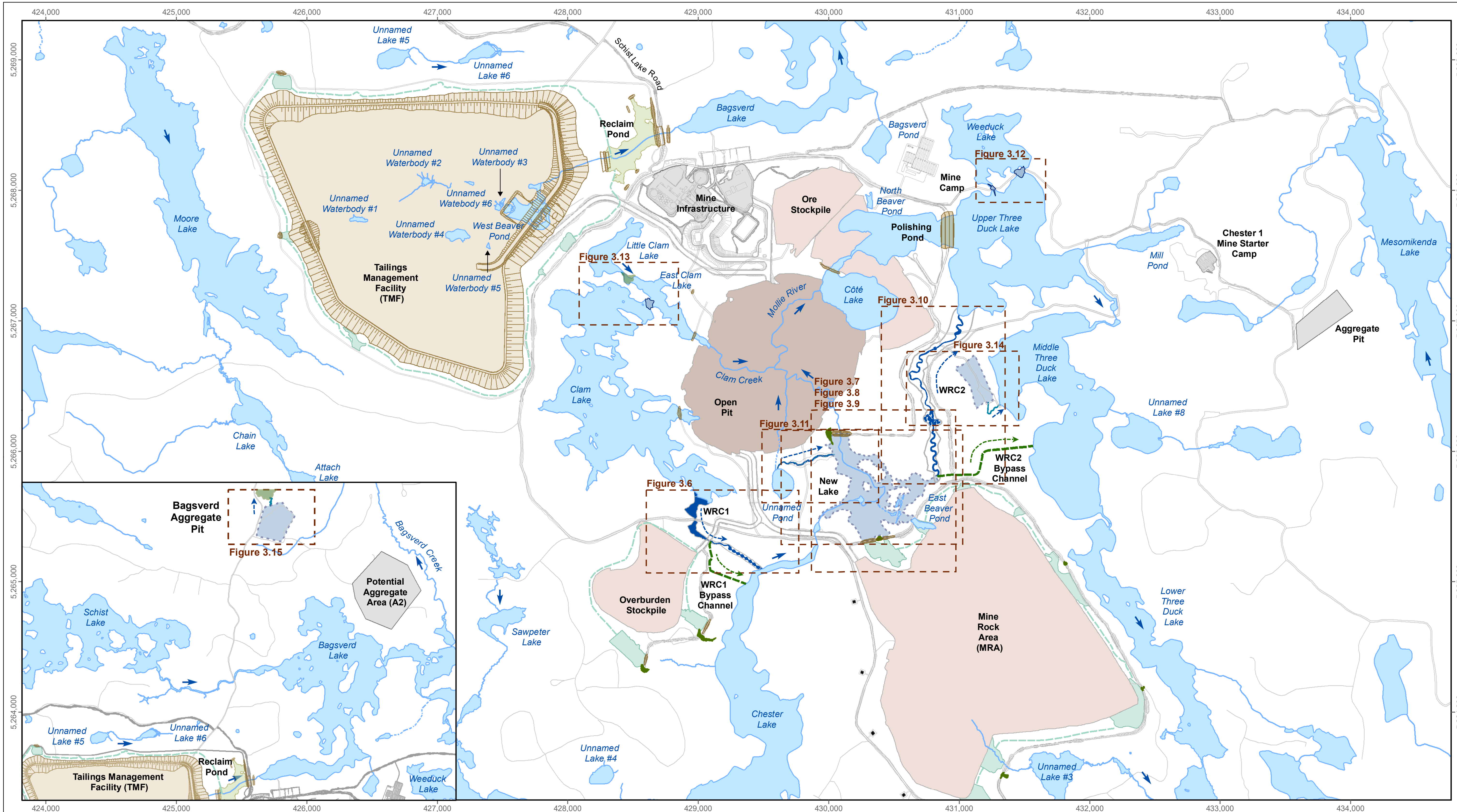
These habitats will create a total of 516,781 m^2 of lake habitat and 23,827 m^2 of stream habitat (Table 3.3). All areas will incorporate habitat features to enhance the created habitat, such as large boulders, rock shoals, large woody debris (including fallen trees, tree stumps, standing snags), riparian vegetation plantings, pools, and cobble riffles. Additional measures to prevent erosion and establish food web components (e.g., planting of macrophytes, relocation of benthic invertebrates, and fish) are discussed in the reduction of lag times (Section 4.7). A description of the fish habitat quality and quantity associated with each of these created water courses/waterbodies is provided below.

3.3.2 Realignment Channel from Clam to Chester (WRC1)

To accommodate the construction of the Open Pit, the outlet of Clam Lake will be relocated to the south end of Clam Lake, where Clam Creek will flow south into Chester Lake while maintaining its connection to the Mollie River watershed (Figure 3.6 and Appendix C). The realignment will incorporate an extension of Clam Lake (lentic area; 21,450 m^2; Table 3.3), 113 m of riffle pool habitat, and a 300 m low gradient channel with alternating pool habitat (Table 3.3 and Figure 3.6).

Table 3.3: Summary of Offsetting Habitat, Côté Gold Project

<table>
<tr><th colspan="2">Location of Impact</th><th>Fisheries Act Authorization (FAA) or Schedule 2</th><th>Area</th><th>Max Depth (m)</th><th>Depth (m)</th><th>Area (m^2)</th></tr>
<tr><td rowspan="9">Waterbody</td><td rowspan="2">New Lake</td><td rowspan="2">FAA for Côté Lake</td><td rowspan="2">New Lake</td><td rowspan="2">6.3</td><td>0-2</td><td>112,757</td></tr>
<tr><td>2-max</td><td>152,425</td></tr>
<tr><td rowspan="2">Aggregate Pit Rehabilitation</td><td rowspan="2">FAA</td><td rowspan="2">Aggregate Pit #3 (Middle Three Duck)</td><td rowspan="2">5.5</td><td>0-2</td><td>35,242</td></tr>
<tr><td>2-max</td><td>17,358</td></tr>
<tr><td>Aggregate Pit Rehabilitation</td><td>FAA</td><td>Bagsverd Aggregate Pit</td><td>3.0</td><td>0-max</td><td>166,600</td></tr>
<tr><td>Mollie River Watershed</td><td>Schedule 2</td><td>Weeduck and Upper Three Duck Lake Connection</td><td>1.5 - 2.0</td><td>0-max</td><td>2,100</td></tr>
<tr><td>Mollie River watershed</td><td>Schedule 2</td><td>East Clam Lake and Clam Lake Connection</td><td>0.5 - 1.5</td><td>0-max</td><td>1,700</td></tr>
<tr><td>Open Pit</td><td>FAA for Clam Creek</td><td>WRC1 - Extension of Clam Lake</td><td>1.0</td><td>0-max</td><td>21,450</td></tr>
<tr><td>Open Pit</td><td>FAA for Mollie River</td><td>WRC2 - Pool/Wetland</td><td>1.8</td><td>0-max</td><td>7,149</td></tr>
<tr><td colspan="6">FAA Gains</td><td>512,981</td></tr>
<tr><td colspan="6">Schedule 2 Gains</td><td>3,800</td></tr>
<tr><td colspan="6">Lake Habitat Total</td><td>516,781</td></tr>
<tr><th colspan="2">Location of Impact</th><th>FAA or Schedule 2</th><th>Area</th><th>Habitat Type</th><th>Length (m)</th><th>Area (m^2)</th></tr>
<tr><td rowspan="16">Stream</td><td rowspan="3">Open Pit</td><td rowspan="3">Schedule 2</td><td rowspan="3">WRC1: Clam to Chester Lake</td><td>Higher-gradient</td><td>113</td><td>416</td></tr>
<tr><td>Alternating Pools</td><td>250</td><td>4,150</td></tr>
<tr><td>Low-gradient</td><td>50</td><td>200</td></tr>
<tr><td rowspan="3">Chester Lake Road Crossing</td><td rowspan="3">FAA Habitat Alteration</td><td rowspan="3">Culvert Placement on Mollie River</td><td>Haul Rd Culverts</td><td>39</td><td>140</td></tr>
<tr><td>Low-gradient</td><td>7</td><td>68</td></tr>
<tr><td>Access Rd Culverts</td><td>19</td><td>68</td></tr>
<tr><td>Mollie River Watershed</td><td>Schedule 2</td><td>Little Clam Lake to East Clam Lake</td><td>Low-gradient</td><td>235</td><td>520</td></tr>
<tr><td>Aggregate Pit Remediation</td><td>FAA</td><td>Aggregate Pit #3 to Middle Three Duck</td><td>Low-gradient</td><td>237</td><td>450</td></tr>
<tr><td rowspan="7">Open Pit</td><td rowspan="6">FAA for Mollie River</td><td rowspan="6">WRC2: New Lake to Upper Three Duck</td><td>Low-gradient</td><td>500</td><td>4,500</td></tr>
<tr><td>Higher-gradient (riffle pool)</td><td>52</td><td>300</td></tr>
<tr><td>Higher-gradient (riffle pool)</td><td>188</td><td>1,560</td></tr>
<tr><td>Low-gradient</td><td>507</td><td>5,831</td></tr>
<tr><td>Higher-gradient (riffle pool)</td><td>248</td><td>2,260</td></tr>
<tr><td>Low-gradient</td><td>236</td><td>2,714</td></tr>
<tr><td>FAA</td><td>Unnamed Pond to New Lake</td><td>Intermittent</td><td>409</td><td>500</td></tr>
<tr><td>Aggregate Pit Remediation</td><td>FAA</td><td>Bagsverd Aggregate Pit to Wetland to the North</td><td>Low-gradient</td><td>100</td><td>150</td></tr>
<tr><td colspan="6">FAA Gains</td><td>18,541</td></tr>
<tr><td colspan="6">Schedule 2 Gains</td><td>5,286</td></tr>
<tr><td colspan="6">Stream Habitat Total</td><td>23,827</td></tr>
</table>



LEGEND

- Habitat Area
- Seepage Collection Pond
- Reclaim Pond
- Spillway
- Lake Connection Offsetting Area
- Outlet Channel
- Realignment Channel
- Proposed Waterbody
- Wetland
- Bypass Channel
- Ditch
- Dam
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail

Note: WRC - Water Realignment Channel

0 0.5 1 2
Kilometers

N E S W

Projection: North American Datum 1983 UTM Zone 17

Overview of Habitat Areas, Côté Gold Project

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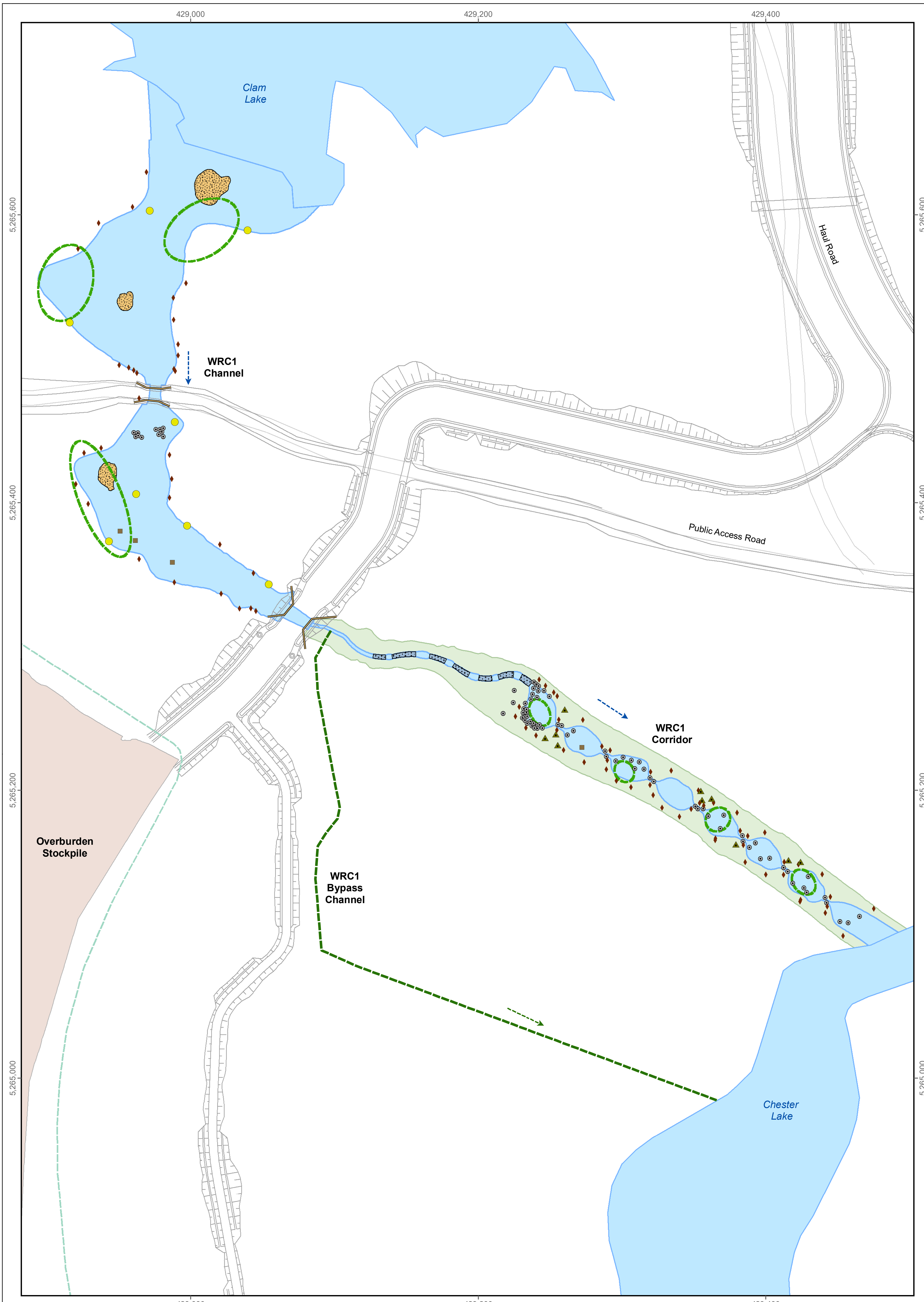
Figure 3.5



LEGEND

- Standing Snag
- Boulder
- Tree Stump
- Tree
- Tree Group
- Boulder Pile
- Riffle
- Aquatic Vegetation Planting Area
- Corridor
- Bypass Channel
- Ditch
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail
- Culvert

Note: See Appendix C for detailed drawings.

WRC1 Habitat, Côté Gold Project

0 50 100 200
Meters

N W E S

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Figure 3.6

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.6 WRC1 Channel Design Overview.mxd

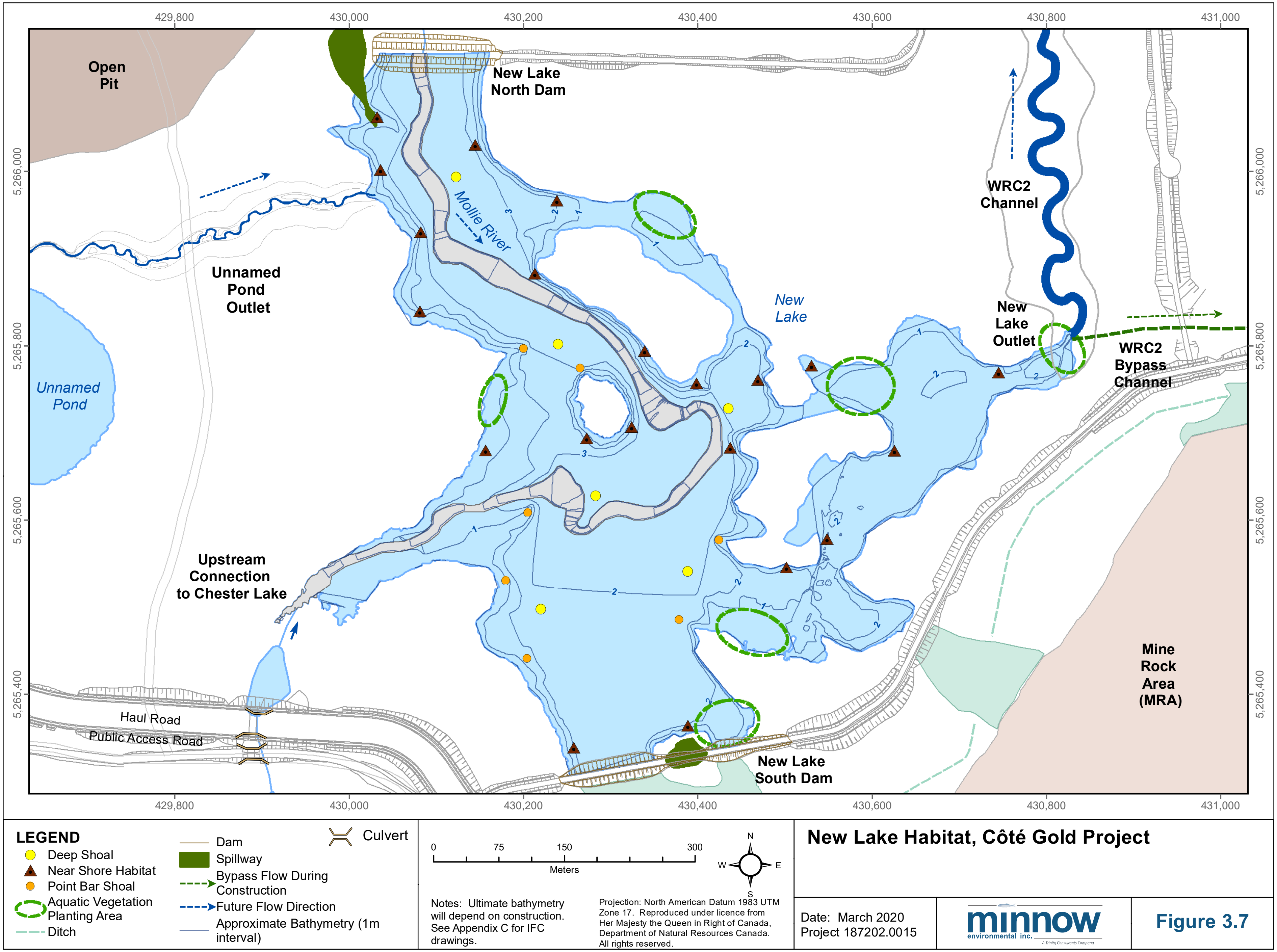
Physical habitat features will be incorporated to increase habitat complexity in the extension of the lake as well as the channel design (Figure 3.6). The majority of habitat is designed to provide excellent spawning, rearing and adult foraging habitat for northern pike and yellow perch, as well as some rearing and adult foraging habitat for walleye and lake whitefish within the lake extension (Appendix Tables B.1 to B.5). In the extension of Clam Lake, features such as fallen trees, large boulders, exposed tree stumps, and rock piles to target spawning for yellow perch, northern pike and smallmouth bass as well as cover for juvenile rearing (Appendix Tables B.1 to B.5). In addition, aquatic vegetation will be planted to expedite the establishment of aquatic vegetative communities for spawning and rearing habitat (Figure 3.6). The max depth in the lake extension will be 1 m with an average depth of 0.8 m.

The outlet channel of Clam Lake will follow a natural design of a riffle pool habitat with a 1.37% gradient (Figure 3.6). The riffle sections will have an average water depth of 0.2 and 0.5 m and an average channel width of 2.8 and 3.75 m, between riffle and pool habitat, respectively. Substrate in riffles will be gravel cobble mixture. The last reach has been designed as a low gradient (0.02%) channel with alternating pools (average water depth of 1 m; Figure 3.6 and Appendix C). Channel sections will have an average wetted width of 4 m and depth of 0.5 m. This reach incorporates fallen trees, stumps and some boulders to increase cover provide habitat complexity and enhance habitat suitability for key juvenile target species and small-bodied fish (Appendix Tables B.1 to B.5). Fallen trees and vegetation within the channel and riparian zone will also add potential spawning habitat for yellow perch and northern pike. The floodplain will be planted with alder live stakes/seedlings; and rush and sedge grasses, which will provide spawning substrate for northern pike in the spring under flooded conditions.

Two road crossings will be constructed within the WRC1 realignment; one for the public access road and the other for the haul road to the topsoil and overburden stockpile (Figure 3.6). Culverts have been designed to accommodate the 1:100 year flood. Each crossing will have two culverts (2,130 x 1,400 mm elliptical CSP; Appendix C) at different invert elevations with 0% gradient. The different invert elevation will allow access/passage for small animals and to accommodate a variety of water levels. The public access road culverts will be 10 m in length whereas, the haul road crossing culverts will be 27 m in length (Appendix C). All culverts will be filled with a 0.2 m depth of streambed material. Natural bed sediments and or gravels in culverts provide areas of low velocity that may be conducive to fish passage, mimics natural hydraulics, and is self-sustaining when designed properly (Hotchkiss and Frei 2007).

3.3.3 Mollie River Road Crossing

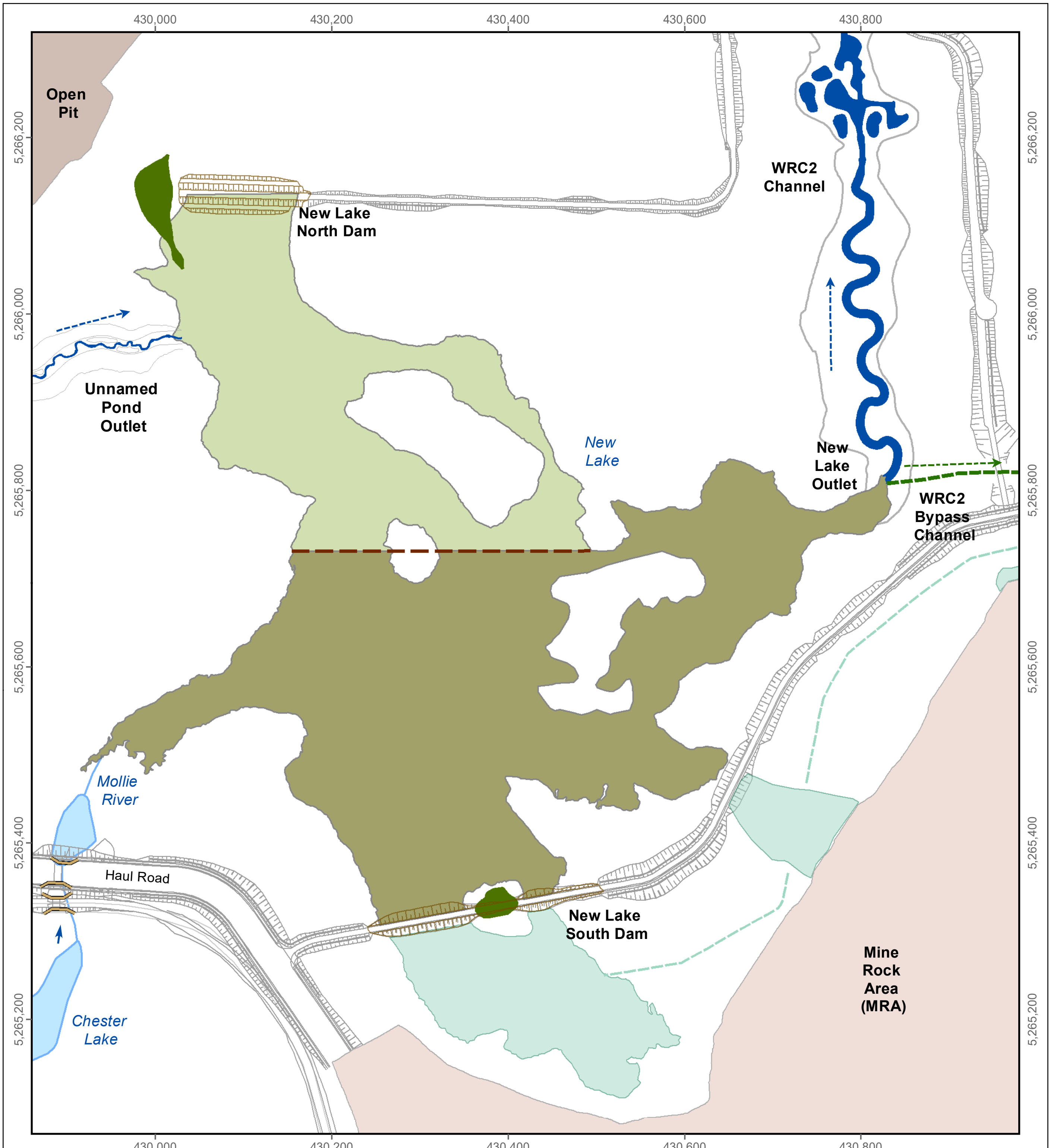
The road located at the Chester Lake outlet will be modified to accommodate not only the public access road but the Haul Road from the Mine Rock Area (Figure 3.7). A single arch culvert has



Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.7 New Lake Habitat.mxd been designed to accommodate the 1:100 year flood with a low flow channel. Each road will have a single multi-plate arch culvert (8,030 span x 4,012 mm rise; see Appendix C) with 0.3% gradient separated by 6.5 m of stream habitat. The public access road culvert will be 10 m in length whereas, the haul road culverts will be 38.5 m in length. Long culverts can block sunlight creating a potential behavioural barrier to fish passage (Kozarek et al. 2017). Therefore, the culverts have been separated instead of creating one continuous culvert to allow for more light to penetrate the culverts and potentially decrease any behavioural barrier to fish passage. Longer culverts with natural substrate can potentially decrease the behavioural barrier of a long dark culvert if fish can rest in reduced velocity zones (Hotchkiss and Frei 2007). The culverts have been designed to provide a depth of flow between 0.7 to 0.8 m in the culvert under average lake (New Lake) elevation conditions therefore velocities are expected to be minimal (GeoProcess 2019c). To improve fish passage under low water conditions, natural baffles will be incorporated into the channel within the culvert. These baffles consist of 0.6 to 0.75 m boulders embedded along the channel bottom with 0.3 m of the boulder's diameter to be exposed. To create a sinuous thalweg, one boulder per baffle will be fully embedded. Under most conditions (low flow, high flow [24 hour two year storm event]), the channel within the culvert will remain in backwater such that both flow depths and velocities will be conducive to passage (GeoProcess 2019c). Under extreme conditions, where low and high flows are combined with low lake levels, the natural baffles will support fish passage for the target species using fish swimming performance design curves (GeoProcess 2019c; Appendix C).

3.3.4 New Lake

A new 265,182 m^2 lake will be created south of the Open Pit on the Mollie River within a natural depression (Figure 3.7 and Table 3.3). This will require flooding a section of the Mollie River in order to create the New Lake. As flooding of vegetated areas can be associated with the formation of methyl mercury (Porvari and Verta 1995), IAMGOLD has committed to the removal of terrestrial vegetation and organic soils within the footprint of the New Lake to prevent the decay and release of associated mercury thereby limiting the possibility of methyl mercury production. Soil sampling determined the New Lake footprint can be divided into two areas separating the drier area with mercury in shallower surface sediments from the wetter areas with higher mercury concentrations in deeper sediment/soils (Figure 3.8; Minnow 2018). Soil will be removed to a depth of 0.5 m north of the boundary and to a depth of 1.5 m south of the boundary (Figure 3.8). In areas where an obvious soil-to-clay boundary is encountered prior to reaching the specified removal depth, terrestrial/organic soil removal will not extend into the clay layer. Bathymetry for the lake was created based on the current contours without the terrestrial/organic removal. Therefore, water depths will be approximately 0.5 to 1.5 m greater depending on what is encountered in the field during construction. Previously wetted areas (e.g., the Mollie River and



LEGEND

- Soil Removal Boundary
- Remove Soil to 0.5 m
- Remove Soil to 1.5 m
- Realignment Channel
- Spillway
- Seepage Collection Pond
- Culvert
- Bypass Channel
- Ditch
- Dam
- Future Flow Direction
- Bypass Flow During Construction
- Mine Site Road
- Existing Road/Trail

New Lake Soil Removal Boundary, Côté Gold Project

0 100 200 400 Meters

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Figure 3.8

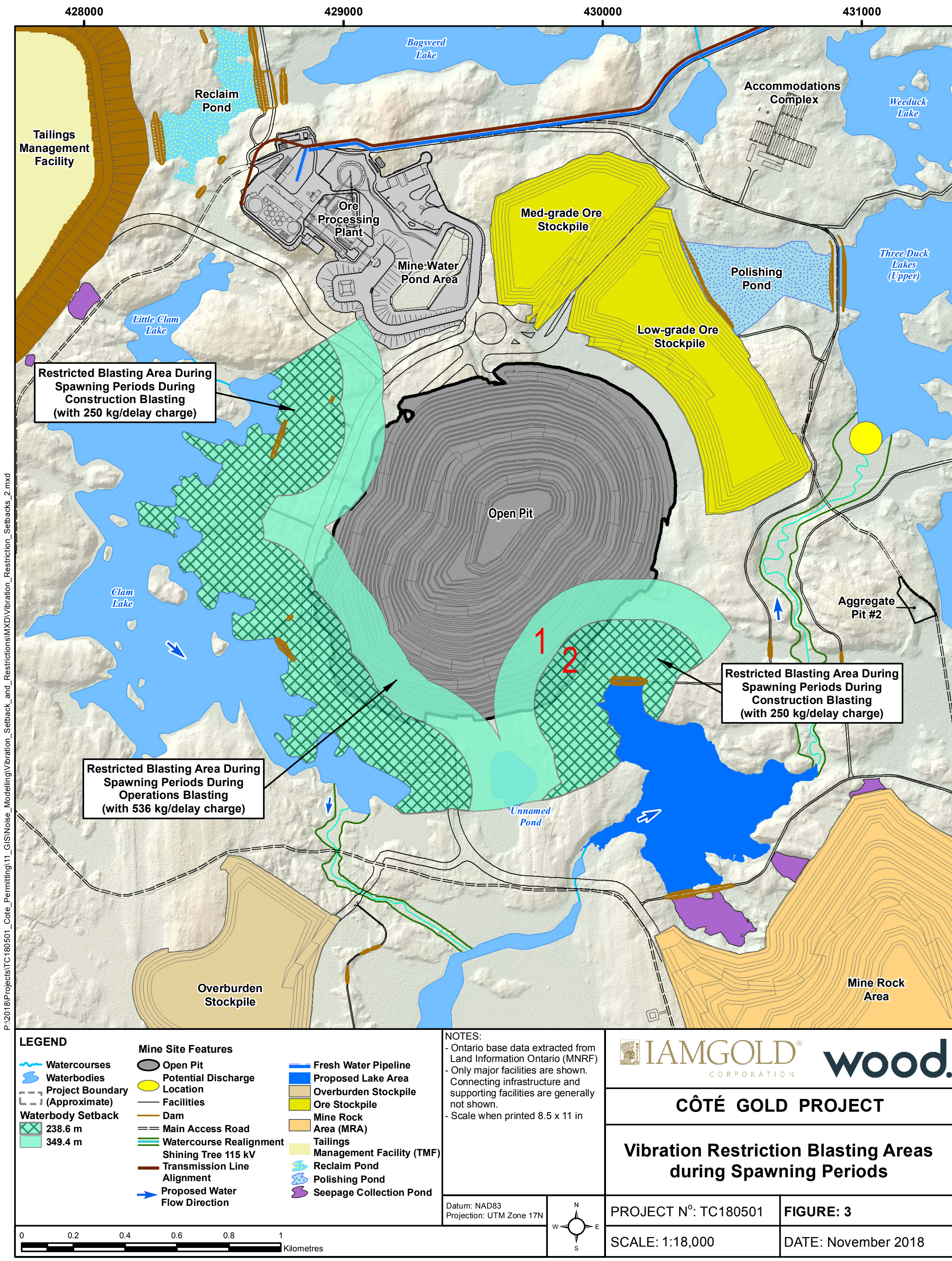
Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.8 New Lake Soil Seeping.mxd

East Beaver Pond) will not have any organic soil removal (Appendix C). With this knowledge, the maximum water depth of the lake will be approximately 6.3 m. Water will flow through the lake to the new Mollie River realignment channel (WRC2) to Upper Three Duck Lake (Figure 3.7). Three islands will be created to increase habitat diversity and shoreline complexity (Figure 3.7).

Terrestrial vegetation will be retained as close to the shoreline as feasible. This will aid in future allochthonous contributions (e.g., food for primary and secondary producers) as well as decreasing wind fetch within the lake (which will aid in decreasing sediment erosion and turbidity along the shoreline and within the water column), especially in the first five years (Minnow 2013, 2017b). The floodplain will be planted with willow and alder live stakes/seedlings, and rush and sedge grasses, which will provide spawning substrate for northern pike in the spring under the flooded conditions. These plantings will aid in decreasing shoreline erosion and water turbidity.

Habitat within the first two meters of water depth is designed to provide excellent spawning, rearing and adult foraging habitat for northern pike, yellow perch, and smallmouth bass, as well as some rearing and adult foraging habitat for walleye and lake whitefish (Appendix Tables B.1 to B.5 and Figure 3.7). Specifically, fallen trees, large boulders, exposed tree stumps, and rock piles (cobble/boulder shoals) will be installed at various locations around the lake (Figure 3.7; Appendix C). Point bar and deep-water shoals will also be installed for the potential spawning habitat for lake whitefish (deeper areas that receive greater wind fetch) and smallmouth bass (in shallower areas; Appendix Tables B.4 and B.5). Aquatic macrophytes, both emergent and submergent, will be transplanted (Figure 3.7) to expedite the aquatic vegetation community within the lake as they provide habitat and food for many different types of organisms such as zooplankton, benthic invertebrates, and fish. Previous experience with other sites has shown that in areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted, providing cover for juvenile fish and decreasing erosion from construction and wind (Minnow 2006, Munnoch et al. 2011). All of these features will be incorporated to provide habitat complexity and enhance habitat suitability for the target species.

As identified in the EER, there is some potential for noise and vibration effects in the north basin of the New Lake during the first years of operation in the Open Pit (i.e., until the pit working surface is greater than 350 m from the adjacent waterbodies). The noise and vibration levels predicted have the potential to impact spawning and as such the value to spawning habitat in this area has been devalued, despite mitigation measures that will be in place. During operations a blasting charge of less than 536 kg/delay will be used and this will ensure the vibration effects do not extended into the adjacent lakes (Figure 3.9). During construction, IAMGOLD is proposing to



Open Pit Restriction Blasting Areas During Spawning Periods, Côté Gold Project

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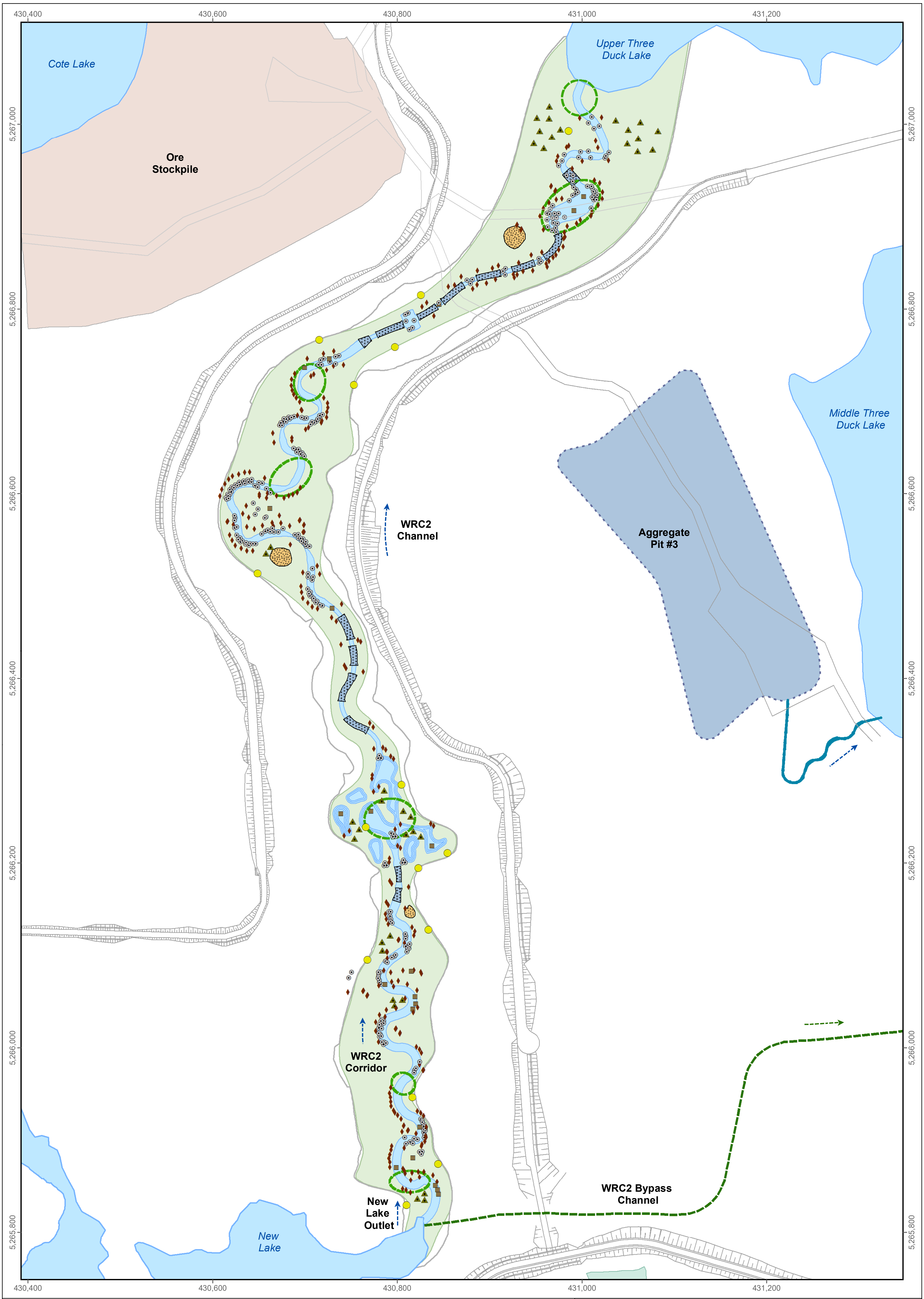
Figure 3.9

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\1-Graphics\ 18-15 Figure 3.9 Open Pit Restriction Blasting Areas establish restrictions on blasting (i.e., smaller blast sizes) during a spawning window from April 1 to July 15. This window is consistent with the "Ontario Restricted Activity Timing Window for the Protection of Fish and Fish Habitat" and encompasses the spawning period for both northern pike and smallmouth bass as well as other spring spawning species. The proposed restricted blasting areas have been outlined in Figure 3.9; the Area marked as 1 would be limited to a charge size of 536 kg per delay during operations and the area labelled 2 would be limited to a charge size of 250 kg per delay during construction. Blasting restrictions are expected to mitigate the effects to fish habitat and fish spawning. Physiological effects to fish from blasting are not expected. In addition, key spawning habitat features within the New Lake have been prioritized outside this area. Once operational, acoustic monitoring will be conducted as described in the EER to confirm predicted conditions.

3.3.5 Realignment Channel from New Lake to Upper Three Duck Lake (WRC2)

The Mollie River will be realigned, flowing from the New Lake north towards Upper Three Duck Lake (Figure 3.10). Natural channel design principles have been incorporated into the design to replicate the form and function of the Mollie River system. The existing channel includes predominantly low and moderate gradient habitat bordered by wetlands. The new 1.7 km realignment channel will incorporate low gradient meandering habitat, an inline wetland area, and high gradient riffles and deep pool habitat (Figure 3.10 and Table 3.3; Appendix C).

The low gradient (bankfull gradient ranges from 0.07 to 0.18%) meandering habitat will have a channel morphology of mostly run habitat with occasional pools (Figure 3.10; Appendix C). Average wetted width will be 9 m with an average depth of 0.5 m in run habitat and 1.0 m in pool areas. The low gradient sections will incorporate fallen trees, stumps, floodplain spawning shelfs, and some boulders to increase cover and provide habitat complexity and enhance habitat suitability for key juvenile target species (Appendix Tables B.8 to B.11) and small-bodied fish species. Fallen trees and vegetation within the channel and riparian zone will also add potential spawning habitat for yellow perch and northern pike. The floodplain will be planted with alder live stakes/seedlings; and rush and sedge grasses, which will provide spawning substrate for northern pike in the spring under flooded conditions. It is expected that this portion of the channel will provide good to excellent spawning, rearing and adult foraging habitat for northern pike and yellow perch along with some overwintering habitat provided through deeper pools (i.e., 2 to 2.5 m) within the channel (Appendix Tables B.8 and B.9). The channel is also expected to provide some habitat for juvenile and adult walleye and smallmouth bass (Appendix Tables B.10 and B.11).



LEGEND

- Standing Snag
- Boulder
- Tree Stump
- Tree
- Tree Group
- Riffle
- Boulder Pile
- Aquatic Vegetation Planting Area
- Aggregate Pit
- Outlet Channel
- Seepage Collection Pond
- Realignment Channel
- Corridor
- Bypass Channel
- Dam
- Ditch
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail

Note: See Appendix C for detailed drawings.

WRC2 Habitat, Côté Gold Project

0 75 150 300
Meters

N E S W

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Figure 3.10

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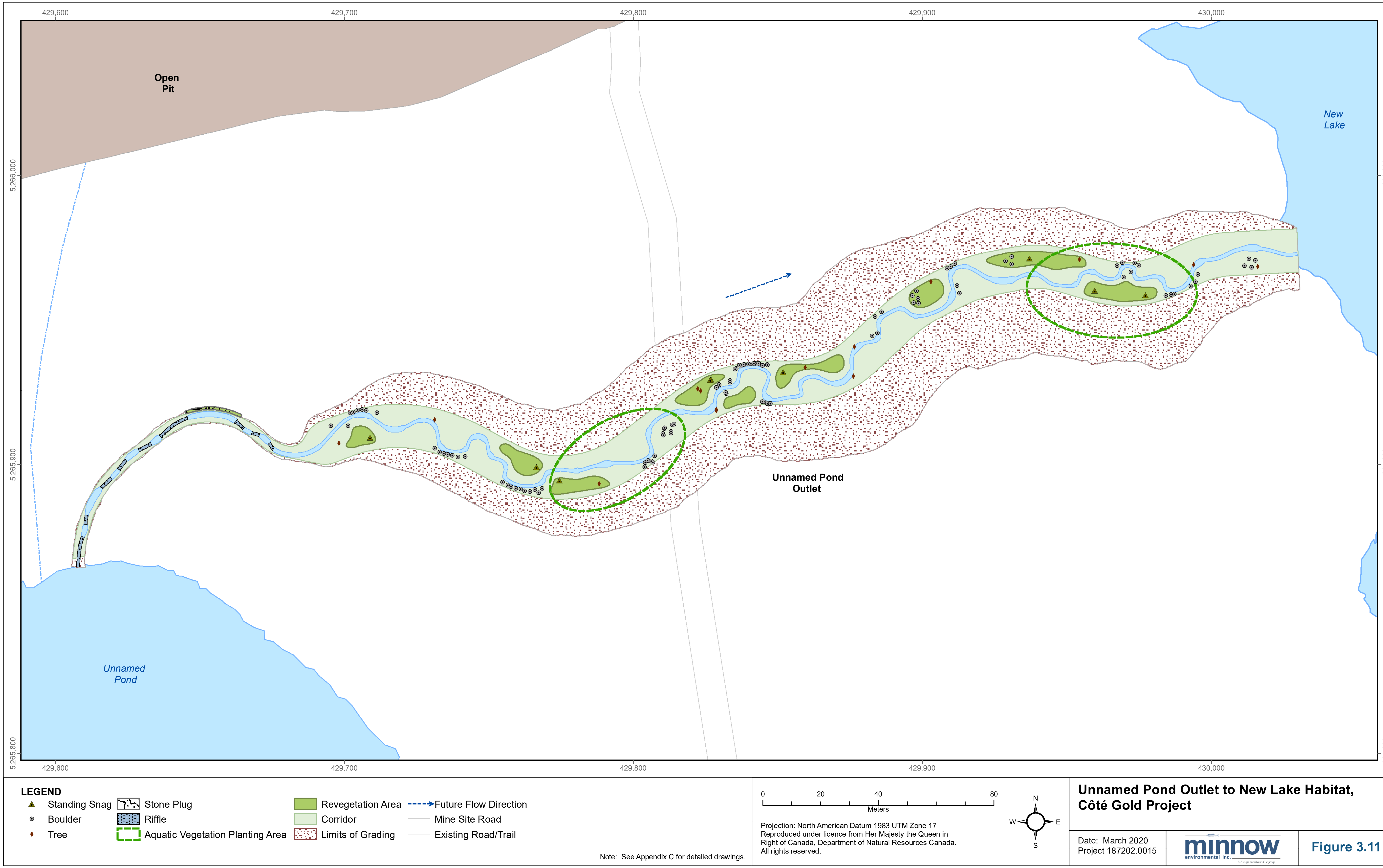
The inline wetland area in the realignment channel will feature fallen trees, boulders, stumps, as well as snags to increase habitat complexity (Figure 3.10; Appendix C). Similar to the other low gradient habitat, the floodplain will be planted as well as aquatic macrophytes to provide spawning substrate for northern pike and yellow perch and cover for juvenile rearing (Appendix Tables B.1 and B.2). The area will provide some juvenile rearing for smallmouth bass and walleye, and adult foraging for smallmouth bass (Appendix Tables B.3 and B.5).

The high gradient riffles and pool channel habitat sections vary in gradient from 1.5 to 3.8% (Appendix C). Pools will range in depth from 0.42 to 1.0 m (Appendix C). Substrate for rifle sections will be a mixture of clay, sand, and gravels (Roundstone Gradation 2 or 3; Appendix C). The higher gradient habitat within the realignment channel is expected to provide spawning habitat potential for walleye resident to Upper Three Duck Lake where spawning habitat is limited. Pools within these alternating riffle habitats are expected to provide some juvenile rearing for northern pike, yellow perch, smallmouth bass, and walleye (Appendix Tables B.8 to B.11).

Overall, the lower gradient habitat is expected to provide good spawning, juvenile rearing, and adult foraging habitat for northern pike and yellow perch (Appendix Tables B.8 to B.11). The channel will provide some juvenile and rearing habitat for smallmouth bass and walleye as well. Higher gradient riffle sections, which were found to be limited in the Mollie River, are expected to provide spawning habitat potential for walleye resident to Upper Three Duck. Pools within the realignment channel will provide some overwintering habitat for all fish species, however, all fish will have access to good overwintering habitat within Upper Three Duck Lake, New Lake, and Chester Lake.

3.3.6 Unnamed Pond Outlet to New Lake

The outlet to Unnamed Pond will be realigned to flow around the Open Pit to the New Lake (Figure 3.11). It is expected that this realignment channel will flow intermittently similar to the current outlet of Unnamed Pond. The watershed of Unnamed Pond will be maintained as much as possible to keep water levels consistent pre-Open Pit development. As mentioned previously, Unnamed Pond will have seepage to the Open Pit at some point during operations (Wood 2020). IAMGOLD has committed to monitoring and maintaining Unnamed Pond and the outlet channel to ensure its proper biological functioning. The new 409 m realignment channel will direct water to the east into New Lake (Figure 3.11, Table 3.3; Appendix C). The new channel will replicate the form and function of the existing Unnamed Pond tributary. The channel will follow a low gradient (<1%) with alternating pools (maximum water depth of <0.5 m). Channel sections will have an average wetted width of 1.5 m and average depth of 0.3 m. This reach incorporates fallen trees to increase cover provide habitat complexity and enhance habitat suitability for small-bodied fish species (Appendix Table B.12).



Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.11 Unnamed Pond Outlet to New Lake.mxd

The floodplain will be planted with alder live stakes/seedlings; and rush and sedge grasses, which will provide shade for the habitat and help prevent erosion in the spring under flooded conditions.

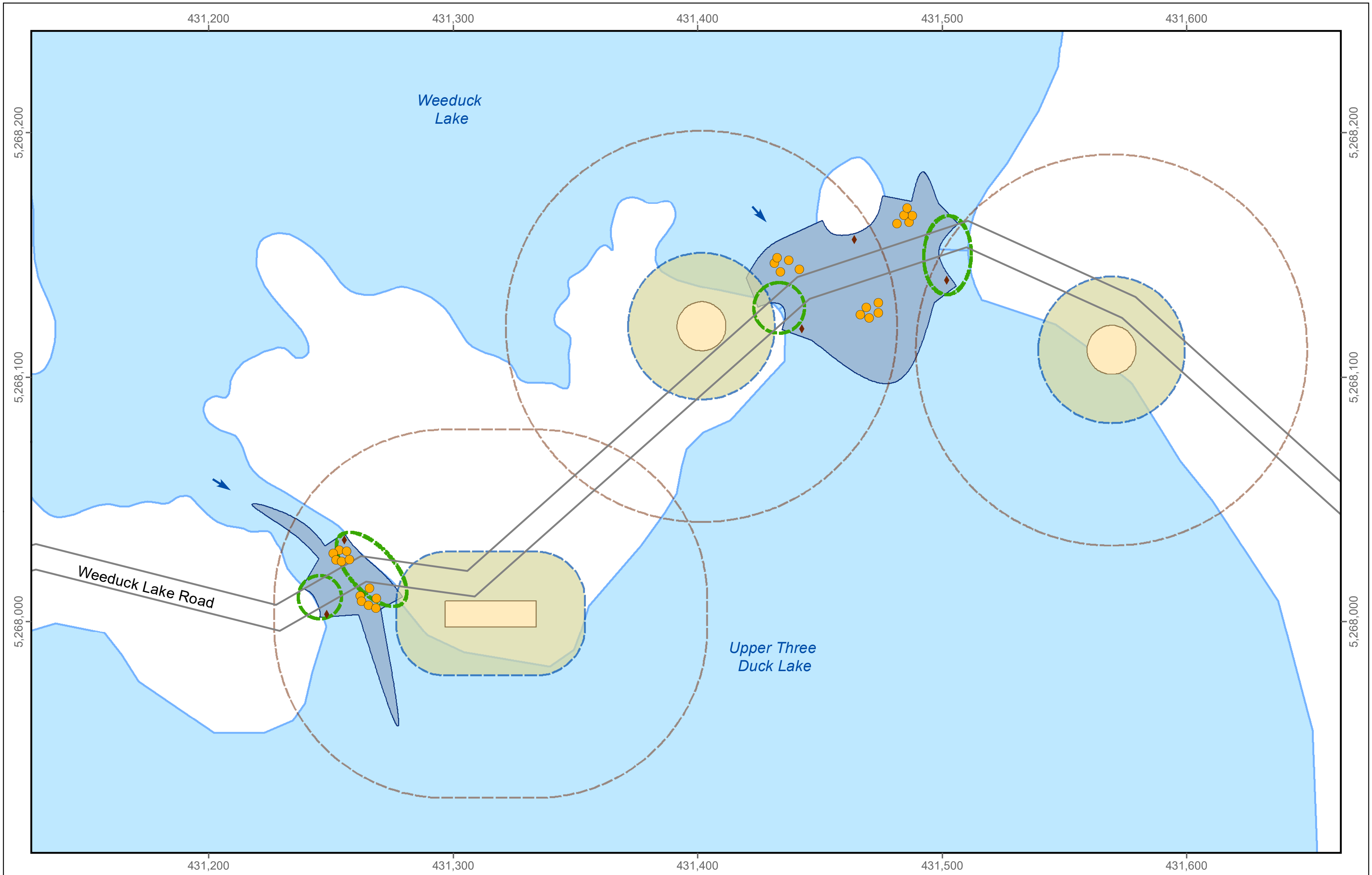
3.3.7 Connection of Weeduck to Upper Three Duck

Weeduck Lake will be connected to Upper Three Duck Lake (currently an isolated headwater lake) through removing three sections of topsoil/road (total of 2,100 m^2; Table 3.3) that separates the two lakes to restore its original configuration (R. Primrose pers. comm. 2019; Figure 3.12). As these areas are in close proximity of three known archeological sites, construction will be overseen by a licensed archeologist. The Ministry of Tourism, Culture, and Sport provided confirmation that monitoring will be required when construction commences but will not involve any additional excavation work based on the current plan (R. Primrose pers. comm. 2019). Maximum water depth within these connections will be 1.5 to 2 m (Appendix C). Physical habitat features such as rocky shoals, boulder clusters and fallen trees will be incorporated to provide habitat complexity and enhance habitat suitability for spawning and rearing smallmouth bass and lake whitefish, and rearing habitat for yellow perch (Appendix Tables B.2 to B.5). In addition, the connection will provide access to good spawning, juvenile rearing, and adult foraging habitat within both lakes for key target species. Most importantly, the fish populations in Weeduck Lake will gain access to better overwintering habitat in Upper Three Duck Lake since the lake is larger (635,534 m^2) and receives flow from the Mollie River. Headwater lakes can experience winter kills due to low dissolved oxygen conditions in late winter (Jackson et al. 2001) and has been observed in Weeduck Lake. This connectivity between the lakes is expected to enhance fish productivity (through increased overwintering success).

3.3.8 Connections of Little Clam, East Clam and Clam Lakes

Little Clam Lake (currently an isolated head water lake) has no connection to East Clam and East Clam Lake and Clam Lake are only connected via a 1.8 m culvert (Figure 3.13). Improving the connection between East Clam, Little Clam, and Clam Lake will provide the fish community with a variety of habitats to address all their life history requirements. Specifically, fish communities from Little Clam and East Clam lakes would benefit from better overwintering habitat provided in Clam Lake (greater water depth and area; Minnow 2014). This connectivity between the lakes is expected to enhance fish productivity (through increased overwintering success and access to a wider variety of habitats).

Little Clam Lake will be connected to East Clam Lake through a 235 m channel (Table 3.3 and Figure 3.13). This channel will have a wetted width of approximately 1.5 m and average depth of less than 0.5 m and incorporate fallen trees to increase cover provide habitat complexity and enhance habitat suitability for juvenile fish and small-bodied fish species. In addition, the



LEGEND

- Point Bar Shoal
- Tree
- Lake Connection Offsetting Area
- Archaeological Site
- No Work Buffer Zone - 20m
- Monitoring Zone - 50m
- Aquatic Vegetation Planting Area
- Existing Road/Trail

Note: See Appendix C for detailed drawings.

0 25 50 100
Meters

N W E S

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Weeduck Lake Connection to Upper Three Duck Lake, Côté Gold Project

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Figure 3.12

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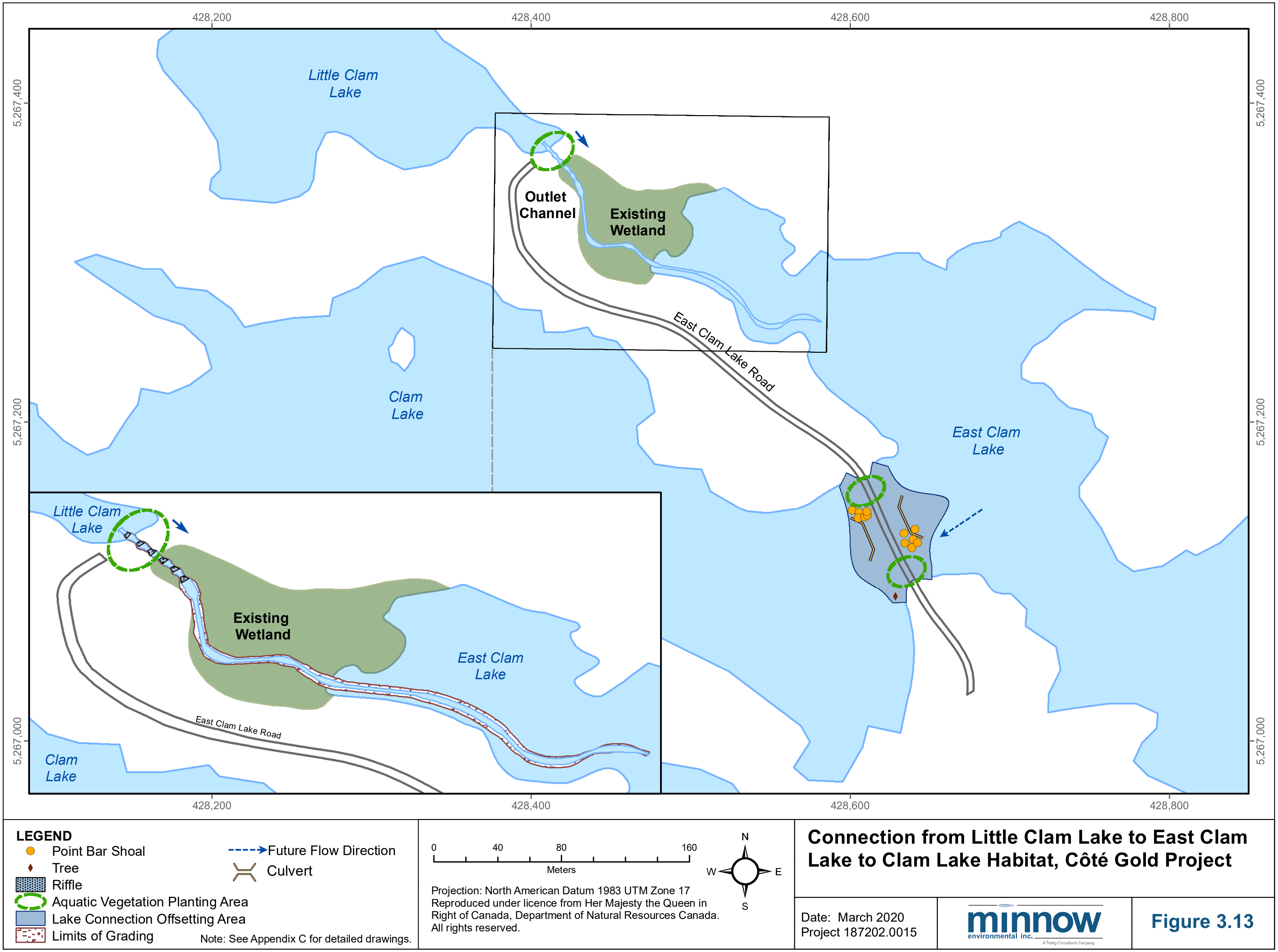

Connection from Little Clam Lake to East Clam Lake to Clam Lake Habitat, Côté Gold Project

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Figure 3.13

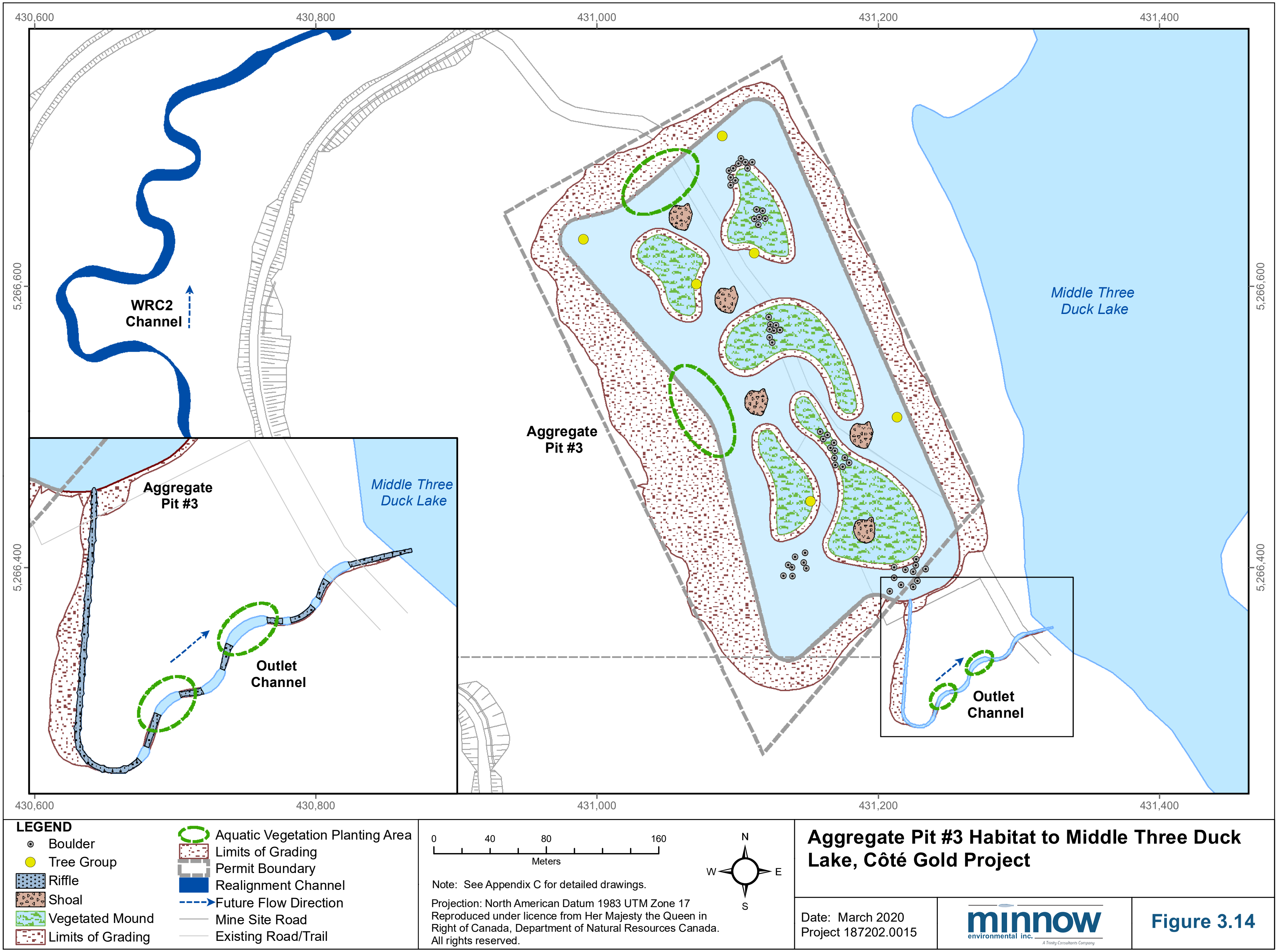
Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.13 Connection Little Clam Lake to East Clake Lake to Clam Lake.mxd floodplain will be planted with alder live stakes/seedlings; and rush and sedge grasses, which will provide shade for the habitat and help prevent erosion in the spring under flooded conditions as well as potential spawning habitat for northern pike and yellow perch (Appendix Tables B.8 and B.9). In stream aquatic vegetation will be planted to promote the colonization of aquatic vegetation in this area for spawning and rearing habitat for these species (Figure 3.13).

The road separating East Clam Lake and Clam Lake will be removed allowing free access for all fish species to both lakes. This area will vary in water depth from 0.5 to 1.5 m (total surface area = 1,700 m^2; Table 3.3 and Figure 3.13; Appendix C). Physical habitat features such as rocky shoals, boulder clusters and fallen trees will be incorporated to provide habitat complexity and enhance habitat suitability for spawning and rearing smallmouth bass, northern pike, and yellow perch (Appendix Tables B.1 to B.5). Shoreline and in-water vegetation will be planted to improve spawning habitat and rearing conditions for these species (Figure 3.13). In addition, the connection will provide Clam Lake fish access to excellent spawning, juvenile rearing, and adult foraging habitat within East Clam Lake for both yellow perch and northern pike (Minnow 2014). East Clam Lake fish communities will have better access to overwintering habitat in Clam Lake.

3.3.9 Remediation of Aggregate Pit #3 (near Middle Three Duck Lake)

Remediation of the aggregate pit will involve excavating the current pit to below the water table and connecting the waterbody to Middle Three Duck Lake (Figure 3.14 and Appendix C). A 52,600 m^2 waterbody will be created with a low-gradient channel connecting it to Middle Three Duck Lake (Table 3.3 and Figure 3.14). The waterbody will have a maximum depth of 5.5 m and connect to the lake via a 237 m long stream with a 1.5 m wide channel with a water depth of 0.25 m (Table 3.3 and Figure 3.14). Terrestrial vegetation will be retained to the closest shoreline extent as feasible. This will aid in future allochthonous contributions (e.g., food for primary and secondary producers) as well as decreasing wind fetch within the bay. The shoreline will be planted with rush and sedge grasses, which will provide spawning substrate for northern pike and yellow perch in the spring under the flooded conditions. In addition, these plantings will aid in decreasing shoreline erosion and water turbidity within the waterbody.

Habitat within the waterbody will provide additional spawning, rearing and adult foraging habitat for northern pike, yellow perch, and smallmouth bass (Appendix Tables B.1 to B.5 and Figure 3.14). Specifically, fallen trees, vegetated mounds, large boulders, standing snags, and rock piles will be installed at various locations. Aquatic macrophytes, both emergent and submergent, will be transplanted to expedite the aquatic vegetation community (Figure 3.14). All of these features will be incorporated to provide habitat complexity and enhance habitat suitability for the target species.



Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.14 Aggregate Pit 3.mxd

3.3.10 Remediation of Bagsverd Aggregate Pit

Remediation of the aggregate pit north of the mine will involve constructing a 166,600 m^2 pond that will support small-bodied fish and possibly northern pike and yellow perch (Table 3.3, Figure 3.15; Appendix C). Maximum water depth with be 3 m to provide good overwintering conditions for small-bodied fish, northern pike and yellow perch (Appendix Tables B.1, B.2 and B.6). Similar to the New Lake and the Aggregate Pit #3, terrestrial vegetation will be retained to the closest shoreline extent as feasible and the riparian shoreline will be planted with native species to prevent erosion and reduce turbidity. Aquatic macrophytes, both emergent and submergent, will be transplanted to expedite the aquatic vegetation community within the pond (Figure 3.15). Physical habitat features such as fallen trees, rocky shoals, and stumps in addition to the aquatic vegetation will provide habitat complexity and enhance habitat suitability for small-bodied fish species as well as spawning, rearing foraging habitat for northern pike and yellow perch (Appendix Tables B.1, B.2, and B.6).

The outlet of the new waterbody will be constructed to flow north to a wetland area which eventually drains to Bagsverd Creek (Figure 3.15). The 100 m outlet will be low-gradient (<1.2%) with alternating pools (maximum water depth of 0.5 m; Table 3.3). Channel sections will have an average wetted width of 1.5 m. This small channel will incorporate fallen trees to increase cover provide habitat complexity and enhance habitat suitability for small-bodied fish species (Appendix Tables B.12). The floodplain will be planted with alder live stakes/seedlings; and rush and sedge grasses, which will provide shade for the habitat and help prevent erosion in the spring under flooded conditions.

3.3.11 Complementary Measures

In addition to in-kind approach offsets, IAMGOLD is proposing one complementary measure for the offsetting project. IAMGOLD has committed funding for research on environmental deoxyribonucleic acid (eDNA) barcoding methods for Environmental Effects Monitoring (EEM). This work is being completed in collaboration of the University of Guelph and several other industry stakeholders.

The objective of this research is to advance the procedure for using eDNA barcoding or DNA meta barcoding for EEM and baseline studies to provide enhanced species specific information, specifically for benthic invertebrates, which will allow for better determination of effects. Benthic invertebrates are an important element of fish habitat and are sensitive indicators of environmental change; the ability to more accurately describe benthic communities will enable a more granular assessment of environmental conditions in monitoring programs with the potential to facilitate diagnosis of issues at an early stage, before they have a biologically meaningful impact

LEGEND

- Standing Snag
- Boulder
- Tree Group
- Riffle
- Shoal
- Vegetated Mound
- Aquatic Vegetation Planting Area
- Outlet Channel
- Limits of Grading
- Permit Boundary
- Future Flow Direction
- Existing Road/Trail

Note: See Appendix C for detailed drawings.

0 55 110 220
Meters

N W E S

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Bagsverd Aggregate Pit Habitat, Côté Gold Project

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Figure 3.15

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 3.15 Bagsverd Aggregate Pit.mxd on fish populations. While initial research has been conducted in a pilot study by the Biodiversity Institute of Ontario (BIO; located at the University of Guelph), additional research is required to continue to advance this science. The full proposal description is provided in Appendix E together with IAMGOLD's letter of support and application form.

Recent proofs-of-concept studies (Borja et al. 2000, Elbrecht et al. 2017, Lobo et al. 2017) have shown that DNA meta barcoding identified more than twice the number of taxa than the morphology-based protocol and yielded greater taxonomic resolution (i.e. more identifications to low taxonomic ranks such as species). The results also indicate that the species richness would be considerably underestimated if only morphological methods were used.

IAMGOLD has committed to partner in this Natural Sciences and Engineering Research Council of Canada (NSERC) study and has contributed $21,000 to fund the next stage as well as;

- In-kind support through the provision of side-by side benthic samples (morphological vs DNA) valued at $18,000.
- Participation in regular meetings with consortium members and contribute to consortium governance valued at $3,000.
- Share data from sites to support research (not valued).
- Work with academic collaborators to comply with reporting requirements to external funders and NSERC (not valued).

This research application was submitted to NSERC March 29, 2019 for approval. Although the grant application has not received funding yet, the application was very well received and the selection panel indicated the research is fundable (S. Adamowicz, pers. comm. 2020). NSERC has indicated that the project can still potentially be funded this fiscal year (end of March 2020). IAMGOLD is committed partner and plans to continue its support for the implementation of this project either through NSERC or alternative private funding. The research project is planned to be implemented over three years and includes commitments to prepare manuscripts for submission to peer-reviewed journals as well as a conference presentation and report targeted to industry comparing methods (Appendix E). It is expected to advance the understanding of benthic invertebrate communities in Ontario which are recognized as a key aspect of fish habitat under the *Fisheries Act.*

3.3.12 Summary of Proposed Habitat in the Offsetting Plan

Habitat will be created through the construction of the realignment cannels (WRC1, WRC2, and Unnamed Pond outlet), creation of the New Lake, remediation of two aggregate pits, and by improving the connection between existing habitat (Figure 3.5 and Table 3.3). The total area of lake habitat to be created is to be 516,781 m^2 (Table 3.3). Of which 512,981 m^2 are being proposed to offset the Section 35 habitat losses and 3,800 m^2 are to be allocated to the Schedule 2 Amendment (Table 3.3). The total length of stream habitat to be created is 3,190 m which is based on design stream width and is equal to 23,827 m^2, 18,541 m^2 of stream habitat is to offset the Section 35 habitat losses, and 5,286 m^2 is to offset the Schedule 2 Amendment (Table 3.3). Based on habitat characteristics incorporated into the designs (presented herein and in Appendix C) relative to the habitat requirements for the various life history stages of the fish species assessed, habitat quality values were assigned (none to excellent as previously described in Section 2.2). The habitat quality and quantity was used to calculate the habitat units to be created (gained). The total habitat units to be created is equal to 3,268,572 lake HU and 222,798 stream HU (Table 3.2, Appendix Tables B.7 and B.13). In addition, to the habitat units created, the proposed offsetting plan will provide greater connectivity between habitats, allowing fish improved access to habitats created for various life stages. It is expected that the increase connectivity will result in increased fish productivity in most areas beyond that accounted for in the habitat unit's assessment. This is particularly true for walleye which will now have improved access to spawning habitat for resident walleye from Weeduck Lake and Upper Three Duck Lake that was previously limited in the system.

3.4 Predicted Net Change in Habitat/Fish Productivity

The predicted loss of fish habitat associated with the Côté Gold Project (Section 3.1) was assessed relative to the planned habitat to be created (and altered) through the offsetting plan (Section 3.2) such that the net change in productive fish capacity could be considered. Habitat units were used as a surrogate for fish productivity. As described in the Methods (Section 2), habitat units were considered for waterbodies and streams separately for five representative resident species considering four key life history stages (e.g., spawning and incubation, juvenile rearing, adult foraging, and overwintering for all life stages). In addition, small-bodied fish habitat was evaluated for those areas lost under Schedule 2 where only small-bodied forage fish were present. The results of this assessment were tabulated for each species for both habitat types before and after mine development (Appendix Tables B.1 to B.13). The overall results of the assessment (i.e., net balance in habitat units) are summarized in Table 3.4.

While this approach provides a quantitative method for the assessment of habitat change, it provides equal weight to all habitat types and life history stages and considers each habitat in isolation, and therefore does not totally account for the benefits of habitat connectivity. Furthermore, it does not allow for the accounting of benefits (increased productivity) in areas where no new habitat is created. For example, in Upper Three Duck Lake where no new habitat

Table 3.4: Net Balance of Habitat Units, Côté Gold Project

Area	Species	Section 35					Schedule 2				
		Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Waterbody	Northern pike	76,977	36,519	-64,277	55,115	104,334	1,800	1,800	1,275	0	4,875
	Yellow perch	75,487	41,881	-13,198	23,135	127,305	1,800	2,325	2,325	0	6,450
	Walleye	0	-65,785	-59,894	-22,121	-147,799	0	950	525	0	1,475
	Lake whitefish	66,296	-31,621	2,964	46,099	83,737	1,050	1,475	950	0	3,475
	Smallmouth bass	29,362	49,731	36,912	59,117	175,121	2,425	2,425	1,900	0	6,750
	Small-bodied Fish	-	-	-	-	86,237	-	-	-	-	-12,064
	TOTAL	**248,122**	**30,725**	**-97,493**	**161,345**	**428,936**	**7,075**	**8,975**	**6,975**	**0**	**10,962**
Stream	Northern pike	-20,836	-21,961	-22,834	-14,401	-80,032	1,164	1,375	107	-62	2,584
	Yellow perch	-19,062	-21,163	-11,659	-14,623	-66,506	338	1,375	157	-62	1,808
	Walleye	-1,492	-2,389	-8,287	-6,664	-18,831	0	1,088	0	0	1,088
	Smallmouth bass	3,223	-3,143	-4,356	-7,162	-11,437	0	1,026	0	0	1,026
	Small-bodied Fish	-	-	-	-	217	-	-	-	-	-335
	Connectivity[a]	-	-	-	-	89,454	-	-	-	-	-
	TOTAL	**-38,166**	**-48,656**	**-47,135**	**-42,850**	**-87,136**	**1,502**	**4,863**	**264**	**-124**	**6,170**
Net Balance[b]		**209,955**	**-17,931**	**-144,628**	**118,495**	**341,799**	**8,577**	**13,838**	**7,239**	**-124**	**17,131**

[a] Connectivity of both Weeduck Lake and Little and East Clam Lakes.
[b] Spatial areas used for the habitat unit calculations are based on current designs (Appendix C).

is planned, the connection to high gradient spawning habitat is expected to improve the walleye productivity within Upper Three Duck Lake but this was not accounted for in the habitat unit assessment because it does not represent a change in a specific habitat unit.

Despite these limitations, the assessment suggests that the proposed habitat offsetting plan will result in a net gain in HU (358,931 HU; Table 3.4) with Section 35 having a gain of 341,799 HU and Schedule 2 having a gain of 17,131 HU (Table 3.4). Based on the evaluation procedure, more offsets are being provided through lake (waterbody/lentic) habitat compared to stream (lotic). The overall net gain in lake (lentic) habitat for both Section 35 and Schedule 2 is 428,936 and 10,962 HU, respectively (Table 3.4). Stream (lotic) habitat has a small net gain for Schedule 2 (6,170 HU), but a loss for Section 35 (-87,136 HU; Table 3.4). While the stream offsets are less, these are driven by stream length and not quality. The offsetting stream habitat is expected to be of high quality incorporating a diversity of habitat (riffles, deep pools, runs) and with a variety of structures (for both cover and spawning). It is expected that this habitat will be suitable for a variety of species and promote connectivity within the watershed and access to a variety of habitats (both stream and lake). For example, as mentioned previously, it is expected that the connection to high gradient spawning habitat (designed in WRC2; Figure 3.10) for walleye will improve walleye productivity in Upper Three Duck Lake. The lentic habitat that will be constructed will be shallow lake habitat, which are known to be generally more productive than deeper lakes and can be as or in some cases more productive than stream habitats (Wetzel 2001). For example, in low-order, canopied streams which describes many of the tributaries where habitat is being lost (some are intermittent and not suitable for large-bodied fish species), riparian vegetation can shade the channel and reduce periphyton and macrophyte productivity. Shallow lakes have a larger surface area, and also allow light penetration to the bottom sediments promoting macrophyte production such that the littoral zone can extend over a large proportion of the lake basin. Littoral areas are associated with diverse and productive periphyton, zoobenthos, and macrophyte communities (Wetzel 2001). It is expected that shallow lake habitat will adequately compensate for the most productive stream habitat (e.g., the Mollie River and Clam Creek) being lost. In addition, restoring East Clam Lake and Weeduck Lake to their original configuration by removing access roads that are no longer required, the fish populations within these lakes will have access not only to a variety of habitat but to better overwintering conditions in larger lakes (e.g., Clam Lake and Upper Three Duck Lake).

The proposed lake offsets indicate a net reduction in juvenile rearing habitat for walleye and lake whitefish and a reduction in adult foraging habitat for three of five representative species (Table 3.4). However, as described above, the offsetting plan will promote productivity by improving connectivity within the watershed and increasing access to existing habitats for all fish;

this enhancement is not accounted for within the HU assessment and is expected to extend beyond the life of the mine. The proposed lake offsets also indicate an overall net loss in walleye habitat (-147,799 HU; Table 3.2), however, adult and rearing walleye habitat is not considered to be limited in the local watersheds and it is not expected to reduce walleye productivity as there are sufficient habitat within the watersheds to support these life history functions. Further, the HU evaluation for walleye was conservative; walleye habitat gains were only counted where they would clearly achieve the HSI requirements for the various life history stages assessed, but it is anticipated that walleye will use much of the offsetting habitat created. Inclusion of walleye spawning habitat in the offsetting plan is limited as the natural topography of the watershed does not lend itself to developing walleye spawning habitat in most areas. Suitable spawning habitat for walleye will be developed in WRC2 where the gradient and water depth will be sufficient and will provide a connection to the necessary downstream juvenile rearing habitat. Gravel shoals are also being constructed within the New Lake and will be available as potential spawning habitat for walleye; however, walleye are not known to spawn in lakes within the area (i.e., local populations primarily spawn in rivers), therefore the constructed shoals were not included as habitat gains within the HU assessment for walleye. It is noteworthy that the habitat losses under the Schedule 2 Amendment are largely isolated waterbodies that support small-bodied fish species. The offsets provided for these habitats were designed for both large-bodied and small-bodied fish species.

Other consideration not taken into account for the offsetting plan is that the Open Pit will be allowed to fill and will form a 450,000 m^2 lake, with the flow from the Mollie River being redirected into the pit, re-establishing the original configuration of the watershed. While the additional lake habitat to be created has not been included in the habitat offsetting evaluation, it does represent a substantial future gain in lentic habitat following mine closure.

The offsetting plan has met the goals of providing new habitat that maintains the hydrologic connectivity of the watersheds, incorporates natural channel design to maximize the habitat potential, and promotes connectivity within the watershed and between habitats. Based on this assessment, the proposed offsetting plan, as described herein, will result in an increase in fish productivity over the existing conditions.

4 MITIGATION MEASURES

4.1 Overview of Undertaking

The development of the Project will see the construction of an Open Pit, TMF, MRA, stockpiles (ore and overburden), as well as, several other mine infrastructures (e.g., processing plant, mine camp). To complete this task the Project requires construction in or near water courses/waterbodies. Construction has been scheduled to commence once the FAA approval has been granted. It is understood that a Schedule 2 Amendment will be required to deposit deleterious substances within the TMF, MRA, and stockpiles areas.

Construction has been divided into three phases (Table 4.1). The first phase focusing on the construction of the dams on the west side of the Open Pit (on East Clam and Clam lakes) and the starter dam for the TMF (Figure 4.1). Two offsetting habitat areas (Weeduck Lake to Upper Three Duck Lake and East Clam Lake to Clam Lake) will be constructed early in Phase 1 to decrease lag times of the entire Project. Unnamed Pond outlet to the New Lake will also be completed in Phase 1 to convey water from Unnamed Pond to the New Lake. In addition, the bypass channels (WRC1 and WRC2 Bypass channels; Figure 4.1 and Table 4.1) will be constructed to divert water around the Open Pit while the realignment channels are under construction and continue diverting water until they are seasoned and ready for commissioning. Other dams required around the Open Pit that will be constructed during Phase 1 include the New Lake Dam North and South and the major realignment channels (WRC1 and WRC2; Figure 4.1). Construction of the New Lake will commence during winter months by removing the terrestrial and organic soils[1] and installation of the habitat features will follow prior to lake filling. Planting (riparian and aquatic vegetation) and biological transplants (benthic invertebrates and fish) will be conducted during Phase 2 and 3 for all habitat constructed in Phase 1. It is anticipated that the lake will be completely filled during the spring freshet in Phase 2, prior to decommissioning of the bypass channels. Decommissioning of bypass channels is anticipated to occur late in Phase 2 after the realignment channels are seasoned (i.e., from the spring freshet to late fall or one growing season; Table 4.1). The TMF starter dam construction will continue throughout Phase 2 and into Phase 3. Construction of the Polishing Pond Dam and the Côté Lake Dam will be started and completed during Phase 2. In addition, the remaining offsetting habitat will be constructed late in Phase 2 and into Phase 3 and includes the connection of Little Clam to East Clam and the remediation of the two aggregate pits and their connection to their associated watersheds. The TMF will continue to be built into the start of operations (projected late fall of 2022/winter 2023; Table 4.1).

[1] IAMGOLD has committed to the removal of terrestrial vegetation and organic soils to prevent the decay and release of associated mercury (Minnow 2018).

Table 4.1: Timeline for Construction, Fish Salvage, Dewatering, Vegetation Planting, Commissioning, and Monitoring of Fish Habitat, Côté Gold Project

Activity	Task	Phase	Approximate Duration (day)	Phase 1										Phase 2												Phase 3								
				Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Construction	Weeduck to Upper Three Duck Lake Connection	1	21																															
	Clam Lake East Dam #2 Cofferdam	1	7																															
	Clam Lake East Dam #3 Cofferdam	1	14																															
	TMF Seepage East Dam Cofferdam	1	15																															
	Mollie River Road Crossing (Chester Lake Outlet)	1	60																															
	New Lake South Dam	1	60																															
	New Lake Cofferdams	1	7																															
	East Clam to Clam Lake Connection	1	31																															
	WRC1 Bypass Channel	1	92																															
	WRC2 Bypass Channel	1	92																															
	Unnamed Pond to New Lake Connection	1	30																															
	New Lake North Dam	1	30																															
	Clam Lake East Dam #2	1	30																															
	TMF East Starter Dam	1/2/3	578																															
	Clam Lake East Dam #3	2	30																															
	WRC 1	2/3	133																															
	WRC 2	2/3	183																															
	New Lake Excavation	2	73																															
	Cote Lake Cofferdams	2	13																															
	Polishing Pond Dam Silt Boom		4																															
	Polishing Pond East Dam	2	209																															
	Cote Lake Dam	2	89																															
	TMF Seepage East Dam	2	45																															
	Aggregate Pit and Connection Channel to Middle Three Duck	3	30																															
	Bagsverd Aggregate Pit and Connection Channel	3	30																															
	Little Clam Lake to East Clam Lake Connection Channel	3	16																															

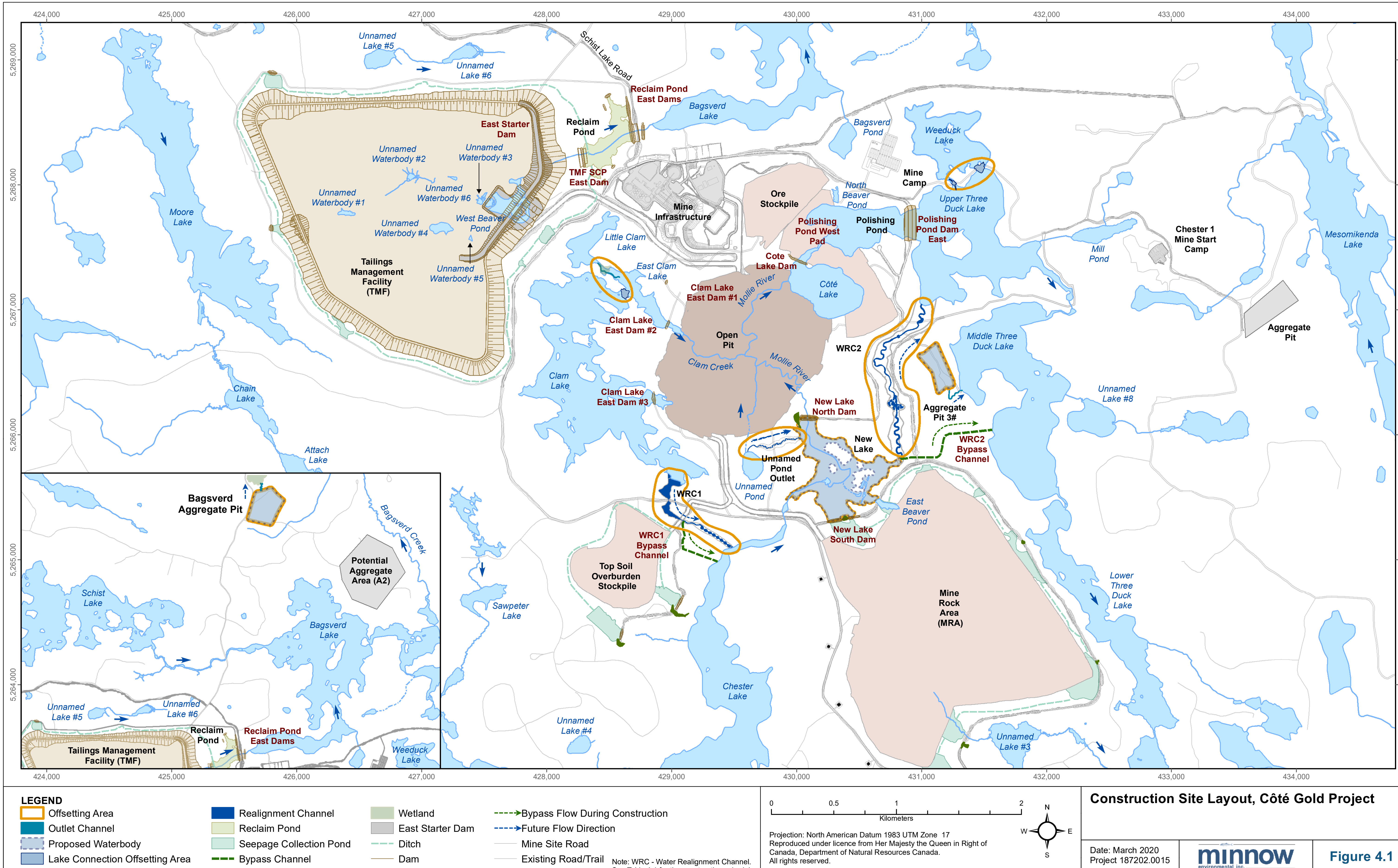
Table 4.1: Timeline for Construction, Fish Salvage, Dewatering, Vegetation Planting, Commissioning, and Monitoring of Fish Habitat, Côté Gold Project

Activity	Task	Phase	Approximate Duration (day)	Phase 1										Phase 2												Phase 3								
				Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish Salvages	Upper Weeduck and Three Duck Lake Reconnection	1	2																															
	Mollie River Road Crossing (Chester Lake Outlet)	1	2																															
	Mollie River (New Lake Footprint)	1	35																															
	East Clam Lake (#2 Dam)	1	23																															
	Upper Clam Creek	1	5																															
	West Beaver Pond (Staged)	1	31																															
	East Beaver Pond Outlet	1	14																															
	Tributary from Unnamed Pond	1	10																															
	West Beaver Pond Outlet (First Pass)	1	14																															
	Clam Lake (#3 Dam)	1	30																															
	East Clam and Clam Lake Reconnection	**1**	**2?**																															
	Mollie River (North Dam Footprint)	1	4																															
	West Beaver Pond Outlet (Upper Stage)	1	4																															
	Mollie River (Mining Pit Footprint)	1	43																															
	Lower Clam Creek	1	20																															
	Upper Three Duck Lake (Silt Boom and Rock Wall)	2	7																															
	Cote Lake (Dam Footprint)	2	9																															
	TMF Unnamed Waterbodies (1-6)	2	21																															
	North Beaver Pond	2	13																															
	East Beaver Pond	2	20																															
	WRC 1 and 2 Bypass Channels	2	28																															
	Cote Lake (Post Dam Construction)	2/3	65																															
	Upper Three Duck Lake	2/3	73																															
Vegetation, Fauna Transfers	Install Features In New Lake	1	30																															
	Divert Water to New Lake	1/2	30																															
	Vegetate New Lake Shoreline	2/3	61																															
	Vegetate WRC 1 and 2 Floodplains	2/3	154																															
	WRC1 and WRC2 Seasoning	2	61																															
	New Lake Aquatic Vegetation Transplant	2	61																															
	New Lake Benthic Invertebrate Transplant	2	61																															
	New Lake Seasoning	2	92																															
	WRC1 and WRC2 Aquatic Vegetation Transplant	2	61																															
	WRC1 and WRC2 Benthic Invertebrate Transplant	2	92																															
	Divert Water to Permanent WRCs	2	31																															
	Reclaim WRC1 and WRC2 Bypass Channels	3	30																															
	Stock WRC1 and WRC2 with Small-bodied Fish	2/3	-																															
	Stock New Lake with Small-bodied Fish	2/3	-																															
	Stock WRC1 and WRC2 with Large-bodied Fish	2/3	-																															
	Stock New Lake with Large-bodied Fish	2/3	-																															
	Little Clam Lake to East Clam Lake	2/3	-																															
	Aggregate Pits and Connections	2/3	-																															
	Stock Aggregate Pits	3	-																															
Monitoring	TSS and Bank Erosion Monitoring	1/2/3	761																															
	Channel Monitoring (Geoprocess)	2/3	457																															
	Geomorphology, Habitat and Fish Community Monitoring[b]	3 & Operations	-																															

Note: Reclaim Pond East Dams and MRA Seepage Dam to be constructed during the operations of the mine. WRC= Water Realignment Channel, TMF= Tailings Management Facility, SCP= Seepage Collection Pond, TSS= Total Suspended Solids

[a] All fish salvages will be conducted in coordination with dewatering efforts.

[b] Monitoring of fish and fish habitat will extend beyond Phase Three as described in Section 5.



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4.2 Construction Sequencing

Construction will only start once the FAA approval and associated permits (e.g., Environmental Compliance Approvals, Permit-to-take-Water Approvals, and Work Permits) have been received (Table 4.1) and IAMGOLD has made a positive construction decision on the project. To develop the Open Pit, MRA, stockpiles, and TMF, a number of steps/phases will need to be implemented. As the Project requires construction in or near water, specific construction sequencing has been established as well as season-specific activities. Season-specific activities include excavation of realignment channels during winter months through wetland/lowland areas. Additional constructions constraints include:

- attention to instream construction work for fish spawning windows[2] (Table 4.2);
- fish salvages must occur during ice-free conditions when water temperatures are warmer than 4 °C and prior to construction in assigned areas; and
- no vegetation clearing to occur within migratory bird nesting windows of mid-April to late August, unless a bird nest survey is undertaken that demonstrates that the proposed clearing areas are free of birds and nests[3].

Understanding these constraints, a construction sequence has been developed, largely focused on the scheduling of dam construction, to prepare the mine site over several seasons (Table 4.1). The fish salvage work will be completed each ice-free season based on construction activities within all Phases with some salvages occurring opportunistically ahead of schedule when conditions permit.

Land clearing has occurred in 2019 (starting in the Open Pit and TMF) and is currently underway in areas that required clearing to access early development of the mine (e.g., aggregate pits, stockpiles, New Lake, portion of MRA, camp, access roads). Once the land is cleared and permits acquired, the primary construction activities include the dams for the Open Pit, dams for the New Lake, as well as the starter dam for the TMF (Table 4.1). Fish salvages will be timed around the requirement of construction areas starting with West Beaver Pond within the TMF footprint, East Clam Lake, and the Mollie River inside the New Lake footprint (Table 4.1 and Figure 4.2). Construction of the Clam Lake dam will also be conducted in Phase 1 and as such the fish salvage in this area as well as downstream Clam Creek will need to be completed (Table 4.1 and Figure 4.2). All fish within these areas will be relocated to either East Clam Lake, Clam Lake,

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[2] Where construction is scheduled to overlap with fish spawning windows, permit approval will be sought through appropriate regulators (i.e., Ministry of Natural Resources and Forestry).

[3] IAMGOLD has established and will continue to implement mitigation measures around vegetation clearing during bird nesting windows in line with best practices and relevant regulations (IAMGOLD 2020).

Table 4.2: Construction Windows by Waterbody/Watercourse for the Northeast Ontario Region, Côté Gold Project

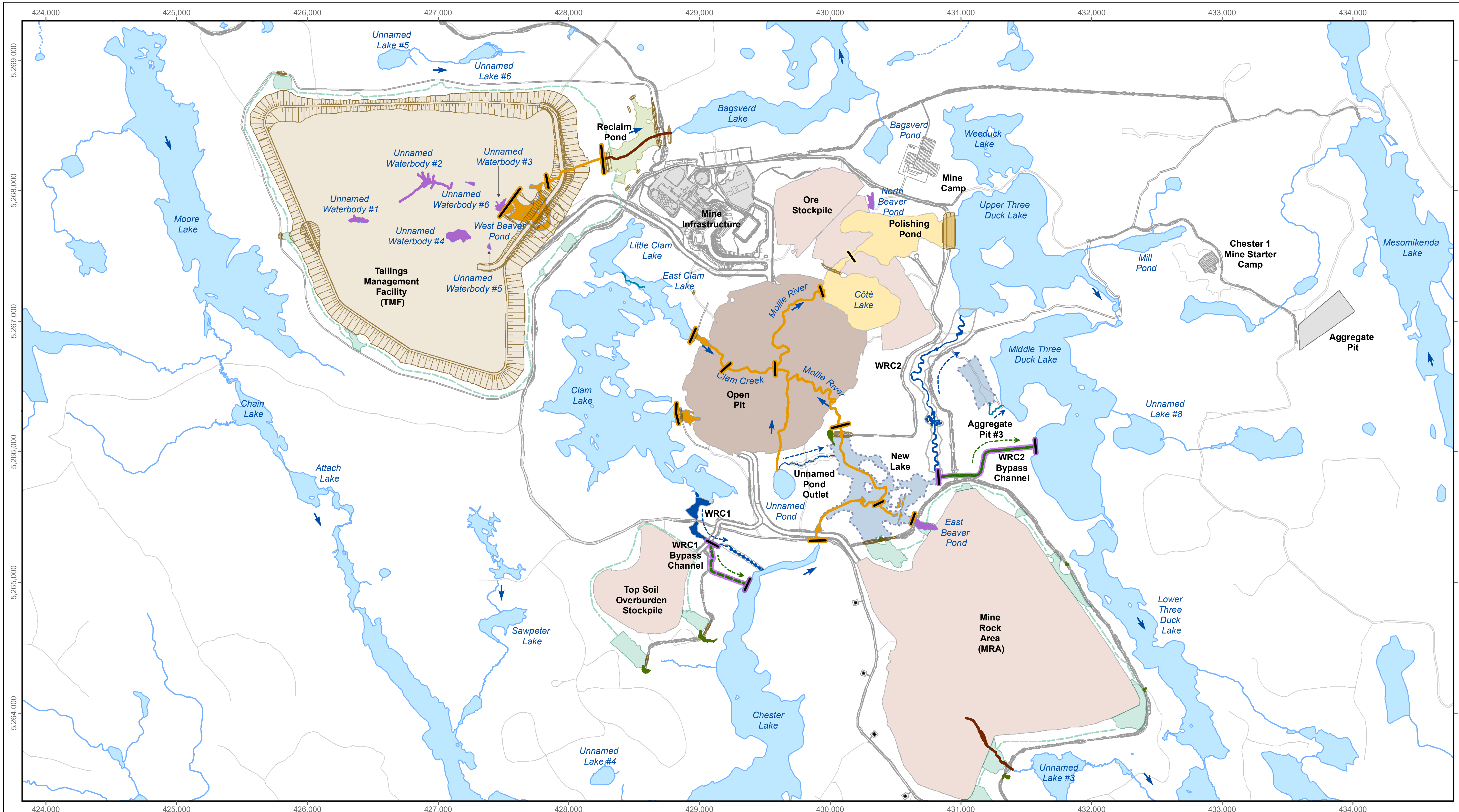
Waterbody	Fish Salvage Timeline	Fish Present	Applicable Spawning Periods
East Clam Lake and Clam Creek	June 20 to July 29 2019	Northern Pike, Yellow Perch, Blacknose Shiner, Golden Shiner, Iowa Darter	Northern Pike: April 1 to June 15 Other spp.: April 1 to June 15
Clam Lake	June 28 to July 17 2019	Burbot, Northern Pike, Smallmouth Bass, Yellow Perch, Blacknose Shiner, Golden Shiner, Iowa Darter, Johnny Darter, Spottail Shiner	Smallmouth Bass: May 15 to July 15 Northern Pike: April 1 to June 15 Other spp.: April 1 to June 15
Unnamed Waterbodies in TMF & associated Tributaries	August 2 to August 21 2019	Central Mudminnow, Fathead Minnow, Finescale Dace, Northern Redbelly Dace, Pearl Dace	Other spp.: April 1 to June 15
West Beaver Pond and Tributary	August 12 to September 12 2019	White Sucker, Central Mudminnow, Fathead Minnow, Finescale Dace, Golden Shiner, Iowa Darter, Northern Redbelly Dace, Pearl Dace	Other spp.: April 1 to June 15
Tributary from Unnamed Pond	June 21 to July 1 2019	Northern Pike, White Sucker, Yellow Perch, Iowa Darter [a]	Northern Pike: April 1 to June 15[a] Other spp.: April 1 to June 15
Unnamed Pond	TBD	Northern Pike, White Sucker, Yellow Perch, Iowa Darter	Northern Pike: April 1 to June 15 Other spp.: April 1 to June 15
East Beaver Pond and Tributary to Mollie River	July 9 to July 12 2019	Fathead Minnow, Finescale Dace, Northern Redbelly Dace	Other spp.: April 1 to June 15
North Beaver Pond	July 14 to July 21 2019	Northern Redbelly Dace, Finescale Dace	Other spp.: April 1 to June 15
Tributary to Unnamed Lake 3	August 21 to August 31 2019	Northern Pike, Yellow Perch, Golden Shiner, Iowa Darter[b]	Northern Pike: April 1 to June 15 Other spp.: April 1 to June 15
Mollie River	April 26 to June 13 2020	Northern Pike, White Sucker, Yellow Perch, Blacknose Shiner, Golden Shiner, Iowa Darter	Walleye: April 1 to June 20[b] Northern Pike: April 1 to June 15 Other spp.: April 1 to June 15
Côté Lake	June 16 to September 1 2020	Burbot, Lake Whitefish, Northern Pike, Walleye, White Sucker, Yellow Perch, Blacknose Shiner, Golden Shiner	Walleye: April 1 to June 20 Northern Pike: April 1 to June 15 Lake Whitefish: September 15 to May 15 Other spp.: April 1 to June 15
Upper Three Duck Lake	May 15 to July 23 2021	Lake Whitefish, Northern Pike, White Sucker, Yellow Perch, Blacknose Shiner, Iowa Darter, Spottail Shiner	Northern Pike: April 1 to June 15 Lake Whitefish: September 15 to May 15 Other spp.: April 1 to June 15

Notes: TMF = Tailings Management Facility, Spp.= Species, TBD = To Be Determined

[a] No suitable spawning habitat for northern pike is present in the upper portions of the tributary.

[b] Fish present in waterbody found in association with stream habitat.

[c] Assumption that walleye can utilize this habitat for spawning, as they are present in both Chester and Côté lakes.



LEGEND

Proposed Fish Barrier
- Phase 1
- Phase 2
- Phase 2 and 3

Fishing Out by Phase
- Phase 1
- Phase 2
- Phase 2 and 3
- During Operation

- Spillway
- Seepage Collection Pond
- Reclaim Pond
- Proposed Waterbody
- Realignment Channel

- Bypass Channel
- Bypass Flow During Construction
- Future Flow Direction
- Mine Site Road
- Existing Road/Trail

Note: WRC - Water Realignment Channel

0 0.5 1 2 Kilometers

Projection: North American Datum 1983 UTM Zone 17

Location of Fishing by Phase, Côté Gold Project

Date: March 2020
Project 187202.0015

minnow environmental inc.

Figure 4.2

Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\1- Offsetting Plan Update\18-15 Figure 4.2 Site Layout for Fishing.mxd

Upper Three Duck Lake, Chester Lake, Unnamed Pond, or downstream of West Beaver Pond (Bagsverd Lake or Bagsverd Creek; Table 4.3). In addition, to prepare the Open Pit and the New Lake construction, all fish within the Open Pit footprint in the Mollie River and Unnamed Pond tributary will be salvaged and relocated to appropriate locations (Table 4.3 and Figure 4.2). Unnamed Pond outlet connection to New Lake will be constructed during the summer of Phase 1. The removal of terrestrial vegetation and organic soils of the constructed habitats (WRC1, WRC2, and New Lake; Figure 4.1) will start in the winter of Phase 1 (Table 4.1). Installation of the habitat features will occur concurrent with excavation in the realignment channels whereas in the New Lake, these features will be installed following excavation (Table 4.1). Additional offsetting habitat construction will be completed for the lake connections (Weeduck Lake and East Clam Lake) to reduce lag times.

In Phase 2 the construction of the TMF starter dam and the Polishing Pond East Dam will continue and the realignment channel constructions will be completed (Figure 4.1). Seasoning of WRC1, WRC2 and the New Lake will occur over the ice-free season in Phase 2, when the areas will be allowed to fill with water, and revegetation of both terrestrial and aquatic plants will occur. Measures to reduce lag times such as transfers of benthic invertebrates will occur in Phase 2 (as outlined in Section 4.7). Fish salvages will continue to occur within the TMF and will be salvaged and relocated downstream (Figure 4.1 and Table 4.3). In addition, the area of the silt boom and rock wall required for the installation of the Upper Three Duck Lake dam and the Côté Lake dam footprints will be salvaged prior to initiating construction of these dams. Fish (especially large-bodied fish) will be salvaged opportunistically from Côté and the west arm of Upper Three Duck Lake once silt booms are in place to reduce the number of fish within these waterbodies over the winter conditions of Phase 2 and limit spawning within these areas in Phase 3. It is anticipated that with the lower flow in this area conditions may become anoxic in some layers of the lake and additional monitoring and mitigation measures will be put in place to maintain suitable overwintering conditions (e.g., aeration to occur if dissolved oxygen fall below 3 mg/L within the top 3 m of water column[4]). Later in the ice-free season of Phase 2, fish from North Beaver Pond and East Beaver Pond will be salvaged and relocated to the New Lake (Table 4.1 and 4.3). All other proposed habitat offsets will be constructed in Phase 2 (Little Clam connection to East Clam, and the remediation of aggregate pits; Table 4.1).

Construction of the Polishing Pond Dam will be completed during the winter of Phase 2 and the fish salvage from the west arm of Upper Three Duck Lake as well as Côté Lake will be undertaken

[4] Dissolve oxygen concentrations based on minimum dissolved oxygen requirements for overwintering in key species found in Côté Lake and the arm of Upper Three Duck Lake(northern pike, yellow perch, and walleye; Appendix Table A.2).

Table 4.3: Fish Transfer Locations for Fish Relocations for the Côté Gold Project

Phase	Map ID[a]	Area	Transfer Location	
			Primary	Secondary
1	1	Mollie River (New Lake Footprint)	Chester Lake	Upper Three Duck Lake
	2	East Beaver Pond Outlet	Chester Lake	Upper Three Duck Lake
	3	East Clam Lake (#2 Dam)	East Clam Lake	Little Clam Lake
	4	Upper Clam Creek	East Clam Lake	Côté Lake
	5	West Beaver Pond	Bagsverd Lake	Bagsverd Creek
	6	West Beaver Pond Outlet (Upper)	Bagsverd Lake	Bagsverd Creek
	7	Clam Lake (#3 Dam)	Clam Lake	Chester Lake
	8	Mollie River (North Dam Footprint)	Upper Three Duck	Côté Lake
	9	Tributary from Unnamed Pond	Unnamed Pond	Chester Lake
	10	North Beaver Pond	New Lake	Upper Three Duck Lake
	11	Mollie River (Mining Pit Footprint)	Upper Three Duck Lake	Côté Lake
	12	Lower Clam Creek	Clam Lake	Côté Lake
2	13	Upper Three Duck Lake (Silt Boom and Rock Wall)	Upper Three Duck Lake	-
	14	Côté Lake (Dam Footprint)	Upper Three Duck Lake	-
	15	East Beaver Pond	New Lake	Chester Lake
	16	TMF Unnamed Ponds	Bagsverd Lake	Bagsverd Creek
	17	Côté Lake (Post Dam Construction)	New Lake	Upper Three Duck Lake
	18	WRC 1 Bypass Channels	WRC1	Chester Lake
	19	WRC 2 Bypass Channel	New Lake & WRC2	Middle Three Duck Lake
3	20	Côté Lake	New Lake	Upper Three Duck Lake
	21	Upper Three Duck Lake	New Lake	Upper Three Duck Lake

[a] Map ID can be found on Figure 4.2.

during Phase 3 (Table 4.1 and Figure 4.2). It is anticipated that the fish from the west arm will be relocated into the New Lake as well as the realignment channels and the remediated aggregate pits (Table 4.3). As water is diverted into the realignment channels, fish salvages will occur in the bypass channels (WRC1 and WRC2 Bypass; Figure 4.2). Upon completion of the fish salvage in the west arm of Upper Three Duck, the Polishing Pond West Pad will be constructed (Figure 4.1).

It is anticipated that the Reclaim Pond East Dams will be constructed in year three of operations and the dams for the southern side of the MRA later in the mine life (Figure 4.1). The fish habitat within these areas will remain as productive functioning habitat until it is required that they be lost (even though the loss is accounted for immediately).

4.3 Fish Salvages/Relocation

4.3.1 Background

Fish salvaging and relocation activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas. The sequence of relocating fish will take into account, as much as possible, the spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish (and therefore no loss in year class). In addition, large-bodied fish will not be transferred to newly constructed habitats until the aquatic plants and benthic invertebrate communities have had a chance to become colonized (i.e., one growing season). Once the new habitat is sufficiently established to support fish, small-bodied fish relocation will commence, prior to the transfer of higher trophic level fish (e.g., northern pike, walleye, smallmouth bass) to ensure an adequate food base for these top predators.

4.3.2 Considerations

Sequencing for fish salvages have been developed in consideration of the amount of time to dewater affected habitats and the construction timetable of the mine (Table 4.1) as well as any spawning windows (Table 4.2) of the resident fish species for the specific waterbody being salvaged. Fish salvages are best conducted in late summer when stream flows are naturally lower and water temperatures are not too hot. However, since the number of areas requiring fish salvages are great, it is not reasonable to conduct them all in late summer early fall. In habitats where large fish species are present, or where there are more sensitive species present (e.g., lake whitefish) efforts will be made to conduct the fish salvages at a time where conditions are optimal. For example, in cooler parts of the day or in the spring or fall. In lentic areas, substantial fishing effort will be conducted prior to any dewatering to limit loss of younger/smaller fish that may get stranded. In addition, timing and rate of drawdowns will be taken into consideration to limit fish stranding. It is likely that salvage operations cannot be effectively undertaken later than mid- to end of October due to weather and water temperature considerations. Most fish collection permits will not allow electrofishing to be conducted at water temperatures below 4 °C.

4.3.3 Approach and Timing

For the protection of fish within the development of the mine site during construction, fish salvages will be required to relocate fish from areas that will be affected by construction activities (Figure 4.2). Prior to any construction, it will be important to isolate the affected section, and safely relocate as many of the fish as possible to a location either upstream or downstream of the affected areas.

Coordination with the construction schedule will be required during all stages to optimize fish salvages through adjusted flow and the isolation of sections of the lentic or lotic habitat. Fish will be captured through a series of intensive fishing efforts using non-destruction collection techniques such as electrofishing, hoop netting, minnow trapping, and/or seining. It is anticipated that a backpack and a boat and/or punt electrofishing unit will provide the most effective catch methods for lotic habitat. For lentic habitat a boat electrofishing unit or series of nets (hoop, trap, or seining) will provide the most effective catch methods.

Salvage operations for lotic habitat will involve blocking off sections of the stream (using mesh stop nets) and sequentially capturing and relocating fish to another undisturbed location. Sequential closed sections of the stream where the fish salvage is taking place will be established. The location of these stations will be established in the field and depend on stream width, depth, and water velocity. In addition, coordination with pumping/drawdown of water will be taken into consideration to maximize efficiency of capture methods as possible. Care will be taken to ensure that fish cannot escape the closed station. Similar to closed station electrofishing used for density estimates, a multiple pass removal method within each section of stream will occur (Ricker 1975). An upstream pass (or “sweep”) of the enclosed reach will be repeated multiple times to remove fish from within the closed section of stream. This system should yield a fish removal pattern of diminishing catches. Once it is concluded that no more fish can be effectively captured within a section, the upstream stop net will be moved downstream. Fishing efforts will move sequentially downstream, until as many fish as possible have been removed from the fish salvage area.

Based on in-stream flow conditions, by-pass pumping or diverting of water may be required to improve conditions for closed electrofishing sections. Longer-term barriers, such as water bladders or till plug, will be required at upstream and downstream locations (for certain construction segments; Figure 4.2) to prevent fish from moving back into the fished out channel. Once a reach has been fished out and the water has been drawn down/diverted, one final inspection of the channel will be completed to ensure no fish have been stranded in any remaining pooled areas. If any additional fish are observed, they will be captured and relocated, if safe to do so.

For lentic habitat, it is anticipated that a series of water drawdowns will occur to aid in concentrating fish for capture. Periods of fishing will occur around these successive drawdowns. The first of a series of fish captures will include intensive fishing effort using non-destructive collection techniques at the original water level. This will allow as many fish as possible to be removed prior to enduring additional stress associated with the higher total suspended solids that will occur during pump downs. Non-destructive collection techniques will include hoop and trap nets, seining, short set gill nets, and electrofishing with either a boat or punt boat equipped with a Smith-Root electroshocking equipment. Following each draw down, fish will continue to be captured and transferred to either upstream or downstream of the construction areas (or to the newly constructed habitat). As water levels decline, fishing effort will take safety as a priority and effectiveness into consideration as the substrate may be too soft to access the water. Catch totals and catch-per-unit-effort will be monitored to evaluate an appropriate time when fishing will cease. The salvage schedule has been developed based on previous experience will similar habitat in northern Ontario (Table 4.1). All fish captured will be identified, enumerated, and transferred as quickly as possible to either upstream or downstream of the construction depending on the salvage area. The captured fish will be transported in a time effective manner in aerated containers. Special attention will be necessary to ensure that larger fish are not overcrowded during the transfer, causing additional stress. Minimizing fish stress will be managed through minimal handling, effective time management, adequate aeration, and fish densities within the transportation containers. Weather may become an issue if prolonged periods of high (>24 °C) or low (<5 °C) temperatures occur (Table 4.4). In such an event, fishing should be conducted during cooler/warmer parts of the day (i.e., early morning, or late morning) or will cease dependent on water and air temperatures, dissolved oxygen concentrations, and fish health[5] (Table 4.4). Fishing should recommence once water and air temperatures are within an appropriate range (Table 4.3).

In both lentic and lotic habitats frogs, turtles, salamanders and mussels will also be collected and transferred to downstream or new habitats to the extent possible.

The goal of the fish salvage is to relocate as many fish as possible to prevent death to fish due to loss of habitat. From the current construction schedule, the entire area affected by construction will require fish salvage operations. Salvage operations will occur during all Phases of mine

[5] Should fish become distressed or fish mortalities occur, collections will be halted until either conditions change or mitigation to alleviate the stress is provided.

Table 4.4: Fish Salvage Temperature and Dissolved Oxygen Guide, Côté Gold Project

Parameter	Trigger Values/ Range	Level of Concern	Required Action
Dissolved Oxygen	>7 mg/L	Optimal	Continue with salvage
	5-7 mg/L	Warning	Reduce holding time, change water in holding bins, increase monitoring of fish health, etc.
	<5 mg/L	High Risk	Work area: Stop fishing IMMEDIATELY
			Bins: replenish water or release fish
Water Temperature	5-20°C	Optimal	Continue with salvage
	21-23°C	Warning	Reduce holding time, change water in holding bins, increase monitoring of fish health, etc.
	>24°C	High Risk	Work area: Stop fishing IMMEDIATELY
			Bins: replenish water or release fish
	<5°C	Warning	Some gear restrictions, such as electrofishing cannot be conducted
Air Temperature	5-24°C	Optimal	Continue with salvage
	0-<5°C or	Warning	Reduce holding time, change water in holding bins, increase monitoring of fish health, etc.
	24-28°C		
	<0 or >28°C	High Risk	Work area: Stop fishing IMMEDIATELY
			Bins: replenish water or release fish

construction (as long as water temperatures are <4 °C and appropriate permits are obtained; Table 4.1).

4.4 Construction Best Management Practices (BMPs) and Monitoring

The contractor will be expected to consider all best management practices (BMPs; Fisheries and Oceans 2016) that should be incorporated into construction plans such as; the location of activities, erosion and sediment control, bank stabilization, fish entrainment or impingement (associated with water pumping or fish barriers), maintenance of machinery, containment and spill management, and develop a response plan(s).

In addition to following BMPs, the construction contractor will be expected to coordinate all monitoring with a contracted biologist. The monitoring objective is to ensure the protection of the fish communities from the negative impacts derived from the development of the mine site construction activities through monitoring of water quality, ensuring sediment, and erosion control measures, and fish impingement and entrainment control measures are operational.

Briefly, water quality monitoring will occur throughout the construction period in active areas that may impact nearby fish bearing water courses. Daily turbidity monitoring will be required along with triggers for investigation of cause, work stoppage, and requirements for further mitigation. All sediment and erosion control and mitigation measures will be monitored regularly as well as any bypass pumping and fish barriers installed for the construction work. Should any exceedance of established thresholds, or any documentation of mitigation measures not functioning properly (i.e., silt plume) be identified, the contracted biologist will be called upon to review the monitoring records and suggest next steps to the core management group for construction.

IAMGOLD is currently developing Environmental Monitoring Plans (EMP; e.g., Aquatic Management and Monitoring, Water Management and Monitoring, Fish and Fish Habitat, Mercury EMP) and Procedures for implementation prior to construction activities. These monitoring plans can be provided to DFO for review if requested (see Appendix Table F.2 for EMP anticipated review schedule).

4.5 Open Pit Blasting

Vibrations resulting from blasting activities in the Open Pit during construction and initial years of mine operation (i.e., until the pit working surface is greater than 350 m from the adjacent water bodies) has the potential to affect spawning success and limit habitat utilization by some fish in water bodies adjacent to the Open Pit. To mitigate these potential effects during construction of the Open Pit and subsequent mine operations, restrictions on blast charge sizes will be implemented during the spawning window from April 1 to July 15. This window is consistent with the “Ontario Restricted Activity Timing Window for the Protection of Fish and Fish Habitat”

(Table 4.2) and encompasses the spawning period for both northern pike and smallmouth bass as well as other spring spawning species (Table 4.2). During mine operations a restriction on blast charge size of 536 kg/delay will be implemented to ensure that vibration effects do not extend to adjacent lakes. Two restricted blasting areas will be established (Figure 3.9); an area extending approximately 350 m outwards from the Open Pit would be limited to a charge size of 536 kg per delay during operations (Area 1) and a second area (Area 2) extending approximately 240 m outwards from Area 1 would be limited to a charge size of 250 kg per delay during construction. As a result of these restrictions, physiological effects to fish from blasting are not expected.

4.6 Monitoring to Verify HSI Variables

Following discussions with DFO, IAMGOLD has committed to verifying HSI variables assigned to all areas lost to confirm habitat lost within the Offsetting Plan. This monitoring will occur in conjunction with the dewatering and fish salvage program during all Phases of construction. Monitoring will include confirming key habitat variables such as substrate type, water depth, water velocity, and vegetation presence in both waterbodies and stream habitat. Data collected will then be used to confirm HSI quality allocated for the key species in the Offsetting Plan to ensure all habitat lost was adequately accounted for. Methods for the monitoring and reporting will be included within the Fish and Fish Habitat EMP and can be made available to DFO for review upon request (see Appendix Table F.2 for EMP anticipated review schedule).

4.7 Reduction of Lag Times

4.7.1 Overview

Lag times, represent the time between the commissioning of new habitats and the ability of the habitat to be fully productive, as designed (Minns 2006). Lag times have the potential to affect the productivity of the system through limiting the ability of fish to fully utilize constructed habitats for their various life stages. Measures have been incorporated into the offsetting plan to minimize lag times to the extent possible within construction constraints. Principally, lag times will be minimized through pre-commissioning measures that will enhance the habitat stability, succession, and recolonization of biological communities (food web). These measures will include, physical structures (e.g., boulder clusters, large woody debris), vegetation planting (aquatic and riparian), and invertebrate transplanting. In addition, reconnection of lake habitats, specifically Weeduck and East Clam lakes, were prioritized to occur early in the construction phase (Phase 1; Table 4.1) to remediate these areas, improve connection, and available habitat (i.e., overwintering habitat) to the resident fish populations as soon as possible thereby minimizing lag times.

To minimize lag times it is proposed that the newly created habitats for the project not only include the construction of physical habitat features (described in Section 3.3) but also the effective transplanting of various ecosystem components in an effort to stimulate the establishment of the aquatic ecosystem in the newly constructed fish habitat (lotic or lentic habitat). The transplanting of vegetation (aquatic and riparian), placement of soils containing rooting material, and transplanting of benthic invertebrates will be carried out to expedite the establishment of created habitat. In addition, benthic organisms will be transplanted to promote the establishment of a benthic community. Through the promotion of vegetation and biological communities (e.g. benthic invertebrates), lag times for the newly constructed habitat are anticipated to be less.

The objective of this effort is to increase the productivity of the created habitat, ensuring the lotic and lentic habitat can be functional as soon as possible thereby reducing lag times. The sections below describe the planned measures to minimize lag times for the offsetting plan.

4.7.2 Physical Structures

Construction activities that will reduce the lag time for establishment of fish communities within the affected waterbodies will include installation and/or creation of specific habitat features required by certain fish species (see Section 3.3 for details). For northern pike, these include hummocks and seasonally flooded shoreline vegetation for spawning, vegetated shallow areas for juvenile rearing and adult foraging, and deeper water for overwintering. These features will also provide necessary habitat for yellow perch. Habitat features created for walleye will include higher gradient riffle areas within stream reaches for spawning (where possible), combined with moderate to low gradient areas downstream for juvenile rearing, root wads and shoals for adult walleye foraging, and sufficient depths for overwintering. Lake whitefish habitat features will include small cobble substrate along shorelines (point shoal bars) for spawning and juvenile rearing, and sufficient depths for adult foraging and overwintering. Smallmouth bass habitat will include sandy-gravel areas with large cobble/boulder or large woody debris cover for spawning, vegetated shallow areas, and rocky shoals for juvenile rearing and adult foraging, and sufficient depths for overwintering.

Many of the species specific habitat requirements are common with others, so incorporation of these features will benefit multiple species. Some of these features will be incorporated into the design and construction phases (i.e., riffle habitat, pools, rocky shoals, tree stump structures; see Section 3.3 for details), while others will be incorporated after construction has been completed (i.e., vegetation within shallow water and shorelines, see Section 3.3) but prior to commissioning.

4.7.3 Vegetation

Aquatic macrophytes (plants) provide habitat and food for many different types of organisms such as zooplankton, benthic invertebrates, and fish. Vegetation provides cover from predators, shade from sun and spawning substrate for certain species of fish (i.e., northern pike and yellow perch). Plants will also improve water quality by stabilizing substrates or preventing erosion (caused by wind or run off). Therefore, it is important to relocate and start the plant community within the constructed habitat as soon as possible to establish a productive, successful plant community, which will provide habitat and a food base for relocated fish. The goal of the aquatic plant transplant is to start/boost the aquatic plant community within the realignments through scattered clusters of plants, and not by completely planting the entire area (see Section 3.3.2 to 3.3.10).

Aquatic macrophytes will be relocated during the spring after construction is complete. Planting in the mid to late spring is ideal because it will give the plants a longer growing season to establish good rooting and shoot growth in the new environment. If plants are not well rooted during the spring freshet (high water levels), they are more prone to being washed away (EC 2006). Therefore, the early planting will help to prevent this from occurring.

The transplant will require extensive manual labour associated with physically digging up and removing various types of aquatic plants from donor sites in the watershed and transporting them to the newly constructed areas. The source areas for these transplantations will be the areas to be lost within the same watershed. Therefore, the transplant activities will not impact the source areas as they are to be lost with the construction of the mine site. During transport, care will be taken to ensure that plants remain damp and that they are replanted in similar water depths to where they were found. Planting at a standard distance apart of 0.5 to 1.0 m is suitable for most plants (EC 2006). Care will be taken to ensure that plants (excluding submergent plants) will have a portion of their stems above the water line to grow. It is anticipated that bur reed (*Sparganium sp.*), mermaid's hair (*Scirpus subterminalis*), pond weed (*Potamogeton sp*.) and sedges (*Carex sp.*) will be the dominant species transplanted to the newly constructed habitat areas. Macrophytes with a tuber or rhizome (i.e., yellow water lilies [*Nuphar variegatum*]) will be planted differently to accommodate the greater water depths required for these species. Plants will be placed with a portion of the donor site soil and some small rocks/gravel into a burlap bag and relocated in deeper areas of newly constructed habitat. This effort will be further complimented by the placement of soils from donor areas containing rooting material from native aquatic plants that will serve to promote the establishment of vegetation.

In addition, soils harvested from areas lost, containing rooting material and a seed bank of native plants, will be placed in the littoral zone to further promote the establishment of vegetation.

The establishment of vegetation in the littoral zone has been shown to increase fish productivity (Randall et al. 1996).

It is also proposed that shoreline areas will be seeded with native sedges and grasses in early spring. A variety of species, such as Canada bluejoint (*Calamagrostis Canadensis*), porcupine sedge (*Carex hystericina*), tussock sedge (*Carex stricta*), softstem bulrush (*Scirpus validus*), and green bulrush (*Scirpus atrovirens*) will be seeded. Shorelines will be planted with live stakes of native tree species such as poplar, alder, and willow to further stabilize the banks and provide shade.

Previous experience with other sites has shown that in areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted, providing cover for juvenile fish and decreasing erosion from construction and wind (Minnow 2006, Connors et al. 2011).

4.7.4 Benthic Invertebrate Transplants/Relocation

Benthic invertebrates will be collected from various habitats within the areas to be lost and transferred to the newly created habitats. The intent of this process is not to relocate all the benthic organisms from the lost areas, but rather to use the native benthic organisms to seed the newly created habitats, thereby expediting the establishment of the base of the food web in these habitats.

Benthos, or benthic invertebrates, living on the bottom of the lotic or lentic habitat to be lost will be transplanted after the aquatic plants in the spring. Benthos are ecologically important to the newly constructed habitat and will aid in the cycling of nutrients and provide a food base for fish (i.e., forage fish). Natural colonization of the benthic community, especially for sedentary taxa, would take much more time if they were not transplanted. Therefore, it is proposed that two different methods will be employed to collect benthic invertebrates. A Ponar grab will be used to collect benthos from depositional areas, whereas benthos along the shoreline or in water less than one meter in depth will be collected using a D-net following a kick and sweep method. Using both of these methods helps provide a broader benthic community food base for fish in the newly constructed areas (Minnow 2006).

A Petite Ponar grab will be used to collect benthos from depositional areas. The sediment from the grab will be emptied into a 500 µm mesh sieve bag and the tub will be rinsed to ensure removal of all residual matter. After sieving, the retained material from the grab will be carefully transferred into buckets with fresh water. These buckets will be transferred to the newly constructed areas and emptied.

Kick and sweep sampling will capture benthic organisms living closer to shore in and around macrophytes/large organic debris. Samples will be collected near the shoreline using a 500 µm D-net. The sampler will hold the net just above the sediment and disturb the substrate with their feet. Each sample will then be sieved in the 500 µm D-net and carefully transferred into buckets with fresh water for transport to the newly constructed areas.

4.7.5 Summary

Construction is scheduled to start once approval is in place and IAMGOLD has made a decision to construct the mine. The sequencing of construction for the Project has incorporated a number of constraints (e.g., migrating birds, fish timing windows, in water construction, and fish salvages) to ensure protection of the resident fish population while implementing the project in a realistic timeline. Fish salvages will take place prior to any in water construction and will be removed from the construction area for the duration of the project to protect fish from construction activities and potential effects from deteriorated water quality. The project will follow all BMPs and have a strict monitoring program in place to protect aquatic organisms downstream of construction.

Best efforts will be made to reduce lag times through the construction schedule, as well as, incorporation of habitat structures (e.g., shoals, large woody debris), transplanting of aquatic and terrestrial vegetation, where possible, and the transplanting of benthic invertebrates. This will expedite the establishment of the biological community (i.e., food web) within the newly created habitat and provide a food source for the fish community.

4.8 Contingency Measures

In the event that the designed offsetting habitat does not function as designed (as shown through monitoring, Section 5) to successfully offset the project losses, mitigations measures will be taken, and the habitat will be repaired/ adjusted/ augmented to function properly. Detailed methods for the monitoring, triggers for mitigation, and reporting will be included within the Fish and Fish Habitat EMP and can be made available to DFO for review upon request (see Appendix Table F.2 for EMP anticipated review schedule). As the plan provides for an excess of habitat units which accounts for the potential for under performance of habitat, no additional habitat offsetting areas are being proposed.

5 MONITORING

5.1 Overview

A biological monitoring program is being proposed to assess the success of the proposed offsetting plan. The program will assess habitat structure, vegetation growth, benthic invertebrate community composition, and fish species composition and abundance in the newly constructed habitats. The objective of the monitoring program will be to document the post-commissioning habitat relative to the design and the requirements of the target species (e.g., northern pike, yellow perch, lake whitefish, walleye, smallmouth bass, small-bodied fish species). Success of offsetting habitats over time will be evaluated by comparing measurements of key habitat characteristics (e.g., water velocity, depth, percent cover, substrate composition, etc.) from each monitoring period to HSI criteria for the five representative and small-bodied fish species. Collection of habitat data will enable comparison of built HUs to the original HU predicted for the proposed offsetting habitat and will ensure that the habitat meets requirements for the intended species use. Other success criteria will include benthic invertebrate endpoints (e.g., composition, density, diversity, biomass), fish abundance, and fish condition in the newly constructed areas relative to data collected from baseline surveys and/or the salvage works for the site. Triggers will be developed to initiate mitigation measures and will focus on the baseline distribution or ± 2 standard deviations from baseline/reference. In the event that the monitoring demonstrates that the habitat is not functioning as intended, mitigation measures will be taken, and the habitat will be repaired/ adjusted/ augmented to function properly. It is expected that the monitoring will document the establishment and succession of habitats over the first few years following commissioning. Detailed methods for the monitoring, triggers for mitigation, and reporting will be included within the Fish and Fish Habitat EMP and can be made available to DFO for review[6] (see Appendix Table F.2 for EMP anticipated review schedule). The subsequent sections briefly describe the various components of the monitoring program, scope, and planned frequency of monitoring that will be included.

5.2 Monitoring

5.2.1 Habitat Conditions and Stability

Habitat condition and stability will be incorporated into the monitoring program to ensure that habitat is constructed as planned, vegetation is becoming established, and other physical structures are functioning as designed. The objective of this aspect of the monitoring program

[6] The Fish and Fish Habitat EMP (which will include all the methods for the fish salvage) will be provided to DFO before the end of June 2020 (pre-construction). It is anticipated that the provision of the EMP will be a condition of the Authorization.

will be to document the post commissioning habitat relative to the design and the requirements of the target species. Habitat conditions and stability can be broken down into three key components: 1) geomorphic stability, 2) habitat structures and vegetation growth (riparian and aquatic plants), and 3) benthic invertebrate community composition and biomass.

5.2.1.1 Geomorphic Stability

The geomorphic monitoring is intended to augment and expand upon the habitat structure and vegetation survey (see below), assessing the performance of the constructed natural channels and habitat enhancement from a geomorphologic perspective. Channel morphology will be monitored using a combination of channel form and substrate measurements and evaluations. The objective will be to combine these elements at local and reach scales to determine how the channel shape and substrate are evolving over time. Rates of change will be compared against the design objectives. The geomorphic monitoring program will consist of:

- A reconnaissance investigation and photographic record of the constructed channels and associated habitat features (Table 5.1 and Figure 5.1);
- Detailed geomorphic surveys of the longitudinal profiles, monumented cross-sections, bank erosion and channel substrate measurements. Cross-sections will be established at different morphologic units (e.g. on both riffles and pools).
- Substrate measurements to be conducted at locations where coarse substrates were added as part of the design (i.e. riffles) and will be characterized in lower gradient reaches where coarse substrate was not incorporated into the design.

A preliminary set of quantifiable performance criteria has been developed for each component of the geomorphic monitoring program. The 'minimum performance target' is the minimum change in the monitoring parameter that will be reported. Otherwise, there's considered to be nominal change. These targets are intended to track changes over time and space and should be used together to assess the performance of the constructed channels. Each metric will be reported on individually and then summarized into reach-averaged evaluations. Metrics that exceeds a minimum performance target should be identified and the potential implications for channel stability and habitat function discussed. Additionally, recommendations will be put forward as to whether remedial measures are required. Remediation might include increased monitoring scrutiny, or active maintenance/repairs to the channel itself.

It is important to note that rivers are not intended to be static systems, in that some change is natural and desired. Different river systems will also have different performance targets. For example, a 10% change in cross-sectional area for a small headwater tributary vs. a large river is very different. For each WRC, initial performance targets are proposed (Table 5.2) but

Table 5.1: Summary of Côté Gold Project Offsetting Monitoring Program

Area	Component	Endpoints	Objective	Location	Scope	Timing Within Year/Frequency
WRC1 and WRC2	Habitat	Aquatic/Riparian Vegetation	To document the progress of plant (aquatic and riparian vegetation) succession. To determine stability of habitat and identify any erosion issues.	Key locations (i.e., critical fish habitat) within the channel. Three 2 x 2 quadrats established at each of three locations per area.	Visual inspection (photo documentation) of aquatic and riparian vegetation growth and survival conducted in June. Survey of species diversity, assessment of functionality (e.g., percent cover) and photo documentation conducted in August; sweep for invasive species at each area on the first day of each field program.	Visual inspection twice yearly (e.g., June and August) during first three years, then years 5 and 10. Annual survey of species diversity, function, and invasive species in August during the first three years, then years 5 and 10.
		Structure	To document whether key habitat structures[a] are functioning as designed.		Visual inspection of constructed habitat, size, form and function.	Visual inspection for stability and function to occur annually during the first three years, then in years 5 and 10.
	Geomorphology	Recon / Photo Inventory	To visually assess and document (via temporal photographs) realignment performance. Augments quantitative evaluation discussed below.	The entirety of WRC1 and WRC2.	Visual inspection (and photo documentation in set locations) of realigned channels.	Once per year for the first three years, then in years 5 and 10.
		Quantitative Performance Metrics	To quantitatively document channel adjustment using established performance targets and temporal monitoring surveys.		Detailed geomorphic survey (longitudinal profile, cross-sections, bank erosion and substrate measurements). Evaluation via performance metrics.	Once per year for the first three years, then years 5 and 10.
	Water	Quality	To track temporal change in water quality and compare to water quality guidelines for the protection of aquatic life.	Up and downstream of WRC1 and WRC2.	Water samples will be taken concurrent with supporting *in situ* field measurements such as water depth, pH, temperature, dissolved oxygen, specific conductivity, and turbidity.	Water samples will be taken monthly during ice-free conditions.
		Flow	To track water flow through the realignment channels, to aid in the evaluation of habitat use and passage.	Within WRC1 and WRC2. Exact locations to be determined	Continuous water level monitoring with water level surveys (minimum twice per year).	Continuous for WRC2, spot measurements for WRC1 (3x per year) in every monitoring year (Year 1, 2, 3, 5, and 10).
	Benthic Invertebrate	Community	To track temporal change in benthic invertebrate communities.	Riffle Habitat	Hess benthic samples at 3 stations within each area.	Yearly for the first three years in August, then years 5 and 10.
				Pools/Lentic Area	Kick and Sweep (CABIN) or Petite Ponar[b] benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then in years 5 and 10.
		Biomass	To assess secondary productivity (food source for fish).	Riffle Habitat	Hess benthic samples at 3 stations within each area.	Yearly for the first three years in August, then in years 5 and 10.
				Pools/Lentic Area	Petite Ponar or area based kick and sweep benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
	Fish	Spawning	To assess spawning success.	Target key areas within the channels ensure coverage of all habitat (riffles, pools, etc.).	Document number and where young-of-the-year fish are captured through all components of the monitoring program. Sample habitat characteristics to verify habitat is functioning as intended (i.e., water velocity, presence of spawning substrate).	Yearly for the first three years in August, then years 5 and 10.
		Abundance	To track temporal change in fish occupancy, abundance and population structure.		Abundance will be estimated by 3 closed station electrofishing stations in each area. Density and total biomass will also be determined. Supplemental spot electrofishing and minnow trapping may be employed.	Yearly for the first three years in August, then years 5 and 10.
		Usage	Evaluate available fish habitat and use, and to track temporal change.		Document where fish are captured and what habitat they are using through all components of the monitoring program.	Yearly for the first three years in August, then years 5 and 10.
		Health	Provide fish population health, specifically growth and condition.		Subsample target species for length, weight and age. Determination of growth, condition, age, and size class composition (if possible).	Yearly for the first three years in August, then years 5 and 10.

Table 5.1: Summary of Côté Gold Project Offsetting Monitoring Program

Area	Component	Endpoints	Objective	Location	Scope	Timing Within Year/Frequency
New Lake	Habitat	Aquatic/Riparian Vegetation	To document the progress of plant (aquatic and riparian vegetation) succession. To determine stability of habitat and identify any erosion issues.	Key locations (i.e., critical fish habitat) within the channel. Three 2 x 2 quadrats established at each of three locations per area.	Visual inspection (photo documentation) of aquatic and riparian vegetation growth and survival conducted in June. Survey of species diversity, assessment of functionality (e.g., percent cover) and photo documentation conducted in August; sweep for invasive species at each area on the first day of each field program.	Visual inspection twice yearly (e.g., June and August) during first three years, then years 5 and 10. Annual survey of species diversity, function, and invasive species in August during the first three years, then years 5 and 10.
		Structure	To document whether key habitat structures (boulder clusters, fallen trees, etc.) are functioning as designed.		Visual inspection of constructed habitat, size, form and function.	Visual inspection for stability and function to occur annually during the first three years, then in years 5 and 10.
	Water	Quality	To track temporal change in water quality and compare to water quality guidelines for the protection of aquatic life.	Outlet of New Lake.	Water samples will be taken concurrent with supporting *in situ* field measurements such as water depth, pH, temperature, dissolved oxygen, specific conductivity, and turbidity.	Water samples will be taken monthly during ice-free conditions. Water quality profiles to be taken monthly during ice-free conditions during the first three years.
			To track *in situ* water quality for overwintering conditions.	Deepest area of the lake.	Water samples will be taken concurrent with supporting *in situ* field measurements such as water depth, pH, temperature, dissolved oxygen, specific conductivity, and turbidity.	Yearly (late winter conditions) for the first three years.
	Benthic Invertebrate	Community	To track temporal change in benthic invertebrate communities.	Nearshore (< 2m water depth)	Kick and Sweep (CABIN) benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
				Depositional area above thermocline[c].	Petite Ponar benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
		Biomass	To assess secondary productivity (food source for fish).	Nearshore (< 2m water depth)	Area based Kick and Sweep benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
				Depositional area above thermocline[c].	Petite Ponar benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
	Fish	Spawning	To assess spawning success.	Target key areas within the channels ensure coverage of all habitat (riffles, pools, etc.).	Document number and where young-of-the-year fish are captured through all components of the monitoring program. Sample habitat characteristics to verify habitat is functioning as intended (i.e., water depth, presence of spawning substrate).	Yearly for the first three years in August, then years 5 and 10.
		Abundance	To track temporal change in fish occupancy, abundance and population structure.		Abundance will be estimated by a varied of standardized fishing techniques (e.g., hoop netting, minnow trapping, seining). Catch-per-unit-effort will be determined. A mark-recapture population estimate will be conducted once in year 5.	Yearly for the first three years in August, then years 5 and 10. A fish population estimate will be conducted in year 5.
		Usage	Evaluate available fish habitat and use, and to track temporal change.		Document where fish are captured and what habitat they are using through all components of the monitoring program.	Yearly for the first three years in August, then years 5 and 10.
		Health	Provide fish population health, specifically growth and condition.		Subsample target species for length, weight and age. Determination of growth, condition, age, and size class composition (if possible).	Yearly for the first three years, then years 5 and 10.

Table 5.1: Summary of Côté Gold Project Offsetting Monitoring Program

Area	Component	Endpoints	Objective	Location	Scope	Timing Within Year/Frequency
Aggregate Pit Remediation	Habitat	Aquatic/Riparian Vegetation	To document the progress of plant (aquatic and riparian vegetation) succession. To determine stability of habitat and identify any erosion issues.	Key locations (i.e., critical fish habitat) within the channel. Three 2 x 2 quadrats established at each of three locations per area.	Visual inspection (photo documentation) of aquatic and riparian vegetation growth and survival conducted in June. Survey of species diversity, assessment of functionality (e.g., percent cover) and photo documentation conducted in August; sweep for invasive species at each area on the first day of each field program.	Visual inspection twice yearly (e.g., June and August) during first three years, then years 5 and 10. Annual survey of species diversity, function, and invasive species in August during the first three years, then years 5 and 10.
		Structure	To document whether key habitat structures (boulder clusters, fallen trees, etc.) are functioning as designed.		Visual inspection of constructed habitat, size, form and function.	Visual inspection for stability and function to occur annually during the first three years, then in years 5 and 10.
	Geomorphology	Recon / Photo Inventory	To visually assess and document (via temporal photographs) channel performance. Augments quantitative evaluation discussed below.	Outlet of Aggregate Pit.	Visual inspection (and photo documentation in set locations) of realigned channels.	Once per year for the first three years, then years 5 and 10.
		Quantitative Performance Metrics	To quantitatively document channel adjustment using established performance targets and temporal monitoring surveys.		Detailed geomorphic survey (longitudinal profile, cross-sections, bank erosion and substrate measurements). Evaluation via performance metrics.	Once per year for the first three years, then years 5 and 10.
	Water	Quality	To track temporal change in water quality and compare to water quality guidelines for the protection of aquatic life.	Outlet of Aggregate Pit.	Water samples will be taken concurrent with supporting *in situ* field measurements such as water depth, pH, temperature, dissolved oxygen, specific conductivity, and turbidity.	Water samples will be taken monthly during ice-free conditions. Water quality profiles to be taken monthly during ice-free conditions during the first three years.
			To track *in situ* water quality for overwintering conditions.	Deepest area of the waterbody.	Water samples will be taken concurrent with supporting *in situ* field measurements such as water depth, pH, temperature, dissolved oxygen, specific conductivity, and turbidity.	Yearly (late winter conditions) for the first three years
	Benthic Invertebrate	Community	To track temporal change in benthic invertebrate communities.	Nearshore (< 2m water depth)	Kick and Sweep (CABIN) benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
				Depositional area above thermocline[c].	Petite Ponar benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
		Biomass	To assess secondary productivity (food source for fish).	Nearshore (< 2m water depth)	Area based Kick and Sweep benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
				Depositional area above thermocline[c].	Petite Ponar benthic samples at 3 stations in each area.	Commencing in year 2 in August of annual monitoring, then years 5 and 10.
	Fish	Spawning	To assess spawning success.	Key locations within the habitat (around habitat structures).	Document number and where young-of-the-year fish are captured through all components of the monitoring program. Sample habitat characteristics to verify habitat is functioning as intended (i.e., water depth, presence of spawning substrate).	Yearly for the first three years in August, then years 5 and 10.
		Abundance	To track temporal change in fish occupancy, abundance and population structure.		Abundance will be estimated by a varied of standardized fishing techniques (e.g., hoop netting, minnow trapping, seining). Catch-per-unit-effort will be determined.	Yearly for the first three years in August, then years 5 and 10.
		Usage	Evaluate available fish habitat and use, and to track temporal change.		Document where fish are captured and what habitat they are using through all components of the monitoring program.	Yearly for the first three years in August, then years 5 and 10.
		Health	Provide fish population health, specifically growth and condition.		Subsample target species for length, weight and age. Determination of growth, condition, age and size class composition (if possible).	Yearly for the first three years in August, then years 5 and 10.

Table 5.1: Summary of Côté Gold Project Offsetting Monitoring Program

Area	Component	Endpoints	Objective	Location	Scope	Timing Within Year/Frequency
East Clam Lake and Clam Lake Connection Weeduck Lake and Upper Three Duck Lake Connection	Habitat	Aquatic/Riparian Vegetation	To document the progress of plant (aquatic and riparian vegetation) succession. To determine stability of habitat and identify any erosion issues.	Key location within the connections. A minimum of 1 area will be identified.	Visual inspection (photo documentation) of aquatic and riparian vegetation growth and survival conducted in June and August.	Twice yearly (e.g., June and August) during every monitoring year (Year 1, 2, 3, 5, and 10).
		Structure	To document whether key habitat structures (boulder clusters, fallen trees, etc.) are functioning as designed.		Visual inspection of constructed habitat, size, form and function.	Visual inspection for stability and function to occur during every monitoring year (Year 1, 2, 3, 5, and 10).
	Geomorphology	Recon / Photo Inventory	To visually assess and document (via temporal photographs) channel performance. Augments quantitative evaluation discussed below.	Connection between lakes.	Visual inspection (and photo documentation in set locations) of realigned channels.	Once per year for the first three years, then years 5 and 10.
		Quantitative Performance Metrics	To quantitatively document channel adjustment using established performance targets and temporal monitoring surveys.		Detailed geomorphic survey (longitudinal profile, cross-sections, bank erosion and substrate measurements). Evaluation via performance metrics.	Once per year for the first three years, then years 5 and 10.
	Fish	Spawning	To assess spawning success.	Key locations within the habitat (around habitat structures).	Document number and where young-of-the-year fish are captured through fishing. Sample habitat characteristics to verify habitat is functioning as intended (i.e., water depth, presence of spawning substrate).	Yearly for the first three years in August, then years 5 and 10.
		Abundance	To track temporal change in fish occupancy, abundance and population structure.		Abundance will be estimated by variety of fishing techniques in each area. Cath-per-unit-effort will be determined.	Yearly for the first three years in August, then years 5 and 10.
		Usage	Evaluate available fish habitat and use, and to track temporal change.		Document where fish are captured and what habitat they are using through all components of the monitoring program.	Yearly for the first three years in August, then years 5 and 10.
		Health	Provide fish population health, specifically growth and condition.		Subsample target species for length, weight and age. Determination of growth, condition, age and size class composition (if possible).	Yearly for the first three years in August, then years 5 and 10.
Small Tributary Connections (Unnamed Pond Outlet, Aggregate Pit Outlets, Little Clam Lake to East Clam Lake)	Habitat	Aquatic/Riparian Vegetation	To document the progress of plant (aquatic and riparian vegetation) succession. To determine stability of habitat and identify any erosion issues.	Key location within the connections. A minimum of 1 area will be identified.	Visual inspection (photo documentation) of aquatic and riparian vegetation growth and survival conducted in June and August.	Twice yearly (e.g., June and August) during every monitoring year (Year 1, 2, 3, 5, and 10).
		Structure	To document whether key habitat structures (boulder clusters, fallen trees, etc.) are functioning as designed.		Visual inspection of constructed habitat, size, form and function.	Visual inspection for stability and function to occur during every monitoring year (Year 1, 2, 3, 5, and 10).
	Geomorphology	Recon / Photo Inventory	To visually assess and document (via temporal photographs) channel performance. Augments quantitative evaluation discussed below.	The entirety of each connection channel.	Visual inspection (and photo documentation in set locations) of realigned channels.	Once per year for the first three years, then years 5 and 10.
		Quantitative Performance Metrics	To quantitatively document channel adjustment using established performance targets and temporal monitoring surveys.		Detailed geomorphic survey (longitudinal profile, cross-sections, bank erosion and substrate measurements). Evaluation via performance metrics.	Once per year for the first three years, then years 5 and 10.
	Fish	Spawning	To assess spawning success.	Locations to include a variety of habitat (riffle, pool).	Document number and where young-of-the-year fish are captured through fishing. Sample habitat characteristics to verify habitat is functioning as intended (i.e., water depth, presence of spawning substrate).	Yearly for the first three years in August, then years 5 and 10.
		Abundance	To track temporal change in fish occupancy, abundance and population structure.		Abundance will be estimated by spot electrofishing and minnow trapping. Cath-per-unit-effort will be determined.	Yearly for the first three years in August, then years 5 and 10.
		Usage	Evaluate available fish habitat and use, and to track temporal change.		Document where fish are captured and what habitat they are using through all components of the monitoring program.	Yearly for the first three years in August, then years 5 and 10.
		Health	Provide fish population health, specifically growth and condition.		Subsample target species for length, weight and age. Determination of growth, condition, age an size class composition (if possible).	Yearly for the first three years in August, then years 5 and 10.

Note: WRC = Water Realignment Channel, Recon - Reconnaissance, CABIN= Canadian Aquatic Biomonitoring Network

[a] Key habitat structures can include fallen trees, riffle, pools, rocky shoals, etc..

[b] Sampling protocol will depend on habitat available.

[c] Depositional area to be sampled, above thermocline - reference baseline.

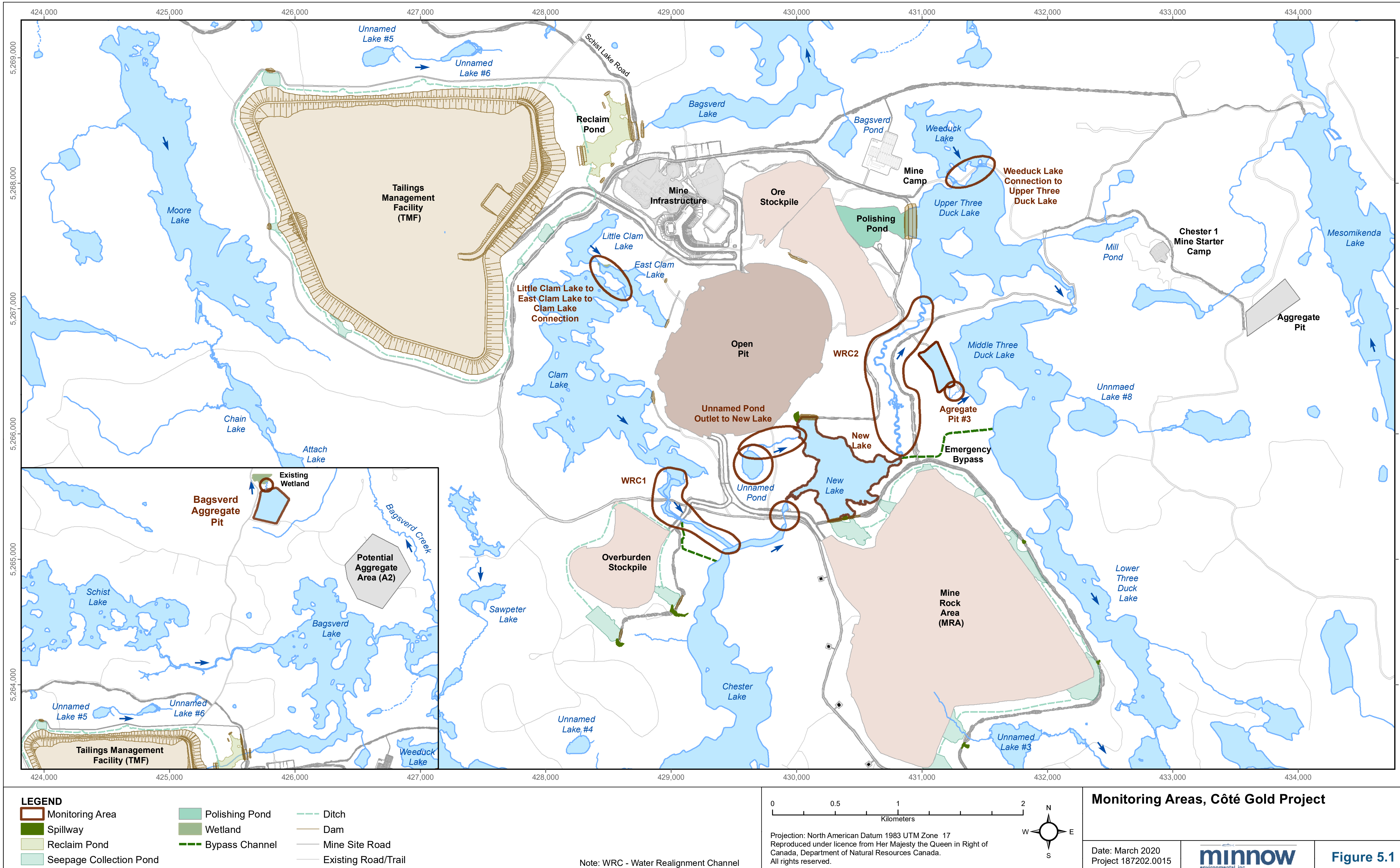


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Table 5.2: Proposed Initial Geomorphic Stability Performance Targets

Monitoring Component	Description	Minimum Tier 1 Performance Target (Local Scale)	Tier 2 Performance Target (Reach Scale / System Wide)
Longitudinal Profile	The rate of bedform development, erosion and deposition in the longitudinal direction. Includes monitoring the location and arrangement of riffles, runs and pool zones (if present), as well as other features of geomorphological significance. Objective bedform analysis will also be undertaken to better quantify the nature of the bedform changes over time. While this type analysis is less telling in a single year's data set, over the course of the program the observed changes provide an unbiased, quantitative measure of the degree in changes to bed morphology. The primary advantage to the objective methods is that they remove operator bias in the identification of the beginning and end of bedforms. For example, even the most experienced practitioners can have different definitions for these features.	**WRC Channels** ±15% change (beyond survey variability) in discrete pool depth or riffle/run crest based on objective (residual pool) method. **Habitat Enhancement Locations** ±25% change (beyond survey variability) in discrete pool depth or riffle/run crest based on objective (residual pool) method.	**WRC Channels** ±25% change (beyond survey variability) in reach averaged pool depth or riffle/run crest based on objective (residual pool) method. **Habitat Enhancement Locations** ±25% change (beyond survey variability) in reach averaged pool depth or riffle/run crest based on objective (residual pool) method. **All** Longitudinal plot of net erosion and deposition based on surveyed longitudinal profiles. This metric helps to identify inherent survey variability associated with temporal measurements of river systems.
Cross-sections	The rate of cross-sectional change of the bankfull channel.	**WRC Channels** ±15% change in bankfull cross-sectional area (beyond survey variability). **Habitat Enhancement Locations** ±25% change in bankfull cross-sectional area (beyond survey variability).	**WRC Channels** Longitudinal plot of cross-sectional area change. ±15% change in reach averaged bankfull cross-sectional area (beyond survey variability). **Habitat Enhancement Locations** Longitudinal plot of cross-sectional area change. ±25% change in reach averaged bankfull cross-sectional area (beyond survey variability).
Lateral Bank Erosion	Excess erosion is determined visually based on the degree of bank exposure, bank angle and absence of stabilizing vegetation.	**All** ±10 cm annual lateral bank migration (averaged over identified eroding bends) (beyond survey variability).	**All** Longitudinal plot identifying bank erosion rates. Reach averaged trends to be identified based on analysis of longitudinal plot.
Substrates	The rate of change of the size of channel bottom materials.	**All** Local changes exceeding an order of magnitude will be flagged and investigated.	**All** Plotting of longitudinal trend of substrate coarsening or fining. No metric is proposed. Rather, the results will be compared back to the longitudinal bedform findings.
Reconnaissance/ Photo Documentation	Overall review of each reach, looking for instances of significant instability that might not otherwise have been captured by the four metric categories (above). For example, construction of a beaver dam at a critical location or erosion at a pedestrian bridge. This component also includes the overall collection and compilation of the photographic record.	N/A	N/A

Note: WRC = Water Realignment Channel

may be updated as additional data are collected and analyzed. Calculated metrics will be compared to visual field assessments (and photographs) and plotted survey data to corroborate performance targets and to flag instances where channel adjustments may be beyond that of natural or expected conditions. Monitoring will be conducted on an annual basis for the first three years and in year five and ten post-commissioning (Table 5.1).

5.2.1.2 Habitat Structures and Vegetation

Generally, habitat structures created will be monitored for size, form and function (i.e., proposed riffle areas are present where proposed, pools are of designed depths) and compared to the habitat design specifications (Table 5.1 and Figure 5.1). The habitat quality and quantity will be documented and augmented with photographs for key structures and/or habitats similar to a reconnaissance-level baseline survey. More specifically, site characteristics such as wetted width, bankfull width, gradient, residual pool depth (or lake depth), substrate size, obstructions, riparian area properties, Secchi depth, etc. will be documented. Key structures (e.g., boulder clusters, large woody debris, and rocky shoals) within the designed habitat will also be documented (i.e., UTMs recorded and photographs taken). If structures are not functioning as planned, these will be documented, and remediation proposed to address the specific issue.

Aquatic and riparian vegetation at each offsetting area will be assessed annually for the presence of invasive species via a sweep which will be conducted concurrently with a general habitat assessment that includes vegetation (Table 5.1 and Figure 5.1). Additionally, more detailed aquatic vegetation monitoring will be conducted within the offsetting areas at locations that are intended to provide critical fish habitat in order to ensure the stability and functionality of these areas. Specifically, three areas will be chosen within each of the main offsetting areas (WRC1, WRC2, New Lake, Aggregate Pit #3, and Bagsverd Aggregate Pit); the three areas will correspond with aquatic vegetation planting areas within the offsetting areas (Figures 3.6, 3.7, 3.10, 3.14, and 3.15). The areas chosen for monitoring will be representative of the range of habitats within each offsetting area that will be utilized by fish; a transect will be established in each area and three 2 m × 2 m quadrats will be assessed along each transect. In June of each monitoring year, progress and succession of aquatic vegetation will be assessed through photo documentation. In August, at the end of the growing season, a more in depth assessment will be conducted at each established quadrat which will include surveys of species diversity, assessment of functionality (i.e., as fish habitat, for example calculation of percent cover) as well as photo documentation to determine survival and growth. This monitoring will be conducted annually for the first three years following commissioning of the habitat. Prior to the end of the warrantee period (for the riparian vegetation), each area will be assessed for percent survival and vegetation success will be documented in the monitoring report. Any drone imagery available will also be included in the monitoring reports.

5.2.1.3 Benthic Invertebrate Community and Biomass

Benthos are ecologically important to the newly constructed habitat and will aid in the cycling of nutrients and provide a food base for fish. Monitoring will evaluate the natural colonization of the benthic communities within the constructed habitat and determine if an adequate food source is available for fish.

Benthic invertebrates will be monitored for community composition, structure, biomass, and density in both in the lotic (e.g., realignment channels) and lentic habitat (e.g., New Lake; Table 5.1 and Figure 5.1). Previous assessments of the benthic community within the Mollie River and Neville Lake watersheds have revealed the presence of only generalist species therefore, an index focused on sensitive species would likely not be appropriate for this site. Taxonomic richness (total number of taxa) will be calculated and has been found to be more sensitive in detecting differences between exposed and reference areas than other tolerance based indices (i.e., Hilsenhoff's biotic index; Kilgour et al. 2004). Benthic invertebrate density monitoring will provide an adequate metric of the abundance of invertebrate forage available for fish. Benthic collection methods will depend on habitat (e.g., erosional habitat will use a Hess sampler, lentic habitat will use a Petite Ponar and/or D-net) and follow Environmental Effects Monitoring protocols (EC 2012). For the lentic habitat, it is anticipated that the substrate may be too hard for a Petite Ponar to penetrate (if all organic soils are removed, substrate will be sand or clay), therefore it is proposed that a kick and sweep sampling protocol be conducted up to 1 m depth. Depending on the amount of vegetation transplanted, it is recommended that benthic sampling commence in year two of sampling so not to hinder plant growth and establishment in these areas. Samples will be sent to a qualified benthic taxonomist for analysis, where they will be identified to the lowest practical level of taxonomy (typically genus or species) using methods described by EC (2012, 2014). Organisms will be grouped at the family-level of taxonomy for weighing (i.e., preserved wet weight biomass) to estimate total biomass. In general, samples will be collected from depositional and erosional areas within the newly constructed habitat and results compared to reference lakes and streams (non-constructed habitat), and/or to baseline information collected from original waterbodies (Table 5.1 and Figure 5.1). Success criteria triggers will be developed and will focus on the baseline distribution or ± 2 standard deviations from baseline/reference.

5.2.2 Water Quality and Flow

Water quality monitoring is ongoing at the Côté Gold site. Furthermore, environmental management plans (EMPs), including quality assurance and quality control procedures, are being developed to support water quality and flow monitoring during construction and operational phases. These plans will be available for DFO review if requested (see Appendix Table F.2 for anticipated review schedule). The water quality up and downstream, as well as within the constructed habitats will be monitored to evaluate post-construction conditions (Table 5.1 and Figure 5.1). Hydrometric data will also be collected at key locations around the site (i.e., Mollie River). In addition, an adaptive management plan is also being developed that will ensure that appropriate actions are taken if water quality degradation were to be identified. Water levels in Upper Three Duck Lake, New Lake, Unnamed Pond, and Clam Lake as well as flow in all constructed channels will be monitored.

Results for samples collected during the year of evaluation will be tabulated and compared to water quality guidelines, background, and baseline. In addition, water quality, level, and flow will be summarized and compared to optimal habitat conditions for the target fish species, fish passage through culverts, and confirm habitat suitability.

5.2.3 Fish Utilization, Abundance, Community Structure and Health

Fish community structure and abundance within created habitat will also be included in the monitoring program. The objective of this aspect of the program will be to demonstrate fish usage of the created habitat for the intended life history stage (e.g., spawning, juvenile rearing, and adult foraging). In addition, the monitoring will demonstrate whether the fish populations are successful (reproducing) and are healthy (condition), where both small- and large-bodied fish sampling will be incorporated.

Small- and large-bodied fish will be assessed for composition and abundance. It is essential that the small-bodied fish populations are thriving within the newly created habitats in order to provide a solid food base for the predatory fish populations. Standardized electrofishing (lotic habitat) and hoop netting (lentic habitat), will be employed to determine abundance (catch-per-unit-effort), along with supplemental seining and minnow trapping within in a variety of different fish habitats (i.e., riffle, pool, nearshore; Table 5.1 and Figure 5.1). During year-five post-construction, a population study will be conducted in New Lake. All fish captured will be identified, enumerated, and sampled (measured for weight and length) prior to release at their capture location. Habitat conditions will also be measured (e.g., water depth, water velocity, substrate characteristic, temperature and dissolved oxygen). Reproduction or spawning success will be determined indirectly through evaluation of catch results and presence of young-of-the-year fish. Direct spawning observation for key target species (northern pike, yellow perch, walleye, whitefish) can be very challenging for this area (and is largely dependent on water clarity), especially when the surface area to be covered is substantial. Confirming spawning through direct observation of YOY also gives an indication of the spawning success/survival of young. Supplemental monitoring may be included where spawning success could be determined visually during the spring spawning period. Growth and condition will be evaluated by collecting lengths and weights (supplemental age data), which can then be compared to data collected during baseline studies (Minnow 2014, 2017a). Similar to other monitoring components, success criteria will be determined and outlined in the Fish and Fish Habitat EMP. Triggers for endpoints such as abundance and condition will focus on the baseline distribution (data collected in baseline and the salvage work) or ± 2 standard deviations from baseline/reference.

5.3 Reporting and Scheduling

Monitoring the functionality of the created habitat, succession of vegetation, colonization of benthic communities, and fish use will be completed each year for the first three years following commissioning, and at year five and ten thereafter. Progress reports will be prepared following each field monitoring program for submission to DFO by May 30th of the following year, with an integrated report prepared following the first three years of monitoring and then subsequent reports prepared at year five and ten (Table 5.1).

6 COSTS

Costs have been developed for each component/phase of the project which include construction, dewatering and fish salvages, implementing mitigation measures (planting and biological transplants) and monitoring (including during and post-construction) broken down by phase and Section 35 versus Schedule 2 activities. It is anticipated that the construction phase of the project will commence in the summer months and continue for approximately three years (see Section 4.1 for more details). Specifically, construction costs[7] include construction (i.e., all new habitat and installation of culverts), fish salvage and dewatering, planting and biological transplants, and monitoring during and post-construction (Tables 6.1 and 6.2). Costs associated with implementing mitigations measures include fish salvages preconstruction (see Section 4.3), monitoring during construction (see Section 4.4), and vegetation and benthic invertebrate transplants, as well as fish relocations, post-construction (see Section 4.7) in the constructed habitat to reduce lag times. Lastly, post-construction monitoring will evaluate the habitat constructed and is proposed to occur annually for the first three years and at year 5 and 10 (see Section 5). Total estimated costs (± 30%; excluding taxes) associated with the project have been summarized in Table 6.1 for Section 35 activities and Table 6.2 for Schedule 2 activities.

[7] Based on IFC design drawings.

Table 6.1: Summary of Construction, Fish Salvage, Dewatering, Biological Transplants, and Monitoring Costs Under Section 35 for the Côté Gold Project

Activity	Location	Description	Estimate Cost (± 30%)						Total Cost (± 30%)
			Phase 1	Phase 2	Phase 3	Operations			
			First Year of Construction	Second Year of Construction	Third Year of Construction	Years 1-3 Post-Construction	Year 5 Post-Construction	Year 10 Post-Construction	
Construction	WRC1	Excavate & install features, riparian vegetation in the extension of Clam Lake	$382,413	-	-	-	-	-	$382,413
		Installation of Culverts	$990,000	-	-	-	-	-	$990,000
	WRC2	Excavate & install features, riparian vegetation planting	$3,387,262	-	-	-	-	-	$3,387,262
	New Lake	North Dam Diversion Ditch	$255,000	-	-	-	-	-	$255,000
		North Dam	$2,633,000	-	-	-	-	-	$2,633,000
		South Dam	$1,318,000	-	-	-	-	-	$1,318,000
		Excavation & install features	$3,699,000	-	-	-	-	-	$3,699,000
		WRC2 Bypass (Water Diversion)	$450,000	-	-	-	-	-	$450,000
	Mollie River Road Crossing	Install culverts for access & haul roads	$2,778,000	-	-	-	-	-	$2,778,000
	Unnamed Pond Outlet	Excavate & install features, riparian vegetation planting	$842,992	-	-	-	-	-	$842,992
	Aggregate Pit #3 Remediation & Connection to Middle Three Duck Lake	Excavate & install features, riparian vegetation planting	-	$6,330,675	-	-	-	-	$6,330,675
	Aggregate Pit (Bagsverd) Remediation & Connection to Bagsverd Creek	Excavate & install features, riparian vegetation planting	-	$9,332,429	-	-	-	-	$9,332,429
Fish Salvage	East Clam Lake & Clam Creek	Fish capture, transport, & release to appropriate relocation areas as described in Table 4.3	$150,000	-	-	-	-	-	$150,000
	Clam Lake		$70,000	-	-	-	-	-	$70,000
	West Beaver Pond & Outlet to TMF Seepage East Dam		$100,000	-	-	-	-	-	$100,000
	Unnamed Pond Outlet		$10,000	-	-	-	-	-	$10,000
	East Beaver Pond Outlet		$8,000	-	-	-	-	-	$8,000
	Mollie River (within New Lake & Open Pit footprint)		$650,000	-	-	-	-	-	$650,000
	North Beaver Pond		-	$10,000					$10,000
	Côté Lake		-	$40,000	$210,000	-	-	-	$250,000
	West Arm of Upper Three Duck Lake		-	$45,000	$600,000	-	-	-	$645,000
Dewatering[a]	Clam Lake, East Clam Lake, West Beaver Pond, Mollie River & Tributaries	Staged dewatering in coordination with fish salvage	$3,005,000	-	-	-	-	-	$3,005,000
	North Beaver Pond & East Beaver Pond		-	$10,000	-	-	-	-	$10,000
	Côté Lake & West Arm of Upper Three Duck Lake		-	-	$373,000	-	-	-	$373,000
Planting and Biological Transplants	WRC1 (lake extension) & WRC2 New Lake Unnamed Pond Outlet Aggregate Pit #3 Remediation & connection to Middle Three Duck Lake Bagsverd Aggregate Pit Remediation & connection to watershed	Aquatic vegetation planting & biological transfers (benthic invertebrates and fish)	-	$150,000	$75,000	-	-	-	$225,000
Monitoring	WRC1 (lake extension) & WRC2	Construction Monitoring (e.g., TSS, erosion, entrainment, entrapment, impingement)	$100,000	$50,000	$50,000	-	-	-	$200,000
	New Lake	Geomorphology & Stability	-	$100,000	$80,000	$255,000	$85,000	$85,000	$605,000
	Unnamed Pond Outlet Aggregate Pit #3 Remediation & connection to Middle Three Duck Lake Bagsverd Aggregate Pit Remediation & connection to watershed	Fish & Fish Habitat Monitoring (Habitat Structure, Aquatic Vegetation Growth, Benthic Invertebrate Community Composition, Fish Utilization, Abundance, Community Structure & Health)	-	-	$100,000	$300,000	$100,000	$100,000	$600,000
		TOTAL	**$20,828,667**	**$16,068,104**	**$1,488,000**	**$555,000**	**$185,000**	**$185,000**	**$39,309,771**

Notes: WRC = Water Realignment Channel, TMF= Tailings Management Facility, TSS = Total Suspended Solids
[a] Includes cost of water barriers and fuel.

Table 6.2: Summary of Construction, Fish Salvage, Dewatering, Biological Transplants, and Monitoring Costs Under Schedule 2 for the Côté Gold Project

Activity	Location	Description	Estimate Cost (± 30%)						Total Cost (± 30%)
			Phase 1	Phase 2	Phase 3	Operations			
			First Year of Construction	Second Year of Construction	Third Year of Construction	Years 1-3 Post-Construction	Year 5 Post-Construction	Year 10 Post-Construction	
Construction	WRC1 (stream habitat)	Excavate & install features, riparian vegetation planting	$382,413	-	-	-	-	-	**$382,413**
		WRC1 Bypass (Water Diversion)	$700,000	-	-	-	-	-	**$700,000**
	Reconnection of Weeduck Lake & Upper Three Duck Lake	Excavate & install features, riparian vegetation planting	$112,481	-	-	-	-	-	**$112,481**
	Channel between Little Clam Lake & East Clam Lake	Excavate & install features, riparian vegetation planting	-	$133,199	-	-	-	-	**$133,199**
	Reconnection of East Clam Lake & Clam Lake	Excavate & install features, riparian vegetation planting	$57,956	-	-	-	-	-	**$57,956**
Fish Salvage	Unnamed Waterbodies #1-6 & associated tributaries	Fish capture, transport, & release to appropriate relocation areas as described in Table 4.3	-	$100,000	-	-	-	-	**$100,000**
	East Beaver Pond		-	$20,000					**$20,000**
Dewatering[a]	Unnamed Waterbodies #1-6 & associated tributaries	Staged dewatering in coordination with fish salvage	-	$566,000	-	-	-	-	**$566,000**
	East Beaver Pond		-	$10,000	-	-	-	-	**$10,000**
Planting and Biological Transplants	WRC1 Reconnection of Weeduck Lake & Upper Three Duck Lake Channel between Little Clam Lake & East Clam Lake Reconnection of East Clam Lake & Clam Lake	Aquatic vegetation planting & biological transfers (benthic invertebrates and fish)	-	$20,000	$10,000	-	-	-	**$30,000**
Monitoring	WRC1 Reconnection of Weeduck Lake & Upper Three Duck Lake Connecting Channel between Little Clam Lake & East Clam Lake Connecting East Clam Lake & Clam Lake	Construction Monitoring (e.g., TSS, erosion, entrainment, entrapment, impingement)	$50,000	$15,000	-	-	-	-	**$65,000**
		Geomorphology & Stability	-	$25,000	$20,000	$45,000	$15,000	$15,000	**$120,000**
		Fish & Fish Habitat Monitoring (Habitat Structure, Aquatic Vegetation Growth, Benthic Invertebrate Community Composition, Fish Utilization, Abundance, Community Structure & Health)	-	-	$30,000	$100,000	$20,000	$20,000	**$170,000**
		TOTAL	**$1,302,850**	**$889,199**	**$60,000**	**$145,000**	**$35,000**	**$35,000**	**$2,467,049**

Notes: WRC = Water Realignment Channel, TMF= Tailings Management Facility, TSS = Total Suspended Solids; West Beaver Pond outlet and Unnamed Lake #3 tributaryare not included in the table as they will be fished out during operations.

[a] Includes cost of water barriers and fuel.

7 REFERENCES

Adamowicz, S. 2020. Associate Professor. Director, Bioinformatics Graduate Program, Department of Integrative Biology, University of Guelph. Email conversation with Kim Connors (Minnow). March 16, 2020.

AMEC (AMEC Americas Limited Earth & Environmental Division). 2011. Phase II Baseline Aquatics Report Chester Project. Chester Township, District of Sudbury, Ontario. Prepared for Trelawney Mining and Exploration Inc., July 2011.

Borja, A., Franco, J. and Pérez, V. 2000. A marine biotic index to establish the ecological quality of soft-bottom benthos within European estuarine and coastal environments. Mar Pollut Bull. 40: 1100–1114. DOI: https://doi.org/10.1016/S0025-326X(00)00061-8

Coker, G.A., Portt, C.B., and Minns, C.K. 2001. Morphological and Ecological Characteristics of Canadian Freshwater Fishes. Canadian Manuscript Report of Fisheries and Aquatic Sciences. 2554: iv+89p.

Connors, K., Russel, C., and Munnoch, K. 2011. Moving a small boreal lake – what is involved? Application of a whole lake compensation plan under the Federal Fisheries Act. Poster at 2011 Canadian Conference for Fisheries Research.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2019. Canadian Wildlife Species at Risk. https://species-registry.canada.ca Accessed on February 12, 2020.

Craig, J.F. 1996. Pike. Biology and Exploitation. Chapman and Hall. London, England.

Dodge, D.P., Tilt, J.C., MacRitchie, I., Goodchild, G.A. and Waldriff D.G. 1989. Manual of Instructions: Aquatic Habitat Inventory Surveys. 9th Edition. Ontario Ministry of Natural Resources, Fisheries Branch. Official Procedural Manual Policy Fl. 2.03.01.

EC (Environment Canada). 2006. Planting the Seed: A guide to Establishing Aquatic Plants– Canadian Wildlife Service Ontario. http://www.on.ec.gc.ca/wildlife/docs/doc-planting-e.html. Retrieved on March 27, 2006.

EC 2012. Metal Mining Environmental Effects Monitoring Technical Guidance Document. Environmental Canada National Environmental Effects Monitoring Office. June 2012.

EC 2014. Laboratory methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples. Canadian Aquatic Biomonitoring Network (CABIN). May 2014.

Edwards, E.A., Gebhart, G., and Maughan, O.E. 1983. Habitat Suitability Information :Smallmouth Bass, U.S. Fish and Wildlife Service, Department of the Interior, FWS/OBS-82/10.36. 47 pp.

Elbrecht, V., Vamos, E. E., Meissner, K., Aroviita, J., and Leese, F. 2017. Assessing strengths and weaknesses of DNA metabarcoding-based macroinvertebrate identification for routine stream monitoring. Methods Ecol Evol. 8: 1265-1275. DOI: https://doi.org/10.1111/2041-210x.12789

Fisheries and Oceans Canada. 2013. Fisheries Productivity Investment Policy: A Proponents Guide to Offsetting, November 2013. Ecosystems Programs Policy, Fisheries and Oceans Canada, Ottawa, Ontario Catalogue Number: Fs23-596/2013E-PDF ISBN:978-1-100-22930-0

Fisheries and Oceans Canada. 2016. Measures to avoid causing harm to fish and fish habitat including aquatic species at risk. http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html

GeoProcess (GeoProcess Research Associates). 2019a. Côté Gold Watercourse Realignments: Fluvial Geomorphology and Natural Channel Design. Prepared for IAMGOLD Corporations. February 2019.

GeoProcess. 2019b. Offsetting Habitat Features Côté Gold Project. August 2019.

GeoProcess. 2019c. Chester Lake Culvert Crossing – Channel Design Côté Gold Project. February 2019.

Holmes, E., Mandrak, N.E., and Burridge, M.E. 2010. The ROM Field Guide to Freshwater Fishes of Ontario. Royal Ontario Museum, Toronto, Ontario.

Hotchkiss, RH., and Frei, C. 2007. Design for Fish Passage at Roadway-Stream Crossings: Synthesis Report. U.S. Department of Transportation. Federal Highway Administration, FHWA-HIF-07-033. 280 pp.

IAMGOLD (IAMGOLD Corporation). 2015. Côté Gold Project Amended Environmental Impact Statement / Final Environmental Assessment Report

IAMGOLD 2018. Environmental Effects Review Report for the Côté Gold Project Chester and Yeo Townships, Ontario. September 2018.

IAMGOLD 2020. Migratory Bird Protection Management Plan (100264-000-AA00-PLN-0516) Revised on March 6, 2020.

Inskip, P.D. 1982. Habitat suitability index models: northern pike. U.S. Dept. Int., Fish Wildlife Service FWS/OBS-82/10.17. 40 pp.

Jackson, D.A., Peres-Neto, P.R. and Olden, J.D. 2001. What controls who is where in freshwater fish communities the roles of biotic, abiotic, and spatial factors. Canadian Journal of Fisheries and Aquatic Sciences, 58(1), pp.157-170.

Kilgour, B.W., Somers K.M., and Barton D.R. 2004. A comparison of the sensitivity of stream benthic community indices to effects associated with mines, pulp and paper mills, and urbanization. Environmental Toxicology and Chemistry 23:212-221.

Krieger, D.A., Terrell, J.W. and Nelson, P.C. 1983. Habitat Suitability Information: Yellow Perch. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.55. December 1983.

Kozarek, J., Hatch, J., and Mosey, B. 2017. Culvert Length and Interior Lighting Impacts to Topeka Shiner Passage. Minnesota Department of Transportation, Minnesota. 94 pp.

Lobo, J., Shokralla, S., Costa, M. H., Hajibabaei, M., and Costa, F. O. 2017. DNA Metabarcoding For High-Throughput Monitoring of Estuarine Macrobenthic Communities. bioRxiv. DOI: https://doi.org/10.1101/117168

McMahon, T.E., Terrell, J.W., and Nelson, P.C. 1984. Habitat suitability information: Walleye. U.S. Fish and Wildlife Service FWS/OBS-82/10.56. 43 pp.

Minnow (Minnow Environmental Inc.). 2006. Agrium Kapuskasing Phosphate Operations Cargill Lake Relocation Summary Report. December 2006.

Minnow 2013. Lake Pitama Monitoring 2010-2012. Prepared for Agrium Kapuskasing Phosphate Operations. May 2013.

Minnow 2014. Côté Gold Aquatic Baseline Report. Prepared for IAMGOLD Corporation. March 2014.

Minnow 2017a. Côté 2016 Aquatic Baseline Data Report. Prepared for IAMGOLD Corporation. January 2017.

Minnow 2017b. Interpretive Aquatic Monitoring Report 2013 to 2016. Prepared for Agrium Kapuskasing Phosphate Operations. May 2017.

Minnow 2018. Soil Removal for the Mitigation of Methyl Mercury Formation. Prepared for IAMGOLD Corporation. November 2018.

Minns C.K. 2006. Effectiveness of Fish Habitat Compensation in Canada in Achieving No Net Loss. Environmental Management. March 2006 Vol. 37, Issue 3, pp 351-366

Munnoch, K., S. Renaud, and K. Connors 2011. The Development of a Pit Lake at Agrium Kapuskasing Phosphate Operations (KPO), Oral Presentation at 2011 International Conference on Mine Closure.

Porvari, P. and Verta, M. 1995, Methylmercury production in flooded soils: a laboratory study. Water, Air, and Soil Pollution. 80: 765-773.

Primrose, R. 2019. Principal, Woodland Heritage Services Ltd. Email Conversation with Kim Connors (Minnow), February 2019.

Randall R.G., Minns,C.K., Cairns, V.W., and Moore, J.E. 1996. The Relationship between an Index of Fish Production and Submerged Macrophytes and other Habitat Features at Three Littoral Areas in the Great Lakes. Canadian Journal of Fisheries and Aquatic Science 53 (Suppl.1):35-44.

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada, 191, pp.1-382.

Scott, W.B. and Crossman, E.J. 1998. Freshwater Fishes of Canada. Galt House Publications, Oakville, Ontario.

Terrell, J.W., T.E. McMahon, P.D. Inskip, R.F. Raleigh, and K.L. Williamson. 1982. Habitat suitability index models: Appendix A. Guidelines for riverine and lacustrine applications of fish HSI models with the Habitat Evaluation Procedures: U.S. Fish and Wildlife Service Biological Report 82(10.A). 54 pp.

Twomey, K.A., K.L. Williamson and P.C. Nelson. 1984. Habitat Suitability Index Models and Instream Flow Suitability Curves: White Sucker. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.64. September 1984.

US Fish and Wildlife Service. 1981. 103 ESM Standards for the Development of habitat Suitability index Models. Division of Ecological Services U.S. Fish and Wildlife Service Department of the Interior Washington, D.C.

Wetzel, R.G. 2001. Limnology: Lake and River Ecosystems. Academic Press. San Diego.

Wood Environmental & Infrastructure Solutions (Wood) 2020. Côté Gold Project Unnamed Pond Seepage and Water Balance Analysis. January 2020.

APPENDIX A
HABITAT SUITABILITY

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A1 HABITAT SUITIBILITY INDICES

A1.1 Introduction

The fish communities within stream and lake habitats of the study area were generally dominated by northern pike (*Esox lucius*) and yellow perch (*Perca flavenscens*). Walleye (*Sander vitreus*), white sucker (*Catostomus commersonii*), and lake whitefish (*Coregonus clupeaformis*) were also common and varied in abundance depending on habitat. Smallmouth bass (*Micropterus dolomieu*) and burbot (*Lota lota*) were only present in low abundance in a few lakes. In addition to these species, fifteen small-bodied species were also identified (Table A.1). Based on the existing fish community composition, the habitat assessment was conducted for five key large-bodied fish (northern pike, yellow perch, lake whitefish, walleye, and smallmouth bass) and small-bodied fish species (in areas where only small-bodied fish were observed).

Fish habitat was evaluated based on the quality of spawning and incubation, rearing (juvenile), foraging (juvenile/adult), and overwintering habitat available. It is assumed that these species requirements should cover the gamut of habitat required for the remaining fish community within the affected area. Habitat requirements for each life stage of each large-bodied species are described in detail in the following sections. Burbot and white sucker were included in the summaries to demonstrate the overlap in habitat requirements of other large-bodied fish species. The availability of these habitat requirements within a waterbody has been ranked for each combination based on a scale from 1 (excellent) to 0 (no available habitat), for which the available habitat within the study area lakes and streams could be evaluated. These classifications/rankings are presented in Table A.2 for each large-bodied species evaluated.

A1.2 Burbot

Burbot are a widely distributed fish species in Canada; their range extends west from New Brunswick to central and eastern British Columbia and north to the continental portion of the Northwest Territories, Yukon, and Nunavut (Scott and Crossman 1998).

Burbot spawn in lakes (Boag 1989), rivers (Johnson 1981, Paragamian 2000), and streams (Arndt and Hutchinson 2000) between January and March, depending on latitude. In lakes, spawning usually occurs under ice cover in near-shore shallows (1.5-10 m deep; Johnson 1981, Boag 1989) or over shallow off-shore reefs and shoals (McCrimmon 1959). Preferred spawning substrate is usually gravel, cobbles, and sometimes sand, and that is relatively free of silt (Boag 1989). In rivers, burbot spawn in low velocity areas in main channels (Breeser et al. 1988) and in side channels behind deposition bars (Sorokin 1971). The preferred substrate in rivers is fine gravel or sand. Male burbot arrive on the spawning grounds first, followed in three or four days by the females; there is no nest preparation and most spawning activity takes place at night (Scott and Crossman 1998). Surface water temperature during the spawning period is usually 0.6^{o}C to 1.7^{o}C. Burbot eggs are small (1.3 to 1.8 mm) and are broadcast randomly in the water column well above the substrate (Fabricius 1954). Eggs are semi-buoyant when first spawned, then become demersal.

Embryos typically hatch in 30 days at 6^{o}C, however depending on latitude the larvae appear from late February to June. In the Great Lakes, young-of-the-year (YOY) undergo a diel vertical migration (Oyadomari and Auer 2004), presumably to avoid predation, to pursue migrating prey, and/or for energetic optimization (Donner and Eckmann 2011). Young-of-the-year are initially pelagic; they settle to the bottom at about 68 days, then migrate along the profundal zone toward shore, where they presumably stay (Fischer 1999, Hofman and Fischer 2001), sheltering under stones and debris in shallow bays and along rocky shores during the day and then foraging at night (Boag 1989). In rivers and streams, YOY burbot also shelter in weed beds, under rocks, debris, and undercut banks during the day (Hanson and Qadri 1980). Sub-adult burbot occupy essentially the same habitat as YOY: shallow littoral environments with rocks, weeds, or debris as cover (McPhail and Paragamian 2000). Young burbot continue to inhabit shallow lake waters but eventually move to deeper water during the summer to take advantage of cooler temperatures.

In central and southern Canada, adult burbot are typically found in deep waters of lakes where they are restricted to the hypolimnion in summer and co-occur with lake trout, whitefishes, and sculpins; in northern Canada they are also present in large, cool rivers. The optimal temperature range for adult rearing is 15.6^{o}C to 18.3^{o}C with an upper limit of approximately 23.0^{o}C (Scott and Crossman 1998). Burbot may move from deep to shallower water at night during the summer months. In the north, summer habitat is often in the river channels of lakes (Scott and Crossman 1998). In lakes, small burbot feed primarily on benthic invertebrates but at lengths greater than 500 mm burbot feed almost exclusively on other species of fish including ciscoes, walleye, yellow perch, alewife, smelts, sculpins, trout-perch, and sticklebacks (Scott and Crossman 1998).

Although information on optimal criteria for dissolved oxygen in burbot habitat is scarce, levels in excess of 6 mg/L are likely preferred for overwintering.

A1.3 Lake Whitefish

Lake whitefish are a cool water species (Scott and Crossman 1998). Spawning usually takes place in lakes in late fall, September to December depending on latitude, at water temperatures of less than 8 °C (Bradbury et al. 1999, Bégout Aras et al. 1999, Scott and Crossman 1998). Lake whitefish are littoral spawners; spawning usually occurs in shallow water at depths of less than 7.6 m, but can occur at depths up to 30 m in larger lakes (Bradbury et al. 1999, Scott and Crossman 1998). Typically, eggs are broadcast at depths ranging from 2 to 4.5 m (Bégout Anras et al. 1999). Preferred spawning substrate is a hard or stoney bottom usually composed of gravel, cobble, flat stones, or boulder but spawning may occasionally occur over sand (Bradbury et al. 1999, Bégout Anras et al. 1999, Scott and Crossman 1998). Lake whitefish have been observed spawning in rivers over gravel or rubble substrates at depths less than one meter (Bradbury et al. 1999, McPhail 2007). Site fidelity has been observed for lake whitefish towards specific substratum and slope characteristics, and low fidelity toward geographical location (Bégout Anras et al. 1999). Mud bottoms are generally avoided by both lake and river spawners (Bradbury et al. 1999).

Eggs will remain on the spawning substrate for four to six months and typically hatch from April to May. Once hatched, fish will remain within the general vicinity of the spawning area (Scott and Crossman 1998, Bégout Anras et al. 1999). Young-of-the-year are generally found over gravel, cobble, or boulder substrate and typically remain in these shallow inshore areas until water temperatures increase (Bégout Anras et al. 1999, Scott and Crossman 1998). They can be associated with emergent vegetation, often within 1 m of shore (McPhail 2007). Juvenile lake whitefish occupy similar habitat to those used by adults, however they are tolerant of higher temperatures (15.5 to 19.5 °C), and therefore can be found in the summer in shallower waters compared to adults (McPhail 2007). By late fall, juveniles begin to move into deeper water as the adults migrate to shallower water to spawn (McPhail 2007).

Adult lake whitefish are bottom feeders consuming a wide variety of bottom-living invertebrates and small fishes (Scott and Crossman 1998). They descend into cooler waters of the hypolimnion during summer months if thermal stratification exists. Preferred temperature range is from about 8 to 14 °C, although they can tolerate ranges from near 0 to 22 °C (McPhail 2007). Outside of the spawning period, adults show no preference for substrate type (Bégout Anras et al. 1999). During spring both juveniles and adults leave deeper water and move into shallower water, returning to deeper, cooler depths as summer water temperatures increase (Scott and Crossman 1998, Bégout Anras et al. 1999).

A1.4 Northern Pike

Northern pike are large piscivores that are important in “top–down” predatory regulation of the fish community and can tolerate a wide range of environmental conditions (Casselman and Lewis 1996). Their occurrence over a broad latitudinal belt (e.g., from Great Bear Lake in the Northwest Territories to Lake Mendota in southern Wisconsin) demonstrates their adaptability to a variety of thermal regimes (Inskip 1982). Optimal conditions include cool-water, shallow (less than 12 m), productive, mesotrophic to eutrophic environments (Casselman and Lewis 1996).

Northern pike are spring spawners with spawning taking place shortly after the ice melts when water temperatures reach 8 to 12 °C (Casselman and Lewis 1996, Inskip 1982). Pre-spawning movements are typically triggered by warming water and movement of ice from the shoreline. Both lake and river populations of northern pike can migrate up tributaries to flooded marshes, wetlands, or shallow pools (Inskip 1982). Spawning occurs over vegetation in areas of calm, shallow water (Inskip 1982). Optimal substrate for spawning includes flooded vegetation, with preference for grasses and sedges, but other vegetation is also used (Casselman and Lewis 1996). The substrate should be adequate to trap eggs and suspend them above the bottom sediment where anoxic conditions can develop (Casselman and Lewis 1996). Eggs are broadcast and adhere to vegetation and typically hatch in 12 to 14 days at adequate water temperatures (Scott and Crossman 1998). Once hatched, alevins remain within the vegetation, feeding on the stored yolk (Scott and Crossman 1998). Northern pike embryos are sensitive to heavy siltation caused by excessive wave action and/or currents (Casselman and Lewis 1996).

Young-of-the-year northern pike grow rapidly and increase in size and activity, therefore their physical habitat needs change, and as they grow their preferred depth range increases (Casselman and Lewis 1996). They are usually found in moderately dense vegetation, and prefer submerged vegetation with some emergent and floating vegetation (Casselman and Lewis 1996). In late summer and early fall, YOY use a wider range of depths (approximately 10 cm in depth for every 10 mm of body length until 150 mm in length; Casselman and Lewis 1996).

Typically, adult northern pike inhabit water shallower than 4 m, are within 300 m of shore, and frequently associate with vegetation (Inskip 1982). They are rarely found at depths greater than 10 m and rarely venture below the thermocline (Inskip 1982). Northern pike populations typically require a minimum of 30% vegetative cover, and are generally most abundant when vegetation is moderately dense (31 to 70%; Casselman and Lewis 1996). In winter, northern pike will tend to occupy deeper habitats as ice cover and decaying vegetation deplete dissolved oxygen in the nearshore habitat (Casselman and Lewis 1996).

Dissolved oxygen concentrations are usually the most important variable affecting overwintering survival (Inskip 1982). Northern pike are more tolerant of low dissolved oxygen conditions during the winter than are many other species (Inskip 1982). They are able to tolerate concentrations as low as 0.1 to 0.4 mg/L for at least several days, and over longer term periods, concentrations greater than 1.5 mg/L are required for survival (Inskip 1982).

Northern pike are not adapted for strong currents, and therefore, throughout their range occur more frequently in lakes than in rivers (Inskip 1982). In rivers, they will inhabit backwater and pools, and avoid channelized reaches and currents greater than 1.5 m/s (Inskip 1982). Currents stronger than this can block spawning migrations (Inskip 1982).

A1.5 Smallmouth Bass

Originally, smallmouth bass were limited to the Great Lakes-St. Lawrence system in Canada, however, since this species has been widely introduced outside its original range, it now occurs from Nova Scotia to central Saskatchewan (Scott and Crossman 1998, Edwards et al. 1983). It is also found in eastern British Columbia and Vancouver Island as a result of invasion from introductions in Washington State (Scott and Crossman 1998).

Bass are primarily a lake fish, but they can also inhabit rivers. They prefer large, mesotrophic, clean and clear lakes (greater than 40.5 ha) with an average depth of over 9 m with rocky shoals and wide rivers or streams (greater than 10.5 m wide; Edwards et al. 1983). Optimal river habitat includes cool and clear water, with moderate current and composed of greater than 50% pool habitat (Brown et al. 2009b, Edwards et al. 1983). Shade and cover should be abundant with substrate composition comprised of gravel and larger material (Brown et al. 2009b).

In northern areas, smallmouth bass spawn as late as June or July, and the eggs hatch after 4 to 10 days at appropriate temperatures (13 to 25 °C; Edwards et al. 1983, Scott and Crossman 1998). They typically spawn over a period of 6 to 10 days (Scott and Crossman 1998). Nest construction is conducted by the males and nests can be found at 0.61 to 6.1 m, although rarely at depths greater than 3 m. Smallmouth bass spawn on sand, gravel, or rocky bottoms of lakes or rivers, usually near the protection of rocks or large woody debris (Scott and Crossman 1998, Edwards et al. 1983, Brown et al. 2009b). Optimal substrate size is considered to be 30 mm (Clark et al. 1998). Nests can typically be found in protected areas of lakes, such as coves, bays, and shorelines where water warms the earliest in the spring (Brown et al. 2009b). Optimal spawning temperature ranges from 12.8 to 21 °C (Brown et al. 2009b, Scott and Crossman 1998). The male will guard the nest and the young for approximately two weeks after they hatch and before they disperse (Scott and Crossman 1998, Brown et al. 2009b).

In river habitat, fingerling bass are abundant in isolated pools, sloughs, and shallow still-water areas along banks, whereas juveniles can be found under larger substrate or shallow water

(Brown et al. 2009b). In lakes, juveniles spend most of their time in quiet water near cover, such as brush or rocks (Edwards et al. 1983). Young bass have a schooling tendency (Brown et al. 2009b).

Bass seek protection from light at all stages (Edwards et al. 1983) and will seek cover under angular bedrock crevices, or under banks or pools in rivers and deep water in lakes (Brown et al. 2009b). Adult bass will use all forms of submerged cover (e.g., rocks, stumps, root-masses, trees, boulders, and crevices) without any apparent preference (Edwards et al. 1983). In the summer, they will occupy the warm epilimnetic waters of shallow lakes (Brown et al. 2009b). In rivers, bass movements may be more restricted and they appear to respect stream riffles as boundaries (Brown et al. 2009b). When water temperatures dip to 15 to 20 °C in the fall, adults seek deeper water, and when temperatures reach 10 °C they become inactive and cease eating (Scott and Crossman 1998, Edwards et al. 1983). Lakes should be at least 3 to 15 m deep to support over-wintering bass (Brown et al. 2009b).

Optimal dissolved oxygen levels for smallmouth bass vary by life stage. Dissolved oxygen requirements for eggs require levels to be at or greater than 7 mg/L, embryo/larvae development requires greater than 6.5 mg/L and normal activities require greater than 6 mg/L (Brown et al. 2009b, Edwards et al. 1983). Smallmouth bass can tolerate periodic turbidity, however, excessive turbidity and siltation will reduce populations (Edwards et al. 1983).

Water temperature is one of the most important environmental variables to affect smallmouth bass (Edwards et al. 1983). It influences range and distribution, migration, spawning, nest guarding behaviour, success of incubation, growth rate, and winter survival (Brown el al. 2009b, Edwards et al. 1983). Optimal range for adult rearing is 21 to 27 °C, with an upper limit of 32 °C (Brown et al. 2009b). Water temperatures must be sufficient for adequate growth of YOY for winter survival (Brown et al. 2009b). Therefore, the northern distribution of smallmouth bass is limited by temperature, as the size of fish in autumn is correlated with their over-winter survival and length of starvation period (Brown et al. 2009b).

A1.6 Walleye

Walleye are a highly successful species inhabiting a wide range of latitudes and habitat conditions including rivers, lakes, lake-river networks, and reservoirs. Walleye have evolved physiology and behaviour to efficiently utilize low light, turbidity, and nocturnal conditions, allowing them to effectively partition habitat with most other co-occurring species (Kelso 1978). They are most abundant in moderate-to-large mesotrophic lacustrine (greater than 100 ha) or riverine systems, or smaller oligotrophic lacustrine or riverine systems characterized by cool water temperatures, shallow to moderate depths, extensive littoral areas and moderate turbidities (1 to 2 m secchi disc; Scott and Crossman 1998, McMahon et al. 1984).

Spawning occurs in the spring, shortly after ice break-up in a lake, at water temperatures of 6.7 to 8.9°C (Scott and Crossman 1998), with most spawning occurring in the range of 6 to 11°C (McMahon et al. 1984). Spawning grounds are rocky areas in white water, riffles below impassable falls and dams in rivers, or boulder to coarse-gravel shoreline areas or shoals of lakes with good water circulation from currents or wave action (McMahon et al. 1984, Scott and Crossman 1998). Spawning water depth can range from 0.2 to 2 m (Bozek et al. 2011) or greater (up to 6 m; McPhail 2007). In rivers, preferred water velocities typically range from 0.40 to 1.5 m/s (Bozek et al. 2011, McPhail 2007). Walleye can also successfully spawn in lakes, reservoirs, and even wetland-marsh environments to take advantage of local environments (Bozek et al. 2011). In lake systems, walleye can spawn along gravel and cobble shorelines, on point bars or reefs or over dense mats of vegetation with adequate water circulation (Bozek et al. 2011, McMahon et al. 1984). Spawning takes place at night with eggs broadcast over substrate (Scott and Crossman 1998). Eggs hatch in 12 to 18 days, the yolk sac is absorbed quickly and young disperse into the upper levels of open water within 10 to 15 days of hatching (Scott and Crossman 1998). In river systems, larvae are passively transported downstream to river mouths and nearshore areas where they begin feeding on zooplankton (Jones et al. 2003).

Young-of-the-year walleye ultimately become demersal and piscivorous and the timing of when this occurs varies by water body (Pratt and Fox 2001). Pratt and Fox (2001) observed YOY walleye were located primarily at heavily vegetated areas 2 to 5 m in depth and were rarely found in habitats that provided little or no cover. As YOY grew, they moved to shallow, low cover habitat where high densities of prey existed, and remained there well into October (Pratt and Fox 2001). Other studies have found YOY at depths of up to 10 m by the fall (Raney and Lachner 1942).

Juvenile and adult walleye often form schools and will remain in deeper or darker water or cover during daytime hours (Bozek et al. 2011). It has been assumed that habitat selection of other environmental features for juvenile walleye probably matches that of adults (Ryder 1977).

Adult movements and habitat use are driven by the fact they are sensitive to light intensities. Lakes with optimum transparencies (1 to 2 m secchi depth) will allow walleye to feed intermittently throughout the day, whereas, in clear lakes, feeding is restricted to twilight or dark periods (McMahon et al. 1984, Scott and Crossman 1998). Walleye will often be associated with sunken trees, boulder shoals, weed beds, or thicker layers of ice to avoid bright light (Scott and Crossman 1998). Optimal vegetation cover was found to be around 25-45%

(McMahon et al. 1984). However, other populations do well without any vegetation (Bozek et al. 2011). Larger fish have been associated with greater depths (McMahon et al. 1984).

Optimal dissolved oxygen concentrations for walleye are 5 to 6 mg/L, however they prefer levels above 5 mg/L (Bozek et al. 2011, McMahon et al. 1984). They can survive extended periods at 3 mg/L and can tolerate lower oxygen concentrations for short periods of time (Barton and Taylor 1996, McMahon et al. 1984). Optimal thermal tolerance for walleye range between 20 to 24 °C and the upper lethal limit is 29.7 ° (Barton and Taylor 1996, McMahon et al. 1984).

A1.7 White Sucker

White sucker is a highly adaptable and widely distributed freshwater fish species in Canada; they are found west from Nova Scotia to north-central British Columbia and north into southeastern Yukon and across the Northwest Territories (Scott and Crossman 1998).

White suckers spawn in the spring, usually from early May to early June. Adults usually migrate from lakes into streams when the daily maximum water temperature reaches 10^{o}C (Geen et al. 1966) and continue until temperatures reach approximately 18^{o}C (Olson 1963); white suckers are also known to spawn on lake margins, or quiet areas in the mouths of blocked streams. Spawning occurs in relatively swift, shallow water (15 to 30 cm in depth; Nelson 1968, Fuiman 1978, Curry 1979) with a gravel substrate (Dence 1948). Water velocities reported during spawning range from 0.14 m/s to 0.9 m/s but velocities between 0.3 and 0.6 m/s appear to be preferred (Nelson 1968, Symons 1976, Curry 1979). No nest is built; the fertilized eggs adhere to the gravel in riffles or drift downstream where they adhere to the substrate in slow water areas (Geen et al. 1966).

White sucker embryos hatch in about two weeks. Embryo development is temperature dependent; eggs have been collected in streams with water temperatures ranging from 11 to 16^{o}C. In one study, maximum hatching success occurred at 15^{o}C with lower and upper lethal limits of 6^{o}C and 24^{o}C, respectively (McCormick et al. 1977). Young-of-the-year remain in the gravel for one to two weeks and start to migrate to the lake about a month after spawning begins (Scott and Crossman 1998). High densities of YOY have been reported in streams and in shoreline areas of lakes with sand and sand/gravel substrate combinations. White sucker larvae appear to prefer water temperatures of 23 to 25^{o}C but occur in water temperatures from 13 to 25^{o}C (Marcy 1976). White sucker YOY prefer moderate currents and do not generally occur in rapids or still pools (Stewart 1926).

Adult white suckers prefer warm, shallow lakes or bays, and tributary rivers of larger lakes. In lakes, they are usually taken from the top six to nine meters. In streams, adults primarily inhabit pools which provide cover (Propst 1982) and are common in areas of slow to moderate velocity (approximately 0.4 m/s). White suckers have broad temperature tolerances, but experimental evidence has suggested an optimum summer water temperature of 24°C (Reynolds and Casterlin 1978) with a critical thermal maximum in the range of 31°C (Reutters and Herdendorf 1976). White suckers are moderately active during the daytime, but active feeding is usually restricted to near sunrise and sunset when they move into shallower water. Juvenile and adult white sucker are bottom feeders, however fry feed near the surface on suspended phytoplankton or zooplankton (e.g., copepods, cladocerans; Siefert 1972). After yolk absorption, the mouth moves from a terminal to a ventral position, and there is a shift to bottom feeding (Siefert 1972). The type of invertebrate food consumed shifts with increasing size and season.

White suckers have been found to avoid areas where the dissolved oxygen was 2.4 mg/L or less (Dence 1948); embryo mortality occurred at dissolved oxygen levels of 1.2 mg/L and less and YOY growth was reduced at less than 2.5 mg/L. Dissolved oxygen levels greater than 6.0 mg/L are generally considered optimum (Twomey et al. 1984).

A1.8 Yellow Perch

Yellow perch are very adaptable and able to utilize a wide variety of cool to warm habitats in lakes or quiet rivers (Scott and Crossman 1998). They are most common in clear freshwater but can be found in brackish water at river mouths (Kreiger et al. 1983). Population sizes in freshwater tend to decrease with increasing turbidity or decreasing vegetation (Scott and Crossman 1998). They are typically associated with shallow waters (less than 10 m depth), especially small weedy water bodies with muck, sand, or gravel bottoms (Brown et al. 2009a).

Yellow perch begin spawning migrations from deep water into tributaries, lake shallows, or low velocity areas of rivers from April to June when water temperatures warm to 7 °C (Krieger et al. 1983, Scott and Crossman 1998). Females release a string of eggs near aquatic or inundated terrestrial vegetation (e.g., plants and woody debris). Cobbles, sand, or gravel may be used if submerged vegetation is not available (Robillard and Marsden 2001; Parker et al. 2009). Yellow perch require low current velocities (i.e., less than 0.05 m/s) for spawning (Krieger et al. 1983). Eggs are broadcast in water depths of 1 to 3.7 m and hatch in approximately 8 to 10 days (Krieger et al. 1983, Scott and Crossman 1998). Soon after hatching, the larvae move into the limnetic zone where they begin feeding (Whiteside et al. 1985). When they reach 25 mm (total length) they return to the littoral zone (Whiteside et al. 1985).

Young-of-the-year and 1+ aged individuals tend to stay in vegetated areas before dispersing to open water habitats (Parker et al. 2009). Juvenile habitat requirements are similar to those of adults with the exception that juveniles tend to inhabit slightly shallower water than adults (Kreiger et al. 1983). Young will often be found in loose aggregations of 50 to 200 individuals segregated by size and often mixed with species of minnow (e.g., spottail shiner; Scott and Crossman 1998).

Adults can be found in moderate currents but prefer sluggish currents or slack water habitat (Krieger et al. 1983). The schools of adult yellow perch are often dense in the summer and more separated in the winter (Scott and Crossman 1998). They are typically inactive at night and rest along the bottom; however they are active throughout the winter under the ice in both shallow and deeper water (Scott and Crossman 1998). Optimal lacustrine habitat is characterized by a littoral area of 20 to 30% of the total lake; 25 to 50% of the littoral area vegetated; warm (20 to 28 °C) surface water temperature in summer; and low to moderate turbidities (Brown et al. 2009a). Temperature preferences during the growing season are between 17.6 to 25 °C (Krieger et al. 1983). Winter dissolved oxygen levels of 0.2 to 1.5 mg/L are considered lethal, and 5 mg/L is considered the lower optimum limit (Kreiger et al 1983, Brown et al. 2009a). Optimal riverine habitat is characterized by deep pools (deeper than average river depth) and slack water areas (25 to 75% of river area) with moderate amounts of vegetation (25 to 50% of pool and backwater area) and low velocities (less than 0.10 m/s; Brown et al. 2009a).

REFERENCES

Arndt, S. K. A., and Hutchinson, J. 2000. Characteristics of a tributary-spawning population of burbot from Columbia Lake, British Columbia. Pages 48-60 *in* V. L. Paragamian and D. W. Willis, editors. Burbot: biology, ecology, and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda.

Barton, B. A. and Taylor, B. R. 1996. Oxygen requirements of fishes in northern Alberta rivers with a general review of adverse effects of low dissolved oxygen. Water Quality Research Journal of Canada 31:361-409.

Bégout Anras, M. L., Cooley, P. M., Bodaly, R. A., Anras, L. and Fudge, R. J. P. 1999. Movement and habitat use by lake whitefish during spawning in a boreal lake: integrating acoustic telemetry and geographic information systems. Transactions of the American Fisheries Society. 128:939-952.

Boag, T. D. 1989. Growth and fecundity of burbot, *Lota lota L.*, in two Alberta lakes. Master's Thesis, University of Alberta, Edmonton.

Bozek, M. A., Haxton, T. J., and Raabe, J. K. 2011. Walleye and sauger habitat (Chapter 5). Pages 133-198 *in* B. A. Barton, editor. Biology, management and culture of walleye and sauger. American Fisheries Society, Bethesda, Maryland.

Bradbury, C., Roberge, M. M., and Minns, C. K. 1999. Life history characteristics of freshwater fishes occurring in Newfoundland and Labrador, with major emphasis on lake habitat requirements. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2485. April 1999.

Breeser, S. W., Steams, F. D., Smith, M. W., West, R. L., and Reynolds, J. B. 1988. Observations of movements and habitat preferences of burbot in an Alaskan glacial river system. Transactions of the American Fisheries Society 117:506-509.

Brown, T. G., Runciman, B., Bradford, M. J., and Pollard, S. 2009a. Biological synopsis of Yellow Perch (*Perca flavescens*). Fisheries and Oceans Canada, Science Branch. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2883.

Brown, T. G., Runciman, B., Pollard, S., Grant, A. D. A., and Bradford, M. J. 2009b. Biological synopsis of smallmouth bass (*Micropterus dolomieu*). Fisheries and Oceans Canada, Science Branch. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2887.

Casselman, J. M. and Lewis, C. A. 1996. Habitat requirements of northern pike (*Esox lucius*). Canadian Journal of Fisheries and Aquatic Sciences 53(Suppl.1):161-174.

Clark, M. E., Rose, K. A., Chandler, J. A., Richter, T. J., Orth, D. J., and Van Winkle, W. 1998. Simulating smallmouth bass reproductive success in reservoirs subject to water level fluctuations. Environmental Biology of Fishes 51:161-174.

Curry, K. D. 1979. Use of a Wabash River tributary for sucker (Catostomidae) reproduction. Ph.D. Dissertation, Purdue Univ., Lafayette, IN. 96 pp.

Dence, W. A. 1948. Life history, ecology, and habits of the dwarf sucker, *Catostomus commersonnii utawana Mather*, at the Huntington Wildlife Station. Roosevelt Wildlife Bulletin 8(4):81-150.

Donner, M. T., and Eckmann, R. 2011. Diel vertical migration of larval and early-juvenile burbot optimises survival and growth in a deep, pre-alpine lake. Freshwater Biology 56:916-925.

Edwards, E. A., Gebhart, G., and Maughan, O. E., 1983. Habitat Suitability Information: Smallmouth Bass. U.S. Fish and Wildlife Service, Department of the Interior. FWS/OBS-82/10.36. 47 pp.

Fabricius, E. 1954. Aquarium observations on the spawning behaviour of the burbot, *Lota vulgaris L.* Report of the Institute of Freshwater Research, Drottningholm 35:51-57.

Fischer, P. 1999. Otolith microstructure during the pelagic, settlement and benthic phases in burbot. Journal of Fish Biology 54:1231-1243.

Fuiman, L. A. 1978. Descriptions and comparisons of northeastern catostomid fish larvae. M.S. Thesis, Cornell Univ., Ithaca, NY. 110 pp.

Geen, G. H., Northcote, T. G., Hartman, G. F., and Lindsey, C. C. 1966. Life histories of two species of catostomid fishes in Sixteen-mile Lake, British Columbia, with particular reference to inlet stream spawning. Journal of the Fisheries Research Board of Canada 23:1761-1788.

Hanson, J. M., and Qadri, S. 1980. Morphology and diet of young-of-the-year burbot, *Lota lota*, in the Ottawa River. Canadian Field-Naturalist 94: 311-314.

Hofmann, N., and Fischer, P. 2001. Seasonal changes in abundance and age structure of burbot *Lota lota* (*L.*) and stone loach *Barbatula barbatula* (*L.*) in the littoral zone of a large pre-alpine lake. Ecology of Freshwater Fish 10:21-25.

Inskip, P. D. 1982. Habitat Suitability Index Models: Northern Pike. U.S. Fish and Wildlife Service, Department of the Interior. FWS/OBS-82/10.17. 40 pp.

Johnson, T., 1981. Biotope changes and life cycle of *Lota lota* in the Bothnian Sea and a coastal river. Oesterriechische Fischereiverband 34: 6-9.

Jones, M. L., Netto, J. K., Stockwell, J. D. and Mion, J. B. 2003. Does the value of newly accessible spawning habitat for walleye (*Stizostedion vitreum*) depend on its location relative to nursery habitats? Canadian Journal of Fisheries and Aquatic Sciences 60:1527-1538.

Kelso, J. R. M. 1978. Diel rhythm in activity of walleye, *Stizostedion vitreum vitreum*. Journal of Fish Biology 12:593–599.

Krieger, D. A., Terrell, J. W. and Nelson, P. C. 1983. Habitat Suitability Information: Yellow Perch. U.S. Fish and Wildlife Service, Department of the Interior. FWS/OBS-82/10.55.

Marcy, B. C., Jr. 1976. Planktonic fish eggs and larvae of the Lower Connecticut River and the effects of the Connecticut Yankee Plant including entrainment. Pages 115-139 *in* D. Merriman and L. M. Thorpe, editors. The Connecticut River ecological study, the impact of a nuclear power plant. American Fisheries Society Monographs 1. 252 pp.

McCormick, J. H., Jones, B. R., and Hokanson, K. E. F. 1977. White sucker (*Catostomus commersoni*) embryo development, and early growth and survival at different temperatures. Journal of the Fisheries Research Board of Canada 34:1019-1025.

McCrimmon, H.R. 1959. Observations on Spawning of Burbot in Lake Simcoe, Ontario. *The Journal of Wildlife Management* 23:447–449.

McMahon, T. E., Terrell, J. W., and Nelson, P. C. 1984. Habitat suitability information: Walleye. U.S. Fish and Wildlife Service, Department of the Interior. FWS/OBS-82/10.56. 43 pp.

McPhail, J. D. 2007. The Freshwater Fishes of British Columbia. The University of Alberta Press, Edmonton, Alberta.

McPhail, J. D., and Paragamian, V. L. 2000. Burbot biology and life history. Burbot: biology, ecology, and management. American Fisheries Society, Fisheries Management Section, Publication 1: 11-23.

Nelson, J. S. 1968. Hybridization and isolating mechanisms between *Catostomus commersoni* and *C. macrocheilus* (Pisces: Catostomidae). Journal of the Fisheries Research Board of Canada 25:101-150.

Olson, D. E. 1963. Role of the white sucker in Minnesota waters. Proceedings of the Minnesota Academy of Science 31:63-73.

Oyadomari, J. K., and Auer, N. A. 2004. Inshore-offshore distribution of larval fishes in Lake Superior off the western coast of the Keweenaw Peninsula, Michigan. Journal of Great Lakes Research 30: 369-384.

Paragamian, V. L. 2000. The effects of varying flows on burbot spawning migrations in the Kootenai River, Idaho and British Columbia, Canada, after construction of the Libby Dam. Pages 111-123 *in* V. L. Paragamian and D. W. Willis, editors. Burbot: biology, ecology, and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda.

Parker, A. D., Stepien, C. A., Sepulveda-Villet, O. J., Ruehl, C. B., and Uzarski, D. G. 2009. The Interplay of Morphology, Habitat, Resource Use and Genetic Relationships in Young Yellow Perch. Transactions of the American Fisheries Society 138:899-914.

Pratt, T. C., and Fox, M. G. 2001. Biotic influences on habitat selection by young-of-year walleye (*Stizostedion vitreum*) in the demersal stage. Canadian Journal of Fisheries and Aquatic Sciences 58:1058-1069.

Propst, D. L. 1982. Warmwater fishes of the Platte River basin, Colorado; distribution, ecology, and community dynamics. Ph.D. Dissertation, Colorado State Univ., Ft. Collins. 284 pp.

Raney, E. C., and Lachner, E. A. 1942. Studies of the summer food, growth and movement of yellow pikeperch, *Stizostedion vitreum vitreum*, in Oneida Lake, New York. Journal of Wildlife Management 6:1-16.

Reutter, J. M., and Herdendorf, C. E. 1976. Thermal discharge from a nuclear power plant: predicted effects on Lake Erie fish.

Reynolds, W. W., and Casterlin, M. E. 1978. Behavioral thermoregulation and diel activity in white sucker (*Catostomus commersoni*). Comparative Biochemistry and Physiology Part A: Physiology 59(3):261-262.

Robillard, S. R. and Marsden, J. E. 2001. Spawning substrate preferences of yellow perch along sand cobble shoreline in southwestern Lake Michigan. North American Journal of Fisheries Management 21:208-215.

Ryder, R. A. 1977. Effects of ambient light variations on behavior of yearling, subadult and adult walleyes (*Stizostedion vitreum vitreum*). Journal of the Fisheries Research Board of Canada 34:1481-1491.

Scott, W. B. and Crossman, E. J. 1998. Freshwater Fishes of Canada. Galt House Publications, Oakville, Ontario.

Siefert, R. E., and Spoor, W. A. 1974. Effects of reduced oxygen on embryos and larvae of the white sucker, coho salmon, brook trout and walleye. Pages 487-495 *in* J. H. S. Blaxter, editor. The early life history of fish. Springer-Verlag, New York.

Sorokin, V. N. 1971. The spawning and spawning grounds of the burbot, *Lota iota* (*L.*). Journal of Ichthyology 11:907-916.

Stewart, N. H. 1926. Development, growth, and food habits of the white suckers, *Catostomus commersonii Lesueur*. Bulletin of the United States Bureau of Fisheries 42:147-184.

Symons, P. E. K. 1976. Behavior and growth of juvenile Atlantic salmon (*Salmo salar*) and three competitors at two stream velocities. Journal of the Fisheries Research Board of Canada 33:2766-2773.

Twomey, K., Williamson, K. L., and Nelson, P. C. 1984. Habitat suitability index models and instream flow suitability curves: white sucker. Western Energy and Land Use Team, Division of Biological Services, Research and Development, Fish and Wildlife Service, U.S. Department of the Interior.

Whiteside, M. C., Swindoll, C. M. and Doolittle, W. L. 1985. Factors affecting the early life history of yellow perch, *Perca flavescens*. Environmental Biology of Fishes 12(1):47-56.

Table A.1: Summary of Habitat Requirements for Various Life Stages of Fish Found in the Vicinity of the Côté Gold Project

Size	Species	Spawning/Incubation	Juvenile/Rearing	Adult/Foraging	Overwintering
Large-bodied Fish Species	Burbot *Lota lota*	Spawns midwinter (January - March) under ice cover in <10 m of water depth over cobble, gravel, and sometimes sand. This is usually done in lakes, but the species is known to also move into rivers to spawn.	Young of the year and yearling burbot are frequently found along rocky shores, and sometimes in weedy areas of tributary streams.	Adults reside in deep, hypolimnetic habitat during the summer, but sometimes move into shallower waters when active at night. In southern and central regions, burbot habitat is primarily in lakes while in the north it also includes large, cool rivers.	No info. Likely prefer dissolved oxygen concentrations > 6 mg/L.
	Lake whitefish *Coregonus clupeaformis*	Spawning occurs in the fall (usually November-December) at shallow depths of less than 25 feet (7.6 m) over hard or stony bottom but sometimes over sand.	Young whitefish generally leave the shallow inshore waters by early summer and move into deeper water.	Whitefish are a cool water species that descend into cooler waters of the hypolimnion (below the thermocline) during the summer months. They move from deep to shallow waters in early spring and back to deeper water as warming occurs.	No info. Likely prefer dissolved oxygen concentrations > 6 mg/L.
	Northern pike *Esox lucius*	Spring spawner during daylight hours on heavily vegetated floodplains of rivers, marshes and bays of larger lakes.	Young remain in shallow spawning areas for several weeks. Generally establish a vague territory where cover and food are adequate.	Inhabit clear, slow, heavily vegetated rivers or warm, weedy bays of lakes. Generally occur in shallower water in spring and fall but move to deeper cooler water at the height of summer temperatures.	Very tolerant of low dissolved oxygen (0.1-0.4 mg/L for several days).
	Smallmouth bass *Micropterus dolomieu*	Typically spawn in late spring and early summer. Nests are built on sandy, gravelly or rocky bottom of lakes and rivers usually near the protection of rock, logs or more rarely near dense vegetation.	Juveniles can be found in shallow areas with cover.	After spawning adult fish move to moderately shallow areas that are rocky and sandy. They will move to greater depths as the weather gets warmer. In winter they congregate near the bottom and are very inactive.	Prefer dissolved oxygen concentrations above 6 mg/L. Can survive extreme winter condition but do not actively feed at <10°C.
	Walleye *Sander vitreus*	Spawning occurs in spring shortly after ice-out, either in white water below impassable barriers or coarse, rocky shoals of lakes.	Occupy the shallow edge of rivers close to vegetation or other forms of cover, and inshore areas of lakes less than two meters deep.	Generally found in large, shallow, turbid lakes or streams. Also thrive in clear lakes and rivers, but in such a habitat walleye will only feed at night due to sensitivity to light.	Generally require dissolved oxygen levels > 5 mg/L, but can tolerate low as 2 mg/L for a short time. Adults tend to avoid turbulent areas in the winter.
	White sucker *Catostomus commersonii*	Typically spawn in the spring from early May to early June. Adults migrate from lakes into streams to spawn in shallow water over gravel. They have also been known to use lake margins.	Young start to migrate to the lake about a month after spawning. Juveniles can be found in association with a variety of other species and are typically found in the same habitat as adults.	Adults usually inhabit warmer shallow lakes or warm, shallow bays, and tributary rivers of larger lakes. They are usually found in the top 20 to 30 feet (6 to 9 m).	Tolerant of low dissolved oxygen and a broad range of environmental conditions. Will avoid dissolved oxygen concentrations lower than 2.4 mg/L.
	Yellow perch *Perca flavescens*	Yellow perch spawn in the spring usually from April to early May in shallow water of lakes or rivers over rooted vegetation, submerged brush or fallen trees, but at times over sand and gravel.	Juvenile habitat requirements are similar to adults. They school in shallower water and nearer to shore than adults and the schools often contain many individuals of different species of minnow.	Perch are adaptable and able to utilize a wide variety of habitat. Most abundant in the open water of clear lakes with moderate vegetation and bottoms of muck to sand and gravel. In response to seasonal temperature, movements occur out of and in to deeper water.	Tolerant of low dissolved oxygen, 5 mg/L is the lower optimum limit.

References:

Brown, T.G., Runciman, B., Pollard, S., Grant, A.D.A and Bradford, M.J. 2009. Biological synopsis of smallmouth bass (*Micropterus dolomieu*). Can. Manuscr. Rep. Fish. Aquat. Sci. 2887

Holmes E., Mandrak, N.E., and Burridge, M.E. 2010. The ROM Field Guide to Freshwater Fishes of Ontario. Royal Ontario Museum, Toronto, Ontario.

Inskip, P. D. 1982. Habitat suitability index models: northern pike. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.17. July 1982.

Klinger, S.A., Magnuson, J.J., and Gallepp, G.W. 1982. Survival mechanisms of the central mudminnow (*Umbra limi*), fathead minnow (*Pimephales promelas*) and brook stickleback (*Culaea inconstans*) for low oxygen in winter. Env. Biol. Fish. Vol 7, No. 2, pp. 113-120.

Krieger, D.A., Terrell, J.W. and Nelson, P.C. 1983. Habitat Suitability Information: Yellow Perch. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.55. December 1983.

McMahon, Thomas E., James W. Terrell, and Patrick C. Nelson. 1984. Habitat suitability information: walleye. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.56 April 1984.

McPhail, J.D. 2007. The Freshwater Fishes of British Columbia. The University of Alberta Press, Edmonton, Alberta.

Scott, W.B. and Crossman, E.J. 1998. Freshwater Fishes of Canada. Galt House Publications, Oakville, Ontario.

Twomey, K.A., K.L. Williamson and P.C. Nelson. 1984. Habitat Suitability Index Models and Instream Flow Suitability Curves: White Sucker. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.64. September 1984.

Table A.1: Summary of Habitat Requirements for Various Life Stages of Fish Found in the Vicinity of the Côté Gold Project

Size	Species	Spawning/Incubation	Juvenile/Rearing	Adult/Foraging	Overwintering
Small-bodied Fish Species	Blacknose shiner *Notropis heterolepis*	Blacknose shiners spawn in spring and summer spawn over sandy bottoms.	Life cycle information is limited for this species.	Prefers clear, vegetated waters in the sandy shallows of lakes.	Adequate water depth. Oxygen thresholds of many freshwater fish as reported from field studies lie between 1.0 and 2.0 ppm with some less tolerant species requiring up to 3.0 ppm or more. Some fish species will use gas bubbles at the ice-water interface (i.e., central mudminnow, fathead minnow, brook stickleback) which will allow for tolerance of low dissolved oxygen (<0.30 mg/L).
	Brook stickleback *Culaea inconstans*	They spawn in shallow water from late April to July. Nests are constructed out of stems of reeds or grass and green algae.	Similar habitat to adults.	Inhabit clear, cold, densely vegetated water of small streams, swampy margins of ponds or larger lakes.	
	Central mudminnow *Umbra limi*	Spawns in early spring, either in upstream shallow waters, flooded benches of main channels, or hillside brooks in weedy areas.	The young move away from spawning sites at 30 mm in length.	Preferred habitat is vegetated, cool, quiet waters of lakes and streams.	
	Common shiner *Luxilus cornutus*	Typically a stream spawning species over gravel beds or other nests but may spawn on gravelly shoals in lakes (May-June).	Juveniles remain in stream habitat and shorelines of clear-water lakes.	Inhabit stream pool and run habitat and shorelines of clear-water lakes.	
	Fathead minnow *Pimephales promelas*	Prolonged spawning begins in spring and continues until as late as August. Spawning occurs in shallow water on the surface of rocks or vegetation.	No info, likely similar to adults.	In North-Central Ontario, habitat is frequently in clear but stained, acid waters of beaver ponds and small lakes.	
	Finescale dace *Chrosomus neogaeus*	Spawns in spring in depressions under some form of cover.	In lakes juveniles school with adults and in streams they remain close to vegetated areas.	Preferred habitat is cool water, heavily vegetated, slow-moving water, shallow water of lakes and streams with bottoms of silt and detritus.	
	Golden shiner *Notemigonus crysoleucas*	Spawning can occur from May to August. Eggs are deposited over filamentous algae where aquatic vegetation is present.	No info, likely similar to adults.	Clear, weedy, quiet waters with extensive shallow areas of lakes. Moves in schools off the bottom over wide areas.	
	Iowa Darter *Etheostoma exile*	Spawning occurs from spring to as late as May or June in shallow waters of lakes, or pond-like expansions in rivers, on bottom organic debris or on fibrous root beds.	No info, likely similar to adults.	Clear, standing or slowly moving waters of lakes or rivers which have rooted aquatic vegetation as well as a bottom of organic debris, sand, peat, or some combination of the three.	

References:

Brown, T.G., Runciman, B., Pollard, S., Grant, A.D.A and Bradford, M.J. 2009. Biological synopsis of smallmouth bass (*Micropterus dolomieu*). Can. Manuscr. Rep. Fish. Aquat. Sci. 2887

Holmes E., Mandrak, N.E., and Burridge, M.E. 2010. The ROM Field Guide to Freshwater Fishes of Ontario. Royal Ontario Museum, Toronto, Ontario.

Inskip, P. D. 1982. Habitat suitability index models: northern pike. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.17. July 1982.

Klinger, S.A., Magnuson, J.J., and Gallepp, G.W. 1982. Survival mechanisms of the central mudminnow (*Umbra limi*), fathead minnow (*Pimephales promelas*) and brook stickleback (*Culaea inconstans*) for low oxygen in winter. Env. Biol. Fish. Vol 7, No. 2, pp. 113-120.

Krieger, D.A., Terrell, J.W. and Nelson, P.C. 1983. Habitat Suitability Information: Yellow Perch. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.55. December 1983.

McMahon, Thomas E., James W. Terrell, and Patrick C. Nelson. 1984. Habitat suitability information: walleye. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.56 April 1984.

McPhail, J.D. 2007. The Freshwater Fishes of British Columbia. The University of Alberta Press, Edmonton, Alberta.

Scott, W.B. and Crossman, E.J. 1998. Freshwater Fishes of Canada. Galt House Publications, Oakville, Ontario.

Twomey, K.A., K.L. Williamson and P.C. Nelson. 1984. Habitat Suitability Index Models and Instream Flow Suitability Curves: White Sucker. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.64. September 1984.

Table A.1: Summary of Habitat Requirements for Various Life Stages of Fish Found in the Vicinity of the Côté Gold Project

Size	Species	Spawning/Incubation	Juvenile/Rearing	Adult/Foraging	Overwintering
Small-bodied Fish Species	Johnny darter *Etheostoma nigrum*	Spawning occurs in the spring, the exact time depending on local conditions but, generally in May but can be as late as June, eggs are deposited on the underside of rocks.	No info, likely similar to adults.	Most common in waters of moderate or no current, over a bottom of sand, sand and gravel, or sand and silt, but do inhabit weedy areas or gravel riffles of streams.	Adequate water depth. Oxygen thresholds of many freshwater fish as reported from field studies lie between 1.0 and 2.0 ppm with some less tolerant species requiring up to 3.0 ppm or more. Some fish species will use gas bubbles at the ice-water interface (i.e., central mudminnow, fathead minnow, brook stickleback) which will allow for tolerance of low dissolved oxygen (<0.30mg/L).
	Longnose dace *Rhinichthys cataractae*	Spawning begins in May, June or early July. Probably occurs in riffles over a gravel bottom, but on occasion occurs over or near the nest of the river chub resulting in hybrids.	Similar to that of adults, but with less overhead turbulence.	Clean, swiftly flowing, streams bedded by gravel or boulders. Can inhabit very turbulent waters. Also occur in inshore waters of lakes over boulder or gravel bottoms. In warm lakes they may move offshore into deep water during increased summer temperatures.	
	Northern redbelly dace *Chrosomus eos*	Commences spawning in spring or early summer. Eggs are deposited in masses of filamentous algae.	Similar to that of adults.	Prefers the quiet waters of beaver ponds, bog ponds, small lakes or quiet pool-like expansions of streams, often over a bottom of finely divided brown detritus or silt.	
	Pearl dace *Margariscus nachtriebi*	Spawns in the spring in clear water 45 – 61 centimetres deep on sand or gravel, in a weak to moderate current.	No info, likely similar to adults.	Typically reside in cool, clear headwater streams in the south and in bog drainage streams, ponds, and small lakes in the north. Also found in stained, peaty waters of beaver ponds.	
	Sculpin sp. *Cottus bairdii* *Cottus cognatus*	Spawns in spring under rocks or ledges when water temperatures reach 4 - 5°C.	No info, likely similar to adults.	Cool streams and lakes over a sand bottom.	
	Spottail shiner *Notropis hudsonius*	Spawns in June or July, over sandy shoals.	Summer habitat is shallow water above sandy bottom or weed beds.	Known to often inhabit relatively large lakes, and large rivers.	
	Trout-perch *Percopsis omiscomaycus*	Spawns in spring to summer when water temperatures reach 10°C in shallow, rocky streams or the nearshore waters of lakes.	No info, likely similar to adults	Prefers cool waters of lakes, but may occasionally be found in streams. Move inshore in the evenings to feed and offshore in the morning to seek shelter.	

References:

Brown, T.G., Runciman, B., Pollard, S., Grant, A.D.A and Bradford, M.J. 2009. Biological synopsis of smallmouth bass (*Micropterus dolomieu*). Can. Manuscr. Rep. Fish. Aquat. Sci. 2887

Holmes E., Mandrak, N.E., and Burridge, M.E. 2010. The ROM Field Guide to Freshwater Fishes of Ontario. Royal Ontario Museum, Toronto, Ontario.

Inskip, P. D. 1982. Habitat suitability index models: northern pike. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.17. July 1982.

Klinger, S.A., Magnuson, J.J., and Gallepp, G.W. 1982. Survival mechanisms of the central mudminnow (*Umbra limi*), fathead minnow (*Pimephales promelas*) and brook stickleback (*Culaea inconstans*) for low oxygen in winter. Env. Biol. Fish. Vol 7, No. 2, pp. 113-120.

Krieger, D.A., Terrell, J.W. and Nelson, P.C. 1983. Habitat Suitability Information: Yellow Perch. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.55. December 1983.

McMahon, Thomas E., James W. Terrell, and Patrick C. Nelson. 1984. Habitat suitability information: walleye. US Department of the Interior, Fish and Wildlife Service. FWS/OBS-82/10.56 April 1984.

McPhail, J.D. 2007. The Freshwater Fishes of British Columbia. The University of Alberta Press, Edmonton, Alberta.

Scott, W.B. and Crossman, E.J. 1998. Freshwater Fishes of Canada. Galt House Publications, Oakville, Ontario.

Twomey, K.A., K.L. Williamson and P.C. Nelson. 1984. Habitat Suitability Index Models and Instream Flow Suitability Curves: White Sucker. United States Department of the Interior – Fish and Wildlife Service. FWS/OBS-82/10.64. September 1984.

Table A.2: Rationale for Assigning Numerical Ranking for Habitat Evaluation

Species	Numerical Ranking	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering
Northern pike	1.00	Dense optimal vegetation (e.g., sedges or grasses) for spawning, calm shallow water (<2 m), access to seasonally flooded areas	Moderately dense vegetation and prefer submerged vegetation with some emergent and floating vegetation, water depth generally <4 m in lakes and < 1m deep in rivers, depth increases with size	Moderately dense (70%) vegetative cover within 300 m of shore, in lakes usually within 10 m depth (optimal 4 m) and rarely venture below the thermocline, in rivers areas of slow moving water (<0.05 cm/s) and low gradient (<0.5%)	Greater than 2 m water depth, large area where oxic conditions could persist for the entire winter, can tolerate very low dissolved oxygen
	0.75	Moderate to dense inundated vegetation	Moderate vegetation and cover	Habitat less than 10 m and within 300 m of shore, moderate to dense vegetative cover	Greater than 2 m water depth, maximum depth and anoxic conditions considered
	0.50	Moderate inundated vegetation	Sparse to moderate vegetation and cover	Habitat less than 10 m depth and within 300 m of shore, sparse to moderate vegetative cover	A minimum of 2 m water depth, abundance of aquatic vegetation taken into consideration to potentially cause anoxic conditions
	0.25	Sparse inundated vegetation	Sparse vegetation and cover, and/or depths >4 m	Shallow water depth (< 1.5 m), with sparse vegetation cover	Shallow water depth (<1.5 m), abundance of aquatic vegetation that could cause anoxic conditions
	0.00	No suitable habitat	No suitable habitat	No suitable habitat	No suitable habitat, less than 1 m water depth
Yellow perch	1.00	Use moderate to dense aquatic or inundated terrestrial vegetation, rocks, sand or gravel may be used if vegetation is not available, typically <4 m water depth and require low current velocities (<0.05 m/s)	Use moderate vegetated littoral areas before dispersing to open water, shallower water compared to adults, often school with mixed species of minnow	Use the littoral area in schools or near vegetation, prefer moderate vegetation cover (25-50%), in rivers deep pools, slow water currents (< 0.10 m/s) with moderate vegetation (25-50%)	Greater than 2 m water depth, large area where oxic conditions could persist for the entire winter, can tolerate low dissolved oxygen (>1.5 mg/L)
	0.75	Moderate vegetation	Moderate to sparse vegetation and cover	Moderate to sparse vegetation and cover	Greater than 2 m water depth, maximum depth and consideration for anoxic conditions considered
	0.50	Sparse to moderate vegetation, or rock, sand or gravel	Sparse vegetation and cover	Sparse vegetation and cover	A minimum of 2 m water depth, abundance of aquatic vegetation taken into consideration to potentially cause anoxic conditions
	0.25	Sparse vegetation or rock, sand, gravel substrate	Little to sparse vegetation or cover, depths greater than littoral	Little to sparse vegetation or suitable cover	Shallow water depth (<1.5 m), abundance of aquatic vegetation that could cause anoxic conditions
	0.00	No suitable habitat	No suitable habitat	No suitable habitat	No suitable habitat (<1.5 m)
Walleye	1.00	Migrate to tributaries to spawn over rocky areas in white water with boulder to coarse-gravel substrate with 0.3 -1.5 m water depth, boulder to course-gravel shoreline areas, between or shoals of lakes with good circulation, water velocities can range from 0.4 to 1.5 m/s	In rivers moderate current (03.-0.6m/s) to transport new hatched fry downstream to heavily vegetated areas in lakes with 2 to 5 m water depth, juveniles will school and use deeper habitat depending on water clarity	Habitat use driven by sensitivity to light, often associated with moderate cover, shoals, weed beds (25-45%), moderate turbidity (1 to 2 m Secchi depth),	Minimum dissolved oxygen of 3 mg/L, water depth >2 m, most abundant in large >100 ha lakes
	0.75	Abundance of suitable spawning substrate with appropriate water velocity	Moderate to dense available habitat	Moderate to dense available habitat with optimal turbidity	Maximum depth of lake >8 m, substantial overwintering area available (>2 m water depth)
	0.50	Moderate amount of suitable spawning substrate with appropriate water velocity	Moderate amount of available habitat	Moderate amount of available habitat with adequate turbidity	Water depth >4 m, total area taken into consideration and potential of dissolved oxygen to remain > 3 mg/L
	0.25	Sparse amount of suitable substrate, sub-optimal water velocity	Sparse amount of suitable habitat	Sparse amount of suitable habitat with suboptimal turbidity	Shallow water depth (<3 or 4 m), high potential for dissolved oxygen to fall below 3 mg/L
	0.00	No suitable habitat	No suitable habitat	No suitable habitat	No suitable habitat (<2 m)
Lake whitefish	1.00	Littoral spawners over gravel, cobble, flat stones or boulder, sometimes over sand, shallow water depths <8 m, in rivers spawning occurs over gravel to cobble or rubble in <1 m	Will remain in spawning areas, can be associated with emergent vegetation within 1 m of shore, shallower water than adults, can tolerate warmer temperatures (15.5 to 19.5°C)	Use the hypolimnion during summer months and the oxic conditions that exist (>5mg/L), no preference for substrate, during spring and fall will use shallower water, temperature preference between 8 to 14°C	Greater than 2 m water depth, well oxygenated (> 5 mg/L)
	0.75	Moderate to dense suitable substrate within adequate depth, and fetch within the lake	Moderate to dense suitable habitat, appropriate temperature range	Moderate to abundant available habitat below the thermocline, oxic conditions taken into consideration during summer months	Maximum depth of lake >8 m, substantial overwintering area available (>2 m water depth)
	0.50	Moderate suitable substrate within adequate depth, and fetch within the lake	Moderate suitable habitat, suboptimal to appropriate temperatures available	Moderate to sparse available habitat below thermocline, oxic conditions taken into consideration during summer months	Water depth >4 m, total area taken into consideration and potential of dissolved oxygen to fall below 5 mg/L
	0.25	Sparse suitable substrate within adequate depth	Sparse suitable habitat, suboptimal temperatures	Sparse available habitat below thermocline, anoxic conditions likely exist, shallow water depth (<2 m) making available habitat not used for much of the year	Shallow water depth (<3 or 4 m), high potential for dissolved oxygen to fall below 5 mg/L
	0.00	No suitable habitat	No suitable habitat	No suitable habitat	No suitable habitat (<2 m)
Smallmouth bass	1.00	Nest construction <3 m water depth, over sandy, gravel, or rocky bottom near protection of rocks or large woody debris, in protected areas of lakes and backwaters of rivers	Use quiet water near cover in littoral, tend to school, in rivers use isolated pools or still-water along banks associated with larger substrate and cover	Use all forms of submerged cover, summer occupy warm epilimnetic water, in rivers movements are typically within riffle boundaries, prefer slower currents	Water depth at least 3 to 15 m, dissolved oxygen >6 mg/L, use deep areas during winter and cease eating once temperatures reach 10°C
	0.75	Moderate abundance of appropriate substrate with nearby protection	Moderate vegetation and cover	Moderate vegetation and cover	Water depth >8 m
	0.50	Sparse to moderate suitable substrate, sparse cover	Sparse to moderate vegetation and cover	Sparse to moderate vegetation and cover	Water depth > 3 m and < 6 m
	0.25	Sparse appropriate substrate within <3 m water depth	Sparse vegetation and cover	Sparse vegetation and cover	Water depth >3 m and < 4
	0.00	No suitable habitat	No suitable habitat	No suitable habitat	No suitable habitat (< 3 m)

APPENDIX B
HABITAT ACCOUNTING

Table B.1: Summary of Lost Habitat and Offsetting Habitat for Northern Pike in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Lost Habitat				Habitat Suitability Index				Habitat Units				
			Max Depth (m)[a]	Max Secchi Depth (m)	Depth Range (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	TOTAL
Habitat Lost															
Open Pit	FAA	East Clam Lake (southern section lost)	2.4	3.4	0-max	5,961	0.50	0.75	0.25	0.00	2,981	4,471	1,490	0	8,942
	FAA	Clam Lake (east arm)	3.0	3.9	0-2	7,365	0.50	0.50	0.50	0.50	3,683	3,683	3,683	3,683	18,139
					2-max	2,727	0.00	0.25	0.50	0.50	0	682	1,364	1,364	
	FAA	Côté Lake	4.3	2.2	0-2	69,798	0.75	0.75	0.75	0.50	52,349	52,349	52,349	34,899	370,067
					2-max	118,748	0.00	0.25	0.50	0.75	0	29,687	59,374	89,061	
	FAA	Upper Three Duck Lake (western arm lost)	4.1	2.9	0-2	60,346	0.75	0.75	0.75	0.50	45,260	45,260	45,260	30,173	435,683
					2-max	154,132	0.00	0.25	0.75	0.75	0	38,533	115,599	115,599	
										Total FAA Losses	104,271	174,663	279,117	274,778	832,829
										Total Schedule 2 Losses	0	0	0	0	0
										TOTAL LOSS	**104,271**	**174,663**	**279,117**	**274,778**	**832,829**
Habitat Created															
New Lake	FAA for Côté Lake	New Lake	6.3	na	0-2	112,757	0.75	0.75	0.50	0.50	84,568	84,568	56,379	56,379	548,636
					2-max	152,425	0.00	0.25	0.50	1.00	0	38,106	76,213	152,425	
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 (Middle Three Duck)	5.5	na	0-2	35,242	0.75	0.75	0.50	0.50	26,432	26,432	17,621	17,621	114,142
					2-max	17,358	0.00	0.25	0.50	0.75	0	4,340	8,679	13,019	
Aggregate Pit Rehabilitation (within Neville Lake watershed)	FAA	Bagsverd Aggregate Pit	3	na	0-max	166,600	0.25	0.25	0.25	0.50	41,650	41,650	41,650	83,300	208,250
Site (within Mollie watershed)	Schedule 2	Weeduck and Upper Three Duck Lake Connection	1.5-2.0	na	0-max	2,100	0.25	0.25	0.00	0.00	525	525	0	0	1,050
Site (within Mollie watershed)	Schedule 2	East Clam Lake and Clam Lake Connection	0.5-1.5	na	0-max	1,700	0.75	0.75	0.75	0.00	1,275	1,275	1,275	0	3,825
Open Pit	FAA for Clam Creek	WRC1 - Extension of Clam Lake	1	na	0-max	21,450	1.00	0.50	0.50	0.25	21,450	10,725	10,725	5,363	48,263
Open Pit	FAA for Mollie River	WRC2 - Pool/Wetland	1.84	na	0-max	7,149	1.00	0.75	0.50	0.25	7,149	5,362	3,575	1,787	17,873
										Total FAA Gains	181,248	211,182	214,841	329,893	937,163
										Total Schedule 2 Gains	1,800	1,800	1,275	0	4,875
										TOTAL GAINS	**183,048**	**212,982**	**216,116**	**329,893**	**942,038**
										DIFFERENCE	**78,777**	**38,319**	**-63,002**	**55,115**	**109,209**

Note: na = Not Available

[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel.

Table B.2: Summary of Lost Habitat and Offsetting Habitat for Yellow Perch in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Lost Habitat				Habitat Suitability Index				Habitat Units				
			Max Depth (m)[a]	Max Secchi Depth (m)	Depth Range (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	TOTAL
Habitat Lost															
Open Pit	FAA	East Clam Lake (southern section lost)	2.4	3.4	0-max	5,961	0.75	0.75	0.50	0.00	4,471	4,471	2,981	0	11,922
	FAA	Clam Lake (east arm)	3.0	3.9	0-2	7,365	0.50	0.50	0.50	0.50	3,683	3,683	3,683	3,683	18,139
					2-max	2,727	0.00	0.25	0.50	0.50	0	682	1,364	1,364	
	FAA	Côté Lake	4.3	2.2	0-2	69,798	0.75	0.75	0.75	0.50	52,349	52,349	52,349	34,899	399,754
					2-max	118,748	0.00	0.25	0.75	0.75	0	29,687	89,061	89,061	
	FAA	Upper Three Duck Lake (western arm lost)	4.1	2.9	0-2	60,346	0.75	0.75	0.75	0.50	45,260	45,260	45,260	30,173	435,683
					2-max	154,132	0.00	0.25	0.75	0.75	0	38,533	115,599	115,599	
										Total FAA Losses	105,761	174,663	310,295	274,778	865,497
										Total Schedule 2 Losses	0	0	0	0	0
										TOTAL LOSS	**105,761**	**174,663**	**310,295**	**274,778**	**865,497**
Habitat Created															
New Lake	FAA for Côté Lake	New Lake	6.3	na	0-2	112,757	0.75	0.75	0.75	0.50	84,568	84,568	84,568	56,379	576,826
					2-max	152,425	0.00	0.25	0.75	0.75	0	38,106	114,319	114,319	
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 (Middle Three Duck)	5.5	na	0-2	35,242	0.75	0.75	0.75	0.50	26,432	26,432	26,432	17,621	127,292
					2-max	17,358	0.00	0.25	0.50	1.00	0	4,340	8,679	17,358	
Aggregate Pit Rehabilitation (within Neville Lake watershed)	FAA	Bagsverd Aggregate Pit	3	na	0-max	166,600	0.25	0.25	0.25	0.50	41,650	41,650	41,650	83,300	208,250
Site (within Mollie watershed)	Schedule 2	Weeduck and Upper Three Duck Lake Connection	1.5-2.0	na	0-max	2,100	0.25	0.50	0.50	0.00	525	1,050	1,050	0	2,625
Site (within Mollie watershed)	Schedule 2	East Clam Lake and Clam Lake Connection	0.5-1.5	na	0-max	1,700	0.75	0.75	0.75	0.00	1,275	1,275	1,275	0	3,825
Open Pit	FAA for Clam Creek	WRC1 - Extension of Clam Lake	1	na	0-max	21,450	1.00	0.75	0.75	0.25	21,450	16,088	16,088	5,363	58,988
Open Pit	FAA for Mollie River	WRC2 - Pool/Wetland	1.84	na	0-max	7,149	1.00	0.75	0.75	0.50	7,149	5,362	5,362	3,575	21,447
										Total FAA Gains	181,248	216,544	297,096	297,913	992,802
										Total Schedule 2 Gains	1,800	2,325	2,325	0	6,450
										TOTAL GAINS	**183,048**	**218,869**	**299,421**	**297,913**	**999,252**
										DIFFERENCE	**77,287**	**44,206**	**-10,873**	**23,135**	**133,755**

Note: na = Not Available

[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel.

Table B.3: Summary of Lost Habitat and Offsetting Habitat for Walleye in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Lost Habitat				Habitat Suitability Index				Habitat Units				
			Max Depth (m)[a]	Max Secchi Depth (m)	Depth Range (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	TOTAL
Habitat Lost															
Open Pit	FAA	East Clam Lake (southern section lost)	2.4	3.4	0-max	5,961	0.00	0.25	0.00	0.00	0	1,490	0	0	1,490
	FAA	Clam Lake (east arm)	3.0	3.9	0-2	7,365	0.00	0.25	0.00	0.00	0	1,841	0	0	3,205
					2-max	2,727	0.00	0.25	0.25	0.00	0	682	682	0	
	FAA	Côté Lake	4.3	2.2	0-2	69,798	0.00	0.50	0.25	0.00	0	34,899	17,450	0	230,471
					2-max	118,748	0.00	0.50	0.50	0.50	0	59,374	59,374	59,374	
	FAA	Upper Three Duck Lake (western arm lost)	4.1	2.9	0-2	60,346	0.00	0.50	0.25	0.00	0	30,173	15,087	0	276,458
					2-max	154,132	0.00	0.50	0.50	0.50	0	77,066	77,066	77,066	
										Total FAA Losses	0	205,525	169,658	136,440	511,623
										Total Schedule 2 Losses	0	0	0	0	0
										TOTAL LOSS	**0**	**205,525**	**169,658**	**136,440**	**511,623**
Habitat Created															
New Lake	FAA for Côté Lake	New Lake	~6.3	na	0-2	112,757	0.00	0.50	0.25	0.00	0	56,379	28,189	0	351,312
					2-max	152,425	0.00	0.50	0.50	0.75	0	76,213	76,213	114,319	
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 (Middle Three Duck)	5.5	na	0-2	35,242	0.00	0.00	0.00	0.00	0	0	0	0	0
					2-max	17,358	0.00	0.00	0.00	0.00	0	0	0	0	
Site (within Mollie watershed)	Schedule 2	Weeduck and Upper Three Duck Lake Connection	1.5-2	na	0-max	2,100	0.00	0.25	0.25	0.00	0	525	525	0	1,050
Site (within Mollie watershed)	Schedule 2	East Clam Lake and Clam Lake Connection	0.5-1.5	na	0-max	1,700	0.00	0.25	0.00	0.00	0	425	0	0	425
Clam Creek	FAA for Clam Creek	WRC1 - Extension of Clam Lake	1	na	0-max	21,450	0.00	0.25	0.25	0.00	0	5,363	5,363	0	10,725
Mollie River	FAA for Mollie River	WRC2 - Inline wetland	1.84	na	0-max	7,149	0.00	0.25	0.00	0.00	0	1,787	0	0	1,787
										Total FAA Gains	0	139,741	109,764	114,319	363,824
										Total Schedule 2 Gains	0	950	525	0	1,475
										TOTAL GAINS	**0**	**140,691**	**110,289**	**114,319**	**365,299**
										DIFFERENCE	**0**	**-64,835**	**-59,369**	**-22,121**	**-146,324**

Note: na = Not Available

[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel.

Table B.4: Summary of Lost Habitat and Offsetting Habitat for Lake Whitefish in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Lost Habitat				Habitat Suitability Index				Habitat Units				
			Max Depth (m)[a]	Max Secchi Depth (m)	Depth Range (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Overwintering	TOTAL
Habitat Lost															
Open Pit	FAA	East Clam Lake (southern section lost)	2.4	3.4	0-max	5,961	0.00	0.00	0.00	0.00	0	0	0	0	0
Open Pit	FAA	Clam Lake (east arm)	3.0	3.9	0-2	7,365	0.00	0.25	0.00	0.00	0	1,841	0	0	3,205
					2-max	2,727	0.00	0.25	0.25	0.00	0	682	682	0	
Open Pit	FAA	Côté Lake	4.3	2.2	0-2	69,798	0.00	0.25	0.25	0.00	0	17,450	17,450	0	123,960
					2-max	118,748	0.00	0.25	0.25	0.25	0	29,687	29,687	29,687	
Open Pit	FAA	Upper Three Duck Lake (western arm lost)	4.1	2.9	0-2	60,346	0.00	0.25	0.25	0.00	0	15,087	15,087	0	145,772
					2-max	154,132	0.00	0.25	0.25	0.25	0	38,533	38,533	38,533	
										Total FAA Losses	0	103,279	101,438	68,220	272,937
										Total Schedule 2 Losses	0	0	0	0	0
										TOTAL LOSS	**0**	**103,279**	**101,438**	**68,220**	**272,937**
Habitat Created															
New Lake	FAA for Côté Lake	New Lake	~6.3	na	0-2	112,757	0.25	0.25	0.25	0.00	28,189	28,189	28,189	0	351,312
					2-max	152,425	0.25	0.25	0.50	0.75	38,106	38,106	76,213	114,319	
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 (Middle Three Duck)	5.5	na	0-2	35,242	0.00	0.00	0.00	0.00	0	0	0	0	0
					2-max	17,358	0.00	0.00	0.00	0.00	0	0	0	0	
Site (within Mollie watershed)	Schedule 2	Weeduck and Upper Three Duck Lake Connection	1.5-2	na	0-max	2,100	0.50	0.50	0.25	0.00	1,050	1,050	525	0	2,625
Site (within Mollie watershed)	Schedule 2	East Clam Lake and Clam Lake Connection	0.5-1.5	na	0-max	1,700	0.00	0.25	0.25	0.00	0	425	425	0	850
Clam Creek	FAA for Clam Creek	WRC1 - Extension of Clam Lake	1	na	0-max	21,450	0.00	0.25	0.00	0.00	0	5,363	0	0	5,363
Mollie River	FAA for Mollie River	WRC2 - Inline Wetland	1.84	na	0-max	7,149	0.00	0.00	0.00	0.00	0	0	0	0	0
										Total FAA Gains	66,296	71,658	104,402	114,319	356,674
										Total Schedule 2 Gains	1,050	1,475	950	0	3,475
										TOTAL GAINS	**67,346**	**73,133**	**105,352**	**114,319**	**360,149**
										DIFFERENCE	**67,346**	**-30,146**	**3,914**	**46,099**	**87,212**

Note: na = Not Available

[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel.

Table B.5: Summary of Lost Habitat and Offsetting Habitat for Smallmouth Bass in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Lost Habitat: Max Depth (m)[a]	Lost Habitat: Max Secchi Depth (m)	Lost Habitat: Depth Range (m)	Lost Habitat: Area (m^2)	Habitat Suitability Index: Spawning/ Incubation	Habitat Suitability Index: Juvenile Rearing	Habitat Suitability Index: Adult Foraging	Habitat Suitability Index: Overwintering	Habitat Units: Spawning/ Incubation	Habitat Units: Juvenile Rearing	Habitat Units: Adult Foraging	Habitat Units: Overwintering	Habitat Units: TOTAL
Habitat Lost															
Open Pit	FAA	East Clam Lake (southern section lost)	2.4	3.4	0-max	5,961	0.00	0.25	0.25	0.00	0	1,490	1,490	0	2,981
	FAA	Clam Lake (east arm)	3.0	3.9	0-2	7,365	0.00	0.25	0.25	0.00	0	1,841	1,841	0	4,364
					2-max	2,727	0.00	0.00	0.25	0.00	0	0	682	0	
	FAA	Côté Lake	4.3	2.2	0-2	69,798	0.25	0.25	0.25	0.00	17,450	17,450	17,450	0	111,723
					2-max	118,748	0.00	0.00	0.25	0.25	0	0	29,687	29,687	
	FAA	Upper Three Duck Lake (western arm lost)	4.1	2.9	0-2	60,346	0.25	0.50	0.25	0.00	15,087	30,173	15,087	0	175,945
					2-max	154,132	0.00	0.00	0.50	0.25	0	0	77,066	38,533	
										Total FAA Losses	32,536	50,954	143,302	68,220	295,012
										Total Schedule 2 Losses	0	0	0	0	0
										TOTAL LOSS	**32,536**	**50,954**	**143,302**	**68,220**	**295,012**
Habitat Created															
New Lake	FAA for Côté Lake	New Lake	~6.3	na	0-2	112,757	0.25	0.50	0.50	0.00	28,189	56,379	56,379	0	331,478
					2-max	152,425	0.00	0.00	0.50	0.75	0	0	76,213	114,319	
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 (Middle Three Duck)	5.5	na	0-2	35,242	0.50	0.75	0.75	0.00	17,621	26,432	26,432	0	92,182
					2-max	17,358	0.00	0.00	0.50	0.75	0	0	8,679	13,019	
Site (within Mollie watershed)	Schedule 2	Weeduck and Upper Three Duck Lake Connection	1.5-2	na	0-max	2,100	0.75	0.75	0.50	0.00	1,575	1,575	1,050	0	4,200
Site (within Mollie watershed)	Schedule 2	East Clam Lake and Clam Lake Connection	0.5-1.5	na	0-max	1,700	0.50	0.50	0.50	0.00	850	850	850	0	2,550
Clam Creek	FAA for Clam Creek	WRC1 - Extension of Clam Lake	1	na	0-max	21,450	0.75	0.75	0.50	0.00	16,088	16,088	10,725	0	42,900
Mollie River	FAA for Mollie River	WRC2 - Inline Wetland	1.8	na	0-max	7,149	0.00	0.25	0.25	0.00	0	1,787	1,787	0	3,575
										Total FAA Gains	61,898	100,685	180,214	127,337	470,134
										Total Schedule 2 Gains	2,425	2,425	1,900	0	6,750
										TOTAL GAINS	**64,323**	**103,110**	**182,114**	**127,337**	**476,884**
										DIFFERENCE	**31,787**	**52,156**	**38,812**	**59,117**	**181,871**

Note: na = Not Available
[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel.

Table B.6: Summary of Lost Habitat and Offsetting Habitat for Small-bodied Fish Species in Waterbodies, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Lake Area	Habitat				Habitat Suitability Index	Habitat Units	TOTAL
			Max Depth (m)[a]	Max Secchi Depth (m)	Depth Range (m)	Area (m^2)			
Habitat Lost									
Open Pit	FAA	North Beaver Pond	~0.5	na	0-max	4,076	0.25	1,019	1,019
Constructed New Lake	FAA - Alteration of habitat	East Beaver Pond/ Overprinted - Altered	<1	na	0-max	2,981	0.25	745	745
Mine Rock Area (MRA)	Schedule 2	East Beaver Pond (small arm to east)	<2	na	0-max	7,758	0.50	3,879	3,879
Tailings Management Facility (TMF)	Schedule 2	Unnamed Waterbody #1	1	na	0-max	4,478	0.25	1,120	8,185
	Schedule 2	Unnamed Waterbody #2	0.6	na	0-max	2,903	0.50	1,452	
	Schedule 2	Unnamed Waterbody #3	1.1	na	0-max	3,036	0.25	759	
		Unnamed Waterbody #4	<1	na	0-max	11,574	0.25	2,894	
		Unnamed Waterbody #5	<2	na	0-max	642	0.25	161	
		Unnamed Waterbody #6	≤0.5	na	0-max	846	0.25	212	
		West Beaver Pond	<2	na	0-max	3,178	0.50	1,589	
	FAA	West Beaver Pond (Under Dam)	3	na	0-max	49,265	0.75	36,949	36,949
								Total FAA Losses	38,713
								Total Schedule 2 Losses	12,064
								TOTAL LOSS	50,776
Habitat Created									
Aggregate Pit Rehabilitation (within Neville Lake watershed)	FAA	Bagsverd Aggregate Pit	3	na	0-max	166,600	0.75	124,950	124,950
								DIFFERENCE	**74,174**

Note: na = Not Available

[a] Target depths have been provided for created habitat, depths for pools in the realignment channels are based on bankfull channel

Table B.7: Summary of Lost Habitat, Created Habitat, and Habitat Balance for Waterbodies, Côté Gold Project

Species		Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost	Northern pike	104,271	174,663	279,117	274,778	832,829
	Yellow perch	105,761	174,663	310,295	274,778	865,497
	Walleye	0	205,525	169,658	136,440	511,623
	Lake whitefish	0	103,279	101,438	68,220	272,937
	Smallmouth bass	32,536	50,954	143,302	68,220	295,012
	Small-bodied Fish	-	-	-	-	50,776
Total Habitat Units Lost		242,568	709,084	1,003,810	822,436	2,828,674
Species		**Spawning/ Incubation**	**Juvenile Rearing**	**Adult Foraging**	**Over-wintering**	**TOTAL**
Habitat Created	Northern pike	183,048	212,982	216,116	329,893	942,038
	Yellow perch	183,048	218,869	299,421	297,913	999,252
	Walleye	0	140,691	110,289	114,319	365,299
	Lake whitefish	67,346	73,133	105,352	114,319	360,149
	Smallmouth bass	64,323	103,110	182,114	127,337	476,884
	Small-bodied Fish	-	-	-	-	124,950
Total Habitat Units Gained		497,765	748,785	913,292	983,781	3,268,572
Species		**Spawning/ Incubation**	**Juvenile Rearing**	**Adult Foraging**	**Over-wintering**	**TOTAL**
Balance	Northern pike	78,777	38,319	-63,002	55,115	109,209
	Yellow perch	77,287	44,206	-10,873	23,135	133,755
	Walleye	0	-64,835	-59,369	-22,121	-146,324
	Lake whitefish	67,346	-30,146	3,914	46,099	87,212
	Smallmouth bass	31,787	52,156	38,812	59,117	181,871
	Small-bodied Fish	-	-	-	-	74,174
	TOTAL	**255,197**	**39,700**	**-90,518**	**161,345**	**439,897**

Note: All values represent habitat units.

Table B.8: Summary of Lost Habitat and Offsetting Habitat for Northern Pike in Streams, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Identification	Habitat Summary					Habitat Suitability Index				Habitat Units				
			Habitat Type[a]	Avg. Channel Width (m)	Avg. Depth (m)[b]	Length (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost																
Open Pit	FAA	Mollie River (area lost to pit, alteration of habitat with the construction of New Lake)	High-gradient	15	<0.5	472	7,083	0.00	0.00	0.00	0.00	0	0	0	0	113,656
			Low-gradient pool	-	na	66	1,990	0.50	0.75	0.75	0.25	995	1,493	1,493	498	
			Low-gradient	10.6	0.7-3	373	3,952	0.75	0.75	0.75	0.50	2,964	2,964	2,964	1,976	
			High-gradient	19.0	<0.5	55	1,044	0.00	0.00	0.00	0.00	0	0	0	0	
			Low-gradient	14.2	0.7-3	2,518	35,749	0.75	0.75	0.75	0.50	26,812	26,812	26,812	17,874	
	FAA	Clam Creek (from East Clam Lake to the Mollie River)	Low-gradient	2.25	0.1-3.5	491	1,105	0.50	0.25	0.25	0.25	553	276	276	276	1,382
			Intermittent	0.5	<0.4	243	121	0.00	0.00	0.00	0.00	0	0	0	0	
Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	West Beaver Pond to Bagsverd South Arm	Low-gradient	3	0.5	41	104	0.00	0.25	0.00	0.00	0	26	0	0	26
	FAA (TMF Dam)			6	0.5-1.2	381	2,286	0.25	0.25	0.00	0.00	572	572	0	0	1,143
	Schedule 2 (between 2 Dams)			6	0.5-1.2	107	642	0.25	0.25	0.00	0.00	161	161	0	0	321
	FAA (Dam)			6	0.5-1.2	65	390	0.25	0.25	0.00	0.00	98	98	0	0	195
	Schedule 2 (Reclaim Pond)			9	0.5-1.2	404	3,474	0.25	0.50	0.25	0.00	869	1,737	869	0	3,474
	FAA (Dam)			12	0.5-1.2	73	896	0.25	0.50	0.25	0.25	224	448	224	224	1,121
	Schedule 2 (between 2 Dams)			11	0.5-1.2	23	248	0.25	0.50	0.25	0.25	62	124	62	62	309
	FAA (Dam)			12	0.5-1.2	25	302	0.25	0.50	0.25	0.25	75	151	75	75	377
Mine Rock Area (MRA)	FAA (Dam)	Tributary of Unnamed Lake #3	Low-gradient	0.5	<0.5	76	38	0.25	0.25	0.00	0.00	10	10	0	0	19
Chester Lake Outlet Culvert	FAA (alteration of habitat)	Mollie River	Low-gradient (upstream)	4.4	<0.5	35	152	0.00	0.25	0.00	0.00	0	38	0	0	92
			Culverts (3)	1.8	<0.5	20	108	0.00	0.00	0.00	0.00	0	0	0	0	
			Higher-gradient	10.4	<0.5	10	108	0.25	0.25	0.00	0.00	27	27	0	0	
											Total FAA Losses	32,328	32,887	31,844	20,924	117,984
											Total Schedule 2 Losses	1,091	2,047	930	62	4,131
											TOTAL LOSS	**33,419**	**34,935**	**32,775**	**20,986**	**122,115**
Created Habitat																
Open Pit	Schedule 2	WRC1: Clam to Chester Lake	Higher-gradient	2.8 /3.75	0.2/0.5	113	416	0.00	0.00	0.00	0.00	0	0	0	0	6,325
			Alternating Pools	17	1	250	4,150	0.50	0.75	0.25	0.00	2,075	3,113	1,038	0	
			Low-gradient	4	0.5	50	200	0.25	0.25	0.00	0.00	50	50	0	0	
Chester Lake Road Crossing	FAA Habitat Alteration	Culvert placement on Mollie River	Haul Road Culverts	3.6	<0.5	39	140	0.00	0.00	0.00	0.00	0	0	0	0	0
			Low-gradient	10.4	<0.5	6.5	68	0.00	0.00	0.00	0.00	0	0	0	0	
			Access Road Culverts	3.6	<0.5	19	68	0.00	0.00	0.00	0.00	0	0	0	0	
Site	Schedule 2	Little Clam Lake to East Clam Lake	Low-gradient	1.5-3.0	<0.5	235	520	0.25	0.50	0.00	0.00	130	260	0	0	390
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 to Middle Three Duck	Low-gradient	1.5 / 2.8	0.25	237	450	0.00	0.25	0.00	0.00	0	113	0	0	113
Open Pit	FAA for Mollie River	WRC2: New Lake to Upper Three Duck	Low-gradient	9	0.5/1.0	500	4,500	0.75	0.75	0.50	0.50	3,375	3,375	2,250	2,250	37,839
			Higher-gradient (riffle pool)	5.3 / 7.3	0.42/1.0	52	300	0.25	0.25	0.25	0.00	75	75	75	0	
			Higher-gradient (riffle pool)	6.8 / 10.8	0.55/1.6	188	1,560	0.25	0.25	0.25	0.00	390	390	390	0	
			Low-gradient	11.5	1.0/2.5	507	5,831	0.75	0.75	0.75	0.50	4,373	4,373	4,373	2,916	
			Higher-gradient (riffle pool)	6.4 / 9.5	0.55/1.5	248	2,260	0.25	0.25	0.25	0.00	565	565	565	0	
			Low-gradient	11.5	1.0/2.0	236	2,714	1.00	0.75	0.50	0.50	2,714	2,036	1,357	1,357	
											Total FAA Gains	11,492	10,926	9,010	6,523	37,951
											Total Schedule 2 Gains	2,255	3,423	1,038	0	6,715
											TOTAL GAINS	**13,747**	**14,349**	**10,048**	**6,523**	**44,666**
											DIFFERENCE	**-19,672**	**-20,586**	**-22,727**	**-14,463**	**-77,448**

[a] Intermittent channel was assigned a channel width of 0.5 m.
[b] Depth in created habitat based on bankfull channel.

Table B.9: Summary of Lost Habitat and Offsetting Habitat for Yellow Perch in Streams, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Identification	Habitat Summary					Habitat Suitability Index				Habitat Units				
			Habitat Type[a]	Avg. Channel Width (m)	Avg. Depth (m)[b]	Length (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost																
Open Pit	FAA	Mollie River (area lost to pit, alteration of habitat with the construction of New Lake)	High-gradient	15	<0.5	472	7,083	0.00	0.00	0.00	0.00	0	0	0	0	104,228
			Low-gradient pool	-	na	66	1,990	0.75	0.75	0.50	0.50	1,493	1,493	995	995	
			Low-gradient	10.6	0.7-3	373	3,952	0.75	0.75	0.50	0.50	2,964	2,964	1,976	1,976	
			High-gradient	19.0	<0.5	55	1,044	0.00	0.00	0.00	0.00	0	0	0	0	
			Low-gradient	14.2	0.7-3	2,518	35,749	0.75	0.75	0.50	0.50	26,812	26,812	17,874	17,874	
	FAA	Clam Creek (from East Clam Lake to the Mollie River)	Low-gradient	2.25	0.1-3.5	491	1,105	0.50	0.50	0.25	0.00	553	553	276	0	1,382
			Intermittent	0.5	<0.4	243	121	0.00	0.00	0.00	0.00	0	0	0	0	
Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	West Beaver Pond to Bagsverd South Arm	Low-gradient	3	0.5	41	104	0.25	0.25	0.00	0.00	26	26	0	0	52
	FAA (Dam)			6	0.5-1.2	381	2,286	0.25	0.25	0.00	0.00	572	572	0	0	1,143
	Schedule 2 (between 2 Dams)			6	0.5-1.3	107	642	0.25	0.25	0.00	0.00	161	161	0	0	321
	FAA (Dam)			6	0.5-1.4	65	390	0.25	0.25	0.00	0.00	98	98	0	0	195
	Schedule 2 (Reclaim Pond)			9	0.5-1.2	404	3,474	0.50	0.50	0.25	0.00	1,737	1,737	869	0	4,343
	FAA (Dam)			12	0.5-1.2	73	896	0.50	0.50	0.25	0.25	448	448	224	224	1,345
	Schedule 2 (between 2 Dams)			11	0.5-1.2	23	248	0.50	0.50	0.25	0.25	124	124	62	62	371
	FAA (Dam)			12	0.5-1.2	25	302	0.50	0.50	0.25	0.25	151	151	75	75	452
Mine Rock Area (MRA)	FAA (Dam)	Tributary of Unnamed Lake #3	Low-gradient	0.5	<0.5	76	38	0.25	0.25	0.25	0.00	10	10	10	0	29
Chester Lake Outlet Culvert	FAA (Alteration of Habitat, culvert placement)	Mollie River	Low-gradient (upstream)	4.4	<0.5	35	152	0.25	0.25	0.25	0.00	38	38	38	0	114
			Culverts (3)	1.8	<0.5	20	108	0.00	0.00	0.00	0.00	0	0	0	0	0
			Higher-gradient	10.4	<0.5	10	108	0.00	0.00	0.25	0.00	0	0	27	0	27
											Total FAA Losses	33,137	33,137	21,496	21,145	108,914
											Total Schedule 2 Losses	2,047	2,047	930	62	5,087
											TOTAL LOSS	**35,184**	**35,184**	**22,426**	**21,207**	**114,001**
Habitat Created																
Open Pit	Schedule 2	WRC1: Clam to Chester Lake	Higher-gradient	2.8 /3.75	0.2/0.5	113	416	0.00	0.00	0.00	0.00	0	0	0	0	6,375
			Alternating Pools	17	1	250	4,150	0.50	0.75	0.25	0.00	2,075	3,113	1,038	0	
			Low-gradient	4	0.5	50	200	0.25	0.25	0.25	0.00	50	50	50	0	
Chester Lake Road Crossing	FAA Habitat Alteration	Culvert placement on Mollie River	Haul Road Culverts	3.6	<0.5	39	140	0.00	0.00	0.00	0.00	0	0	0	0	34
			Low-gradient	10.4	<0.5	6.5	68	0.00	0.25	0.25	0.00	0	17	17	0	
			Access Road Culverts	3.6	<0.5	19	68	0.00	0.00	0.00	0.00	0	0	0	0	
Site	Schedule 2	Little Clam Lake to East Clam Lake	Low-gradient	1.5-3.0	<0.5	235	520	0.50	0.50	0.00	0.00	260	260	0	0	520
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 to Middle Three Duck	Low-gradient	1.5 / 2.8	0.25	237	450	0.00	0.25	0.25	0.00	0	113	113	0	225
Open Pit	FAA for Mollie River	WRC2: New Lake to Upper Three Duck	Low-gradient	9	0.5/1.0	500	4,500	1.00	0.75	0.75	0.50	4,500	3,375	3,375	2,250	42,149
			Higher-gradient (riffle pool)	5.3 / 7.3	0.42/1.0	52	300	0.25	0.50	0.50	0.00	75	150	150	0	
			Higher-gradient (riffle pool)	6.8 / 10.8	0.55/1.6	188	1,560	0.25	0.50	0.50	0.00	390	780	780	0	
			Low-gradient	11.5	1.0/2.5	507	5,831	1.00	0.75	0.50	0.50	5,831	4,373	2,916	2,916	
			Higher-gradient (riffle pool)	6.4 / 9.5	0.55/1.5	248	2,260	0.25	0.50	0.50	0.00	565	1,130	1,130	0	
			Low-gradient	11.5	1.0/2.0	236	2,714	1.00	0.75	0.50	0.50	2,714	2,036	1,357	1,357	
											Total FAA Gains	14,075	11,973	9,837	6,523	42,408
											Total Schedule 2 Gains	2,385	3,423	1,088	0	6,895
											TOTAL GAINS	**16,460**	**15,396**	**10,924**	**6,523**	**49,303**
											DIFFERENCE	**-18,724**	**-19,788**	**-11,502**	**-14,684**	**-64,699**

[a] Intermittent channel was assigned a channel width of 0.5 m.
[b] Depth in created habitat based on bankfull channel.

Table B.10: Summary of Lost Habitat and Offsetting Habitat for Walleye in Streams, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Identification	Habitat Summary					Habitat Suitability Index				Habitat Units				
			Habitat Type[a]	Avg. Channel Width (m)	Avg. Depth (m)[b]	Length (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost																
Open Pit	FAA	Mollie River (area lost to pit, alteration of habitat with the construction of New Lake)	High-gradient	15	<0.5	472	7,083	0.50	0.00	0.00	0.00	3,541	0	0	0	34,834
			Low-gradient pool	-	na	66	1,990	0.00	0.25	0.25	0.00	0	498	498	0	
			Low-gradient	10.6	0.7-3	373	3,952	0.00	0.25	0.25	0.25	0	988	988	988	
			High-gradient	19.0	<0.5	55	1,044	0.50	0.00	0.00	0.00	522	0	0	0	
			Low-gradient	14.2	0.7-3	2,518	35,749	0.00	0.25	0.25	0.25	0	8,937	8,937	8,937	
	FAA	Clam Creek (from East Clam Lake to the Mollie River)	Low-gradient	2.25	0.1-3.5	491	1,105	0.00	0.00	0.00	0.00	0	0	0	0	0
			Intermittent	0.5	<0.4	243	121	0.00	0.00	0.00	0.00	0	0	0	0	
Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	West Beaver Pond to Bagsverd South Arm	Low-gradient	3	0.5	41	104	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (TMF Dam)			6	0.5-1.2	381	2,286	0.00	0.00	0.00	0.00	0	0	0	0	0
	Schedule 2 (between 2 Dams)			6	0.5-1.3	107	642	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (Dam)			6	0.5-1.4	65	390	0.00	0.00	0.00	0.00	0	0	0	0	0
	Schedule 2 (Reclaim Pond)			9	0.5-1.2	404	3,474	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (Dam)			12	0.5-1.2	73	896	0.00	0.00	0.00	0.00	0	0	0	0	0
	Schedule 2 (between 2 Dams)			11	0.5-1.2	23	248	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (Dam)			12	0.5-1.2	25	302	0.00	0.00	0.00	0.00	0	0	0	0	0
Mine Rock Area (MRA)	FAA (Dam)	Tributary of Unnamed Lake #3	Low-gradient	0.52	<0.5	76	40	0.00	0.00	0.00	0.00	0	0	0	0	0
Chester Lake Outlet Culvert	FAA (Alteration of Habitat, culvert placement)	Mollie River	Low-gradient (upstream)	4.4	<0.5	35	152	0.00	0.00	0.00	0.00	0	0	0	0	0
			Culverts (3)	1.8	<0.5	20	108	0.00	0.00	0.00	0.00	0	0	0	0	0
			Higher-gradient	10.4	<0.5	10	108	0.50	0.25	0.00	0.00	54	27	0	0	81
											Total FAA Losses	4,117	10,450	10,423	9,925	34,915
											Total Schedule 2 Losses	0	0	0	0	0
											TOTAL LOSS	**4,117**	**10,450**	**10,423**	**9,925**	**34,915**
Habitat Created																
Open Pit	Schedule 2	WRC1: Clam to Chester Lake	Higher-gradient	2.8 /3.75	0.2/0.5	113	416	0.00	0.00	0.00	0.00	0	0	0	0	1,088
			Alternating Pools	17	1	250	4,150	0.00	0.25	0.00	0.00	0	1,038	0	0	
			Low-gradient	4	0.5	50	200	0.00	0.25	0.00	0.00	0	50	0	0	
Chester Lake Road Crossing	FAA Habitat Alteration	Culvert placement on Mollie River	Haul Road Culverts	3.6	<0.5	39	140	0.00	0.00	0.00	0.00	0	0	0	0	0
			Low-gradient	10.4	<0.5	6.5	68	0.00	0.00	0.00	0.00	0	0	0	0	
			Access Road Culverts	3.6	<0.5	19	68	0.00	0.00	0.00	0.00	0	0	0	0	
Site	Schedule 2	Little Clam Lake to East Clam Lake	Low-gradient	1.5-3.0	<0.5	235	520	0.00	0.00	0.00	0.00	0	0	0	0	0
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 to Middle Three Duck	Low-gradient	1.5 / 2.8	0.25	237	450	0.00	0.00	0.00	0.00	0	0	0	0	0
Open Pit	FAA for Mollie River	WRC2: New Lake to Upper Three Duck	Low-gradient	9	0.5/1.0	500	4,500	0.00	0.25	0.00	0.25	0	1,125	0	1,125	16,084
			Higher-gradient (riffle pool)	5.3 / 7.3	0.42/1.0	52	300	0.50	0.25	0.00	0.00	150	75	0	0	
			Higher-gradient (riffle pool)	6.8 / 10.8	0.55/1.6	188	1,560	0.50	0.50	0.00	0.00	780	780	0	0	
			Low-gradient	11.5	1.0/2.5	507	5,831	0.00	0.50	0.25	0.25	0	2,916	1,458	1,458	
			Higher-gradient (riffle pool)	6.4 / 9.5	0.55/1.5	248	2,260	0.75	0.50	0.00	0.00	1,695	1,130	0	0	
			Low-gradient	11.5	1.0/2.0	236	2,714	0.00	0.75	0.25	0.25	0	2,036	679	679	
											Total FAA Gains	2,625	8,061	2,136	3,261	16,084
											Total Schedule 2 Gains	0	1,088	0	0	1,088
											TOTAL GAINS	**2,625**	**9,149**	**2,136**	**3,261**	**17,171**
											DIFFERENCE	**-1,492**	**-1,301**	**-8,287**	**-6,664**	**-17,744**

[a] Intermittent channel was assigned a channel width of 0.5 m.
[b] Depth in created habitat based on bankfull channel.

Table B.11: Summary of Lost Habitat and Offsetting Habitat for Smallmouth Bass in Streams, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Identification	Habitat Summary					Habitat Suitability Index				Habitat Units				
			Habitat Type[a]	Avg. Channel Width (m)	Avg. Depth (m)[b]	Length (m)	Area (m^2)	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost																
Open Pit	FAA	Mollie River (area lost to pit, alteration of habitat with the construction of New Lake)	High-gradient	15	<0.5	472	7,083	0.00	0.00	0.00	0.00	0	0	0	0	31,268
			Pool	-	na	66	1,990	0.00	0.25	0.25	0.25	0	498	498	498	
			Low-gradient	10.6	0.7-3	373	3,952	0.00	0.25	0.25	0.25	0	988	988	988	
			High-gradient	19.0	<0.5	55	1,044	0.00	0.00	0.00	0.00	0	0	0	0	
			Low-gradient	14.2	0.7-3	2,518	35,749	0.00	0.25	0.25	0.25	0	8,937	8,937	8,937	
	FAA	Clam Creek (from East Clam Lake to the Mollie River)	Low-gradient	2.25	0.1-3.5	491	1,105	0.00	0.00	0.00	0.00	0	0	0	0	0
			Intermittent	0.5	<0.4	243	121	0.00	0.00	0.00	0.00	0	0	0	0	
Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	West Beaver Pond to Bagsverd South Arm	Low-gradient	3	0.5	41	104	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (TMF Dam)			6	0.5-1.2	381	2,286	0.00	0.00	0.00	0.00	0	0	0	0	0
	Schedule 2 (between 2 Dams)			6	0.5-1.3	107	642	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (Dam)			6	0.5-1.4	65	390	0.00	0.00	0.00	0.00	0	0	0	0	0
	Schedule 2 (Reclaim Pond)			9	0.5-1.2	404	3,474	0.00	0.00	0.00	0.00	0	0	0	0	0
	FAA (Dam)			12	0.5-1.2	73	896	0.00	0.25	0.00	0.00	0	224	0	0	224
	Schedule 2 (between 2 Dams)			11	0.5-1.2	23	248	0.00	0.25	0.00	0.00	0	62	0	0	62
	FAA (Dam)			12	0.5-1.2	25	302	0.00	0.25	0.25	0.00	0	75	75	0	151
Mine Rock Area (MRA)	FAA (Dam)	Tributary of Unnamed Lake #3	Low-gradient	0.52	<0.5	76	40	0.00	0.00	0.00	0.00	0	0	0	0	0
Chester Lake Outlet Culvert	FAA (Alteration of Habitat, culvert placement)	Mollie River	Low-gradient (upstream)	4.4	<0.5	35	152	0.25	0.50	0.25	0.00	38	76	38	0	152
			Culverts (3)	1.8	<0.5	20	108	0.00	0.00	0.00	0.00	0	0	0	0	0
			Higher-gradient	10.4	<0.5	10	108	0.00	0.25	0.25	0.00	0	27	27	0	54
											Total FAA Losses	38	10,825	10,563	10,423	31,849
											Total Schedule 2 Losses	0	62	0	0	62
											TOTAL LOSS	**38**	**10,887**	**10,563**	**10,423**	**31,911**
Habitat Created																
Open Pit	Schedule 2	WRC1: Clam to Chester Lake	Higher-gradient	2.8 /3.75	0.2/0.5	113	416	0.00	0.00	0.00	0.00	0	0	0	0	1,088
			Alternating Pools	17	1	250	4,150	0.00	0.25	0.00	0.00	0	1,038	0	0	
			Low-gradient	4	0.5	50	200	0.00	0.25	0.00	0.00	0	50	0	0	
Chester Lake Road Crossing	FAA Habitat Alteration	Culvert placement on Mollie River	Haul Road Culverts	3.6	<0.5	39	140	0.00	0.00	0.00	0.00	0	0	0	0	17
			Low-gradient	10.4	<0.5	6.5	68	0.00	0.25	0.00	0.00	0	17	0	0	
			Access Road Culverts	3.6	<0.5	19	68	0.00	0.00	0.00	0.00	0	0	0	0	
Site	Schedule 2	Little Clam Lake to East Clam Lake	Low-gradient	1.5-3.0	<0.5	235	520	0.00	0.00	0.00	0.00	0	0	0	0	0
Aggregate Pit Rehabilitation	FAA	Aggregate Pit #3 to Middle Three Duck	Low-gradient	1.5 / 2.8	0.25	237	450	0.00	0.25	0.25	0.00	0	113	113	0	225
Open Pit	FAA for Mollie River	WRC2: New Lake to Upper Three Duck	Low-gradient	9	0.5/1.0	500	4,500	0.25	0.50	0.50	0.25	1,125	2,250	2,250	1,125	20,170
			Higher-gradient (riffle pool)	5.3 / 7.3	0.42/1.0	52	300	0.00	0.25	0.25	0.00	0	75	75	0	
			Higher-gradient (riffle pool)	6.8 / 10.8	0.55/1.6	188	1,560	0.00	0.25	0.25	0.00	0	390	390	0	
			Low-gradient	11.5	1.0/2.5	507	5,831	0.25	0.50	0.25	0.25	1,458	2,916	1,458	1,458	
			Higher-gradient (riffle pool)	6.4 / 9.5	0.55/1.5	248	2,260	0.00	0.25	0.25	0.00	0	565	565	0	
			Low-gradient	11.5	1.0/2.0	236	2,714	0.25	0.50	0.50	0.25	679	1,357	1,357	679	
											Total FAA Gains	3,261	7,682	6,207	3,261	20,412
											Total Schedule 2 Gains	0	1,088	0	0	1,088
											TOTAL GAINS	**3,261**	**8,769**	**6,207**	**3,261**	**21,499**
											DIFFERENCE	**3,223**	**-2,118**	**-4,356**	**-7,162**	**-10,412**

[a] Intermittent channel was assigned a channel width of 0.5 m.
[b] Depth in created habitat based on bankful channel.

Table B.12: Summary of Lost Habitat and Offsetting Habitat for Small-bodied Fish in Streams, Côté Gold Project

Location of Impact	FAA / Schedule 2 / Created Compensation or Alteration of Habitat?	Identification	Habitat Summary					Habitat Suitability Index	Habitat Units	
			Habitat Type[a]	Avg. Channel Width (m)	Avg. Depth (m)[b]	Length (m)	Area (m^2)		Habitat Units	TOTAL
Habitat Lost										
Open Pit	FAA - alteration of habitat	Unnamed stream between Unnamed Pond and Mollie River	Intermittent	0.5	<0.5	276	138	0.25	35	455
		Unnamed stream from Unnamed Pond to Mollie River	Low-gradient	1.8	<0.5	468	842	0.50	421	
New Lake	FAA - alteration of habitat	Unnamed stream outlet from East Beaver Pond	Intermittent	0.5	<0.3	139	70	0.25	17	17
		Unnamed stream between East Beaver Ponds	Intermittent	0.5	<0.3	113	57	0.25	14	14
Tailings Management Facility (TMF) and Reclaim Pond	Schedule 2	Unnamed Waterbody #2 Main Inlet	Low-gradient	1.5	0.4	267	400	0.25	100	272
		Unnamed Waterbody #2 Small Inlets	Low-gradient	0.45	0.35	244	110	0.25	27	
		Unnamed Waterbody #2 Outlet	Low-gradient	1.8	<0.5	161	290	0.50	145	
Mine Rock Area (MRA)	Schedule 2	Tributary of Unnamed Lake #3	Low-gradient	0.5	<0.3	217	109	0.25	27	63
			Intermittent	0.5	<0.3	104	52	0.25	13	
			Low-gradient	0.5	<0.3	22	11	0.25	3	
			Low-gradient	0.5	0.3-<1	162	81	0.25	20	
									Total FAA Losses	487
									Total Schedule 2 Losses	335
									TOTAL	**822**
Habitat Created										
Open Pit	FAA	Unnamed Pond to New Lake	Intermittent	1.5	0.3	409	768	0.50	384	384
Aggregate Pit	FAA	Bagsverd Aggregate Pit to wetland to the north	Low-gradient	1.5	0.5	100	427	0.75	320	320
									Total FAA Gains	704
									Total Schedule 2 Gains	0
									TOTAL GAINS	**704**

[a] Intermittent channel was assigned a channel width of 0.5 m.
[b] Depth in created habitat based on bankfull channel.

Table B.13: Summary of Lost Habitat, Created Habitat, and Habitat Balance for Streams, Côté Gold Project

Species		Spawning/ Incubation	Juvenile Rearing	Adult Foraging	Over-wintering	TOTAL
Habitat Lost	Northern pike	33,419	34,935	32,775	20,986	122,115
	Yellow perch	35,184	35,184	22,426	21,207	114,001
	Walleye	4,117	10,450	10,423	9,925	34,915
	Smallmouth bass	38	10,887	10,563	10,423	31,911
	Small-bodied Fish	-	-	-	-	822
Total Habitat Units Lost		72,758	91,455	76,187	62,541	303,764
Species		**Spawning/ Incubation**	**Juvenile Rearing**	**Adult Foraging**	**Over-wintering**	**TOTAL**
Habitat Created	Northern pike	13,747	14,349	10,048	6,523	44,666
	Yellow perch	16,460	15,396	10,924	6,523	49,303
	Walleye	2,625	9,149	2,136	3,261	17,171
	Smallmouth bass	3,261	8,769	6,207	3,261	21,499
	Small-bodied Fish	-	-	-	-	704
	Connectivity Weeduck Lake[a]	-	-	-	-	47,665
	Connectivity Little and East Clam[a]	-	-	-	-	41,789
Total Habitat Units Gained		36,094	47,662	29,316	19,568	222,798
Species		**Spawning/ Incubation**	**Juvenile Rearing**	**Adult Foraging**	**Over-wintering**	**TOTAL**
Balance	Northern pike	-19,672	-20,586	-22,727	-14,463	-77,448
	Yellow perch	-18,724	-19,788	-11,502	-14,684	-64,699
	Walleye	-1,492	-1,301	-8,287	-6,664	-17,744
	Smallmouth bass	3,223	-2,118	-4,356	-7,162	-10,412
	Small-bodied Fish	-	-	-	-	-118
TOTAL		**-36,665**	**-43,793**	**-46,871**	**-42,973**	**-80,966**

Note: All values represent habitat units.

[a] Connectivity was determined by calculating 10% of the total area gained for access to habitat (e.g., 10% of total surface area for Upper Three Duck Lake and Clam Lake) by the suitability of the habitat gained (i.e.., Upper Three Duck was assigned an HSI of 0.75, Clam Lake 0.5 as fish from Little Clam and East Clam had partial access to this area).

APPENDIX C
DESIGN DRAWINGS

GEOPROCESS DESIGN BRIEF

Côté Gold Watercourse Realignments: Fluvial Geomorphology and Natural Channel Design

FINAL REPORT

Prepared for

IAMGOLD Corporation

401 Bay Street, Suite 3200
Toronto, ON
M5H 2Y4

February 2019
Project No. P2017-288

Prepared by

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GeoProcess
RESEARCH ASSOCIATES

Knowledge
Research
Consulting

February 4, 2019

Steven Woolfenden
Manager, Corporate Environmental Assessments and Approvals
IAMGOLD Corporation
401 Bay Street, Suite 3200
Toronto, Ontario, M5H 2Y4

Re: Watercourse Realignments: Fluvial Geomorphology and Natural Channel Design
Côté Gold Project

Dear Mr. Woolfenden:

GeoProcess Research Associates Inc. (GRA) is pleased to submit our detailed design for two watercourse realignments to IAMGOLD in support of the Côté Gold Project. These channels were designed using Natural Channel Design principles with the overall objective of maximizing habitat potential and creating long-term geomorphically stable channels that function in concert with the existing watershed system and proposed hydrology as a result of the Project. Enclosed in this submission are:

- Detailed design drawing package for WRC1, WRC2 and New Lake, and;
- Supporting design brief document.

Please don't hesitate to contact us if you have any questions regarding the contents contained within this submission.

Regards,

GEOPROCESS RESEARCH ASSOCIATES INC

Jeff Hirvonen, MASc
Principal

Ben Plumb, PhD, P.Eng.
River Engineer

Executive Summary

The proposed Côté Gold Project will overprint Clam Creek, a section of the Mollie River and Côté Lake. To maintain hydrologic connectivity and aquatic habitat (lakes connected through short sections of river), two Watercourse Realignment Channels (WRCs) and a New Lake have been designed.

To support the WRC designs, a geomorphologic assessment was completed for the existing sections of Clam Creek and Mollie River to be affected by the mine infrastructure. The assessment characterized the existing morphology and bed material of both watercourses. Results from the assessment were combined with hydrologic and hydrogeomorphic modelling to inform key design criteria for the WRC designs. Both WRCs were designed using principles of Natural Channel Design (NCD), with the overall objective of creating functional channels that work with the existing natural processes of the broader hydrologic system. Additionally, the channels were designed to maximize available habitat potential, matching or enhancing the existing habitat conditions for both Clam Creek and Mollie River.

This document summarizes the existing conditions geomorphological assessment and outlines the rationale and design criteria for the proposed WRC and New Lake designs. The detailed design drawings accompany this document.

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1. Introduction

GeoProcess Research Associates Inc. (GRA) was retained by IAMGOLD Corporation (IMG) to design two watercourse realignments using Natural Channel Design (NCD) principles to accommodate the proposed Côté Gold Project infrastructure. As part of the project plan, realignments of Clam Creek, the Mollie River and a new lake are proposed, with the objectives of providing long-term geomorphic stability and providing similar or enhanced aquatic habitat conditions in the watercourses. This technical design brief and accompanying drawings pertain to the designs of the low flow (bankfull) channels and habitat revetments for the two watercourse realignments and lake. Flood impacts, corridor design and associated dam designs have been completed by others in the IMG Engineering team.

To achieve designs that function in concert with hydrological, morphological, sedimentological and ecological objectives, a baseline fluvial geomorphological assessment was completed for the existing reaches of Clam Creek and Mollie River. This assessment characterized the existing morphological characteristics of both reaches. Additional hydrogeomorphic modelling was undertaken using field data and hydrologic modelling results provided by the IMG Engineering team to estimate fluvial processes pertaining to the dominant discharge, sediment mobility, backwater characteristics and the channel-floodplain interactions. Ultimately, these results guided design criteria for the watercourse realignment channels (WRCs), and were used with the fish community targets identified by Minnow Environmental (the fisheries consultant).

2. Background

The Côté Gold Project is in the district of Sudbury, between the Cities of Sudbury and Timmins, close to the Town of Gogama, ON. The area is typical of this region of northern Ontario, with topographically high features of exposed bedrock interspersed with glacial-deposited overburden in the lower lying areas. The area has extensive networks of lakes connected by rivers. The rivers generally transition between local higher gradient reaches (as they flow down bedrock outcrop areas) to wider low gradient reaches through the topographically low areas.

The project proposes to overprint Côté Lake, Clam Creek and portions of the Mollie River. As such, it is necessary to reroute flows from these features. To reroute the flows, watercourse realignments and the construction of a New Lake are proposed. These new hydrologic features have been designed to mimic the existing features while enhancing regionally constrained aquatic habitats, where feasible. A map illustrating the existing lake and river system and the general arrangement of the proposed watercourse realignments and New Lake is shown in Figure 1.

New Lake will connect to the Chester Lake outlet, replacing a section of the existing Mollie River valley. A dam will be constructed along the Mollie River to stop the flow to Côté Lake and to create New Lake (all dam designs were prepared by others and are not part of this technical brief). In addition to New Lake, two watercourse realignment channels (WRCs) are proposed; WRC1 and WRC2. WRC1 is a new outlet for Clam Lake, effectively replacing Clam Creek and rerouting the Clam Lake flows. WRC2 connects the New Lake (and in turn, Chester Lake) to Upper Three Duck Lake, replacing the reach of the Mollie River. WRC2 will convey both the discharge entering Chester Lake from the upper watershed as well as the discharge from WRC1, flowing from Clam Lake.

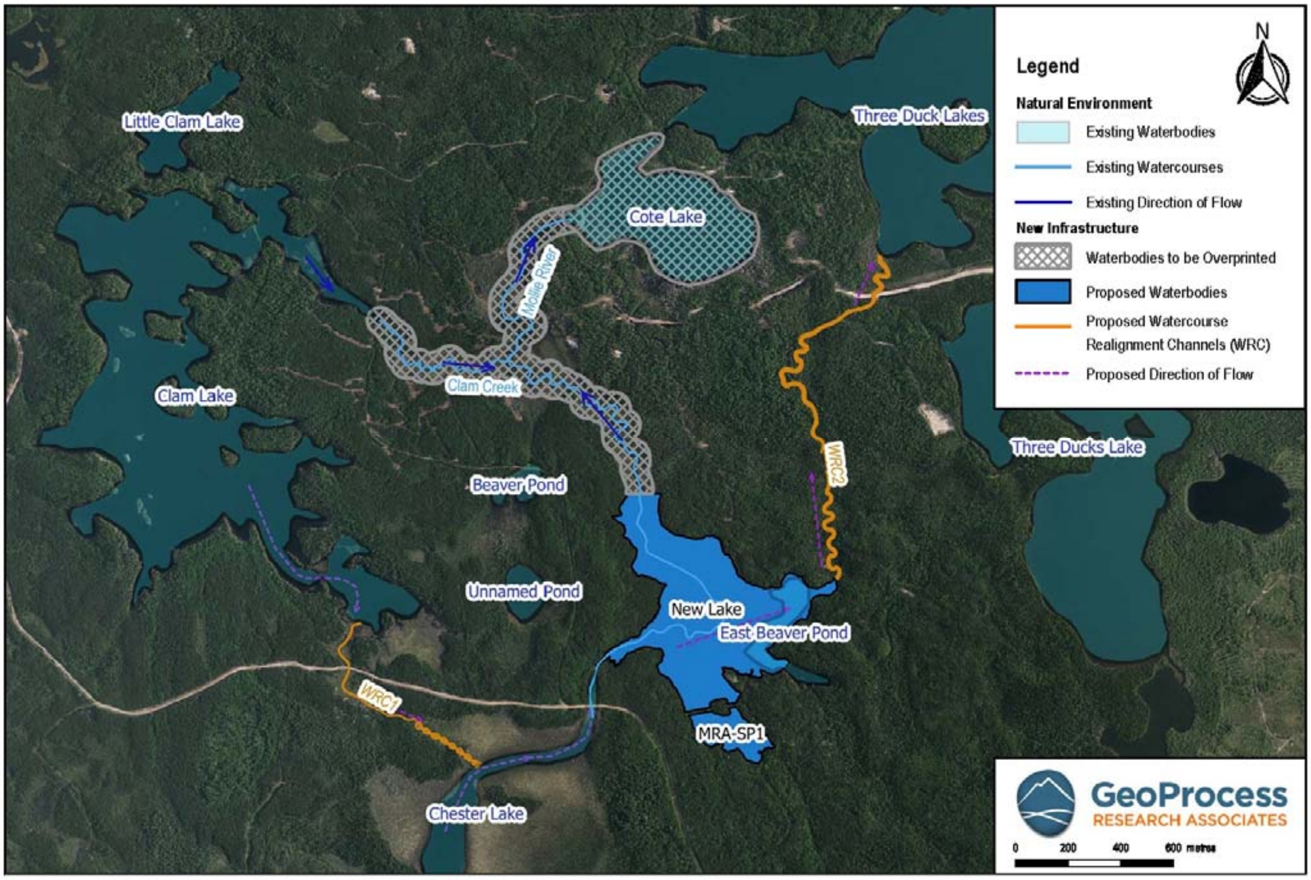


Figure 1: Côté Gold Project proposed watercourse and lake alterations.

3. Existing and Proposed Hydrology

An assessment of the existing and proposed hydrology was undertaken to gain an understanding of the rerouting requirements and to obtain design parameters for the WRCs. Golder undertook this assessment and provided continuous daily flow data. These data were derived from a GoldSim hydrologic model developed for the project and calibrated to available Environment Canada gauges (Golder, 2014). Both existing and proposed conditions models were developed, each having a period of record of 43 years. Details on the model development, assumptions, validation and results can be found in Golder (2014). Below is a summary of the modelled existing and proposed hydrologic conditions related to the watercourse realignment.

3.1. Summary of Continuous Flow Model (Golder, 2014)

The output for the hydrologic model was provided as lake outflows, therefore it was necessary to relate this data to the correct watercourse. Côté Lake outflow was used to estimate the existing conditions as it includes both the Mollie River and Clam Creek. However, since Côté Lake will be overprinted by the mine, Chester Lake outflow was used for the proposed conditions for WRC2 since it encompasses both WRC1 and the Chester Lake watershed (Figure 1). The Clam Lake outflow was used to estimate the flow regime in WRC1 for the proposed conditions. Since New Lake was not included in the GoldSim model, it is assumed that the

Chester Lake outflow will have similar discharge characteristics. Table 1 summarizes the lake outflows used for each representative watercourse.

Table 1: Locations used for hydrologic analysis for each scenario.

Scenario	Clam Lake Outflow	Chester and Côté Lake Outflow	Chester Lake Outflow
Existing Conditions	Clam Creek	Mollie River	Mollie River
Proposed Conditions	WRC1	N/A	WRC2

The mean and maximum annual discharges for Côté and Chester Lakes (WRC2) are approximately an order of magnitude greater than Clam Lake (WRC1) (Table 2 and Table 3). The proposed conditions outflow from Chester Lake is less than the existing conditions flow discharging from Côté Lake, on average. This likely reflects the loss of contributing watershed area due to overprinting by the mine since precipitation falling on the mine will be directed to treatment facilities. Flows from Clam Lake do not considerably change between existing and proposed conditions.

Table 2: Mean annual discharges for existing and proposed conditions for the simulated periods of record (m^3/s).

	Existing			Proposed	
Lake Outflow	Côté	Chester	Clam	Chester	Clam
Corresponding Watercourse	Mollie River and Clam Creek	Mollie River (upstream of Clam Creek)	Clam Creek	WRC2	WRC1
Mean	0.40	0.32	0.04	0.32	0.03
Min	0.10	0.08	0.01	0.07	0.02
Max	0.60	0.49	0.06	0.49	0.05

Table 3: Max annual discharges for existing and proposed conditions for the simulated periods of record (m^3/s).

	Existing			Proposed	
	Côté	Chester	Clam	Chester	Clam
Mean	4.27	3.40	0.42	3.55	0.42
Min	0.86	0.78	0.04	1.87	0.20
Max	6.91	5.62	0.79	6.09	0.81

For both systems, the highest flows occur in the spring, corresponding to snowmelt and the spring freshet (Figure 2) which generally occurs between March and June. April has the highest flows, on average. Another period of high flows occurs in the fall between October and November (Figure 2).

Based on the flow duration curves (Figure 3) for WRC1 (Clam Lake), the proposed conditions result in a slight reduction in higher discharges and a corresponding increase in low flows. The model predicts a reduction for the full range of flows for WRC2 (Côté and Chester Lakes) (Figure 3).

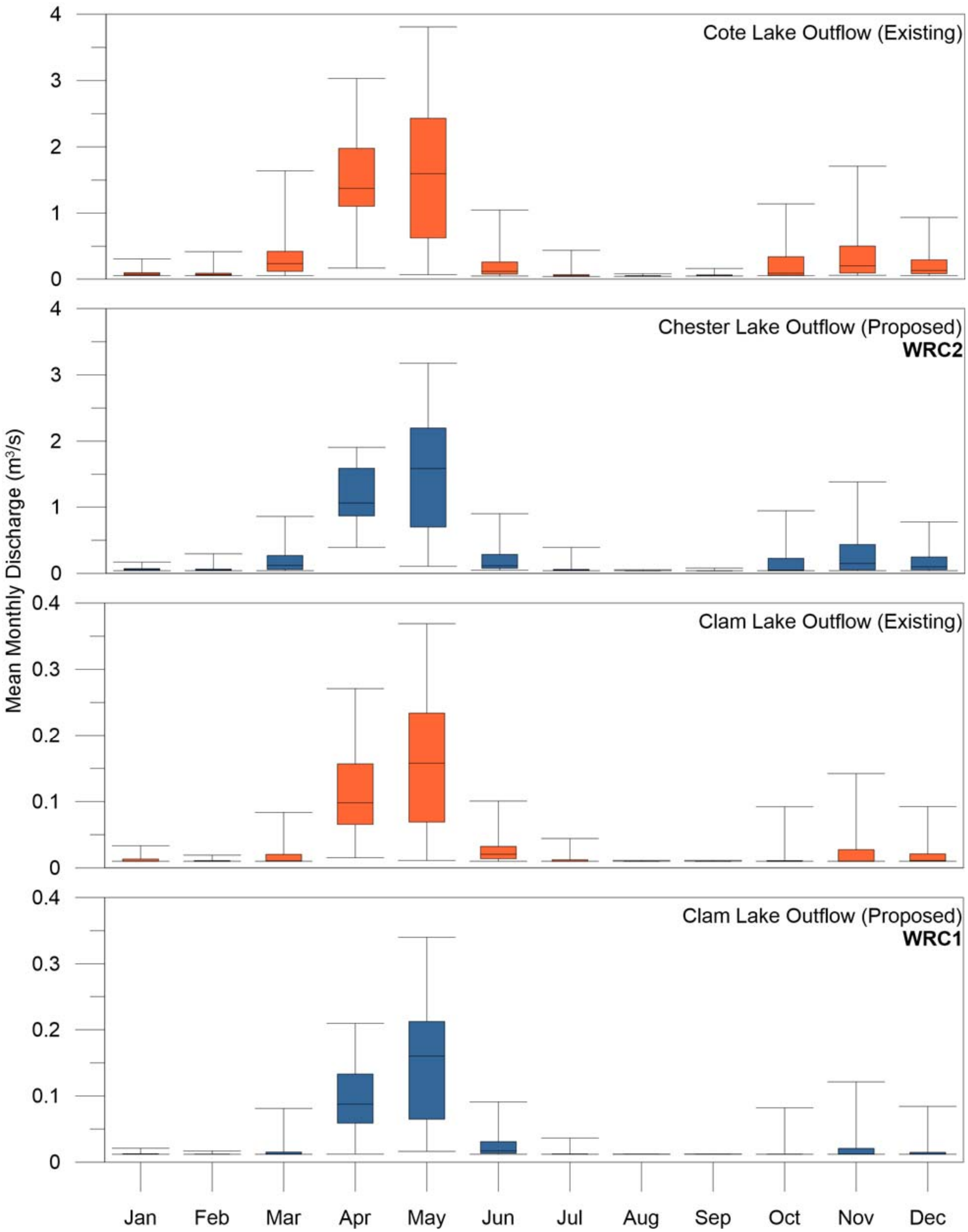


Figure 2: Mean monthly flows for existing and proposed conditions for the simulated periods of record. Whiskers represent range in mean monthly flows for simulated period of record.

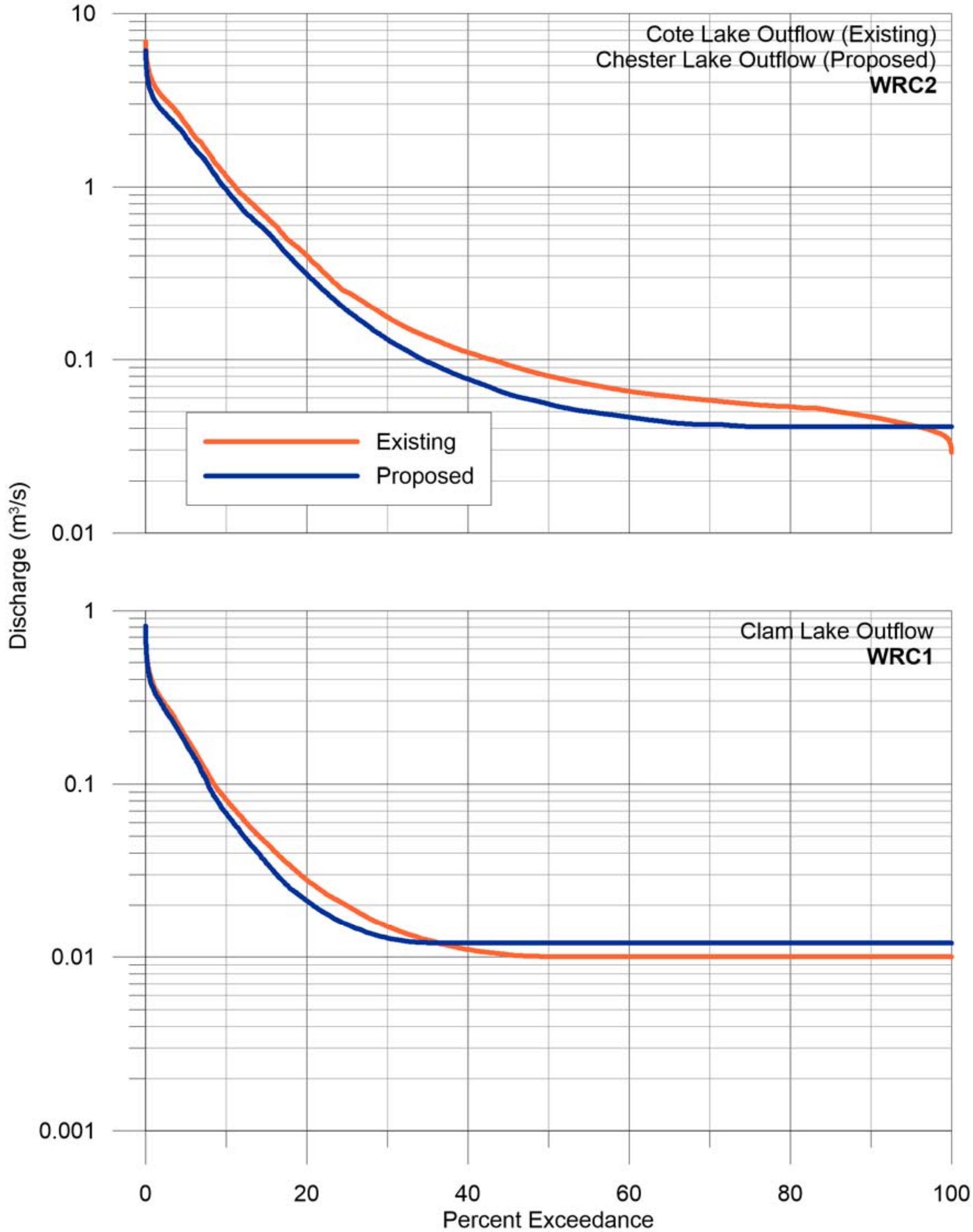


Figure 3: Flow-duration curves for existing and proposed conditions for the simulated periods of record.

Return-period flows were estimated by Weibull plotting position using both maximum annual discharge series and partial duration series. Partial duration series, or "events over a threshold", were set to include all hydrologically independent peak discharges above a defined threshold. This threshold was taken to be slightly below the lowest maximum annual discharge for the periods of record; 0.8 m^3/s and 0.03 m^3/s for Côté/Chester (WRC2) and Clam (WRC1) Lakes, respectively.

The objective of the flood-frequency analysis (FFA) is to provide an initial estimate of the dominant discharge, to size the low flow channel within the realignment corridor. As such, infrequent floods were not estimated as part of the FFA.

For the 2-year discharge, the difference between the maximum annual and partial series results was negligible. In general, discharges for return-periods less than the 1-year were higher for the partial-duration series (Figure 4). This effect of a lower return-period for a given discharge reflects the possibility of multiple events occurring in a given year, a scenario that occurs on occasion when the fall discharge is sufficiently high. A summary of the annual and 2-year discharge values is provided in Table 4.

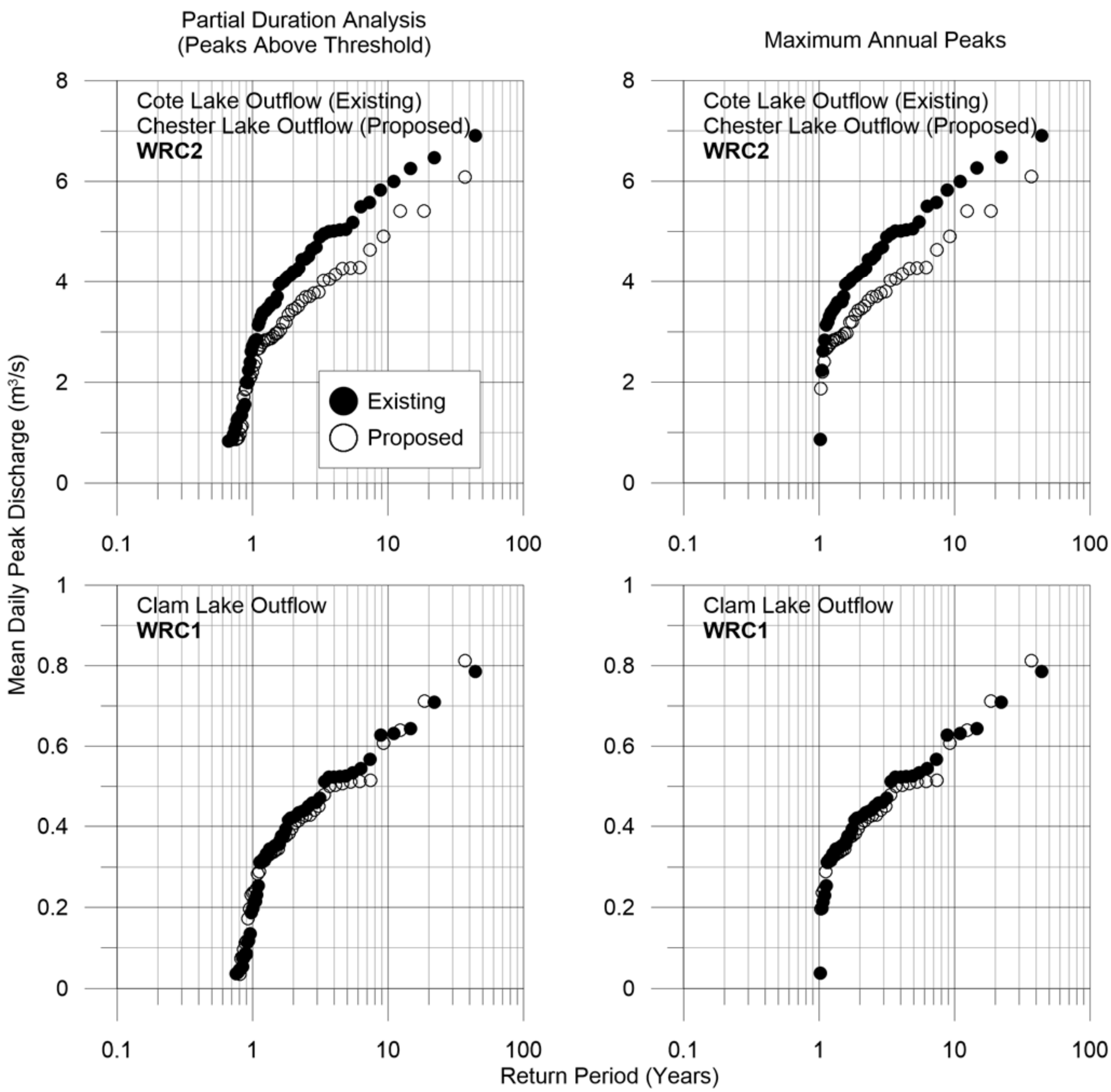


Figure 4: Flood frequency analysis for existing and proposed conditions.

Table 4: Estimated return-period discharges using Weibull plotting position based on partial duration series for both existing and proposed conditions periods of record.

	Existing			Proposed	
	Côté	Chester	Clam	Chester	Clam
2-year	4.20	3.44	0.42	3.45	0.40
1-year	2.71	2.12	0.20	2.21	0.24

4. Geomorphological Assessment and Existing Conditions

Field and analytical investigations were completed for the existing Clam Creek and Mollie River reaches that are proposed to be overprinted by mine infrastructure. The objective of the existing conditions assessment was to collect a morphologically representative dataset that established the groundwork for the design criteria so that the new NCDs will maintain a form and function that suit the governing channel processes. We understand that the new river corridors will have a different set of overarching conditions, but there are parameters and relationships that can be derived from existing channel morphology that can be scaled to the new sites.

4.1. Planform Characteristics

A morphometric analysis was completed for both the Mollie River and Clam Creek within the low gradient meandering reaches (Figure 5). The objective was to determine planform relationships that can be applied to the new corridors. The hydrologic modelling indicated that the operational hydrology (proposed conditions) will be less than the existing conditions, but not by a significant margin (i.e. is sufficiently similar for estimating purposes), as discussed in Section 3. Therefore, the proposed watercourse realignments will maintain similar flow conditions to the existing Clam Creek (for WRC1) and the Mollie River upstream of Clam Creek (for WRC2).

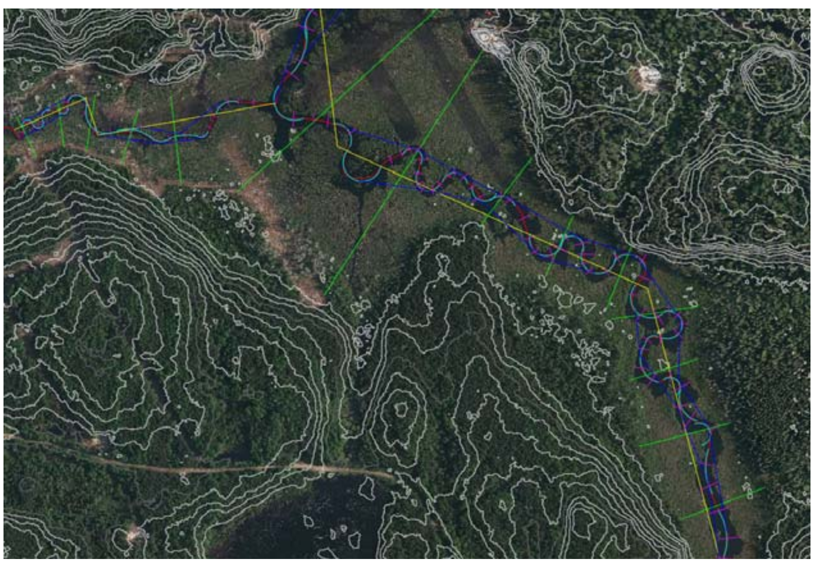


Figure 5: Example of the morphometric analysis for the Mollie River (right) and Clam Creek (left).

In general, there is a considerable range in meander geometry (Table 5). This is expected considering the variability in meander characteristics of the low gradient reaches, which vary from highly sinuous to nearly straight.

Table 5: Mollie River and Clam Creek planform characteristics for low gradient reaches.

		Wetted Width (m)	Valley Bottom Width (m)	Radius of Curvature (m)	Meander Wavelength (m)	Sinuosity
Mollie River	Mean	15.9	123.4	30.9	86.8	1.29
	Max	38.6	348.8	85.8	157.6	1.65
	Min	6.4	26.0	9.2	48.1	1.01
	Median	14.2	97.3	22.2	84.3	1.24
	St.Dev.	6.6	84.8	21.0	28.1	0.26
Clam Creek	Mean	5.1	65.8	18.3	43.1	1.21
	Max	8.8	97.7	56.6	71.7	1.50
	Min	3.1	49.0	5.5	24.7	1.00
	Median	4.8	63.7	11.0	40.8	1.12
	St.Dev.	1.5	19.0	16.6	16.7	0.26

The mean planform parameters were compared to empirical relationships of Williams (1986) to estimate if they relate to the estimated bankfull channel relationships. It is acknowledged that the measured parameters vary considerably and, therefore, have the potential for a wider range of uncertainty. Using the applicable relationships, a range for each morphologic parameter was estimated (Table 6). The spread in the parameters reflects the variability of the measured data, the bankfull channel estimates and the inherent uncertainty associated the Williams (1986) relationships. While the measured ranges (Table 5) generally overlap with those estimated from empirical relationships (Table 6), the variability reasserts the overall meander complexity of these systems and the possible backwater influence of Côté Lake on the downstream portions of the Mollie River and Clam Creek.

Table 6: Maximum and minimum morphologic parameters estimated using the relationships from Williams (1986).

Morphologic Parameter	Mollie River		Clam Creek	
	Min	Max	Min	Max
Meander Wavelength (m)	140.0	276.5	29.1	82.9
Radium of Curvature (m)	19.1	49.3	5.2	9.5
Bankfull Area (m^2)	5.0	12.7	1.7	5.7
Bankfull Width (m)	0.9	59.3	0.5	11.1
Bankfull Depth (m)	0.5	1.7	0.2	0.6
Meander Belt Width (m)	52.9	317.3	26.3	52.7

4.2. Field Investigation

A detailed geomorphological investigation was completed in June 2018. Detailed geomorphic surveys of both the Mollie River and Clam Creek were undertaken to ascertain a physical representation of the existing river systems and to inform design criteria for the WRCs. The following section summarizes the existing morphologic conditions.

4.2.1. Reach Delineation

A single river may transition between different morphologies along its course due to changes in geology, slope, valley type, sediment sources, anthropogenic influences or discharge. As such, it is common to separate rivers into segments, or reaches. A reach can range in length, depending on the size and characteristics of the river. However, it should be sufficiently long that average hydraulic and morphologic characteristics can be confidently estimated. In this assessment, reaches were delineated based on desktop analyses of planform conditions and further refined after the field investigation, taking into consideration the previously listed factors and the field observations. The resulting reach delineations are illustrated in Figure 6.

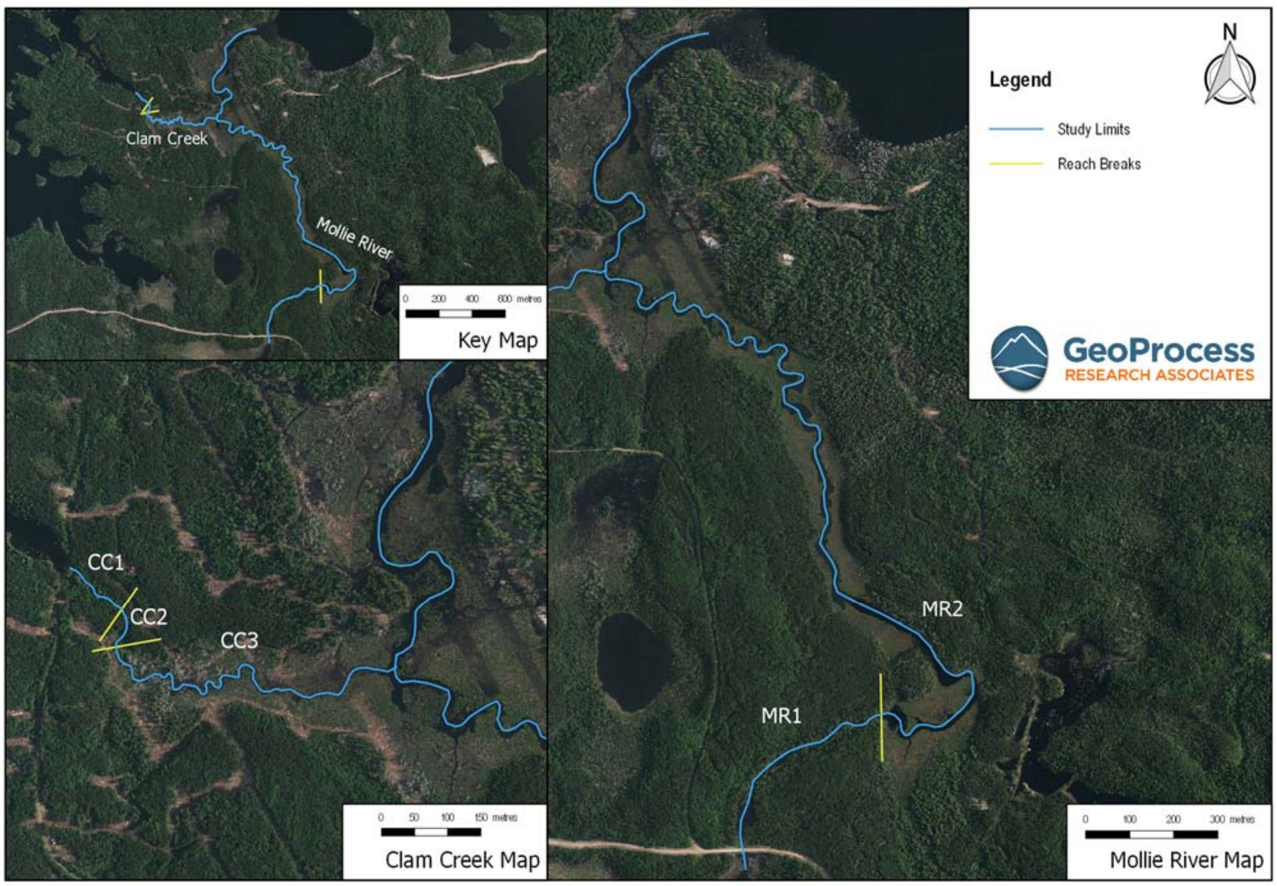


Figure 6: Reach delineations for field characterization.

4.2.2. Mollie River

The Mollie River study area is contained between Chester Lake (upstream) and Côté Lake (downstream). There are two distinct reaches: 1) a steep reach immediately downstream of Chester Lake (MR1) that transitions into 2) a low gradient reach eventually flowing into Côté Lake (MR2). Figure 9 plots the longitudinal profile of the entire study reach with reach breaks shown. Table 7 summarizes measured cross-sectional bankfull geometry characteristics and modelled hydraulic parameters.

MR1 is characterized by a series of steps, riffles and runs with small to large forced pools spaced between. Large woody debris is prominent throughout the reach. Bedrock outcrops were observed along the length, with a portion of the bed directly flowing on exposed bedrock. Bed material was mainly large cobble to boulder-sized material, with minimal sands (and fines) contained in the interstitial spaces of the larger stones. A small floodplain is present in this reach, although visual evidence (vegetation types, lack of sedimentary deposits) suggests that the floodplain is infrequently inundated. Typical photographs of MR1 are shown in Figure 7. The gradient in this reach is moderate to steep, except at local instances of large forced pools, ranging between 0.36% and 3.70% (illustrated in Figure 9). Six cross-sections were measured in MR1, with top widths and depths ranging between approximately 9 m – 10.5 m and 0.4 m – 1.2 m, respectively.

Cross-sectional parameters were referenced to the field identified bankfull stage (elevation where water begins to spill into the floodplain or terrace). Based on field observations, the bankfull channel appears to be oversized relative to the flow regime. This observation is consistent with this type of system, due to its limited sediment supply, as is typical in reaches immediately downstream of lakes, where the channel is not maintained by sediment input from upstream. Instead, the channel is controlled by the large, stable bed material, vegetation and erratic instances of bedrock outcrops.

Figure 7: Looking upstream at Chester Lake (top left), typical view of MR1 (top right), large bed material typical of MR1 (bottom left), looking upstream from MR2 (bottom right).

MR2 is a low gradient, sluggish reach that varies considerably in planform and cross-sectional geometry. The reach is dominated by a vast, densely vegetated floodplain that has an active connection to the bankfull channel. Bed material is mainly sands and organics, with local instances of consolidated overburden or bedrock outcrops. There were several sporadic boulders throughout the reach, providing additional in-stream habitat. Large woody debris was common. Planform geometry ranged between relatively straight to highly sinuous. Well-defined run-pool sequence (shown in Figure 9) were present throughout most of the reach, with runs and pools typically coinciding with meander cross-overs and outer bends, respectively. The photos in Figure 8 depict typical conditions in MR2. The hydraulic gradient measured throughout the reach was shallow, with slopes ranging between 0.006% and 0.02%. Cross-sectional geometry also varied considerably (seven cross-sections were measured), with top widths and depths ranging between approximately 8 m – 21 m and 0.9 m – 4.7 m, respectively.

The low gradient and active floodplain connection indicate that this reach is a low-energy system. This is supported by the lack of observed channel instability. Bank stability is primarily governed by shoreline riparian vegetation. While sediment supply of coarse material is limited due to factors discussed for MR1, some sands and finer particles are likely delivered from MR1, and local scour and deposition has generated and maintained the run-pool sequence. These processes appear in balance, based on the lack of observed instability.

Figure 8: Looking downstream from MR1 (top left), typical view of MR2 (top right), typical view of MR2 (bottom left), example of sporadic instances of large boulders through MR2 (bottom right).

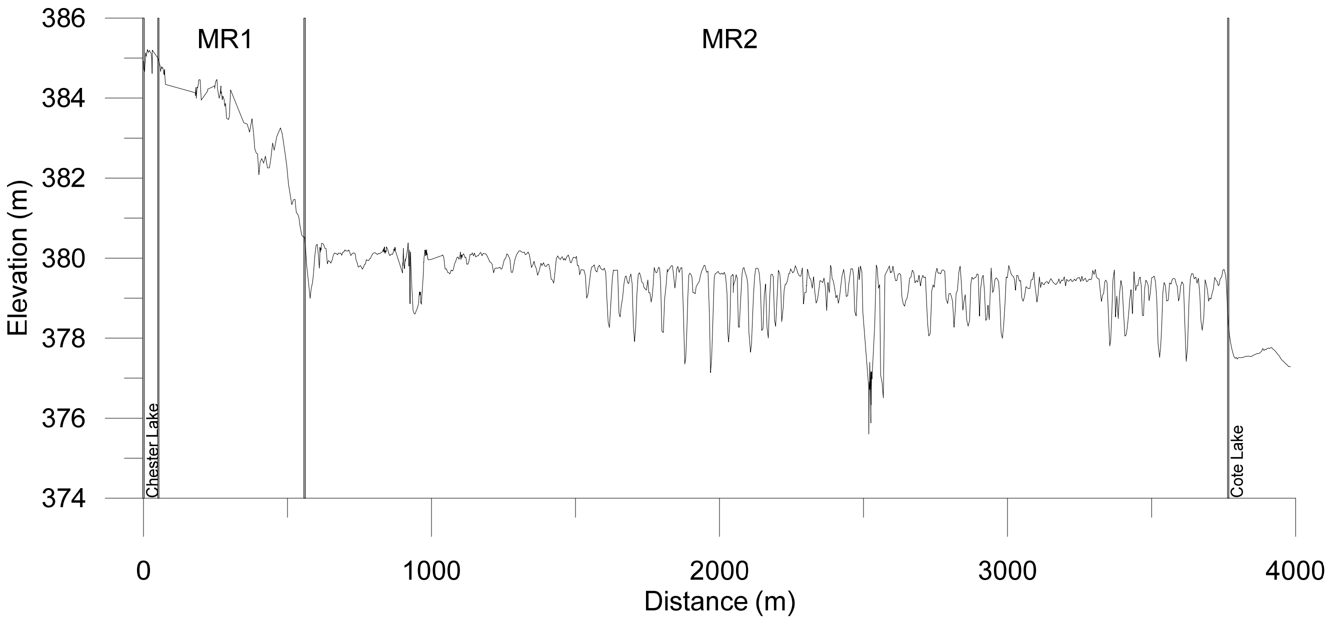


Figure 9: Mollie River longitudinal profile.

Table 7: Mollie River cross-sectional characteristics.

	MR1			MR2			River
	Average	Minimum	Maximum	Average	Minimum	Maximum	Average
Gradient (%)	0.5	0.36	3.70	0.01	0.006	0.02	0.26
Area (m^2)	4.35	1.60	7.99	14.85	5.31	43.02	9.60
Top Width (m)	9.90	8.95	10.48	13.56	7.65	21.48	11.73
Mean Depth (m)	0.43	0.18	0.76	1.00	0.55	2.41	0.71
Max Depth (m)	0.71	0.35	1.19	1.73	0.93	4.67	1.22
Wetted Perimeter (m)	10.24	9.12	11.22	17.37	8.56	41.44	13.81
Hydraulic Radius (m)	0.41	0.18	0.71	0.77	0.53	1.04	0.59
Width-Depth Ratio (-)	28.86	13.76	50.00	15.81	7.43	31.28	22.34
Velocity (m/s)	0.96	0.56	1.41	0.20	0.13	0.26	0.58
Discharge (m^3/s)	4.88	0.89	11.26	3.24	0.74	11.03	4.06
Froude Number (-)	0.48	0.42	0.53	0.07	0.06	0.10	0.28
Shear Stress (Pa)	20.32	8.62	34.92	0.58	0.34	1.02	10.45
Shear Velocity (m/s)	0.14	0.09	0.19	0.02	0.02	0.03	0.08
Unit Stream Power (Watts/m^2)	23.53	4.90	53.00	0.17	0.05	0.61	11.85

4.2.3. Clam Creek

Clam Creek flows from Clam Lake and outlets to the Mollie River, shortly upstream of Côté Lake. For this analysis the creek has been separated into three distinct reaches; a low gradient wetland reach at the Clam Lake/Clam Creek transition (CC1), a high gradient middle reach similar to MR1 (CC2) and a low gradient sinuous channel similar to MR2 that outlets to the Mollie River (CC3). Figure 13 illustrates the longitudinal profile of the entire study reach with reach breaks shown. Table 8 summarizes measured cross-sectional bankfull geometry characteristics and modelled hydraulic parameters.

CC1 is located immediately downstream of the Clam Lake culvert. The upstream portion of this reach is essentially a short lake extension as Clam Lake transitions to Clam Creek. Bed material is primarily organics with a large abundance of in-channel vegetation. There is no clearly defined bankfull channel in the upstream portion of CC1, owing to the lack of erosive forces and shallow slope. Figure 10 shows typical photographs of CC1. Downstream, the gradient increases and a defined bankfull channel persists, with top widths and depths of approximately 2.3 m and 0.3 m, respectively. Bed material in the downstream portion of CC1 is dominated by gravel and cobbles.

Figure 10: Looking upstream at Clam Lake culvert (top left), typical view of CC1 (top right), typical view of CC1 (bottom left), large woody debris common through CC1 (bottom right).

CC2 has a similar morphology to MR1. Here, Clam Creek loses most of its gradient in a short, steep section. Like MR1, bed material consisted of larger material and bedrock outcrops. The gradients range between 2.3% and 9.2%. Top widths and depths range between approximately 2.3 m – 3 m and 0.15 m – 0.40 m, respectively. Like MR1, this reach is sediment supply limited and therefore has overall low sediment mobility. Channel stability is maintained by large, immobile bed material and bedrock outcrops. Figure 11 illustrates typical photographs of CC2.

Figure 11: Large cobble material common in CC2 (top left), looking downstream at steepest section of CC2 (top right), looking upstream at steepest section of CC2 (bottom left), looking downstream at CC3 (bottom right).

CC3 has similar morphology to MR2. A well-vegetated floodplain and low gradient meandering channel dominate the reach. The exception is the upstream portion which is slightly steeper and less sinuous, as the creek transitions from the higher gradient CC2 reach. Bed material was mainly soft organic material with a large abundance of in-channel vegetation and large woody debris. Gradients range between 0.006% and 2%. Similar to MR2, cross-sectional geometry varies considerably with top widths and depths ranging between approximately 2.7 m – 3.3 m and 0.5 m – 1 m, respectively. Stability in the reach is mainly controlled by riparian vegetation, with few indicators of instability. Figure 12 illustrates typical photographs of CC3. It should be noted that, due to the soft layer of organic material, only a portion of CC3 was surveyed. Hydraulic gradient was measured throughout the entire reach.

Figure 12: Typical view of CC3 (top left), common in-channel vegetation and soft organic bed (top right), floodplain and meandering section of CC3 (bottom left), looking downstream near the confluence with the Mollie River (bottom right).

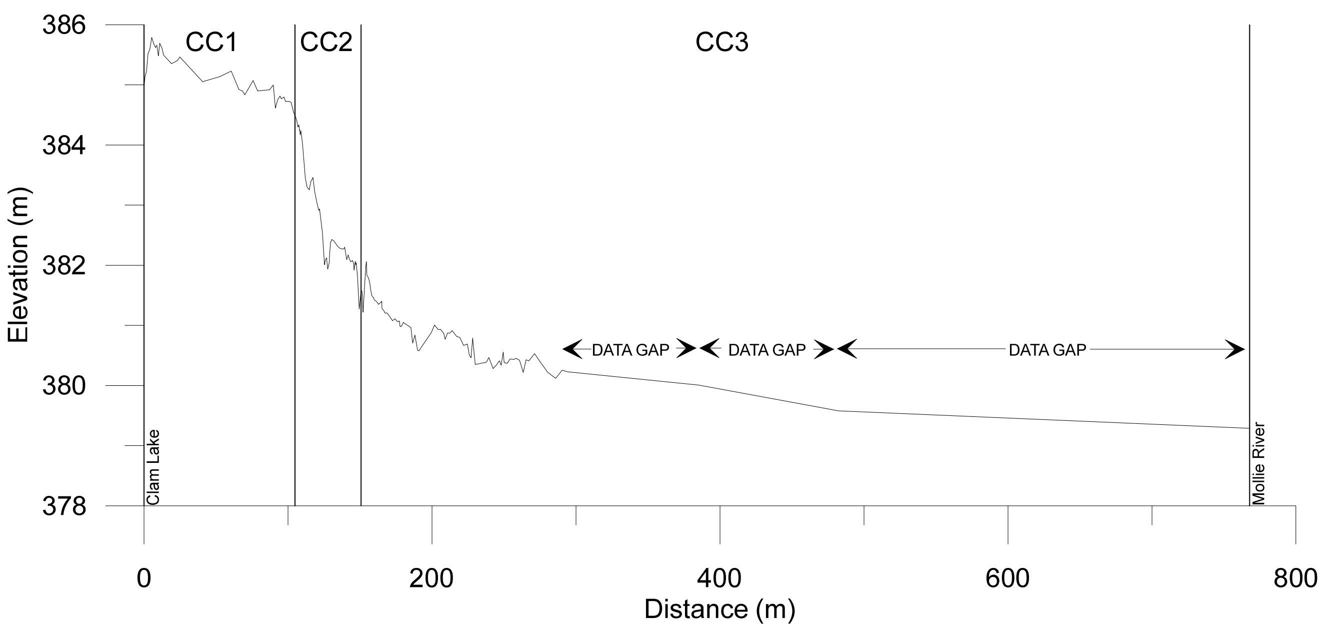


Figure 13: Clam Creek longitudinal profile.

Table 8: Clam Creek cross-sectional characteristics.

	CC1			CC2			CC3			River Average
	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	
Gradient (%)	1.20	0.70	1.70	6.30	2.30	9.20	0.02	0.006	2	
Area (m^2)	0.39	0.37	0.41	0.47	0.13	0.82	1.70	1.08	2.57	0.86
Top Width (m)	2.28	2.27	2.28	2.61	2.28	2.94	2.97	2.65	3.31	2.62
Mean Depth (m)	0.17	0.16	0.18	0.17	0.06	0.28	0.56	0.37	0.78	0.30
Max Depth (m)	0.30	0.29	0.32	0.29	0.15	0.43	0.73	0.47	1.04	0.44
Wetted Perimeter (m)	2.44	2.39	2.49	2.88	2.33	3.43	3.65	3.34	4.27	2.99
Hydraulic Radius (m)	0.16	0.15	0.17	0.15	0.05	0.24	0.45	0.32	0.60	0.25
Width-Depth Ratio (-)	13.30	12.61	14.00	25.95	10.50	41.41	5.68	4.26	7.95	14.98
Velocity (m/s)	0.82	0.80	0.84	2.22	1.19	3.24	0.15	0.12	0.18	1.06
Discharge (m^3/s)	0.32	0.30	0.35	1.41	0.15	2.67	0.27	0.13	0.46	0.67
Froude Number (-)	0.66	0.65	0.66	1.88	1.64	2.11	0.07	0.07	0.07	0.87
Shear Stress (Pa)	10.99	10.60	11.37	90.87	33.19	148.55	0.71	0.51	0.94	34.19
Shear Velocity (m/s)	0.10	0.10	0.11	0.28	0.18	0.39	0.03	0.02	0.03	0.14
Unit Stream Power (Watts/m^2)	9.75	9.00	10.50	300.50	41.00	560.00	0.14	0.07	0.22	103.46

4.2.4. Bed Material

Bed material in the higher gradient reaches (MR1 and the downstream portion of CC1) is dominated by large, immobile particles. These large particles, in addition to locations of bedrock outcrops, provide stability. Sediment samples were collected on riffles in both MR1 and CC1. Results are illustrated in Figure 14 and Table 9.

Table 9: Riffle bed material percentiles (mm) from steep reaches (MR1 and CC1).

	Clam Creek	Mollie River
D_{16}	4	30
D_{35}	10	191
D_{50}	17	242
D_{65}	30	298
D_{84}	54	401
D_{95}	84	578

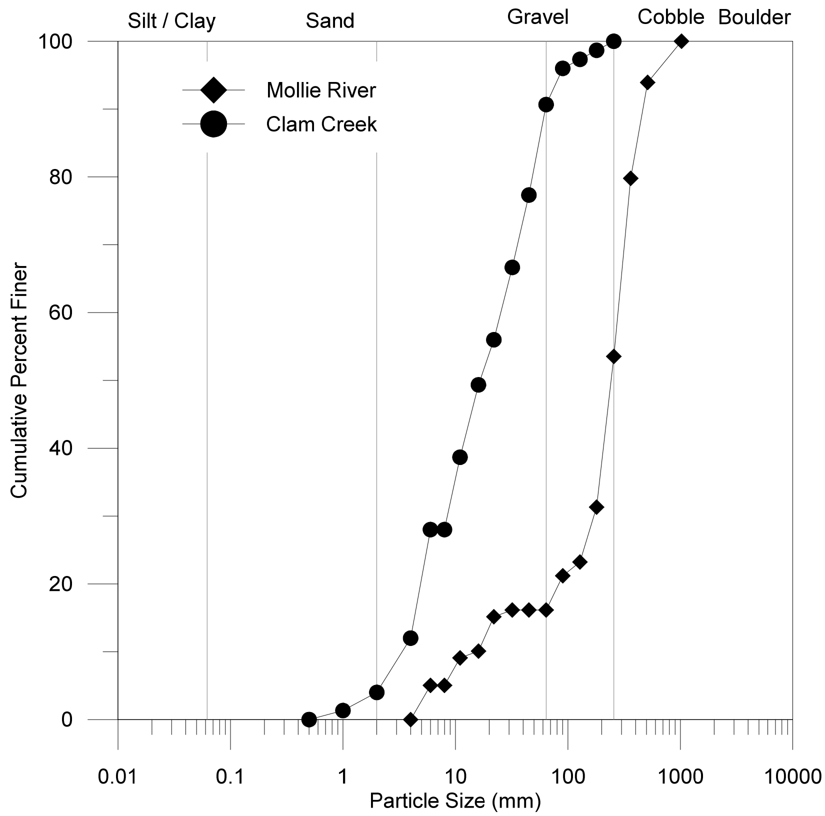


Figure 14: Grain-size distributions of riffle bed material.

4.3. Hydraulic Analysis

Hydraulic modelling was undertaken to assess the existing channel dynamics and flood patterns, as input to the design criteria for the WRCs. Hydraulic models were developed for the existing conditions (i.e., the Mollie River and Clam Creek) and the proposed designs (WRC1 and WRC2). Models were developed using HEC-RAS and related software. The model setup and discussion of the existing hydraulics are provided below. A discussion of the hydraulic analysis for the proposed conditions is provided in Section 5.4.1.

4.3.1. Existing Conditions Model

The existing conditions model included the Mollie River and Clam Creek. The Mollie River was modelled from the outlet of Chester Lake to the inlet of Côté Lake, and Clam Creek was model from the outlet of Clam Lake to the confluence with the Mollie River.

The channel's model geometry was developed from survey data collected by GRA and the floodplain geometry was taken from a digital elevation model (DEM) provided by IAMGOLD. Model flows were derived from the range of simulated flows in the hydrologic modelling (discussed further in Section 4.4). The downstream boundary condition for Côté Lake was established as the mean annual lake level (380.7 masl).

4.4. Hydrogeomorphic and Sediment Mobility Analysis

A hydrogeomorphic analysis was completed using the HEC-RAS 1D model output and key hydraulic parameters having relevance to sediment transport processes. These processes are represented by hydraulic forces and parameters such as shear stress, flow velocity and stream power. Each parameter is a manifestation of the forces acting to erode and deposit sediment within the reach. The objective of the hydrogeomorphic analysis was to relate the combination of these processes with the observed instances of erosion or deposition, as well as to the grain size distribution collected as part of the field program. The ultimate goal was to relate the findings to the natural channel form and to inform design criteria for sediment mobility within the WRCs.

The hydrogeomorphic analyses primarily involved simulating incrementally increasing flows in the hydraulic model and evaluating metrics used to infer the sediment transport and erosion potential. It was also used to corroborate the field-derived bankfull discharge (c.f. Annable et al., 2011). The existing conditions 1D model was used to model 80 incrementally increasing discharges between 0.1 and 8 m^3/s for the Mollie River and 0.01 and 0.08 m^3/s for Clam Creek. These discharges approximate the expected geomorphically significant flow regime, based on the hydrologic modelling estimates. It should be noted that the maximum discharge of 8 m^3/s for the Mollie River is greater than the discharges in the hydrologic model estimates, however, it was selected to maintain a similar number of discharge intervals as Clam Creek.

Discharge velocity (m/s) was determined by the following formula,

$$V_d = \frac{Q}{A}$$

where Q is the total discharge (m^3/s) and A is the total flow area obtained from HEC-RAS. Unit stream power (W/m^2) is defined by,

$$\widehat{P} = \frac{\gamma Q S_f}{W}$$

where γ is the specific weight of water (N/m^3), S_f is the friction slope and W is the top width of the flow for that specific cross-section. The total shear (N/m^2) is defined as,

$$\tau = \gamma R_h S_f$$

where R_h is the hydraulic radius (flow area / wetted perimeter). The width-depth ratio is the ratio of the top width of the flow to the hydraulic depth (flow area / top width). This metric doesn't directly relate to sediment transport or erosion potential (as the other three do), however, it can be used to observe how the wetted top width of the channel changes relative to the flow depth with increasing discharge, providing an indication of when the floodplain is accessed.

The results of the hydrogeomorphic analysis for existing conditions are presented in Appendix B. The analysis was undertaken at a reach level, using the same reaches discussed in Section 4.2.1. The analysis and results focused on developing an understanding of the existing condition that could be emulated in the proposed design, therefore it was not necessary to undertake hydrogeomorphic analysis on reaches and morphologies that are not being used to inform the channel realignments.

Clam Creek: The downstream portion of CC1 was found to have peak velocities ranging between approximately 0.9 and 1.2 m/s and peak shear stresses ranging between approximately 10 and 27 N/m^2. CC3 is a much lower energy environment, with peak velocities ranging between approximately 0.1 and 0.15 m/s and peak shear stresses less than N/m^2. This confirms the reason for the fine sediment seen in the field and for in-channel vegetation growth observed throughout this reach. Reach CC2 hydrogeomorphic results are not discussed here as this type of morphology (i.e., steep bedrock cascade) is not being included in the realignment designs.

Mollie River: MR1 is a higher energy environment, supporting coarse substrate and bedrock outcrops that dominate the reach. Riffles had peak velocities ranging between 1.6 and 2 m/s and shears stress ranging between approximately 50 and 80 N/m^2. Pools had peak velocities ranging between approximately 0.6 and 1 m/s and shears ranging between approximately 5 and 12 N/m^2. The hydrogeomorphic analysis confirms the field observation that MR1 does not have frequent floodplain access, with many of the cross-sections containing the full range of simulated discharges. MR2 is hydraulically similar to CC3, with low velocities (peaks ranging between approximately 0.16 and 0.3 m/s) and shear stresses (approximately 1 N/m^2). The floodplain was accessed by flows approximating the mean annual peak discharge (Table 3), however, irregularities in floodplain geometry (owing to the DEM) confounded some of the hydrogeomorphic plots (Appendix B).

Sediment mobility was estimated using the measured bed material distributions combined with results from the hydraulic modelling. The mobility ratio was used to indicate the relative mobility of a particle percentile. This ratio is defined as the ratio of applied shear stress to critical shear stress and can be considered the ratio of forces exerted on a particle (from the moving water) to the resistive forces (from gravity and interactions with other particles). A mobility ratio greater than one implies that the particle will mobilize for those flow conditions, and less than one implies the particle will remain stable. In reality, particle mobility and sediment transport is a complex and highly stochastic process that is dependent on local hydrodynamic turbulence, localized bed geometry and specific particle arrangements (e.g. stacking or hiding). Thus, it is possible for particles to become mobile even when estimated mobility ratios are less than one, and vice versa. However, this mobility estimate is appropriate for estimating average particle mobility at larger (i.e. reach) scales.

Critical shear stress was estimated using the empirical equation from Komar (1987). This relationship estimates the critical shear stress for a given particle percentile, i (τ_{ci}), and applies a weighted coefficient based on the D_{50} particle size. This weighted coefficient accounts for the tendency (in gravel-cobble beds with a range of particle sizes) for smaller particles to be shielded from the forces of water by larger particles. Conversely, larger particles are more exposed to flow as they protrude from the bed. This is referred to as particle hiding, and the weighted coefficient is a form of a hiding factor. Critical shear stress (τ_{ci}) for the ith was estimated by the following,

$$\tau_{ci} = 0.045(\rho_s - \rho_w)gD_{50}^{0.6}D_i^{0.4}$$

where ρ_s and ρ_w are the densities of sediment (2650 kg/m^3) and water (1000 kg/m^3), respectively, g is the acceleration of gravity (9.81 m/s^2), D_{50} is the median particle size and D_i is the ith particle percentile being assessed. The applied shear was estimated from the HEC-RAS models, specifically the main channel shear stress output which only considers the shear stress acting on the main channel (where most of the sediment transport will occur).

The mobility analysis was completed for the maximum modelled and 2-year flows for reaches CC1 and MR1 because sediment samples were obtained from these reaches during the field investigation. The results are summarized in Table 10 and Table 11.

Clam Creek: CC1 was found to have mobility ratios greater than one for the median and lower particle sizes (and exactly one for the D_{65}) when considering the maximum discharge. The 2-year discharge mobility rates are lower, with the median particle having a mobility ratio equal to one. This implies that, while some sediment mobility may be occurring, it is at a slow rate and generally only under larger flow events. With limited upstream sediment supply to replenish transported material, it is suspected that this reach is slowly eroding and would continue to do so until contacting the underlying bedrock material.

Mollie River: MR1 has mobility ratios that are mostly less than one for both the maximum and 2-year discharges, implying that the bed is close to immobile for a wide range of discharges. This supports field observations of riffles and runs with highly embedded material and few indicators of an actively mobile system.

Table 10: Mobility ratios for Clam Creek (CC1).

Percentile	Size (mm)	τ_{ci} (N/m^2)	Mobility Ratio Max Discharge	Mobility Ratio 2-year Discharge
		Discharge (m^3/s)	0.8	0.4
		Applied shear stress (N/m^2)	16	12
D_{16}	4	6.9	2.3	1.7
D_{35}	10	10.0	1.6	1.2
D_{50}	17	12.4	1.3	1.0
D_{65}	30	15.6	1.0	0.8
D_{84}	54	19.7	0.8	0.6
D_{95}	84	23.5	0.7	0.5

Table 11: Mobility ratios for Mollie River (MR1).

Percentile	Size (mm)	τ_{ci} (N/m^2)	Mobility Ratio Max Discharge	Mobility Ratio 2-year Discharge
		Discharge (m^3/s)	8	3.45
		Applied shear stress (N/m^2)	90	60
D_{16}	30	76.5	1.2	0.8
D_{35}	191	160.5	0.6	0.4
D_{50}	242	176.4	0.5	0.3
D_{65}	298	191.7	0.5	0.3
D_{84}	401	215.9	0.4	0.3
D_{95}	578	249.9	0.4	0.2

5. WRC Natural Channel Designs

Because of the planned Côté Gold Project infrastructure, a realignment of Clam Creek and a portion of the Mollie River is required. This provides an opportunity to enhance the system with new morphologic and hydrodynamic variability to promote higher value habitat for targeted species.

5.1. Target Morphology Types

Three distinct target morphologies are proposed, based on the existing conditions assessment, with a fourth morphology added for increased morphologic variability. The objective of the WRC designs was to incorporate each of these morphologies into the WRCs in a way that is sustained by natural processes over the long-term.

Lake Extension / In-line wetland: This morphology represents backwater conditions where the water level is controlled by the downstream channel invert. It is anticipated that wetlands will persist in some form at these locations (similar to CC1). The wetlands will provide storage and help to maintain low flows during the summer months. These wetland communities are also important biological features as they enhance the overall aquatic and terrestrial ecology by integrating abiotic and biotic elements. In considering key target species, critical habitat requirement (e.g. spawning northern pike and yellow perch or turtle nesting) within the wetlands will provide high-value wildlife habitat functions.

Low Gradient Sinuous: This morphology type emulates the existing downstream conditions of the Mollie River and Clam Creek (MR2 and CC3). The hydraulic conditions here are influenced by the downstream lake level, with backwater and very low velocities dominating the hydraulic regime. Here, bed and bank stability will be primarily achieved by riparian vegetation. Additional backwater habitats have been created to promote floodplain spawning (e.g. for Northern Pike). The meander geometry for these reaches is based on the existing meander pattern for the Mollie River (for WRC2), which provides a range of planform variability that mimics the existing channels. These zones typically have a wide valley to allow for natural processes and adjustments. These low gradient channels create excellent opportunities for northern pike spawning habitat, juvenile walleye rearing habitat or adult white sucker foraging habitat. The inclusion of boulders and large quantities of large woody debris (LWD) creates conditions for small-bodied fish refugia and, consequently, smallmouth bass foraging habitat.

Riffle-Pool: These reaches are the steepest and are in areas corresponding to bedrock outcrops (similar to MR1 and CC2). Here, a series of riffles, steps and pools have been designed to promote areas of higher velocity and more hydrodynamic variability. These features will be constructed by over-blasting pools while maintaining key grade-control locations within the native bedrock to maintain long-term bed stability. Pools or runs will then be created by backfilling the over-blasted zones with appropriate substrate. Due to a lack of upstream sediment resupply, the design has adopted a threshold-based approach for sediment stability. These zones have narrower valleys as they are constrained by the natural terrain, while still allowing for an adequate floodplain to promote energy dissipation for flood flows exceeding the bankfull channel. The features will also provide spawning habitat for species preferring swift water and coarse substrates, such as walleye. Careful consideration was given to the function of these riffles as walleye spawning habitat. Large pools were added to the downstream end of the riffle-pool sequences. This will create high-quality walleye spawning habitat found in the present-day Mollie River. Spawning occurs at the riffles under the correct flow conditions in the spring and can also occur within the stone and boulder-lined pool. The pool provides a staging area for spawning fish but, more importantly, provides refuge habitat for newly hatch fry drifting downstream and, eventually, juvenile rearing habitat.

Low Gradient Alternating Pools: This morphology is similar to the low gradient sinuous reach but is straighter. Instead of a sinuous channel, the top width alternates between wide, deep pools and narrow, shallower runs. This morphology emulates naturally occurring forced pools in low gradient environments, for example, those caused by beaver activity. Beaver dams play critical roles in wetland hydrology, fish habitat and carbon sequestration. The inclusion of this morphology in the downstream portion of WRC1, which is located in a bog community, is ideal for this setting as it will function with the local hydrology. This was a key consideration, due to the sensitive nature of bogs and their dependence on stable hydraulic conditions. This morphology provides a unique habitat enhancement opportunity as it creates a complex habitat system in a small area. The combination of the closely clustered pools and short chutes mixed with large woody debris and boulders creates conditions for all life stages of many fish species. This includes all life stages for small-bodied fish, spawning habitat for large fish such as northern pike, foraging habitat for smallmouth bass and rearing habitat juvenile fish such as walleye.

5.2. Design Components

Some of the key design components are as follows:

Floodplain Connectivity: The floodplain and low flow channel interactions are designed to mimic the existing conditions. Floodplain inundation is modelled to occur once every two years (approximately), delivering nutrients to the riparian vegetation.

Planform: The proposed channel alignment has been designed to replicate existing planform geometry. Higher gradient reaches are less sinuous and lower gradient reaches have considerably more sinuosity and meander complexity.

Sediment Transport: The natural condition of these watercourses is such that there is limited upstream sediment supply as they are short fed by lakes. Therefore, the channels were designed to have limited mobility, specifically in the higher gradient reaches where natural migration of the watercourse is expected to be minimal. The lower gradient reaches are primarily controlled by backwater from downstream lakes or grade-controls and are, therefore, low energy systems having minimal sediment entrainment. The reference-based design in these low gradient reaches will allow for natural adjustment similar to the existing channels, with channel stability being mostly driven by riparian vegetation and strategically placed grade-controls.

Bedform Creation and Habitat Complexity: The design includes bedforms dispersed throughout the longitudinal profile. The high-gradient reaches have riffle-pool sequences to promote hydrodynamic variability and to establish substrates preferred for spawning by target species. The riffles and pools within this reach will incorporate sporadic boulders and keystones which create zones of turbulence and refugia at higher flows. Lower gradient reaches consist of run-pool morphology and have an overall greater amount of habitat complexity. Additionally, a variety of bio-engineering treatments have been specified throughout the low gradient reaches to emulate the large woody debris commonly observed in the existing reaches of Clam Creek and Mollie River.

5.3. Design Criteria

Design criteria were established by field investigation, hydrologic, hydraulic and hydrogeomorphic analysis, as well as biological assessments. Qualitative and quantitative data were used to establish criteria and were augmented with modelling to estimate dominant fluvial processes acting within each watercourse. Parameters that were evaluated include:

- Bankfull discharge: the discharge that coincides with water beginning to spill out of the channel into the floodplain;
- Erosive potential: estimated channel velocities and shear stresses across a range of flows and the resulting sediment transport potential (size of particles mobilized);
- Cross-sectional geometry: the range in channel sizes currently persisting within both watercourses.

As discussed, the proposed corridors will have new boundary conditions (e.g. different gradients to meet critical tie-ins such as lake levels), however, the existing conditions characteristics need to be considered for the realignments, to maintain long-term function within the larger watershed system. The following sub-sections outline the key design criteria for each watercourse realignment.

5.3.1. Design Discharge

Modelled bankfull discharges for the Mollie River and Clam Creek ranged between 0.7 m^3/s – 11.3 m^3/s and 0.1 m^3/s – 2.1 m^3/s, respectively, with averages of 4.1 m^3/s and 0.7 m^3/s, respectively. This large range is owing to the relatively high variability in channel geometry and morphology throughout the study area. Analysis of the simulated hydrologic data revealed similarities in the average annual maximum and 2-year return period flow, with discharges of approximately 3.5 m^3/s and 0.4 m^3/s for the Mollie River and Clam Creek, respectively. These discharges are within the range of variability estimated from field measurements, with both being slightly lower than the average for each reach. These modelled discharges were adopted for the design to have more frequent floodplain inundation, estimated to occur once every two years, on average. Design discharges are summarized in Table 12.

Table 12: Design discharges for realignment channels (m^3/s).

Watercourse	Design Discharge
WRC1	0.4
WRC2	3.5

5.3.2. Channel Dimensions

Channel dimensions were designed within the range of measured cross-sectional parameters for each watercourse system. The extents of each reach are shown on the design drawings. Key dimensions at riffles and runs for both WRCs are provided in the following tables. All dimensions can also be found in the accompanying drawing packages.

Table 13: Key channel dimensions at riffle/run locations for WRC1.

Reach	WRC1-LE	WRC1-HG	WRC1-HG	WRC1-LG
Description	Lake extension	Upstream bedrock crest	Riffle-pool	Low gradient alternating pools
Gradient (%)	N/A	1.37	1.37	0.02
Riffle Gradient (%)	N/A	2.25	2.25	N/A
Run Gradient (%)	N/A	N/A	N/A	0.02
Bottom Width (m)	N/A	2.00	2.00	2.00
Top Width (m)	N/A	2.80	4.00	4.00
W:D Ratio (-)	N/A	14.00	8.00	8.00
Depth (m)	N/A	0.20	0.50	0.50
Avg. Riffle/Run Spacing (m)	N/A	N/A	14-20	36

Table 14: Key channel dimensions at riffle/run locations for WRC2.

Reach	WRC2-LG1	WRC2-HG1	WRC2-HG1	WRC2-Wetland	WRC2-HG2
Description	Low gradient sinuous	Upstream bedrock crest	Riffle-pool	In-line wetland	Upstream bedrock crest
Gradient (%)	0.18	2.00	2.00	N/A	0.59
Riffle Gradient (%)	N/A	2.00	3.80	N/A	2.00
Run Gradient (%)	0.18	N/A	N/A	N/A	N/A
Bottom Width (m)	7.00	8.00	3.50	N/A	4.30
Top Width (m)	9.00	9.00	5.30	N/A	5.60
W:D Ratio (-)	18.00	32.10	20.00	N/A	15.50
Depth (m)	0.50	0.28	0.45	N/A	0.36
Avg. Riffle/Run Spacing (m)	Varies	N/A	Varies	N/A	N/A

Table 15: Key channel dimensions at riffle/run locations for WRC2 continued.

Reach	WRC2-HG2	WRC2-LG2	WRC2-HG3	WRC2-HG3	WRC2-LG3
Description	Riffle-pool	Low gradient sinuous	Upstream bedrock crest	Riffle-pool	Low gradient sinuous
Gradient (%)	0.59	0.07	0.73	0.73	0.07
Riffle Gradient (%)	1.30	N/A	2.00	1.50	N/A
Run Gradient (%)	N/A	0.07	N/A	N/A	0.07
Bottom Width (m)	4.30	7.90	10.20	4.20	7.90
Top Width (m)	6.60	11.50	11.50	6.36	11.50
W:D Ratio (-)	15.50	12.80	34.50	11.80	12.80
Depth (m)	0.57	0.90	0.33	0.54	0.90
Avg. Riffle/Run Spacing (m)	33-46	Varies	N/A	Varies	Varies

5.3.3. Planform Characteristics

Planform characteristics were designed within the range of measured characteristics outlined in Section 4.1. Where possible, existing planform sequences were directly translated to the WRC designs, applying appropriate scaling factors, if required. Planform for the higher gradient reaches were kept relatively straight to mimic existing conditions while attempting to minimize the amount of bedrock blasting (to limit overall disturbances due to construction). Detailed alignments are shown on the accompanying drawings.

5.3.4. Sediment Transport and Stability

Given the limited sediment input into the system and overall limited mobility of the channel beds, a threshold-based approach was used to size substrate that is likely to remain immobile under all but the most extreme flow conditions. This approach minimizes risk associated with erosion and mimics the system's existing sediment regime. By matching the existing sediment regime, the designs should not contribute additional sediment delivered to downstream lakes, like the present-day conditions.

Stone has been specified for the construction of the grade control features (i.e., riffles, crossovers and crests) within the low flow channels. Rounded stone, as opposed to riprap, is recommended as it is more representative of natural watercourse sediment, favouring colonization by benthos.

The stone sizing was determined using a threshold (tractive force) approach for predicting the threshold particle size for the maximum predicted shear stress. This approach relies on the determination of a critical shear stress to calculate the stable stone size. The Shields parameter (τ_*) is used to define the ratio of shear force to the weight of a stone under channelized flow. The critical value of Shields (τ_{*C}) defines the particle size corresponding to the beginning of particle mobility. Solving for the diameter of the particle size d_s, the stable particle is determined as follows:

$$d_s = \frac{\tau}{(p_s - p)g\tau_{*C}}$$

Where: d_s = threshold diameter of particle at incipient motion (m)

τ = bed shear stress (N/m^2) for the peak discharge available

p_s = density of sediment (2650 kg/m^3)

p = density of water (1000 kg/m^3)

g = gravitational acceleration (9.81 m/s^2)

τ_{*C} = Critical Shield's parameter for coarse particles (Julien, 2002).

Bed shear stress is dependant on the local channel geometry and hydraulics. Therefore, threshold stone sizes will vary throughout a system. At-a-station hydraulics analysis (taking the 1D hydraulic model output) using the Manning's equation was undertaken for representative channel dimensions along each reach of WRC1 and WRC2. This established the range of critical bed shear stresses expected for the proposed design. In doing this, the threshold stone sizing was set for a representative flood event for each reach. A safety factor was also applied to increase the stone sizes for long term stability and to account for uncertainty. A summary of the channel shear stresses and threshold stone sizes for each reach is provided in Table 16. It is noted that no roundstone was required for reaches WRC1-LE and WRC2-WETLAND. For all the LG reaches, compacted native material will be the preferred substrate material, similar to the existing conditions in MR2 and CC3. However, roundstone at run/cross-over sections may be added during construction to at those locations depending on the quality of native material, at the discretion of the supervising qualified professional who is experienced in natural channel design and implementation (herein referred to as the QP).

Table 16: Summary of channel shear and threshold stone size for each reach.

Reach		Channel Shear Stress (Pa)	Threshold Stone Sizing (mm)
WRC1	HG	45	68
	LG	1	38
WRC2	LG1	11	38
	HG1	54-118	113-248
	HG2	55 -70	113-143
	LG2	5	38
	HG3	47-55	98-113
	LG3	5	38

Using the threshold stone sizes, stone mix gradations were developed. A gradation provides volumetric proportions of a range of stone sizes. The stone mixture allows for construction of features that are more representative of natural channels, and that include larger boulders (or keystones) that are sized to remain stable under all floods and smaller stones that fill voids and provide better aquatic habitat. The keystone boulders (placed at the feature crests) were sized to be twice as large as the maximum stone in the mix. Clay or approved material has also been specified for the stone gradation to help provide cohesion to the bed material and to fill voids.

Due to the range in the stone sizes, a unique stone gradation was not required for every reach. A total of three different stone gradations were deemed sufficient, which were sized to satisfy the shear thresholds in WRC1 and WRC2. The three stone gradations are listed in Table 17. A summary of which gradations applies to which design reach is shown in Table 18.

Table 17: Roundstone gradations.

Roundstone Gradation 1	Roundstone Gradation 2	Roundstone Gradation 3
20% - clay[1] 40% - sand 40% - <25 mm ø[2]	10% - clay[1] 10% - <25 mm ø[2] 10% - 25 to 100 mm ø 10% - 100 to 200 mm ø 30% - 200 to 300 mm ø 30% - 300 to 500 mm ø Keystone - 600 to 750 mm ø	15% - clay[1] 15% - <25 mm ø[2] 15% - 25 to 50 mm ø 30% - 50 to 100 mm ø 25% - 100 to 200 mm ø Keystone - 300 to 400 mm ø

NOTES:
1. Clay or approved equivalent
2. Granular fill material
3. Boulders to be used for feature crests
4. % indicates the percent of the mixture by volume

Table 18: Summary of gradation mixtures for each reach of WRC1 and WRC2.

Reach		Gradation Mixture
WRC1	LE	N/A
	HG	3
	LG	1*
WRC2	LG1	1*
	HG1	2
	WETLAND	N/A
	HG2	2
	LG2	1*
	HG3	2
	LG3	1*

*Native compacted substrate may be replaced with Mixture 1 during construction, depending on the quality of native material at the discretion of the supervising QP.

5.3.5. Fish Habitat Structures and Target Fish Species

A key component of the design is to restore or augment functional fish habitat in these novel ecosystems. The intent of the habitat features is to mimic fish habitat found in the Clam Creek and Mollie River systems, focusing on key (target) species identified during baseline characterization. A description of the existing conditions and key fish species in the existing waterbodies is found in Minnow Environmental Inc. *Cote Gold Offsetting Plan* (2019). Tables 19 to 21 list key species and specific habitat features for inclusion in the WRCs and in New Lake.

Table 19: Target fish species and proposed habitat structures for various life stages for WRC1.

Target Fish Species	Habitat Feature	Design Reach	Targeted Life Stage
Northern Pike	Low gradient pools with woody debris	LG	*Spawning:* The pools with submerged woody vegetation will provide submerged structure for spawning. *Juvenile:* Pools will provide juvenile rearing habitat.
	Clam Lake backwater wetland	LE	*Spawning:* Large wetlands with direct channel connection provide excellent spawning habitat.
Walleye	Low gradient pools with woody debris and short riffles	LG	*Juvenile rearing:* Deep pools with woody debris provide excellent habitat for emerging fry flushed downstream from spawning riffles.
	Riffles	HG	*Spawning:* Riffles upstream of the alternating pool morphology.
Yellow Perch	Low gradient pools with woody debris	LG	*Spawning:* Submerged woody debris is excellent structure for yellow perch spawning habitat.
	Clam Lake backwater wetland	LE	*Spawning:* Large wetlands with direct channel connection provide excellent spawning habitat.
Smallmouth Bass	Low gradient pools with woody debris	LG	*Adult Foraging:* Woody debris provides structural cover for refugia and foraging.

Table 20: Target fish species and proposed habitat structures for various life stages for WRC2.

Target Fish Species	Habitat Feature	Design Reach	Targeted Life Stage
Northern Pike	Floodplain spawning shelf	LG3	*Spawning:* The spawning shelf, located at the downstream extent of the WRC2, is designed to provide riparian flooding during the critical spawning period (spring freshet). *Alvin/Fry:* The shelf will provide shallow water for emerging fry refuge, with easy access to the main channel as the fry develop and water levels drop, reducing the likelihood of stranding within the floodplain.
	Inline wetlands	WETLAND	*Spawning and juvenile:* Wetlands are designed to flood for a large portion of the year, providing excellent spawning habitat and juvenile rearing habitat in shallow, warmer water with access to the main channel.
Walleye	High gradient riffles	HG3	*Spawning:* Riffles located at the downstream end of WRC2 provide spawning substrates (gravels to cobbles). Critical to the spawning success are the pools immediately downstream of the riffles for new emerging fry to drift into, and most critically, a large deep pool has been placed downstream of the run of riffles to provide both a staging area for the spawning adults but also critical juvenile habitat.
	Deep pool downstream of riffle	LG3	*Adult/spawning/Alvin/young of year/juvenile rearing:* Staging area for adult spawners. The pool is lined with appropriately sized substrates which can be used as spawning habitat. Newly emerging fry from the upstream riffles will drift downstream into the large pool, which will provide the appropriate conditions (low velocity, shallow margins, warmer water temperatures, macrophytes, food) for the development of young walleye.
White sucker	Riffle	HG1, HG2 & HG3	*Spawning:* Appropriately sized substrates are provided in the riffles for spawning.
Yellow Perch	Large woody debris	All reaches	*Spawning:* Yellow perch use submerged wood, particularly branches, which their eggs adhere to.
Smallmouth Bass	Woody debris	All reaches	*Adult foraging:* Woody structure provides excellent cover for refugia and foraging.

Table 21: Target fish species and proposed habitat structures for various life stages for New Lake.

Target Fish Species	Habitat Feature	Design Reach	Targeted Life Stage
Whitefish	Submerged cobble/boulder shoal	NA	*Spawning:* White fish spawning over submerged shoals of cobble and boulder.
Yellow Perch	Submerged woody debris (logs and stumps)	NA	*Spawning:* Submerged woody debris is excellent structure for yellow perch spawning habitat.
Smallmouth Bass	Submerged cobble/boulder shoal	NA	*Spawning:* Bass will spawn on pockets of sands and gravels found on or at the margins of the shoals. *Foraging:* The structure provided by a shoal will attract small-bodied fish, which smallmouth bass will forage on.

5.3.6. Terrestrial Habitat Considerations

The designs for WRC1 and WRC2 recognizes that a watercourse is more than just the low flow channel. There is an intricate link between the channel, it's floodplain and the surrounding hillslope. The channel is the ultimate expression of the flow, biotic and abiotic inputs, with runoff generated from hill slopes and riparian zones delivering nutrients and allochthonous material. The health of the riparian zone is dependant on intermittent flooding by the channel, delivering needed moisture, sediment and nutrients to the plants on the floodplain, all of which is critical to the wildlife. Recognizing these interconnections, the WRC designs follow a holistic, ecosystem-based approach and include not only fish habitat structures but also terrestrial wildlife elements.

Terrestrial wildlife elements included in the stream corridor include:

- Turtle nesting sites;
- Brush piles for small mammals;
- Standing snags which serve as habitat for a variety of wildlife including raptor perches, song bird nesting, woodpecker nesting and bat maternal roosting;
- Rock piles for reptiles and small mammals; and,
- Offline, floodplain wetland pockets for amphibians and reptiles.

A goal of the WRC designs was to maximize ecological benefits that can be realized at the interface between the aquatic and terrestrial environments.

5.3.7. New Lake

New Lake will connect Chester Lake to WRC2. It was designed to follow to existing topography, with some grading for reasons of organic soil removal (for methylmercury contaminant prevention) and erosion control along the shoreline. The lake will range between 1-6 m deep, with the deepest points located where it will overprint the existing Mollie River.

Several habitat features have been included in New Lake to enhance fish habitat. Because this is a newly created lake, it is important to 'jump start' fish habitat as the lake would otherwise only provide homogenous and simplistic habitat. Habitat features which have been included in New Lake include:

Submerged logs will provide a variety of functions, including structure for refuge, structure for spawning and foraging habitat;

Point bars will be created from a mix of sand, gravel, cobble and boulders. Point bars provide a variety of habitat functions and connect the shoreline with deeper, open water habitats. This provides productivity enhancements throughout all life stages, from juvenile rearing to adult refuge, to foraging and spawning. The point bars are created from larger cobbles and boulders which will create interstitial spaces that are critical for benthic macroinvertebrate production, young-of-the-year refuge and egg protection for egg dispersal spawning fish such as white fish.

Deep water shoals are structurally similar to point bars but do not have the shoreline connection. These help to create habitat in the pelagic zone (open water) of New Lake, which would otherwise be lacking structure. As with the point bars, the deep-water shoals will provide habitat for a variety of fish species and benthic macroinvertebrates throughout their life stages. They will likely be used more by pelagic species such as white fish and large-bodied fish such as smallmouth bass.

5.4. Evaluation of Expected Channel Performance

5.4.1. Hydraulic Analysis

Two separate models were developed for the proposed conditions; one each for WRC1 and WRC2. The models were developed similarly to the existing conditions model, with some minor differences. A combined 1D and 2D model was developed for WRC1, with the 1D geometry extending from Clam Lake to the downstream extent of reach WRC1-HG (see drawings for reference). The 2D geometry covered WRC1-LG and ended at Chester Lake. For the WRC2 model, two separate geometries (a 1D and 2D) were developed. The model extends from the outlet of New Lake to Upper Three Duck Lakes. The 1D geometry was primarily used to assess the reach averaged hydrogeomorphic and sediment mobility conditions (Section 5.4.2), similar to existing conditions. The 2D models were used to assess localized hydraulics as they pertain to fish habitat features and metrics (Section 5.4.3).

As with the existing conditions model, the flows used within the models were taken from the hydrologic analysis completed by Golder. For WRC1, flows from the Clam Lake outlet were used for the upstream boundary conditions, and the mean annual Chester Lake level (i.e., 385.8 masl) was used for the downstream boundary condition. For WRC2, flows from the Chester Lake outlet were used to simulate the New Lake outlet and were used for the upstream boundary conditions, and the mean annual Upper Three Duck Lake level (i.e., 380.7 masl) was used for the downstream boundary condition. Both models were developed with unsteady flow regimes (for the eco-hydraulic analysis) and steady-state simulations (for the hydrogeomorphic and sediment mobility analyses).

For the eco-hydraulic analysis (Section 5.4.3), three different flow simulations were run within each of the models; (1) the mean, max annual discharge event (mean MAD), (2) the maximum, max annual discharge event (max MAD) and (3) the mean annual low flow event. Plots of the three flow hydrographs are provided below in Figure 15 and Figure 16.

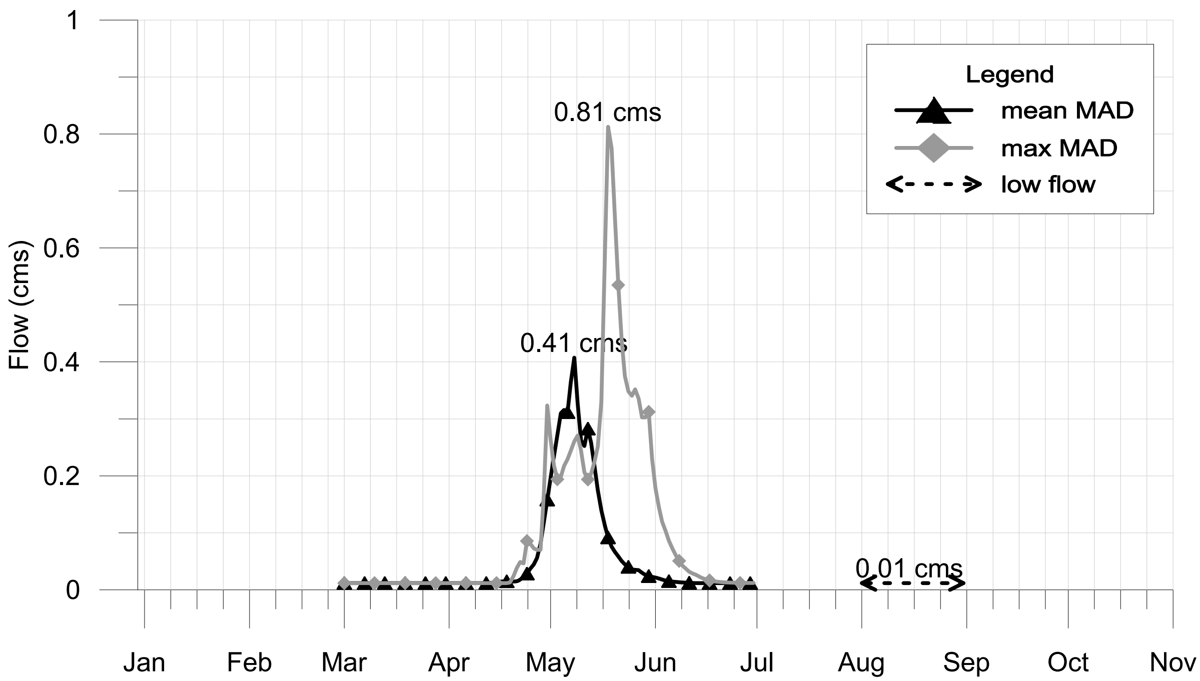


Figure 15: Hydrographs used for the upstream boundary of WRC1 model.

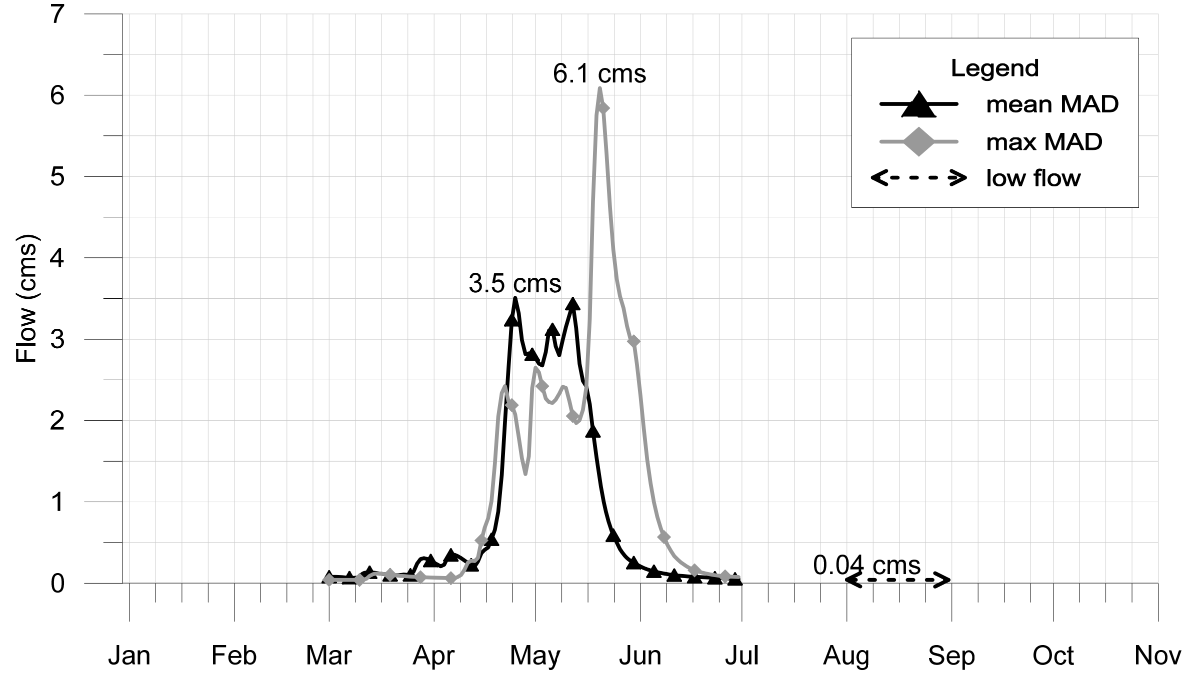


Figure 16: Hydrographs used for the upstream boundary of WRC2 model.

5.4.2. Hydrogeomorphic and Sediment Mobility Analysis

A hydrogeomorphic analysis was completed for both WRC1 and WRC2 using the steady-state 1D HEC-RAS models. The detailed plots are presented in Appendix C. The proposed conditions 1D models were used to model 80 incrementally increasing discharges between 0.1 and 8 m^3/s for the WRC2 and 0.01 and 0.08 m^3/s for WRC1. Similar to existing conditions, these discharges approximate the expected geomorphically significant flow regime, based on the hydrologic modelling estimates. Again, the maximum discharge of 8 m^3/s for WRC2 is greater than the discharges in the hydrologic model estimates, however, it was selected to maintain a similar number of discharge intervals as WRC1.

WRC1: WRC1-HG was found to exceed the bankfull condition for riffles between 0.4 and 0.6 m^3/s and is within the expected range of variability associated with the modelling tolerances (there is only approximately 3 cm difference in water surface elevations between 0.4 and 0.6 m^3/s at riffle sections). Riffles were found to have peak velocities ranging between approximately 1 and 1.2 m/s and peak shear stresses ranging between approximately 30 and 40 N/m^2. Pools generally exceeded bankfull conditions at approximately 0.4 m^3/s and were found to have peak velocities of approximately 0.35 m/s and peak shear stresses of approximately 3 N/m^2. The 2D model was used to estimate the range of shear stresses and velocities for WRC1-LG. Pool sections were found to have peak velocities ranging between approximately 0.06 and 0.1 m/s and peak shear stresses of less than 1 N/m^2. Run sections were found to have peak velocities ranging between approximately 0.3 and 0.5 m/s and peak shear stresses approximately than 24 N/m^2.

WRC2: Similar to WRC1, WRC2-HG reaches had higher velocities and shear stress at riffle sections, owing to their steeper gradients. Peak velocities ranged between approximately 1.2 and 2 m/s and peak shear stresses between approximately 40 and 80 N/m^2. The higher velocities and shear stresses occurred throughout the WRC2-HG1 reach, which has the steepest gradient. The LG reaches have considerably lower velocities (between approximately 0.25 and 0.4 m/s) and shear stresses (between approximately 2 and 5 N/m^2).

Throughout WRC2, the floodplain is accessed between 2 and 5 m^3/s, implying that some reaches will access the floodplain more frequently than others, with the overall reach having average access approximating the design target.

Sediment mobility was assessed similarly to existing conditions using the mobility ratio to confirm the specified stone mixtures. Maximum estimated channel shear stress values of approximately 45 and 130 N/m^2 for WRC1 and WRC2, respectively, were extracted from the HEC-RAS models. As illustrated in Table 22 and Table 23, the mobility ratios for all particle percentiles but the finest fractions indicate immobility, supporting the threshold based design criteria for the channels and emulating the existing river systems.

Table 22: Mobility ratios for WRC1.

Percentile	Size* (mm)	τ_{ci} (N/m^2)	Mobility Ratio
		Discharge (m^3/s)	0.8
		Applied shear stress (N/m^2)	45
D_{16}	11	25.6	1.8
D_{35}	65	52.0	0.9
D_{50}	76	55.4	0.8
D_{65}	89	59.0	0.8
D_{84}	160	74.6	0.6
D_{95}	270	92.0	0.5
*percentile sizes estimated from specified stone mix			

Table 23: Mobility ratios for WRC2.

Percentile	Size* (mm)	τ_{ci} (N/m^2)	Mobility Ratio
		Discharge (m^3/s)	8
		Applied shear stress (N/m^2)	130
D_{16}	53	102.6	1.3
D_{35}	190	171.0	0.8
D_{50}	270	196.8	0.7
D_{65}	370	223.2	0.6
D_{84}	450	241.4	0.5
D_{95}	510	253.8	0.5
*percentile sizes estimated from specified stone mix			

5.4.3. Eco-Hydraulic Analysis

The functions of key habitat features designed for WRC1 and WRC2 were assessed using the 2D hydraulic models. The 2D models simulated the hydraulic conditions of many of the proposed habitat features over a typical year, which provided insight into the hydrodynamics during critical life stages. The 2D model also allowed for visual representation of the hydraulic output (e.g., velocity, flow depth and flow direction through particle tracking) and evaluated the 'duration of flooding', which is important for features such as pike spawning ledges and in-line wetlands. The 2D hydraulic analysis was completed for:

- WRC1 – Low gradient alternating pools
- WRC2 – High gradient riffles and large downstream pools
- WRC2 – Northern Pike spawning shelf
- WRC2 – In-line wetland

The analysis simulated spring freshet conditions that corresponded to the design, as well as average low flow conditions for the period of record (from the simulated hydrologic model).

5.4.3.1. Low Gradient Alternating Pools

The Low Gradient Alternating Pools were designed to work with the hydrology of the surrounding bog community, through which the channel is being cut. The design mimics a series of beaver ponds which help to reduce velocities and shear stresses. Increasing channel stability in this reach is important given the peaty nature of the surficial soils (common to a bog environment). This will also reduce hydraulic impacts to the adjacent bog community, by maintaining the hydrostatic pressure in the saturated rooting zone. Drawing WRC1-R-2 shows habitat features that have been added to the channel to increase fish habitat complexity. Features include submerged boulders, submerged stumps and large woody debris in the pools and boulder/log clusters in the chutes. The boulder/log clusters in the chutes mimic old breached beaver dams observed in the existing watercourses.

To better understand potential fish usage of the Low Gradient Alternating Pool morphology, the 2D hydraulic model was used to assess flow depth and velocity. Figure 17 shows the velocities through the feature during the mean annual peak spring freshet flows (a close approximation of the design discharge). The spring freshet was used as it is typical of annual high flow conditions, flows that generally occur in the spring when many key fish species are spawning or migrating to spawn. It is also the flow for which the channel will be most susceptible to erosion. The 2D modelling shows generally low velocities throughout the features, with the peak being 0.5 m/s in the most downstream chute and approximately 0.3 m/s in the remaining chutes. These velocities are well within the passable range for key fish species in WRC1 (Figure 17). Velocities within the pools are generally below 0.1 m/s with the particle tracking showing that lowest velocities are along the bank margins. These velocities and flow patterns demonstrate that the system is expected to function as designed, creating a low velocity environment.

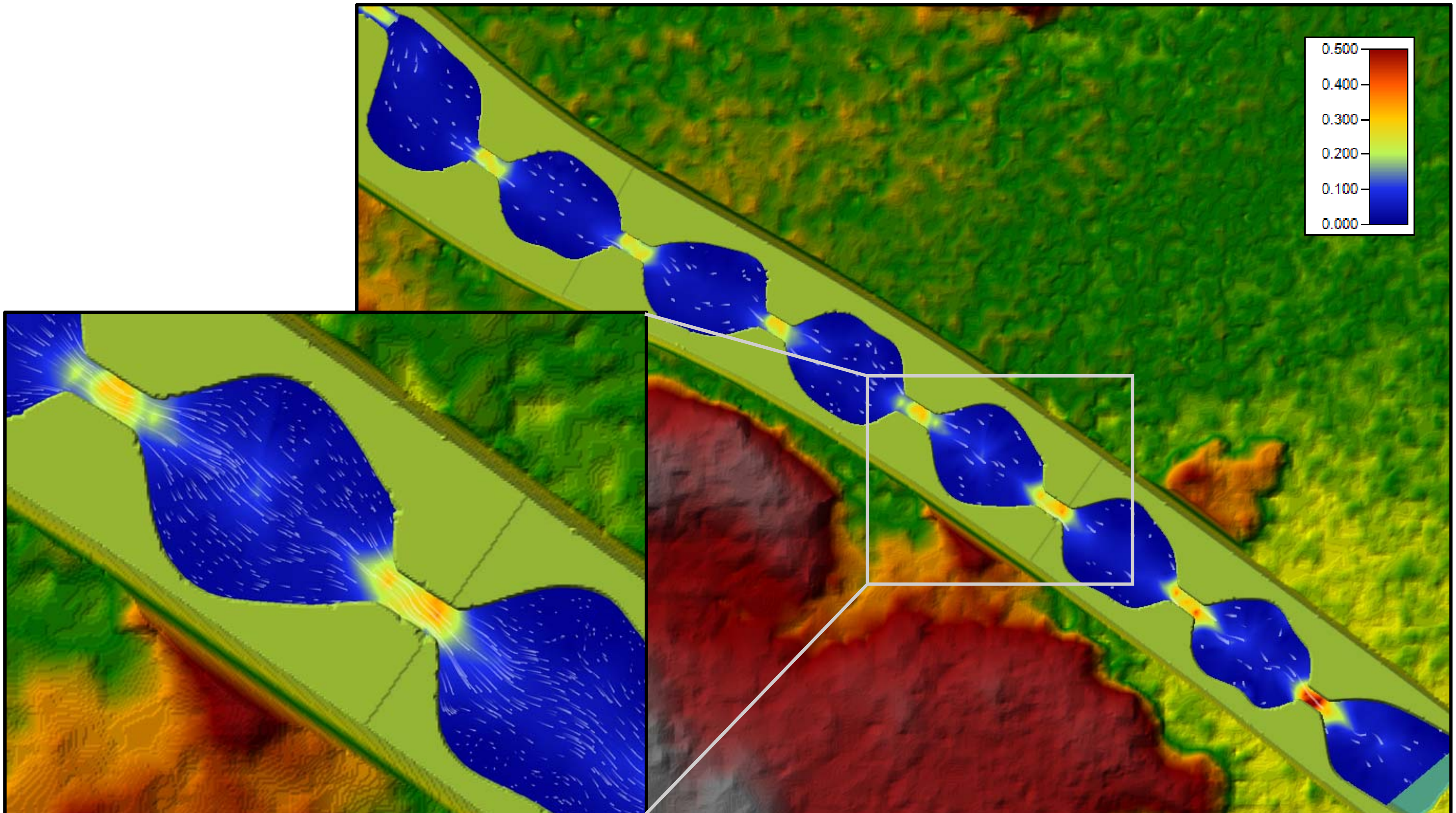


Figure 17: Estimated velocities for low gradient alternating pools in WRC1-LG at peak of mean annual maximum discharge event.
(NOTE: white lines show particle tracking, representing anticipated flow paths and velocities)

5.4.3.2. High Gradient Riffles and Lager Downstream Pool

The high gradient sections in WRC2 (reach WRC2-HG3) were also assessed from a fish habitat perspective. Shallow, fast water, such as flow over bedrock outcroppings in the Mollie River, are common in northern Ontario. Often these features result in barriers to upstream fish migration during high flows when velocities are not passable. For HG3 it was necessary to design a channel that would remain stable under high flow conditions and allow fish passage and spawning during the spring freshet. The key target species for this reach was walleye as they are known to migrate and spawn within the Mollie River system. Newbury and Gaboury (1993) suggest walleye use coarse gravel, rubble and boulder substrates on riffle having gradients up to 2.5%. Spawning velocities for walleye are documented by McMahon *et al.* (1984) to be 0.6 to 0.9 m/s at an optimal depth of 0.6 to 1.8 m. The proposed riffle design for HG3 includes a channel slope of 1.5% and coarse substrate that is suitable for spawning. To transition the high gradient reach to the connection with Upper Three Duck Lake and to create spawning habitat, two large pools separated by a submerged riffle were designed within the downstream extent of WRC2 (reach WRC2-LG3). These pools are lined with the coarse substrate and boulder clusters. WRC2-LG3 emulates similar morphology found within the Mollie River, which was identified as high-quality walleye habitat.

The series of riffles connected to the large downstream pools provides several critical habitat functions. First, this area provides staging habitat for spawning adults, allowing them to access the upstream riffles when flow conditions are optimal and giving them a resting area. Second, by lining the pools with appropriately sized spawning substrates and boulder clusters, it provides walleye with potential spawning habitat within the deep pools and submerged riffle. The deep pools downstream of the riffles also provides critical habitat for newly emerging fry that are flushed downstream and require a lower velocity environment to develop. This demonstrates the importance of the riffle-deep pool sequence for the successful breeding of adults and rearing of juvenile walleye.

The potential performance of the riffle-deep pool morphology for walleye spawning and passage was assessed using the 2D hydraulic model. Figure 18 shows the results of the modelling as the spring freshet rises, peaks and recedes, as well as low flow conditions. Figure 18a shows the flows and velocities in early April (on average) as the spring melt is beginning, which coincides with the early onset of walleye spawning. The analysis shows that velocities on the riffles are within the preferred spawning range and allow for upstream passage across the entire riffle. As the spring melt reaches peak conditions (Figure 18b), velocities across the riffles exceed optimal spawning velocities and fish passage becomes a challenge as fish are forced to migrate along margins of the riffles. Upstream migration is likely still possible during this time, for the following reasons:

1. The lower, passible velocities in the near-bank portion of the channel;
2. The relatively short length of the riffles (< 30 m);
3. The low velocities within the pools allow for fish to rest and recover before the next riffle ascent, and;
4. The inclusion of large boulders placed on the riffle face which will create pockets of slack water on the riffle.

Boulders on the riffle faces were not incorporated into the 2D hydraulic model for reasons of computational complexity. Figure 18c corresponds to the recession of the spring melt hydrograph and the end of the typical walleye spawning season. It shows the velocities are within the spawning range on the riffles. Finally, Figure

18d shows the low flow season, demonstrating that velocities across the riffles are low and are not a barrier to upstream migration of the target fish species found within the WRC2 system.

Overall, the 2D model results predict that the riffle-pool morphological will function under the spring flow, providing spawning habitat for walleye within the critical time of the year. The model results also demonstrate that fish passage through the riffles will likely occur for much of the year and, while passage is sub-optimal during the peak flow of the spring freshet, it is still possible.

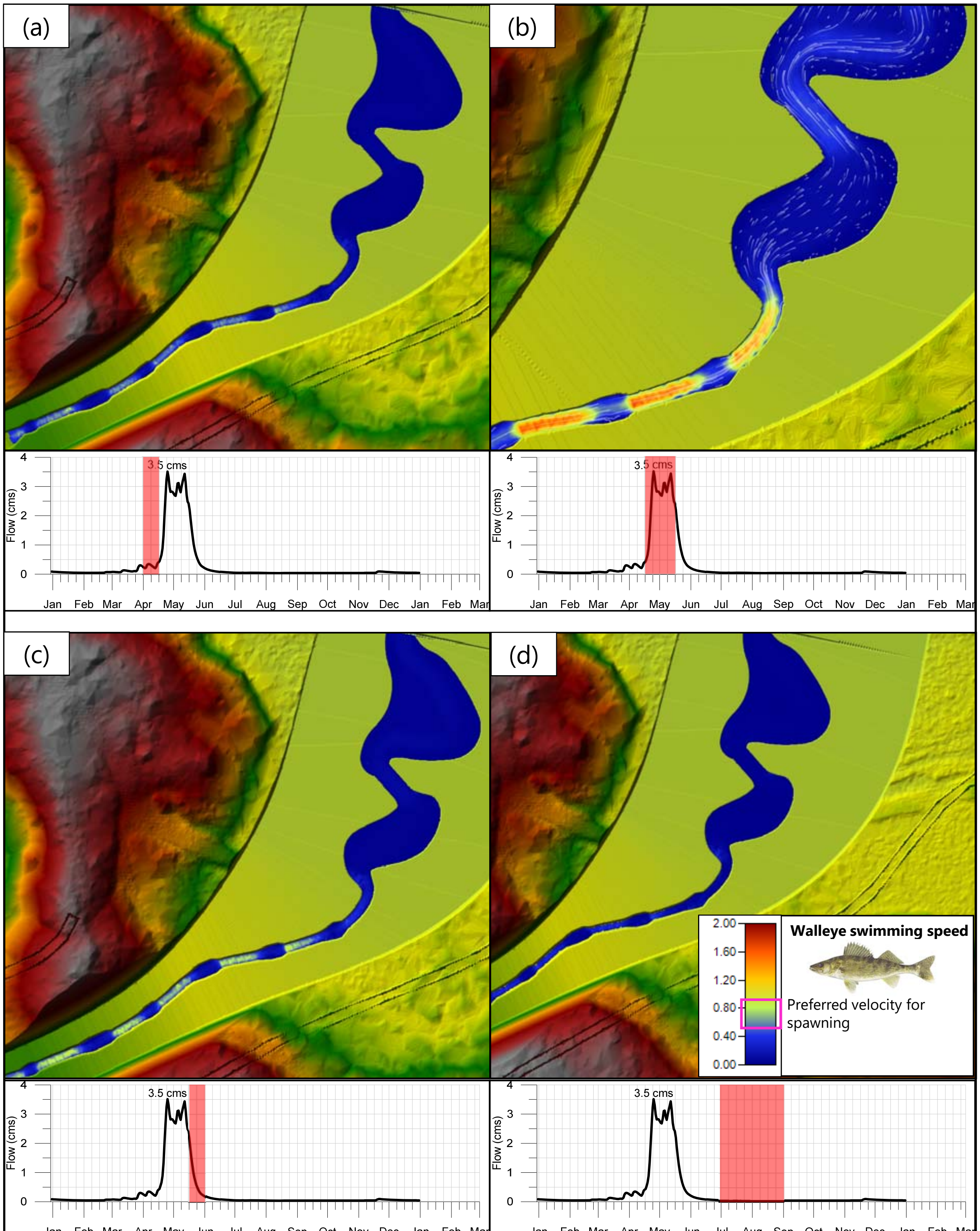


Figure 18: Estimated velocity for proposed walleye spawning features at downstream extent of WRC2 (WRC2-HG3 and WRC2-LG3) for;

(a) the start of the spring freshet and spawning season; (b) the peak of the freshet; (c) the end of the freshet and spawning season, and; (d) the low flow condition.

(NOTE: white lines show particle tracking, representing anticipated flow paths and velocities)

5.4.3.3. Northern Pike Spawning Shelves

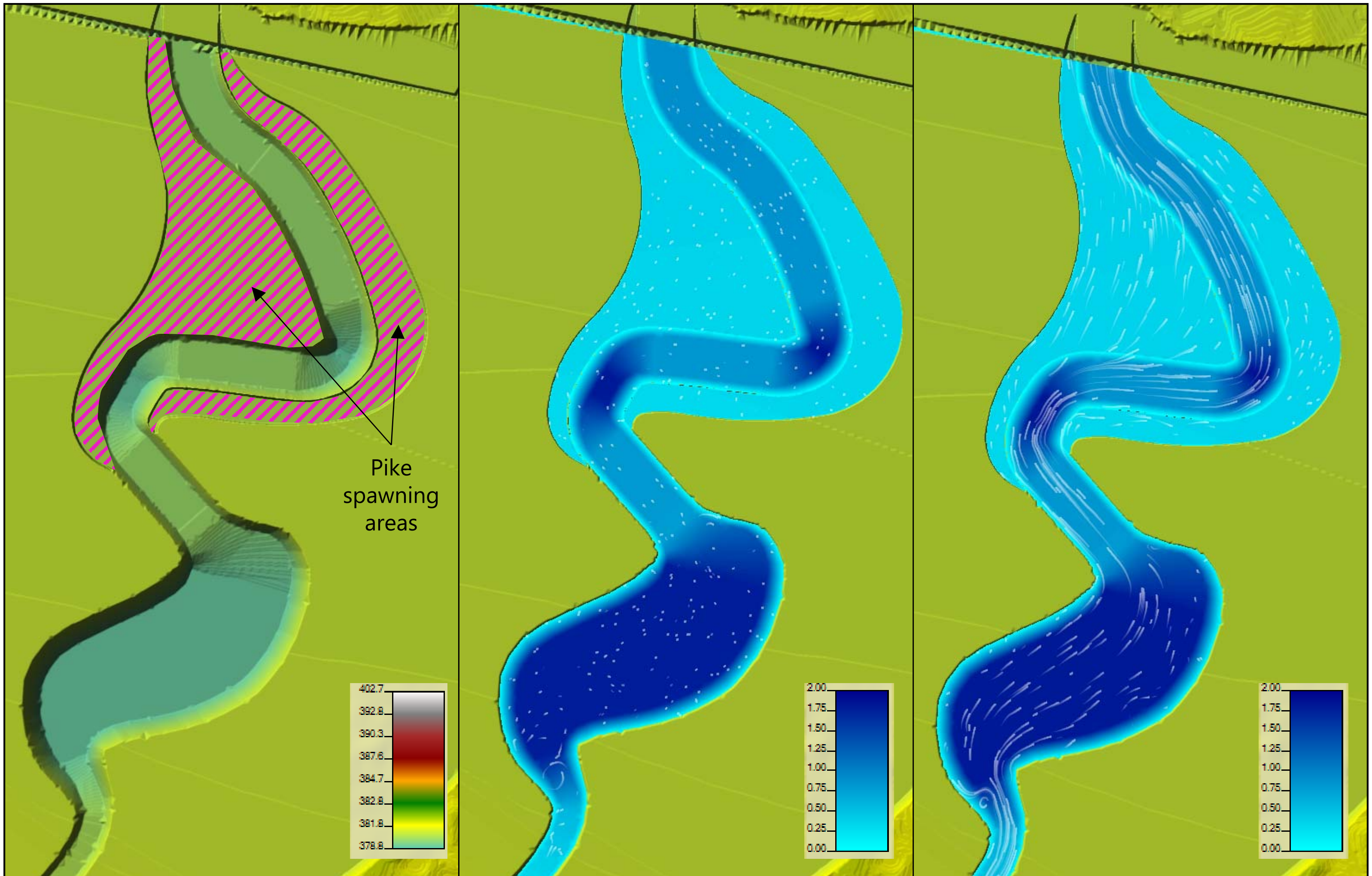
A shelf, or floodplain terrace, has been incorporated into the design for WRC2-LG3 near the confluence with Upper Three Duck Lake. The shelf will be built by cutting back the channel banks to create a wide flat area, 0.4 m below the normal floodplain. The purpose of this feature is to create Northern Pike spawning habitat. Pike typically spawn on flooded vegetation within the riparian zone, soon after ice breakup. By creating these shelves near the confluence of the lake, it will provide high-quality spawning habitat for pike migrating upstream during the spring freshet and will facilitate the newly emerged fry to drift into the shallow margins of Upper Three Duck Lake as flows recede. Submerged logs/trees have been added to the shelf to provide cover for spawning pike and newly emerging fry, and structure for pike to spawn near and for their eggs to adhere to. It also provides yellow perch spawning habitat.

The 2D hydraulic modelling of the pike spawning shelves predicts that the features will be wetted throughout the spawning period of April to June (Figure 19). The model also predicts good flushing flows on the shelf throughout the spring period, which are critical to preventing eggs from becoming covered in sediment (thus keeping them oxygenated). The model shows that the shelves may stay flooded throughout the summer, but it is noted that the model assumes a constant downstream lake level. Because the shelves are at the confluence with the lake, they are highly influenced by lake backwater. As a result, as the lake level drops in the summer it is likely the shelves will become exposed. The influence of the lake is important as it will likely maintain some water depth on the shelves past the peak spring flows, implying less likelihood of fry and young-of-the-year pike becoming stranded on the floodplain.

5.4.3.4. In-line Wetland

An in-line wetland is included in WRC2 (WRC2-Wetland), between high gradient reaches HG1 and HG2. The wetland has been designed as a broad floodplain with an in-line deep pool to create both emergent marsh conditions and open water components. Raised hummocks, which remain dry during peak flow event, have also been included with turtle nesting material (i.e., coarse sand and gravel) on the south facing slopes. The wetland will provide diversity and complexity for both aquatic and terrestrial wildlife. In addition to the turtle nesting sites, wildlife and aquatic habitat elements include standing snags, submerged stumps, submerged woody debris, boulder clusters, and turtle basking logs.

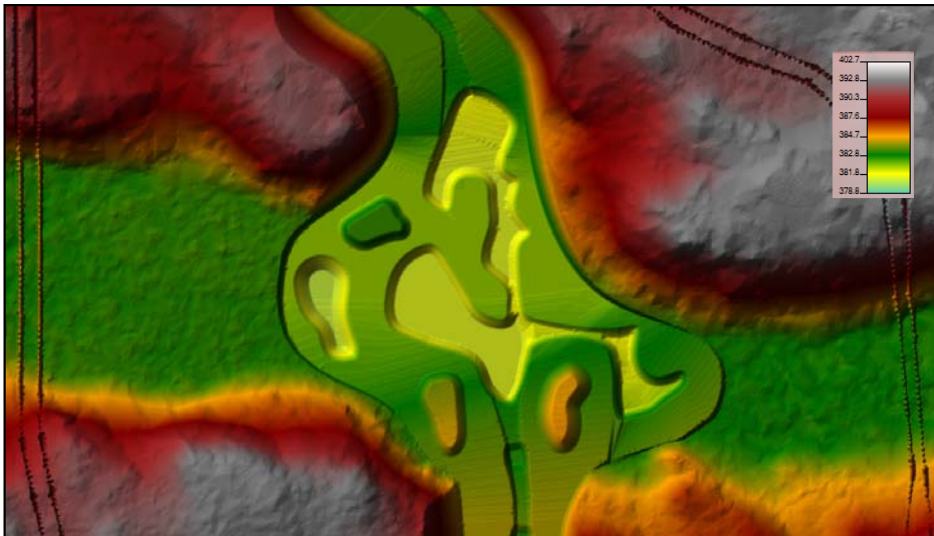
A 2D hydraulic analysis of the in-line wetland shows that the entire wetland is flooded during the spring freshet with good flow circulation throughout (Figure 20). The in-line wetland remains wetted throughout the low flow summer months, with shallow water (i.e., up to 0.25 m in depth) along the shoreline, which is key to maintaining emergent marsh vegetation. Overall, the modelling shows that, hydraulically, the in-line wetland is predicted to function as designed and will provide optimal conditions for the proposed ecological habitat features.



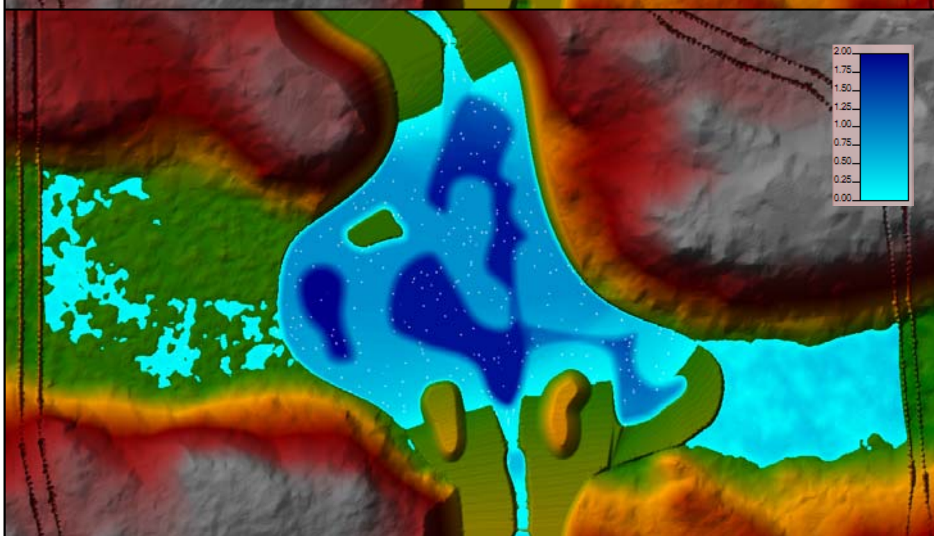
Proposed pike spawning areas showing terrain relief	Anticipated flow depth for low flow conditions (i.e., start of August)	Anticipated flow depths for mean annual spring freshet conditions (i.e., mid-April to mid-May)

Figure 19: Estimated flow depth for proposed pike spawning area in WRC2-LG3.

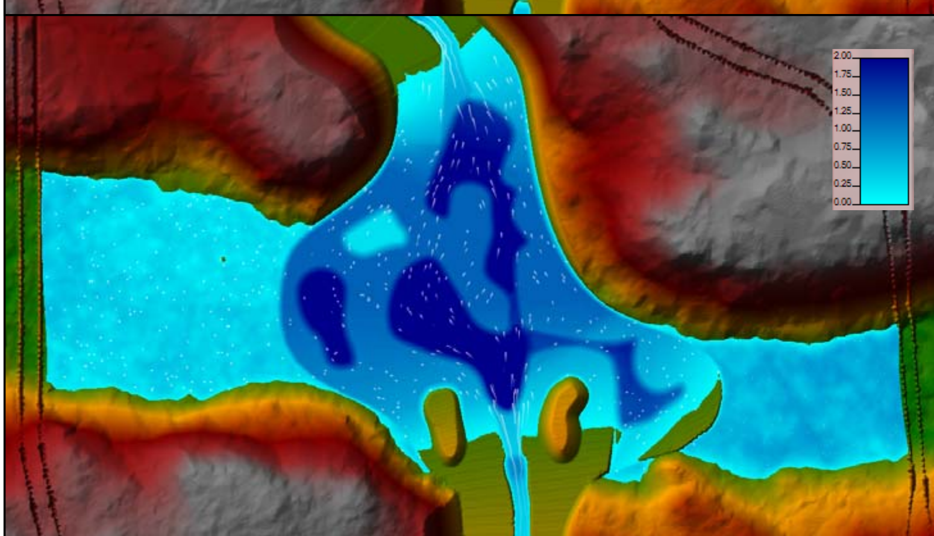
(NOTE: white lines show particle tracking, representing anticipated flow paths and velocities)



Proposed wetland feature showing terrain relief



Anticipated flow depth for low flow conditions (i.e., start of August)



Anticipated flow depths for mean annual spring freshet conditions (i.e., mid-April to mid-May)

Figure 20: Estimated flow depth for proposed in-line wetland feature, WRC2-Wetland.

(NOTE: white lines show particle tracking, representing anticipated flow paths and velocities)

5.5. Constructability, Staging and Erosion & Sedimentation Control (ESC)

The detailed staging and ESC plans are provided in the accompanying drawings. An overview of staging and ESC for each WRC is discussed below.

5.5.1. WRC1

WRC1 construction is split into two phases. Phase 1 involves the construction of a flow by-pass channel and the upstream lake extension portion of WRC1. All construction will be completed in the dry, with upstream and downstream berms/check dams to isolate the work area. A temporary sediment pond will be constructed at the downstream end of the by-pass channel during construction to allow sediment to settle, with collected water being pumped to a sediment bag or basin (to be approved by on-site construction supervisor) before returning to Chester Lake. Once the by-pass channel and lake extension are constructed, the upstream berm will be removed and flow from Clam Lake will be diverted through the by-pass channel while the downstream portion of WRC1 is constructed (Phase 2).

Phase 2 involves the construction of the downstream portion of WRC1, water management plan during the revegetation period and commissioning of WRC1. Similar to Phase 1, all work will be completed in the dry and will be isolated by upstream and downstream berms/earthen plugs. A temporary sediment pond will be placed at the downstream portion of WRC1-LG, with collected water being pumped to a sediment bag or basin (to be approved by on-site QP) before returning to Chester Lake. WRC-HG1 will be constructed using a combination of excavation and precision blasting, with key elevations confirmed by the supervising QP. When construction and revegetation are completed, the water management system will be modified to establish the long-term water management system whereby groundwater, snowmelt and rainfall will be managed throughout the growing season while vegetation is established in WRC1-LG and WRC1-HG. Following the growing season, all temporary measures will be removed and water from Clam Lake will be directed into the downstream portion of WRC1.

5.5.2. WRC2

WRC2 construction is also split into two phases. Phase 1 involves the construction of a flow by-pass channel between New Lake and Middle Three Duck Lake and the construction of a berm at the upstream end of WRC2 to isolate it for construction during Phase 2. All construction will be completed in the dry, with a downstream check dam to isolate the work area (New Lake will not be filled at the time of Phase 1 construction). A temporary sediment pond will be constructed at the downstream end of the by-pass channel during construction to allow construction sediment to settle, with collected water being pumped to a sediment bag or basin (to be approved by on-site QP) before returning to Middle Three Duck Lake. When the by-pass channel is completed, all temporary measures will be removed and water from New Lake will be routed through the by-pass channel while WRC2 is constructed (Phase 2).

Phase 2 involves the construction of WRC2, water management plan during the revegetation period and commissioning of WRC2. Similar to Phase 1, all work will be completed in the dry and will be isolated by upstream and downstream berms/earthen plugs. When access roads are completed, WRC2 construction will commence at both the upstream and downstream ends, with temporary sediment ponds being pumped to sediment bags or basins (to be approved by on-site QP) before returning to either New Lake or Upper Three Duck Lake (as shown on accompanying drawings). All work in each reach will be completed from downstream to upstream. In the WRC2-HG reaches, a combination of excavation and precision blasting will be required, with key elevations confirmed by the supervising QP. When construction is complete, a baseflow of approximately 8000 m^3/day will be introduced via a pump to maintain inflow to Upper Three Duck Lake in order to provide assimilative capacity to the lake. Throughout this period the stream and pump outlet will be monitored regularly to ensure adverse erosion or deposition are not occurring and that vegetation is establishing as expected. Given the low volume of discharge, it is not expected to generate excess erosive conditions. Following the growing and baseflow season, all temporary measures will be removed and water from New Lake will be directed into WRC2.

5.5.3. New Lake

New Lake will also follow a two-phase approach. Prior to the lake construction, the Mollie River dam and associated by-pass (designed by others) will be constructed and heavy-duty silt fence will be installed along the Mollie River. Phase 1 consists of removing organic material from the areas that will be inundated by New Lake and the installation of shoreline erosion control blanket and habitat features. Phase 2 involves the removal of all temporary ESC measures, the decommissioning of the Mollie River dam by-pass channel and the filling of New Lake.

5.6. Revegetation Plan

The riparian planting plan has taken a simple approach to re-establishing the riparian zone. The number of species has been kept to a minimum as the planting plan strives to establish anchor species around which natural revegetation from the surrounding forest (and native seed bank) will provide the seed and rhizome stock for regeneration of a broader riparian community. The intent of the planting plan is to quickly establish a rooting zone, to shade the creek and to provide the tree material for long term forest growth. To achieve these goals most efficiently, plantings were divided into two zones. These zones are explained below and shown in the accompanying drawing package.

Zone 1 is intended to provide fast growth immediately adjacent to the channel. This will be achieved by planting a mix of both conifer and deciduous species. The apex forest in this region is conifer-dominated by white and black spruce, which may take decades to establish. The deciduous species selected for this zone are pioneer species which can establish quickly and will grow at a quicker rate than the conifer species. Zone 1 is located immediately adjacent to the creek and within those reaches in which wide swaths of riparian vegetation and floodplain will be stripped away. As the riparian forest matures, the conifer species will become dominant and the deciduous species will be replaced through succession.

Zone 2 plantings are located between the Zone 1 plantings and the existing forest communities. This zone consists of only conifer species, reflecting the ultimate forest community which will be established. White and black spruce are the dominant species, reflecting the surrounding forest communities with a lesser percentage of lodge pole pine.

Table 24: Species mix for planting Zones1 and 2.

	Common Name	Scientific Name	% Mix
Zone 1	Trembling Aspen	*Popuus tremuloides*	30
	White Birch	*Betula papyrifera*	30
	Green Alder	*Alnus viridis*	10
	White Spruce	*Picea glauca*	20
	Black Spruce	*Picea mariana*	10
Zone 2	White Spruce	*Picea glauca*	40
	Black Spruce	*Picea mariana*	40
	Lodge Pole Pine	*Pinus contorta*	20

6. Conclusions

A fluvial geomorphological assessment was undertaken for Clam Creek and a section of the Mollie River to inform designs of two watercourse realignment channels (WRC) to support the proposed development of IAMGOLD's (IMG) Côté Gold Project. The following are key conclusions drawn from the information in this report:

- The existing watercourses (Mollie River and Clam Creek) had morphology that was characterized in two general categories 1) sections of high gradient channels with large, immobile bed material and bedrock outcrops, and 2) sections of low gradient channels with sinuous planform, in-channel vegetation and large woody debris.
- The proposed WRC designs emulate the morphologic, hydraulic and sediment mobility characteristics of both existing watercourses.
- The proposed designs have incorporated a variety of habitat enhancements that are expected to perform as intended (as demonstrated through the eco-hydraulic analysis).
- Additional terrestrial habitat features have been incorporated into the floodplain corridor for a holistic, eco-system based approach to Natural Channel Design.
- Detailed design drawings have been completed and accompany this design brief.

7. References

Annable, W.K., Lounder, V.G., Watson, C.C. (2011). Estimating channel-forming discharge in urban watercourses. River Research and Applications, 27. 738-753.

Golder Associates (2014). Côté Gold Project, Environmental Assessment Report, Technical Support Document: Hydrology, Version R2. Prepared for IAMGOLD Corporation. November 7, 2014.

Julien, P.Y. (2002). River Mechanics. Cambridge University Press.

Komar, P.D. (1987). Selective gravel entrainment and the empirical evaluation of flow competence. Sedimentology, 34. 1165-1176.

McMahon, T.E., Terrell, J.W., Nelson, P.C. (1984). Habitat Suitability Information Walleye. U.S. Department of Interior, Fish and Wildlife Service. Report Number FWS/OBS-82/10.56.

Newbury, R.W., Gaboury, M.N. (1993). Stream Analysis and Fish Habitat Design. Newbury Hydraulic Ltd. Gibsons, British Columbia.

Williams, G.P. (1986). River Meanders and Channel Size. Journal of Hydrology, 88. 147-164.

Côté Gold Watercourse Realignments: Fluvial Geomorphology and Natural Channel Design

Prepared for IAMGOLD Corporation

February 2019

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Project Number P2017-288

Appendix A

Detailed Design Drawing Set

Table A1: Design drawing set for WRC1.

Drawing Number	Description
S-1	Staging and ESC – Phase 1
S-2	Staging and ESC – Phase 2
P-1	Plan and Profile
P-2	Plan and Profile
P-3	Plan and Profile
C-1	Sections
C-2	Sections
C-3	Sections
C-4	Sections
C-5	Sections
R-1	Revegetation and Restitution
R-2	Revegetation and Restitution
B-1	By-Pass Channel Plan and Profile
B-2	By-Pass Channel Plan and Profile
B-3	By-Pass Channel Plan and Profile
T-1	Typical Details
T-2	Typical Details

Table A2: Design drawing set for WRC2.

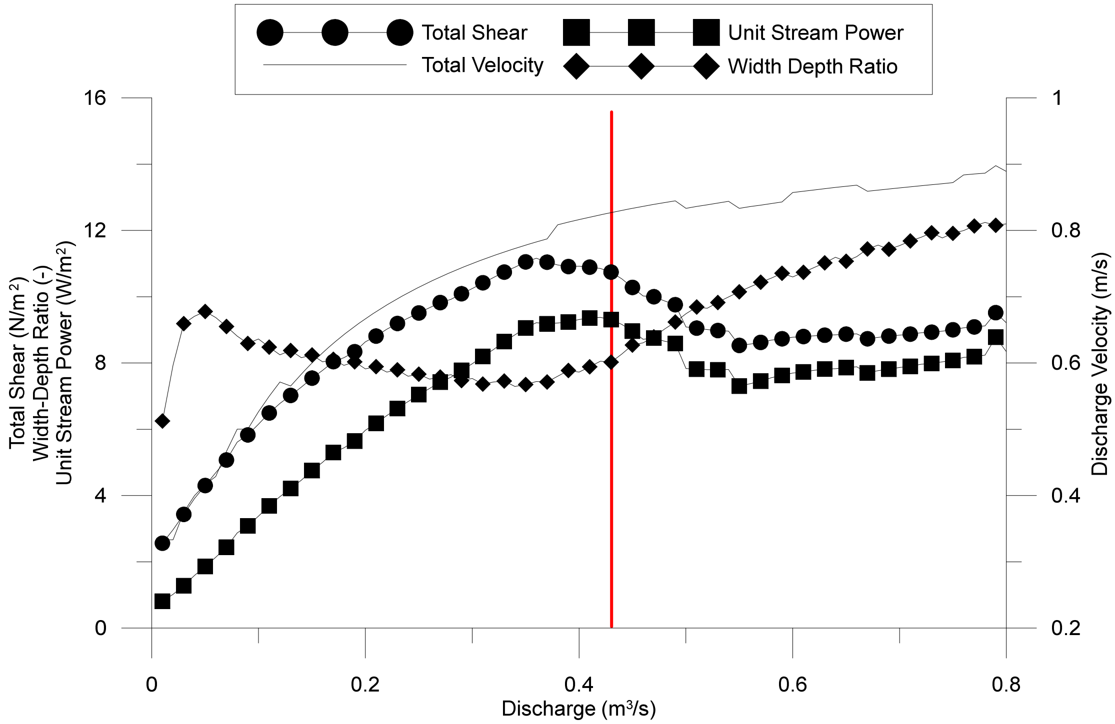
Drawing Number	Description
S-1	Staging and ESC – Phase 1
S-2	Staging and ESC – Phase 2
P-1	Plan and Profile
P-2	Plan and Profile
P-3	Plan and Profile
P-4	Plan and Profile
P-5	Plan and Profile
C-1	Sections
C-2	Sections
C-3	Sections
C-4	Sections
C-5	Sections
C-6	Sections
C-7	Sections
C-8	Sections
C-9	Sections
R-1	Revegetation and Restitution
R-2	Revegetation and Restitution
R-3	Revegetation and Restitution
R-4	Revegetation and Restitution
R-5	Revegetation and Restitution
B-1	By-Pass Channel Plan and Profile
B-2	By-Pass Channel Plan and Profile
B-3	By-Pass Channel Plan and Profile
T-1	Typical Details
T-2	Typical Details

Table A3: Design drawing set for New Lake.

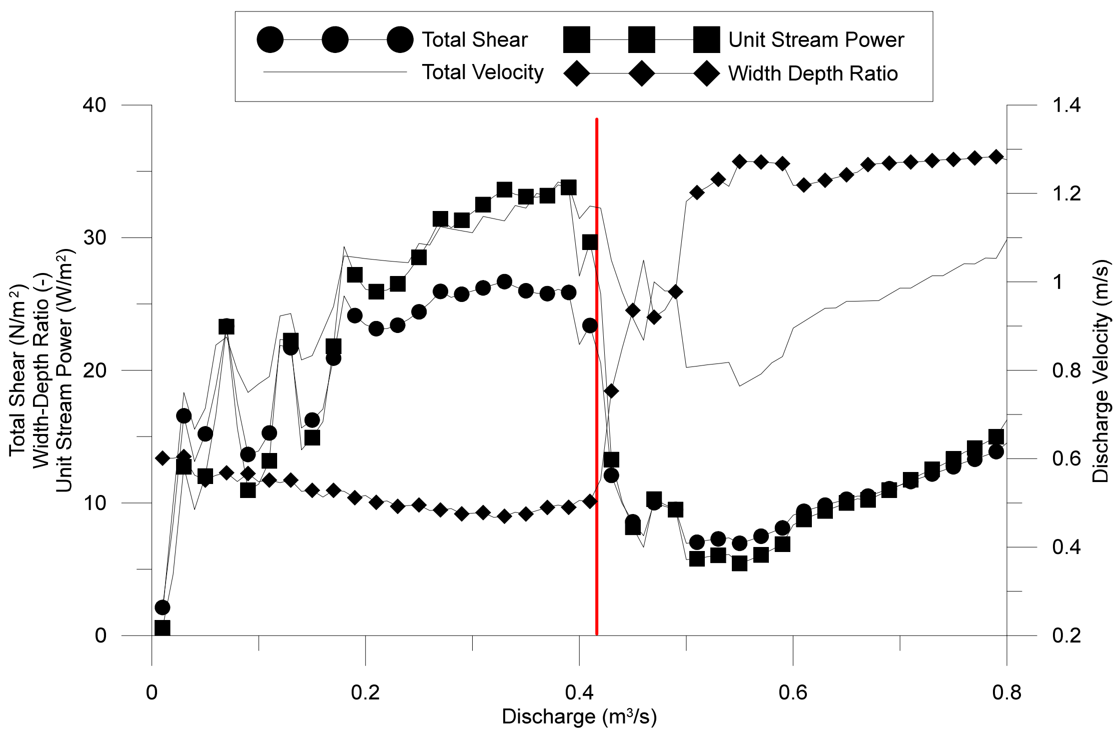
Drawing Number	Description
G-1	Grading Plan
C-1	Sections
T-1	Typical Details

Appendix B

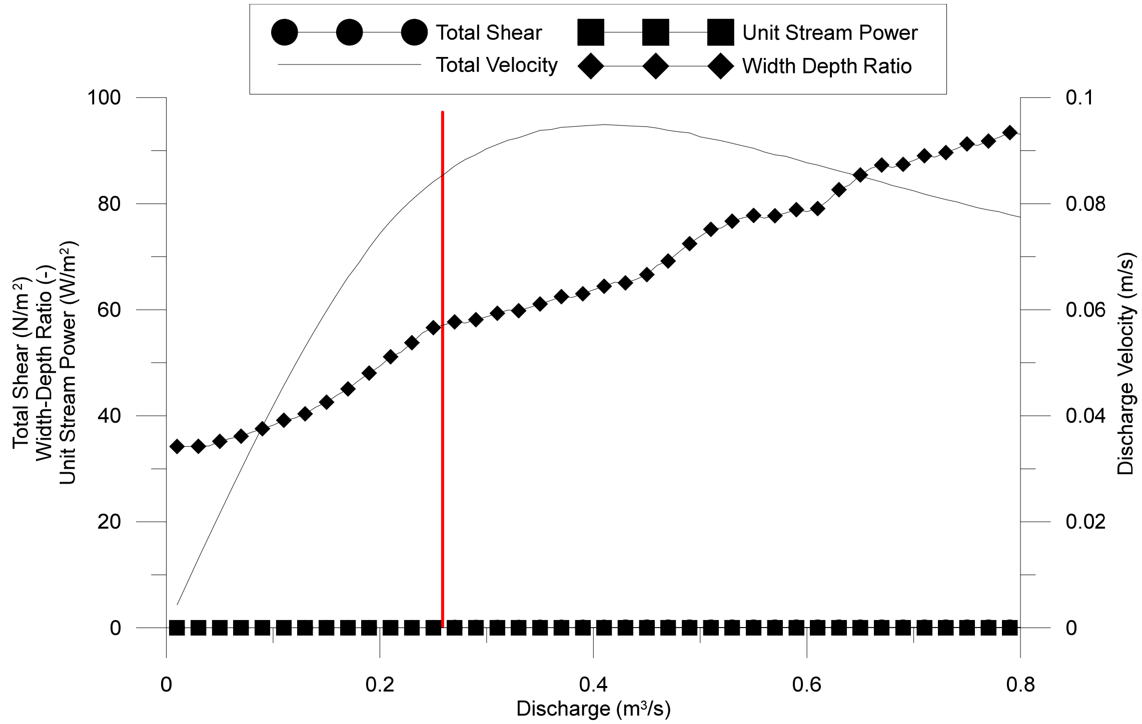
Hydrogeomorphic Plots – Existing Conditions



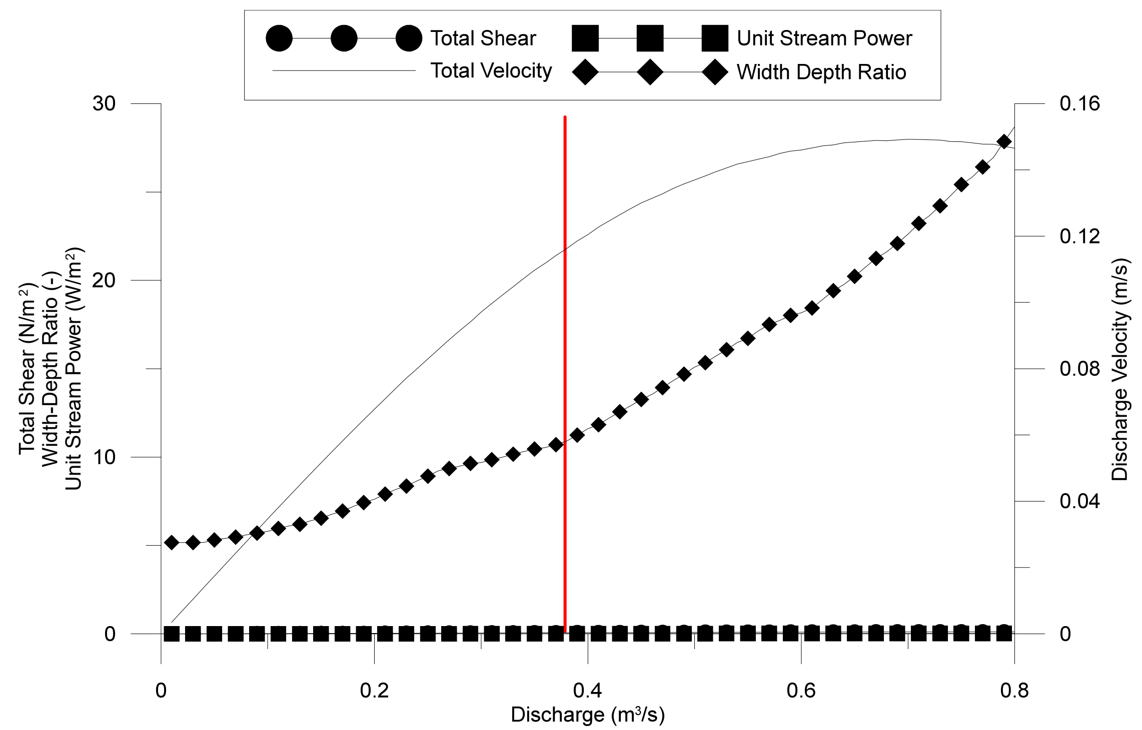
Appendix Figure 1: Hydrogeomorphic plot for CC1 representative riffle section. Red vertical line represents bankfull channel limit.



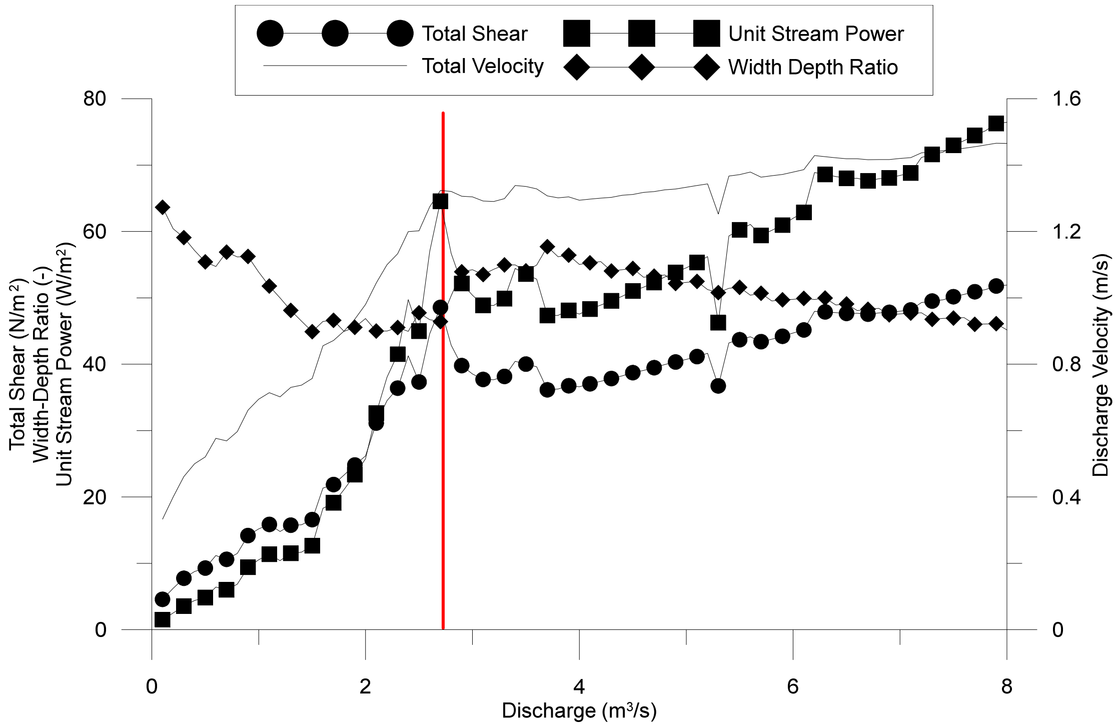
Appendix Figure 2: Hydrogeomorphic plot for boundary between CC1 and CC2 (immediately upstream of bedrock cascade). Red vertical line represents bankfull channel limit.



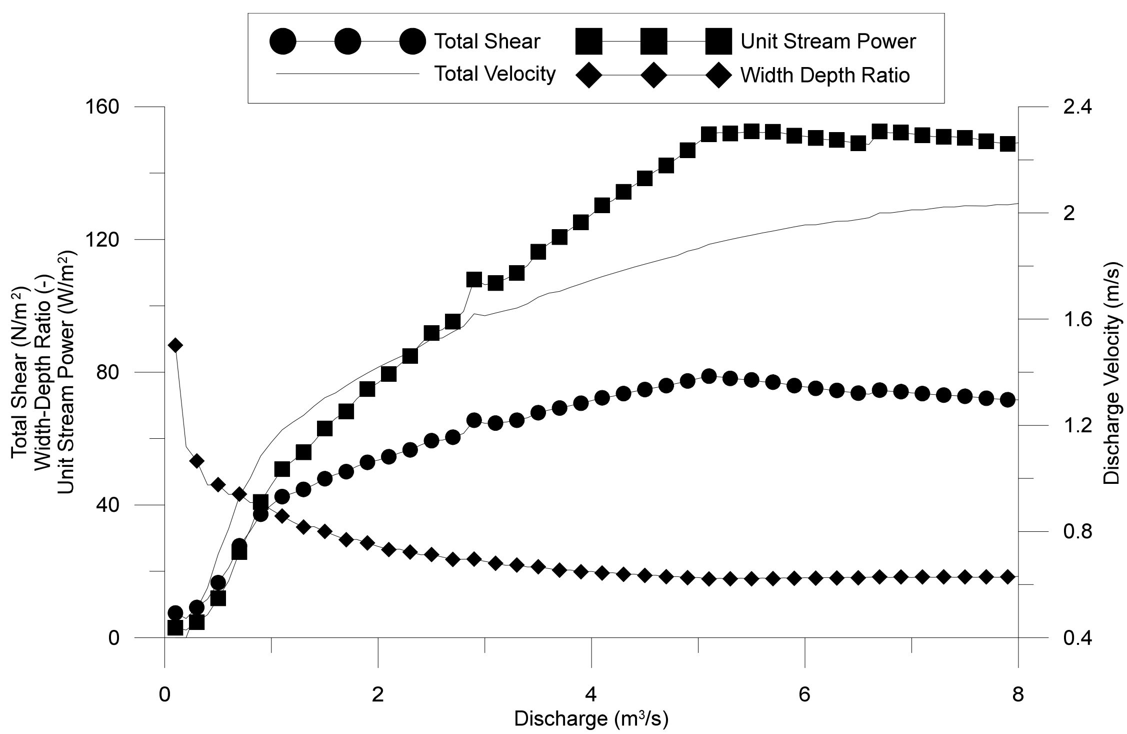
Appendix Figure 3: Hydrogeomorphic plot for CC3 representative section. Red vertical line represents bankfull channel limit.



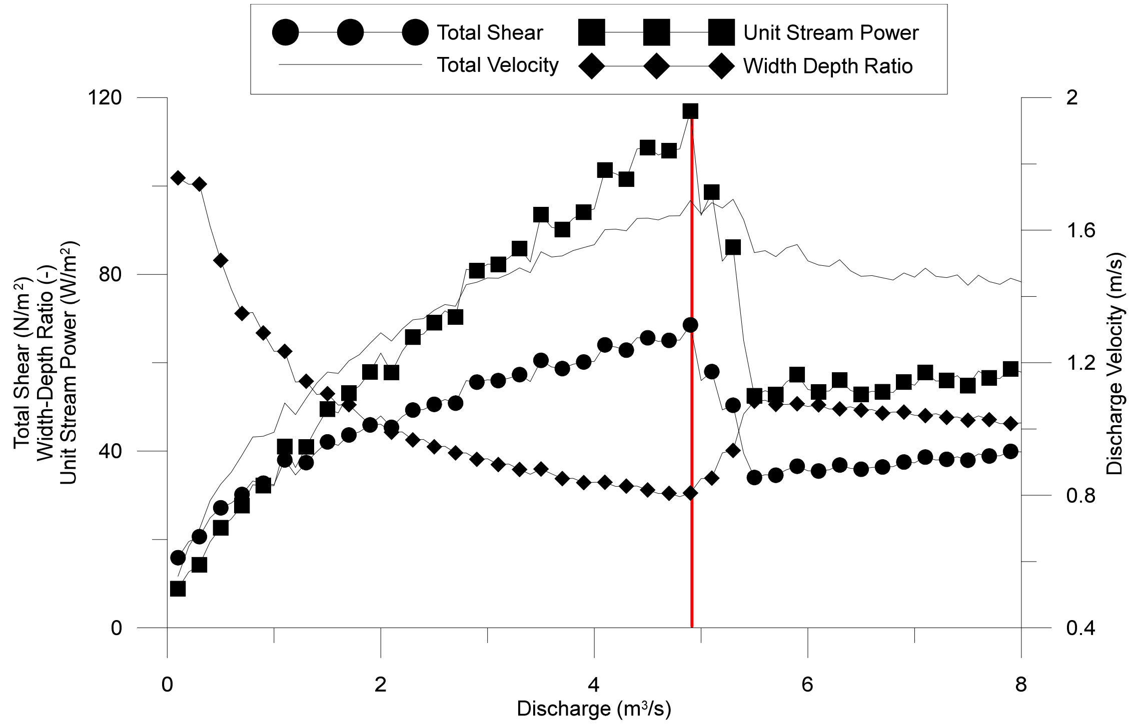
Appendix Figure 4: Hydrogeomorphic plot for CC3 representative section. Red vertical line represents bankfull channel limit.



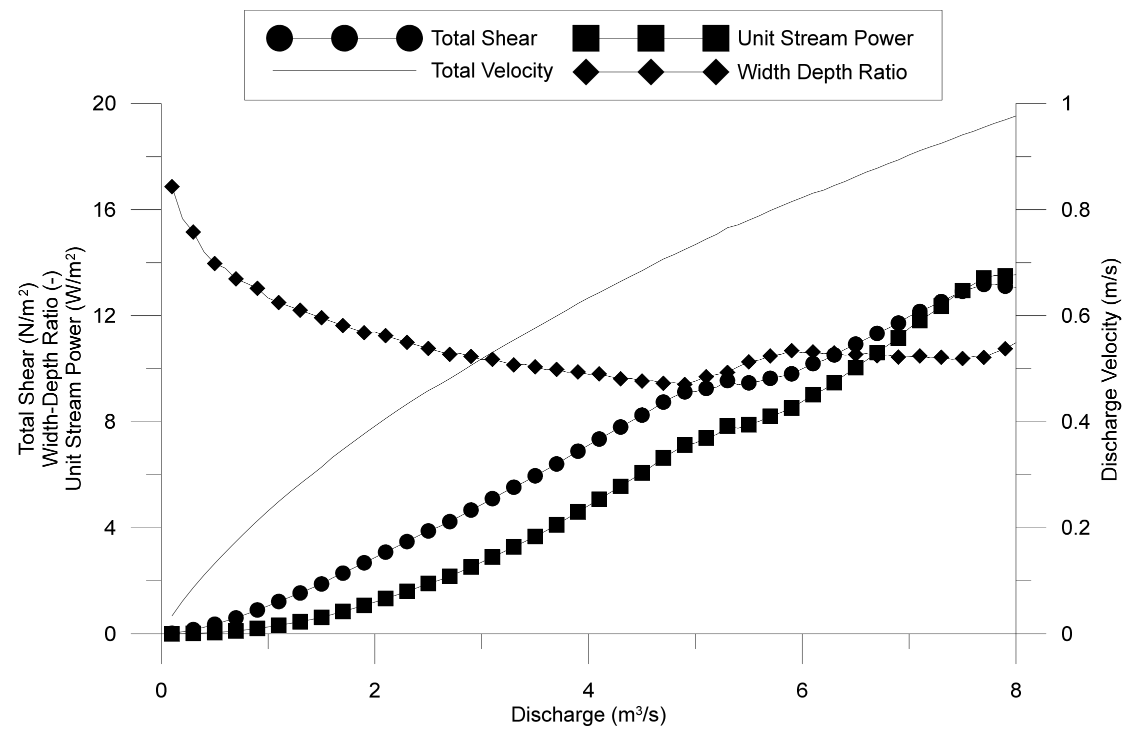
Appendix Figure 5: Hydrogeomorphic plot for MR1 representative riffle section. Red vertical line represents bankfull channel limit.



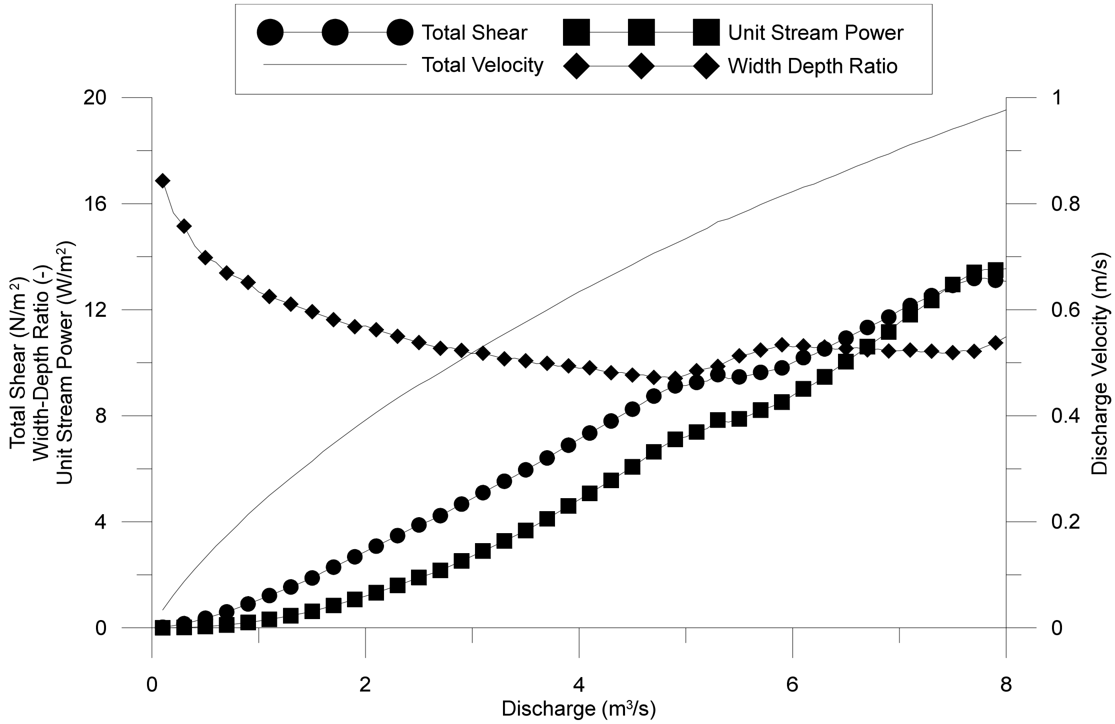
Appendix Figure 6: Hydrogeomorphic plot for MR1 representative riffle section. Flow contained within bankfull channel limits.



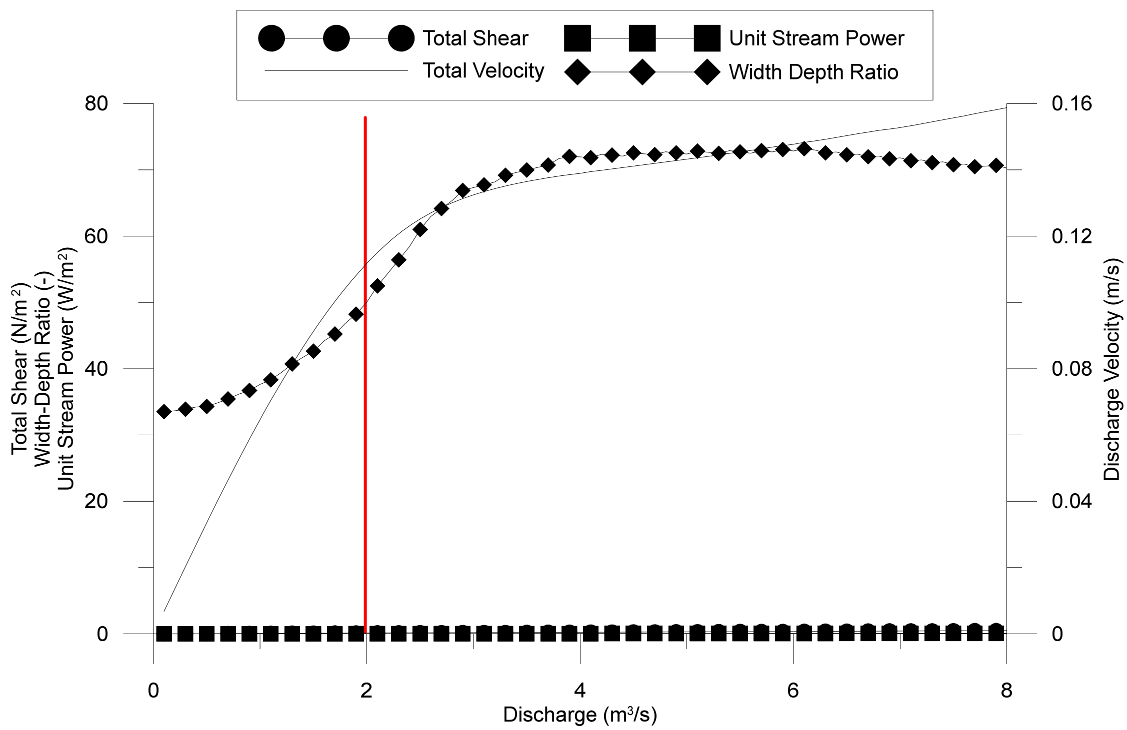
Appendix Figure 7: Hydrogeomorphic plot for MR1 representative riffle section. Red vertical line represents bankfull channel limit.



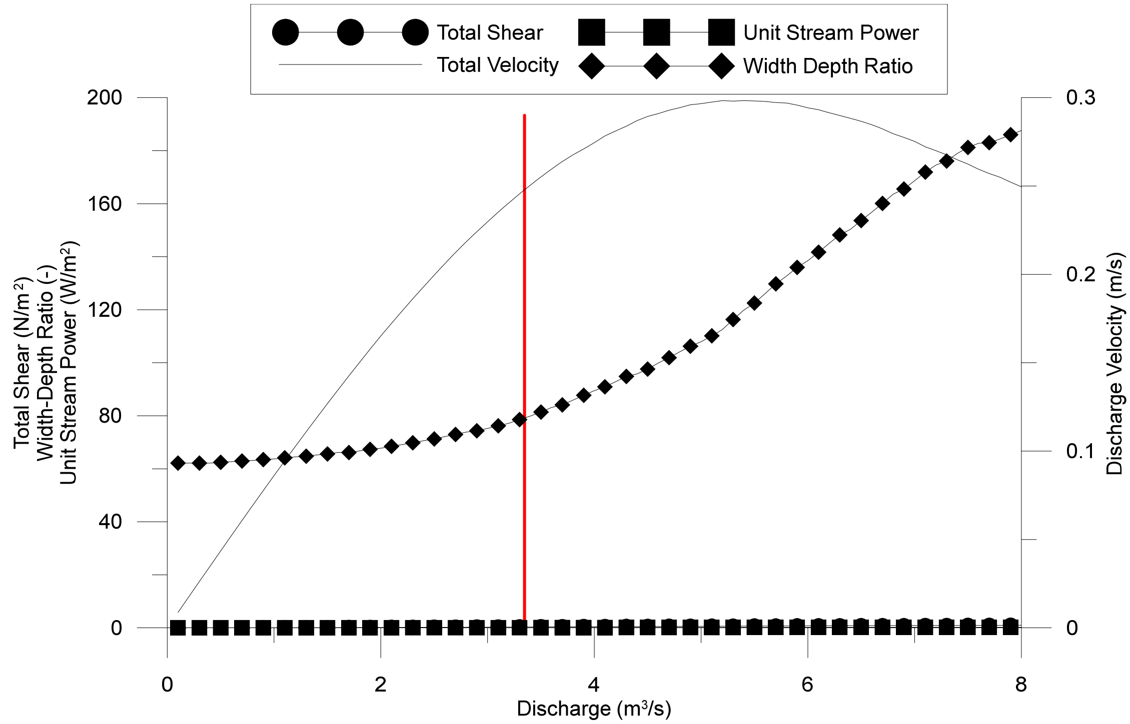
Appendix Figure 8: Hydrogeomorphic plot for MR1 representative pool section. Flow contained within bankfull channel limits.



Appendix Figure 9: Hydrogeomorphic plot for MR1 representative pool section. Red vertical line represents bankfull channel limit.



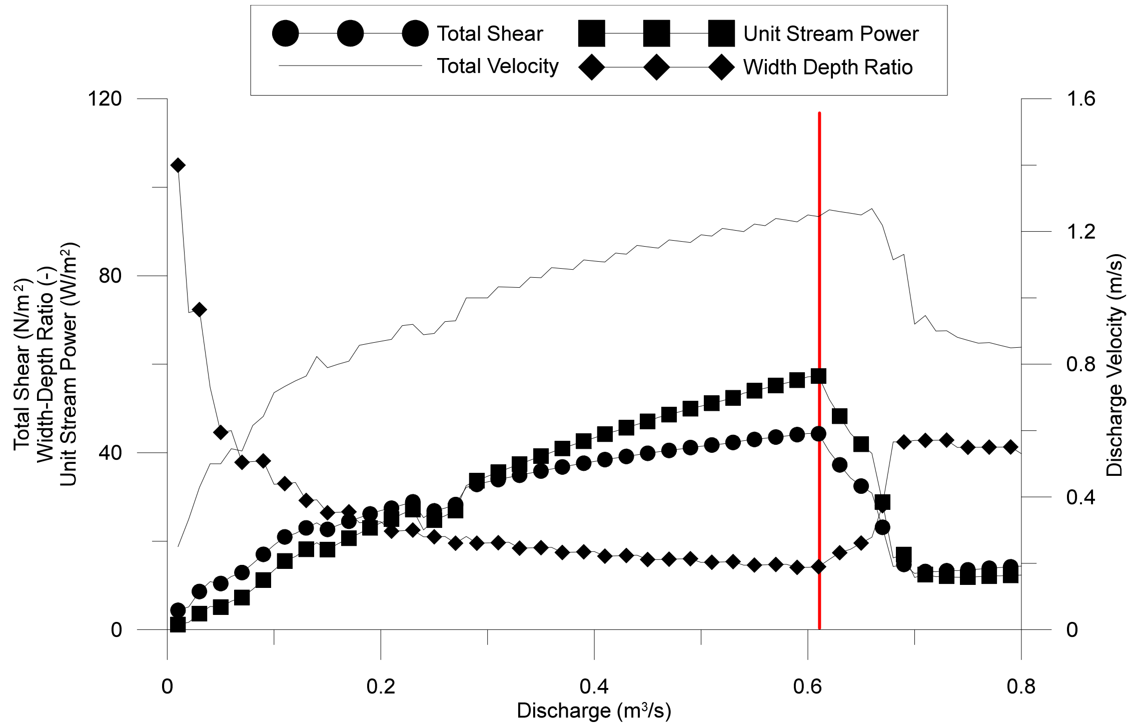
Appendix Figure 10: Hydrogeomorphic plot for MR2 representative run section. Red vertical line represents bankfull channel limit.



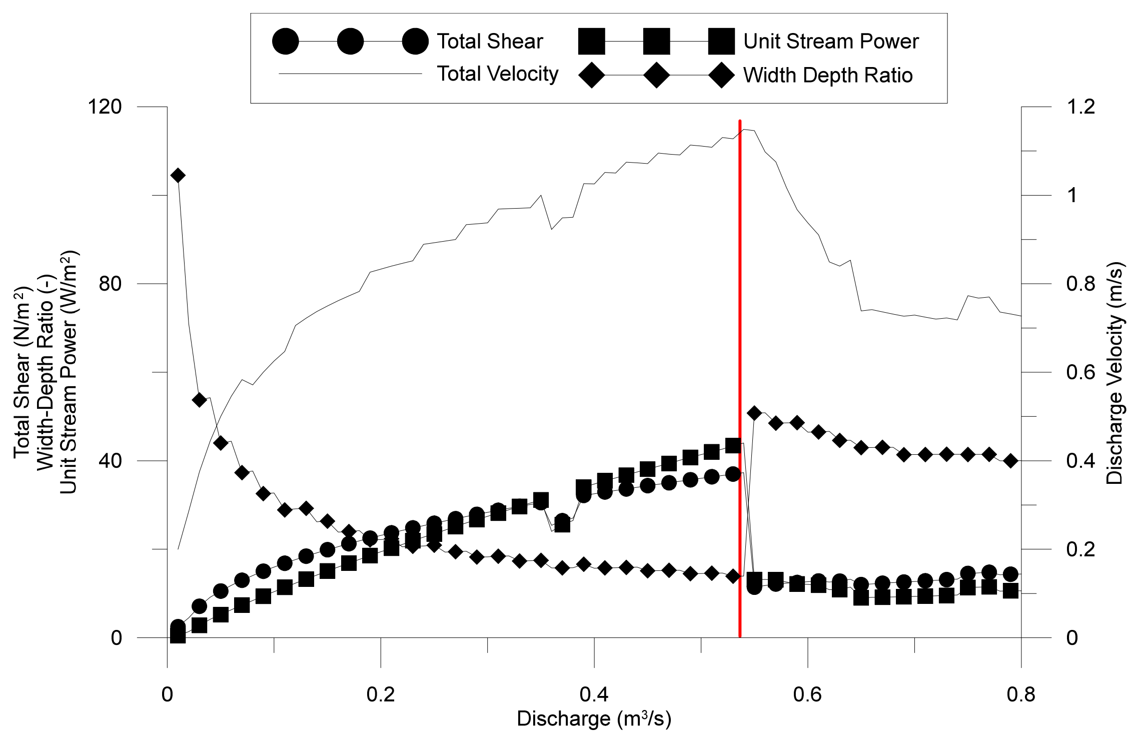
Appendix Figure 11: Hydrogeomorphic plot for MR2 representative run section. Red vertical line represents bankfull channel limit.

Appendix C

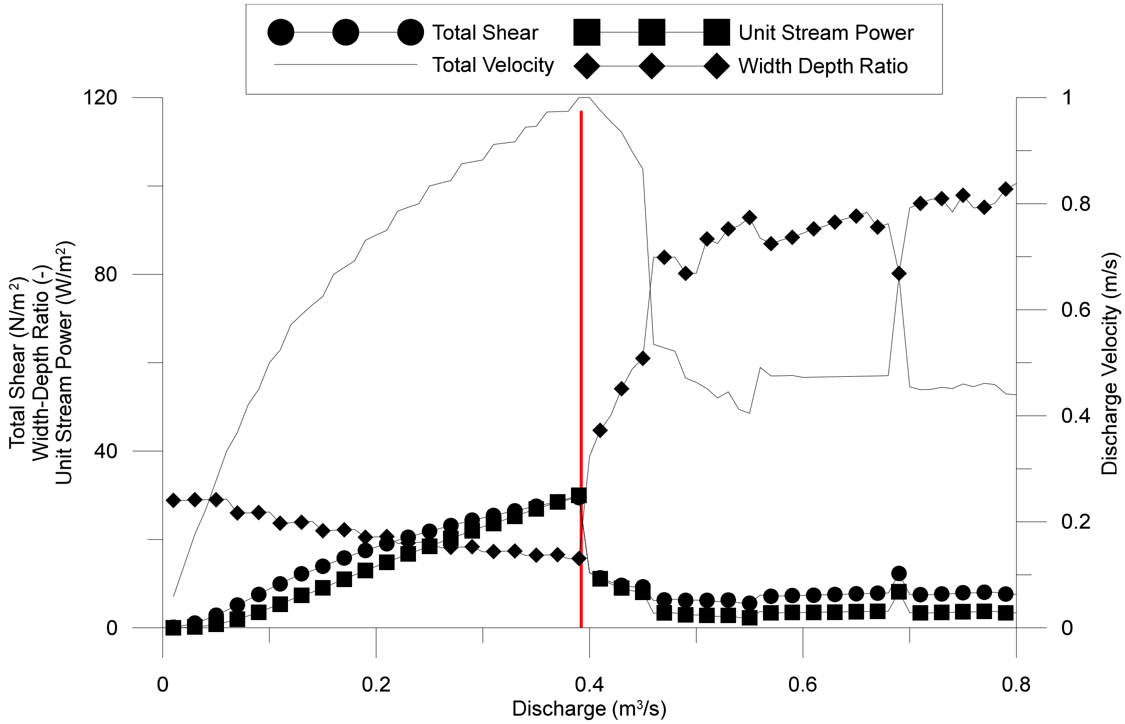
Hydrogeomorphic Plots – Proposed Conditions



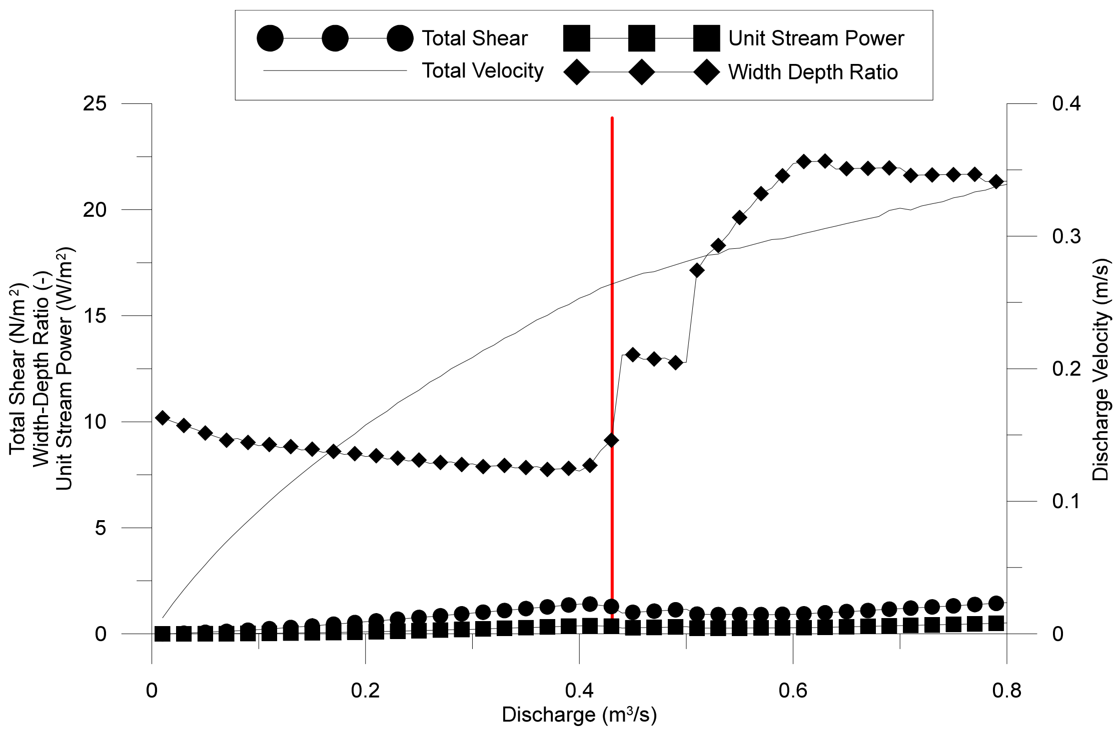
Appendix Figure 12: Hydrogeomorphic plot for WRC1-HG lake outlet. Red vertical line represents bankfull channel limit.



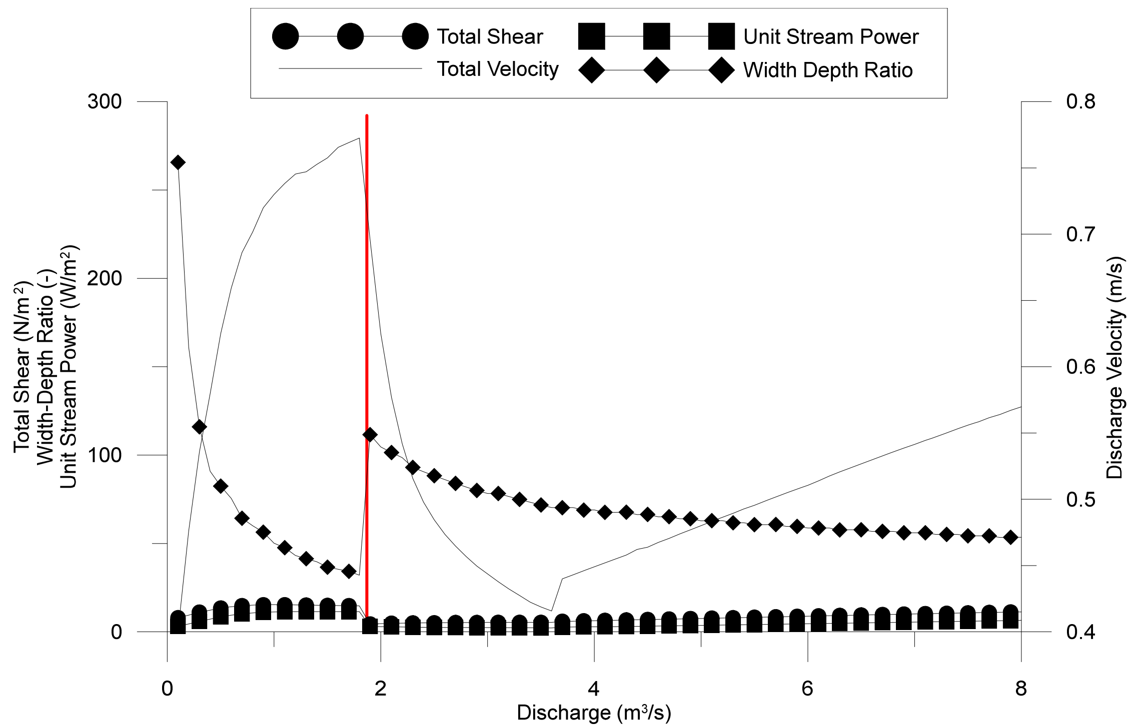
Appendix Figure 13: Hydrogeomorphic plot for WRC1-HG representative riffle section. Red vertical line represents bankfull channel limit.



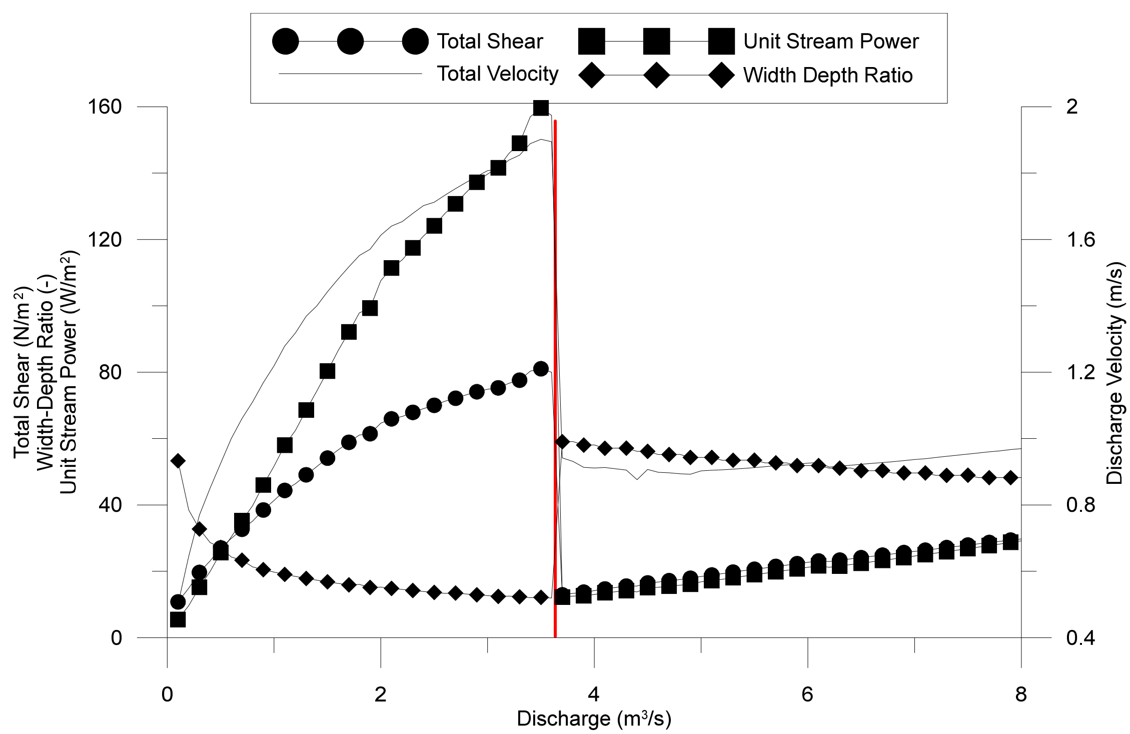
Appendix Figure 14: Hydrogeomorphic plot for WRC1-HG representative riffle section. Red vertical line represents bankfull channel limit.



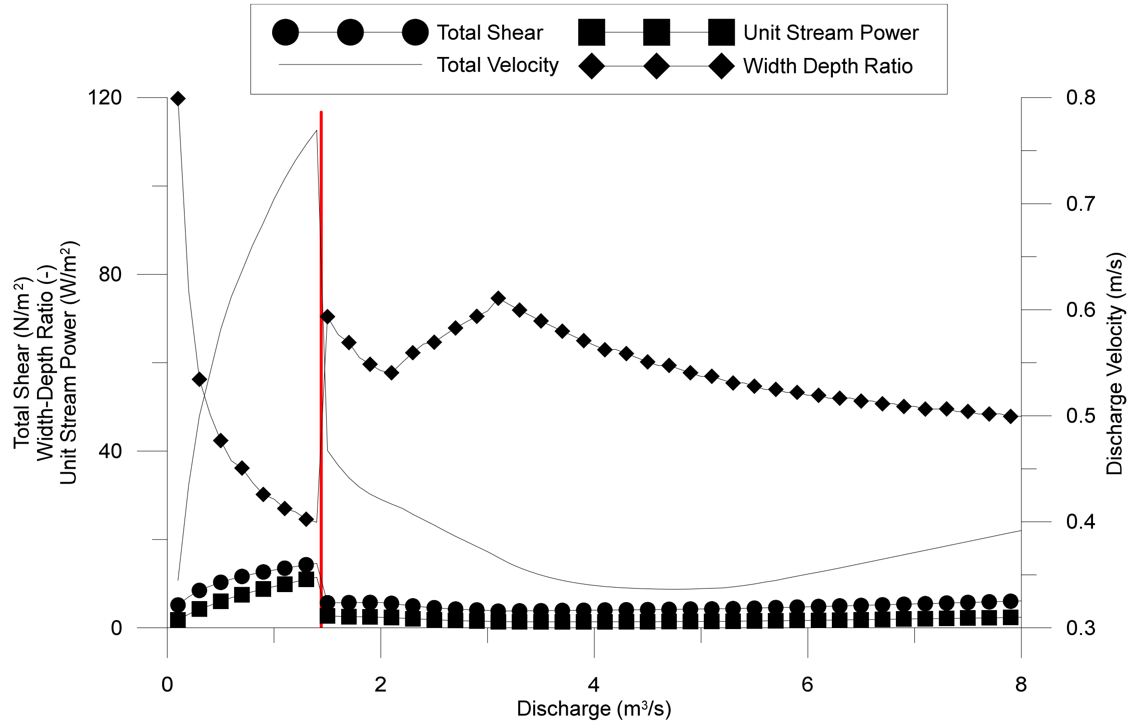
Appendix Figure 15: Hydrogeomorphic plot for WRC1-HG representative pool section. Red vertical line represents bankfull channel limit.



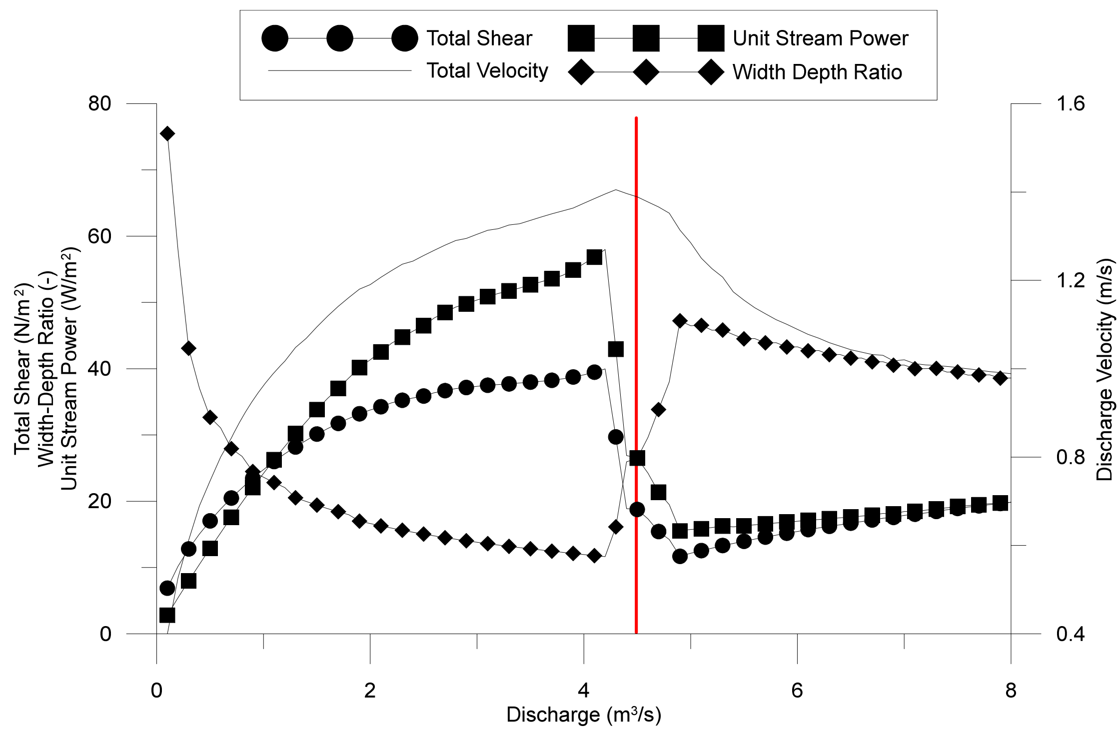
Appendix Figure 16: Hydrogeomorphic plot for WRC2-HG1 crest section. Red vertical line represents bankfull channel limit.



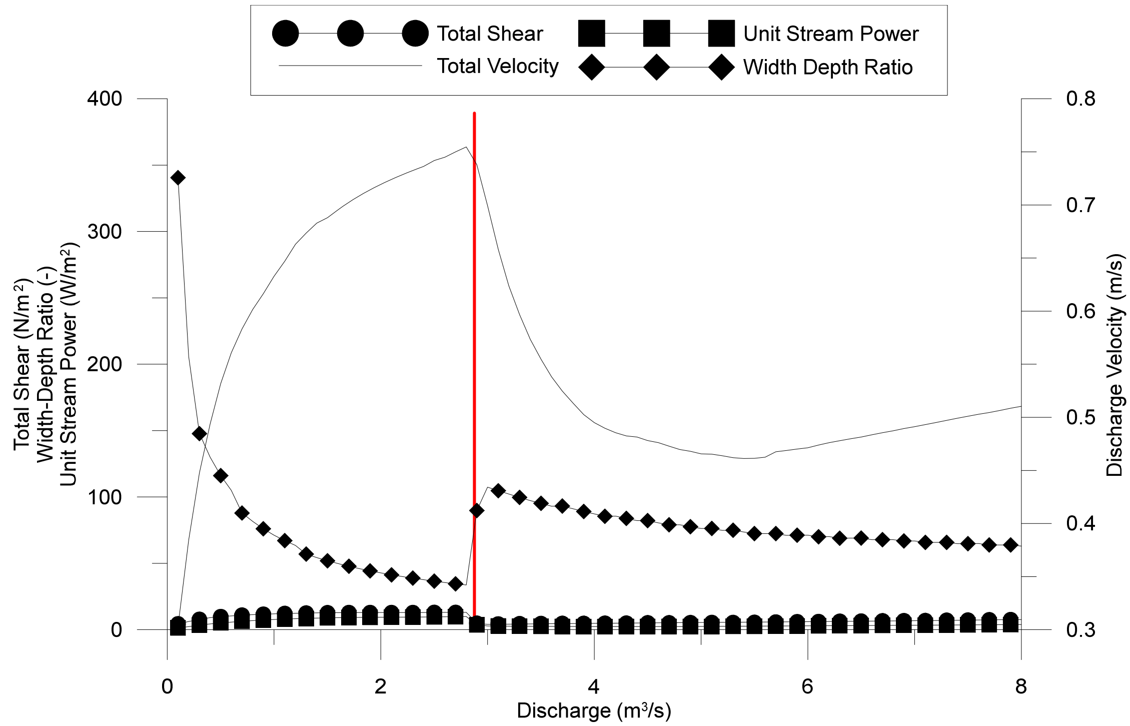
Appendix Figure 17: Hydrogeomorphic plot for WRC2-HG1 riffle section. Red vertical line represents bankfull channel limit.



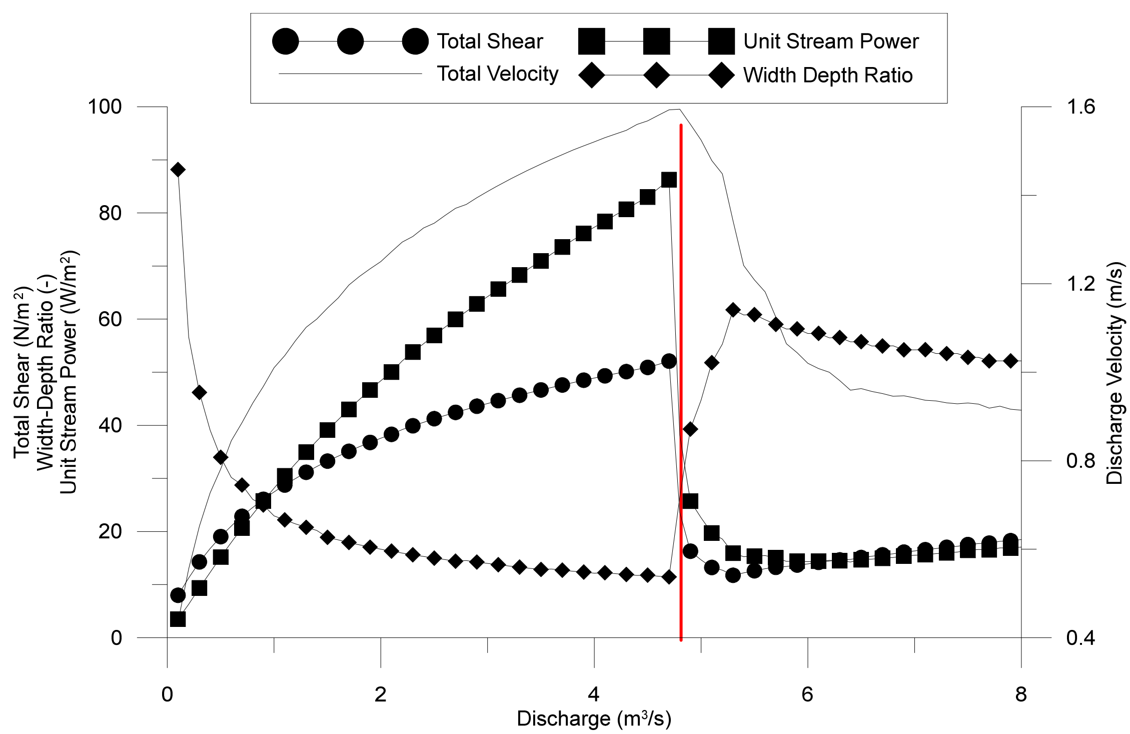
Appendix Figure 18: Hydrogeomorphic plot for WRC2-HG2 crest section. Red vertical line represents bankfull channel limit.



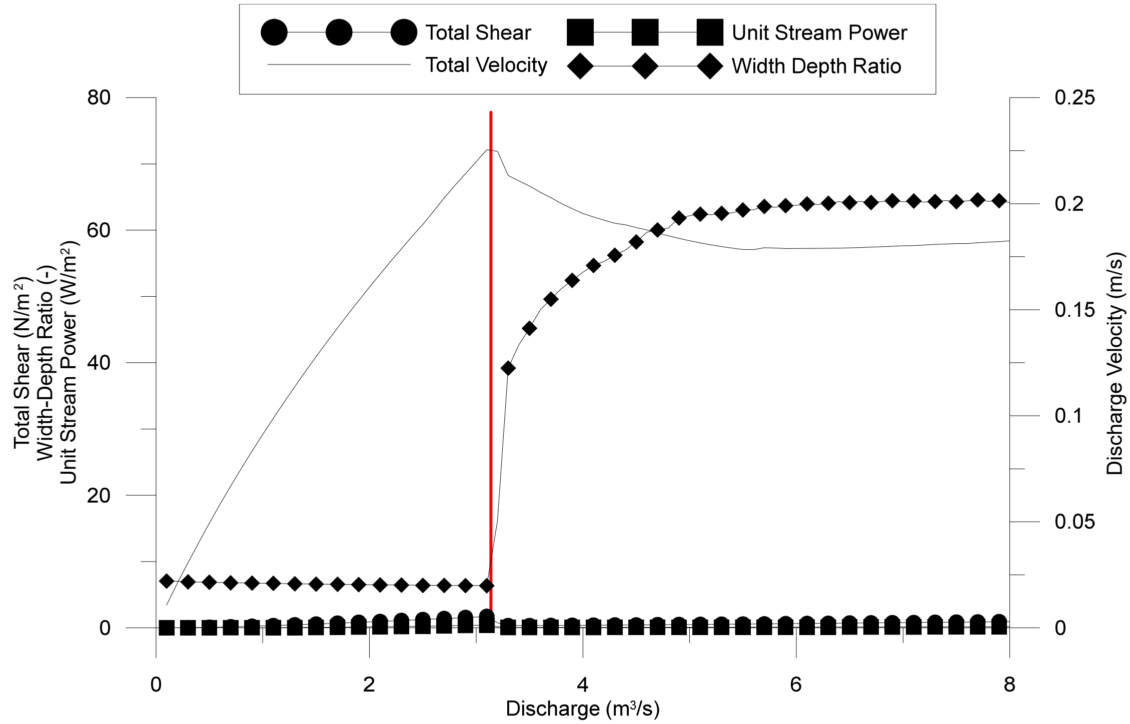
Appendix Figure 19: Hydrogeomorphic plot for WRC2-HG2 riffle section. Red vertical line represents bankfull channel limit.



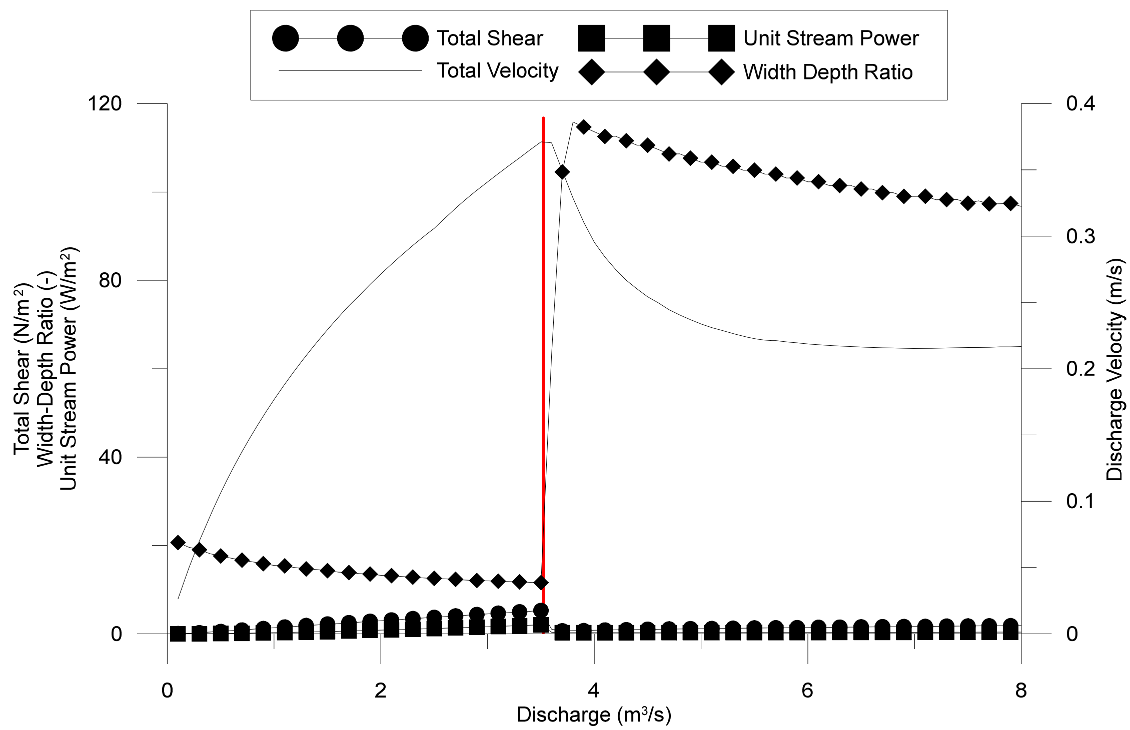
Appendix Figure 20: Hydrogeomorphic plot for WRC2-HG3 crest section. Red vertical line represents bankfull channel limit.



Appendix Figure 21: Hydrogeomorphic plot for WRC2-HG3 riffle section. Red vertical line represents bankfull channel limit.



Appendix Figure 22: Hydrogeomorphic plot for WRC2-LG pool section. Red vertical line represents bankfull channel limit.



Appendix Figure 23: Hydrogeomorphic plot for WRC2-LG run section. Red vertical line represents bankfull channel limit.

GeoProcess
RESEARCH ASSOCIATES
Knowledge
Research
Consulting

DESIGN BRIEF

August 25, 2019

Dave Brown
Manager, Environment and Community Relations
IAMGOLD Corporation
401 Bay Street, Suite 3200
Toronto, Ontario, M5H 2Y4

Re: Offsetting Habitat Features
Côté Gold Project

Dear Mr. Brown:

GeoProcess Research Associates Inc. (GRA) is pleased to submit this design brief to IAMGOLD outlining the design of six small watercourse/water body improvements forming part of the proposed offsetting habitat proposal, in support of the Côté Gold Project. This document outlines the design criteria and approach for the watercourse enhancements and is intended to complement the fish offsetting plan completed by Minnow Environmental, to be submitted to DFO at a future date.

1. Location Overview

The offsetting habitat improvements and creation include six sites as shown below:

PO Box 65506 Dundas
DUNDAS, ON, L9H 6Y6
905.466.6721
www.geoprocessresearch.com

Site #1: East Clam Lake Connection:

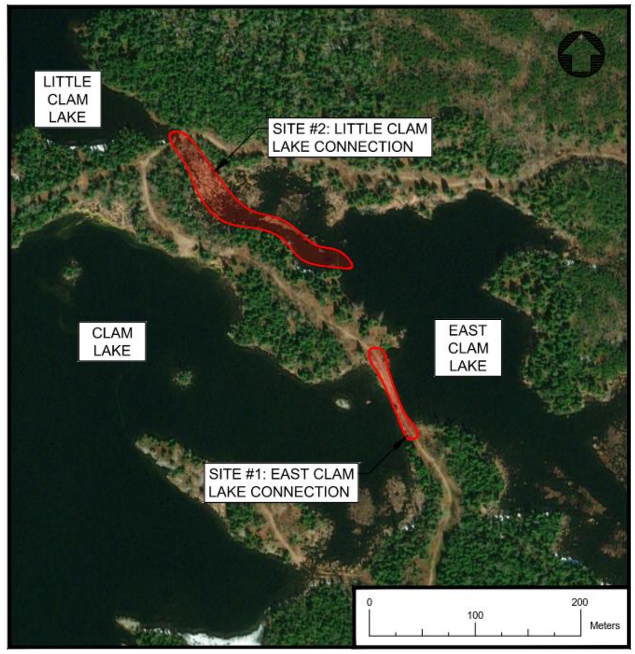
Design Elements: *Crossing removal*

This site is located at the culvert/access road separating East Clam Lake and Clam Lake. In order to improve the fish passage and habitat connectivity, the removal of the access road and the corresponding culvert is proposed.

Site #2: Little Clam Lake Connection:

Design Elements: *Natural channel design*

This site is located at the overland flow area where water flows from Little Clam Lake to East Clam Lake. This area consists of an approximately 1-1.5 m drop at the edge of Little Clam Lake that acts as a fish migration barrier. In order to improve the fish passage and habitat connectivity, the flow path is to be enhanced through the construction of a step-pool profile to connect the two lakes while facilitating fish passage.



Site #3: Weeduck Lake Connection:

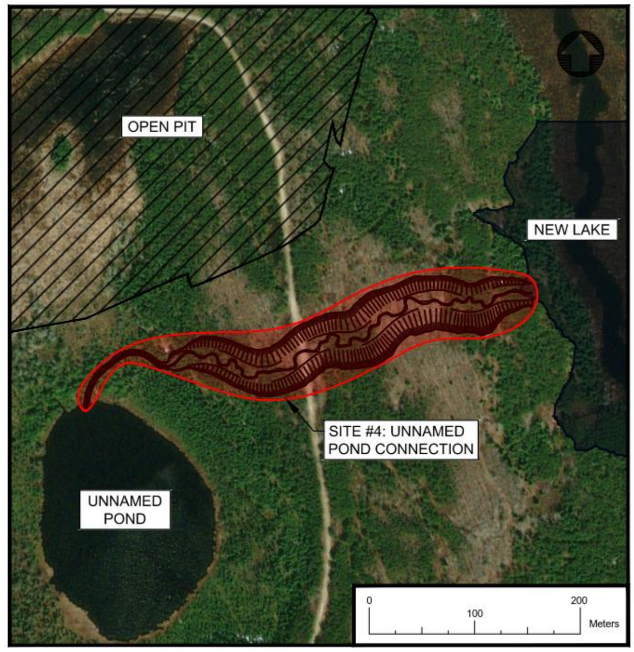
Design Elements: *Crossing removal*

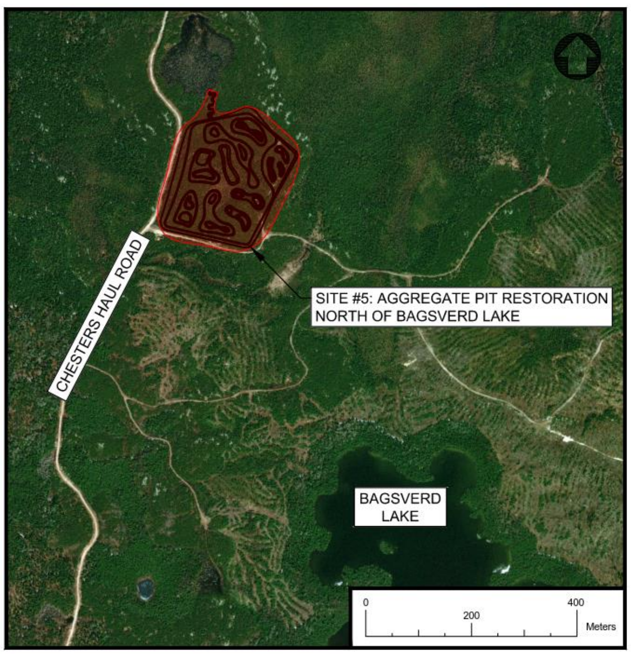
This site is located at the culvert/access road separating Weeduck Lake and Upper Three Duck Lake. In order to improve the fish passage and habitat connectivity, the removal of the access road and the corresponding culvert is proposed. Since two road crossings exist between the two lake features, two connections will be made to improve the habitat connectivity.

Site #4: Unnamed Pond Connection:

Design Elements: *Natural channel design*

This site is located immediately south of the open pit and connects Unnamed Pond to the proposed New Lake. As Unnamed Pond currently has no observable defined flow paths, a channel connection to New Lake is proposed to provide fish passage and habitat connectivity. This low flow channel will sit within a broader valley cut for draining groundwater flows away from the open pit.

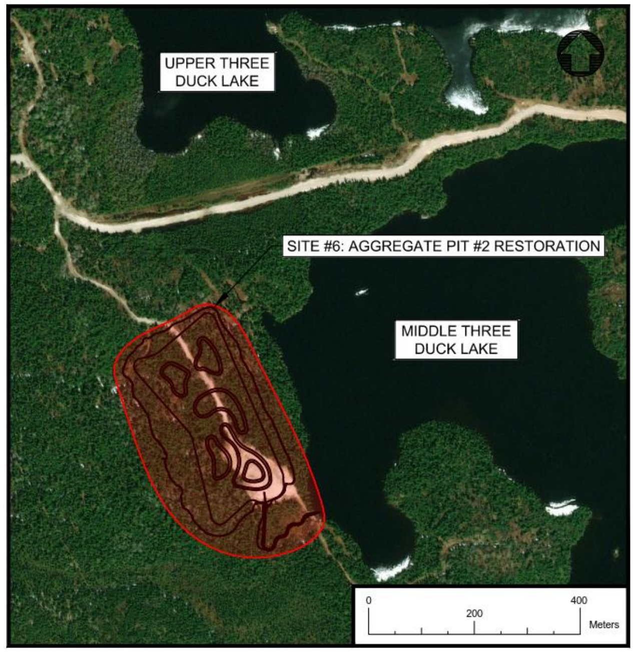




Site #5: Aggregate Pit Restoration North of Bagsverd Lake:

Design Elements: *Habitat creation, natural channel design*

This site consists of the restoration of proposed aggregate pit located north of Bagsverd Lake. The restoration plan consists of excavating the aggregate pit to an elevation below the water table and providing other habitat features to enhance fish, amphibian and reptile habitat. This excavated pit area is to be connected to a wetland feature north of the site to provide fish passage to other natural habitat features.



Site #6: Aggregate Pit #2 Restoration:
This site is located just west of Middle Three Duck Lake at an existing aggregate pit (Aggregate Pit #2). The restoration of this site includes excavating the pit to a depth below the Middle Three Duck Lake water level to provide permanent water within the feature, as well as habitat features within the pit and a low flow channel connection to Middle Three Duck Lake for fish passage.

2. Design Objectives and Target Morphologies

The key design objectives used to guide the design process for the offsetting habitat sites are as follows:

Barrier Removal: To improve the quality of existing habitats, such as lake and channel connections, the removal of barriers to fish passage and habitat connectivity is proposed. To achieve this, unnecessary road crossings will be removed, and ill-defined channel connections will be improved to provide a more concentrated flow path to improve fish passage. Barrier removal also includes connecting existing or proposed habitat areas that are not or would not be connected naturally.

Habitat Conversion/Creation: To provide an overall habitat benefit, areas that either present low habitat value or other areas that have been altered due to temporary mine works will be reconstructed to improve the overall habitat value. This involves creating or enhancing areas to provide high-quality fish and amphibian habitat and providing connection to other natural areas to provide habitat connectivity.

Habitat Complexity: The offsetting habitat designs contain many features to improve habitat complexity. This includes features such as large woody debris, turtle spawning areas and placed boulders and shoals. To further increase the habitat complexity and quality, native plant species are used to improve both the terrestrial and aquatic systems.

Natural Channel Design: The proposed channel designs for the offsetting habitat features follows the principals of natural channel design. The objective is to provide channel designs that fit within the site constraints but also achieve the habitat improvement desired for the sites. This involves selecting appropriate channel morphologies and features that mitigate the risk of instability or the development of fish migration barriers. Since the proposed channel features are fed by lakes or other bodies of water where there is a limited sediment supply, the channels were designed to have limited sediment mobility.

The objectives listed above apply to the specific offsetting habitat designs as follows:

Site #1: Barrier Removal

Site #2: Barrier Removal, Natural Channel Design

Site #3: Barrier Removal

Site #4: Barrier Removal, Habitat Complexity, Natural Channel Design

Site #5: Barrier Removal, Habitat Conversion/Creation, Habitat Complexity, Natural Channel Design

Site #6: Barrier Removal, Habitat Conversion/Creation, Habitat Complexity, Natural Channel Design

As a part of the natural channel design process, different channel morphologies are proposed based on the natural conditions and design constraints. These channel morphologies are outlined below:

Low Gradient Sinuous (LG): This morphology type emulates the existing conditions of nearby natural channel systems. The hydraulic conditions here are influenced by the downstream lake level, with backwater and very low velocities dominating the hydraulic regime. Here, bed and bank stability will be primarily achieved by riparian vegetation. The meander geometry for these reaches is based on the existing meander patterns of nearby natural channels, and also on the existing geometry of the proposed project site. These zones typically have a wide valley to allow for natural processes and adjustments. These low gradient channels create excellent opportunities for northern pike spawning habitat, juvenile walleye rearing habitat or adult white sucker foraging habitat. The inclusion of boulders and large quantities of large woody debris (LWD) creates conditions for small-bodied fish refugia and, consequently, smallmouth bass foraging habitat. ***Sites containing this morphology:*** Site #2, Site #4.

Riffle-Pool (RP): These reaches are in areas with a moderate gradient (0.5-2%) used to make up grade differences for channels connecting existing water body features. Here, a series of riffles, steps and pools have been designed to promote areas of higher velocity and more hydrodynamic variability. Due to a lack of upstream sediment resupply, the design has adopted a threshold-based approach for sediment stability. These zones are sufficiently connected to the floodplains to promote energy dissipation of flood flows exceeding the bankfull channel. The features will also provide spawning habitat for species preferring swift water and coarse substrates, such as walleye. The pool sizes were varied to add complexity to the system, with larger pools providing a staging area for spawning fish where they can find refuge from high flows. ***Sites containing this morphology:*** Site #4, Site #5, Site #6.

Run-Pool (RuP): This morphology type is used for moderately steep reaches and consists of extended runs with small intermittent pools. This section has been designed to be a straight reach due to topography constraints, with runs that contain large material relative to the expected flow depths to break up the flow, and shallow and short pool features aimed at adding energy dissipation through creating a hydraulic jump. The design also incorporated fish passage considerations, with the pools providing refuge from high velocity flows, and the large material in the runs providing pockets for turbulence and slower moving water to ease upstream navigation. Similar to the other reaches with a lack of sediment resupply, the design has adopted a threshold-based approach for sediment stability. ***Sites containing this morphology:*** Site #5.

Step-Pool (SP): These reaches are used to cover large drops in elevation over a shorter distance to limit cut/fill and to try and provide fish passage to poorly accessible areas. The step-pool sequences have been designed to provide manageable drop heights between steps to avoid excessively large scour pools and to provide the ability for fish to navigate the steps. Additionally, the pools have been designed to provide energy dissipation and refuge for fish trying to navigate these steeper reaches. Again, due to the lack of upstream sediment resupply, the design has adopted a threshold-based approach for sediment stability. To achieve this, large boulders were used in the design to line the steps and designed to remain stable at high flows. ***Sites containing this morphology:*** Site #2.

3. Design Criteria

Design criteria were established through hydrologic and hydraulic analysis. Quantitative and qualitative data were used to establish criteria. Parameters that were evaluated include:

- Bankfull discharge: the discharge that coincides with water beginning to spill out of the channel into the floodplain;
- Channel sizing and planform: the cross-sectional channel size and plan form used to create the channel morphology;
- Substrates: the size of the channel material; and
- Habitat features: the restoration and revegetation strategy for improving and enhancing the proposed habitats.

3.1. Design Discharge

In order to properly size the channels for Site #2, Site #4, Site #5 and Site #6, the design discharge for each of these sites needed to be established. To do this, the hydrology for each of the sites was evaluated to determine the return period flow events. Due to the small size of the catchments, and the resulting low discharge regime, the 2-year return period event was chosen as the design discharge for all of the offsetting habitat sites.

Due to the small drainage area of several of the sites, it was often not possible to assess the hydrology of the site itself. To assess these sites, the hydrology scaled from the Little Clam Lake Hydrological Assessment. When sites were compared to both the Little Clam Lake and the Bagsverd Creek drainage areas, the more conservative (greater flow) results were used. The results of this analysis are shown below:

Site	Drainage Area [km^2]	Design Discharge [m^3/s] (2-year return period)	100-year Discharge [m^3/s]
Site#2: Little Clam Lake Connection	0.541	0.180	0.998
Site#4: Unnamed Pond Connection	0.027	0.008	0.050
Site#5: Bagsverd Aggregate Pit	0.211	0.074	0.408
Site#6: Aggregate Pit #2	0.136	0.045	0.250

3.2. Channel Sizing and Planform

The approach for determining the channel sizing and planform differed between morphology types.

Low Gradient Sinuous and Riffle-Pool

For these morphology types, the design approach was iterative. The planform was based upon the channel size as well as the planform of other local river reaches and studies morphological parameters. The channel sizing was based on the design discharge and channel slope, which is impacted by the channel planform. By estimating an initial channel size, a channel planform was initially designed, after which both the planform and channel size were iterated until they reached an appropriate balance that was suitable for their respective sites. The channel sizing was based on calculations using an at-a-station hydraulic model.

Run-Pool and Step-Pool

These morphology types had a more straightforward design approach. Since the planform for these morphologies is typically straighter than the low gradient and riffle-pool morphologies, the planform was able to be based primarily on the most efficient path in the existing topography. From this planform and the resulting channel slope, the channel sizing could be determined using Manning's equation.

Results

The results of the channel sizing are shown in the following table:

Site	Sub Reach	Design Discharge (m3/s)	Reach Slope (%)	Riffle/Run Slope (%)	Top Width (m)	Bottom Width	Depth
Site#2: Little Clam Lake Connection	SP	0.18	3.9	N/A	1.5	0.3	0.3
	LG		0%	0%	1.5	0.3	0.3
Site#4: Unnamed Pond Connection	LG	0.008	0%	0%	1.1	0.3	0.2
	RP		0.7%	1.0-2.0%	1.1	0.3	0.2
Site#5: Bagsverd Aggregate Pit	RP	0.074	0.6-0.8%	0.8-3.1%	1.1	0.3	0.2
Site#6: Aggregate Pit #2	RuP	0.045	2.0%	3.8%	1.5	0.5	0.25
	RP		0.8%	3.2%	1.5	0.5	0.25

3.3. Substrates

Given the limited sediment input into each of the sites and the overall limited mobility of the channel beds, a threshold-based approach was used to size substrate that is likely to remain immobile under all but the most extreme flow conditions. This approach minimizes the risk associated with erosion and mimics the system's existing sediment regime. By matching the existing sediment regime, the designs should not contribute additional sediment delivered to downstream lakes, like the present-day conditions.

Stone has been specified for the construction of grade control features for each of the channel reaches (ie. riffles, crossovers and crests) within the low flow channels. Rounded stone, as opposed to riprap, is recommended as it is more representative of natural watercourse sediment, favouring colonization by benthos.

The stone sizing was determined using a threshold (tractive force) approach for predicting the threshold particle size for the maximum predicted shear stress. This approach relies on the determination of a critical shear stress to calculate the stable stone size. The Shields parameter (τ_*) is used to define the ratio of shear force to the weight of a stone under channelized flow. The critical value of Shields (τ_{*C}) defines the particle size corresponding to the beginning of particle mobility. Solving for the diameter of the particle size d_s, the stable particle is determined as follows:

$$d_s = \frac{\tau}{(\rho_s - \rho) g \tau_{*C}}$$

Where: d_s = threshold diameter of particle at incipient motion (m)

τ = bed shear stress (N/m^2) for the peak discharge available

ρ_s = density of sediment (2650 kg/m^3)

ρ = density of water (1000 kg/m^3)

g = gravitational acceleration (9.81 m/s^2)

τ_{*C} = Critical Shield's parameter for coarse particles (Julien, 2002).

Bed shear stress is dependant on the local channel geometry and hydraulics. Therefore, threshold stone sizes will vary throughout a system. At-a-station hydraulics analysis using the Manning's equation was undertaken for each site. Since some sites contained two sub-reaches, the sub-reach that would produce the more conservative (larger) stone sizing was used for the analysis. In doing this, the threshold stone sizing was set for a representative flood event (100-yr) for each reach. A safety factor was also applied to increase the stone sizes for long term stability and to account for uncertainty. A summary of the channel shear stresses and threshold stone sizes for each reach is provided in Table 1.

Table 1: Summary of channel shear and threshold stone size for each reach.

Reach Used		Channel Shear Stress (Pa)	Threshold Stone Sizing (mm)
Site #2: Little Clam Lake Connection	SP	143	197
Site #4: Unnamed Pond Connection	RP	15	20
Site #5: Bagsverd Aggregate Pit	RP	35	48
Site #6: Aggregate Pit #2	RuP	49	68

Using the threshold stone sizes, stone mix gradations were developed. A gradation provides volumetric proportions of a range of stone sizes. The stone mixture allows for construction of features that are more representative of natural channels, and that include larger boulders (or keystones) that are sized to remain stable under all floods and smaller stones that fill voids and provide better aquatic habitat. The keystone boulders (placed at the feature crests) were sized to be twice as large as the maximum stone in the mix. Clay or approved material has also been specified for the stone gradation to help provide cohesion to the bed material and to fill voids.

Due to the range in the stone sizes, a unique stone gradation was not required for every site or sub-reach. Two different stone gradations were sized to satisfy the shear thresholds in each of the sites. The stone gradations are listed in Table 2.

Table 2: Roundstone gradations.

Site #2	Sites #4, 5, 6
10% - clay1 20% - 25 to 100 mm Ø 20% - 100 to 200 mm Ø 30% - 200 to 300 mm Ø 20% - 300 to 400 mm Ø Keystone – 500 mm Ø NOTES: 1. Clay or Approved Equivalent	10% - clay1 20% - 25 to 50 mm Ø 20% - 50 to 75 mm Ø 30% - 75 to 125 mm Ø 20% - 125 to 200 mm Ø

3.4. Habitat Features

The key function of each of the offsetting habitat sites is to enhance the natural habitat for each of the areas. Since the goals are not the same for each site, the table below outlines approaches used in this design to enhance the natural habitat, and each site contains a combination of these approaches.

Target Habitat	Description	Sites
Lake Habitat Connection	To enhance existing lake systems, it is proposed that existing access roads and bridges that run between lake features be removed. This enhances the existing habitat by increasing the connectivity between the existing lake systems and provides additional area for fish and aquatic habitat.	#1, #3
Stream Habitat	The creation of a stream system provides many different habitat improvements. While the proposed streams provide aquatic habitat within the stream itself, the proposed design contains morphologies that are also aimed at providing fish passage and connectivity between other existing and proposed aquatic features (ie. lakes, ponds and wetlands).	#2, #4, #5, #6
Water Body Creation	At the proposed aggregate pits, the creation of aquatic habitat is proposed to convert these disturbed areas into high-value habitat features. These aquatic features will resemble lake and wetland features, providing areas for fish and other aquatic species. Additionally, these features are designed to provide variable habitat, including areas aimed not only at aquatic species, but also terrestrial species such as birds, reptiles and amphibians.	#5, #6
Terrestrial Habitat Features	To provide the greatest habitat enhancement, the inclusion of other terrestrial habitat features is proposed. These features include large woody debris (i.e.. fallen trees and standing snags) and boulders to add value to both aquatic and terrestrial habitats. Additionally, shoreline areas are proposed to include features such as turtle spawning areas and native aquatic plantings to provide habitat for amphibians and reptiles.	#4, #5, #6

Restoration and Revegetation	Disturbed areas are proposed to be restored and enhanced with native species. These species have been specified to target the specific conditions of each area. Additionally, planting areas have also been proposed to improve the habitat present within bedrock cut areas.	#2, #4, #5, #6

4. Constructability, Staging and Erosion & Sediment Control

4.1. Site #1:

The removal of the bridge and access road between East Clam Lake and Clam Lake is to be undertaken from the existing road. The working area is to be isolated with a turbidity curtain (OPSD 219.260) placed on both sides of the removal. The exact limits of grading are to be confirmed on site by the construction administrator, and all accumulated sediment is to be removed from the working area with a vac truck prior to the removal of the turbidity curtain.

For further details on construction staging and ESC of Site #1 see GRA Drawing #03 – Clam Lake Connections: Revegetation and Erosion and Sediment Control.

4.2. Site #2

The construction of the Little Clam Lake connection is to be isolated from Little Clam Lake through the use of a temporary berm, and from East Clam Lake through the use of a turbidity curtain (OPSD 219.260), a temporary rock flow check dam (OPSD 219.211) and a temporary seepage and sedimentation pond (OPSD 219.220). Since the limits of Little Clam Lake and East Clam Lake have not been confirmed, and the variability in lake levels, the upstream and downstream limits of the connection channel are to be confirmed in the field by a qualified contract administrator. The channel is to be constructed from the downstream limits to the upstream limits, with the removal of the upstream berm and the downstream turbidity curtain and seepage pond to be completed once the low flow channel and banks are stabilized.

For further details on construction staging and ESC of Site #2 see GRA Drawing #03 – Clam Lake Connections: Revegetation and Erosion and Sediment Control.

4.3. Site #3

The removal of the bridge and access road between Weeduck Lake and Upper Three Duck Lake is to be undertaken from the existing road. The working area is to be isolated with a turbidity curtain (OPSD 219.260) placed on both sides of the removal. The exact limits of grading are to be confirmed on site by the construction administrator, and all accumulated sediment is to be removed from the working area with a vac truck prior to the removal of the turbidity curtain.

For further details on construction staging and ESC of Site #3 see GRA Drawing #04 – Weeduck Lake Connection.

4.4. Site #4

The construction area of the Unnamed Pond connection is to be isolated using a temporary berm at the upstream end, and a temporary seepage and sedimentation pond (OPSD 219.220), temporary rock flow check dam (OPSD 219.211) and a turbidity curtain (OPSD 219.260) at the downstream end. The channel is to be constructed from the downstream end to the upstream. Upon the inspection by a qualified person, all temporary materials and works are to be removed.

For further details on construction staging and ESC of Site #8 see GRA Drawing #08 – Unnamed Pond Connection Channel: Erosion and Sediment Control and Revegetation Plan.

4.5. Site #5

The construction of the Bagsverd Aggregate Pit habitat feature is proposed to take place in two steps, first constructing the channel feature, and then constructing the designed pit feature.

For the channel construction, the access is through the aggregate pit and down the channel centerline. The works are to be isolated from the downstream wetland using a silt fence flow check dam (OPSD 219.190) and a temporary seepage pond. The channel is to be constructed from the downstream end to the aggregate pit. Once the channel and banks are stabilized, construction of the pit feature may begin.

For the construction of the aggregate pit feature, all dewatering is to be pumped to a sediment trap (OPSD 219.240) beyond the excavation limits. The grading is to be completed in a general north to south direction, and upon completion of planting and restoration, and the inspection by a qualified person, all temporary materials may be removed from the site.

For further details on construction staging of Site #5, see GRA Drawing #11 - Bagsverd Aggregate Pit: Erosion and Sediment Control and Revegetation Plan.

4.6. Site #6

The construction of Aggregate Pit #3 is proposed to take place in two steps, first constructing the channel feature, and then constructing the designed pit feature.

For the channel construction, the access is through the aggregate pit and down the channel centerline. The works are to be isolated from the downstream wetland using a silt fence flow check dam (OPSD 219.190) and a temporary seepage pond. The channel is to be constructed from the downstream end to the aggregate pit. Once the channel and banks are stabilized, construction of the pit feature may begin.

For the construction of the aggregate pit feature, all dewatering is to be pumped to a sediment trap (OPSD 219.240) beyond the excavation limits. The grading is to be completed in a general south to north direction, and upon completion of planting and restoration, and the inspection by a qualified person, all temporary materials may be removed from the site.

For further details on construction staging of Site #5, see GRA Drawing #14 – Aggregate Pit #3: Erosion and Sediment Control and Revegetation Plan.

5. Revegetation Plan

The revegetation plan has taken a simple approach to re-establishing lost vegetated areas. The number of species has been kept to a minimum, as the planting plan strived to establish anchor species around which natural revegetation from the surrounding areas will provide the seed and rhizome stock for a broader vegetation community. The intent of the planting plan is to quickly establish a rooting zone, to shade the creek and to provide the tree material for long term forest growth. To achieve these goals most efficiently, plantings were divided into three zones. These zones are explained below and shown in the accompanying drawing package.

Zone 1 is located in areas of expected shallow water within the aggregate pit features. The plantings here are aimed to provide a start for these developing into well-vegetated wetland areas. While the density of plantings proposed for these areas is below what would be found within these types of areas naturally, the plantings are aimed to reduce the time it takes for these vegetation communities to establish.

Zone 2 is intended to provide fast growth immediately adjacent to the shorelines and channel features. This will be achieved by planting a mix deciduous shrub species. The apex forest in this region is conifer dominated by white and black spruce, which may take decades to establish. The deciduous species selected for this zone are pioneer species which can establish quickly and will grow at a quicker rate than the conifer species. Zone 1 is located immediately adjacent to creek features and in shoreline and low-lying areas. As the riparian forest matures, the conifer species will become dominant as the deciduous shrub species will be replaced through succession. Zone 2 plantings are the only plantings for the riparian corridors and shorelines for Sites #1-4.

Zone 3 plantings are located in the aggregate pit designs in areas that are expected to be dry, away from riparian and shoreline areas. This zone consists of only conifer species, reflecting the ultimate forest community which will be established. White and black spruce and jack pine are the dominant species, with a lesser percentage of tamarack and balsam fir.

	Common Name	Scientific Name	% Mix
Zone 1	Broad-Leaved Arrowhead	Sagittaria latifolia	25
	Pickeral Weed	Pontederia cordata	25
	Softstem Bulrush	Scirpus Validus	25
	Common Cattail	Typha latifolia	25
Zone 2	Green Alder	Alnus crispa	20
	Speckled Alder	Alnus rugosa	50
	Red-Osier Dogwood	Cornus stolonifera	30
Zone 3	Black Spruce	Picea mariana	30
	Balsam Fir	Abies balsamea	10
	White Spruce	Picea glauca	20
	Tamarack	Larix laricina	10
	Jack Pine	Pinus banksiana	30

6. Post-Construction Monitoring

The offsetting habitat areas will be monitored using the same methods and timelines as the Watercourse Realignment Channels. See Table 5.1 of the Offsetting Monitoring Program for the details related to this monitoring program.

Regards,

GEOPROCESS RESEARCH ASSOCIATES INC

Jeff Hirvonen, MASc
Principal

Chris McKie, BASc, EIT
Water Resources Specialist

Côté Gold Offsetting Habitat Features: Natural Channel Design

Prepared for IAMGOLD Corporation

August 2019

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Disclaimer

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Project Number P2017-288

GeoProcess
RESEARCH ASSOCIATES
Knowledge
Research
Consulting

TECHNICAL MEMO

July 11, 2019

Dave Brown
Manager, Environment and Community Relations
IAMGOLD Corporation
401 Bay Street, Suite 3200
Toronto, Ontario, M5H 2Y4

Re: Chester Lake Culvert Crossing – Channel Design
Côté Gold Project

Dear Mr. Brown:

GeoProcess Research Associates Inc. (GRA) has completed a design of the low flow channel within the proposed arch culverts at Chester Road and the proposed haul road. The objective of the design is to facilitate fish passage through the culverts while providing a stable channel to mitigate erosion risk to the proposed road infrastructure.

To facilitate fish passage, the channel in the culvert was designed such that the bankfull channel will be backwatered by the downstream New Lake. Additionally, natural baffles have been incorporated in the design to further accommodate fish passage during periods of low lake levels.

Please don't hesitate to contact us if you have any questions regarding the contents contained within this submission.

Regards,

GEOPROCESS RESEARCH ASSOCIATES INC

Ben Plumb, PhD, P.Eng.
River Engineer

Jeff Hirvonen, MASc
Principal

PROJECT NO. P2017-288

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1. Introduction and Background

Two culverts are proposed at the Chester Lake outlet to accommodate the Côté Gold mine infrastructure. Currently, there is a single road with three 1830 mm CSP culverts. These culverts will be replaced by a single span 8.03 m open bottom multi-plate arch culvert. A second culvert immediately downstream of the road (same dimensions) will accommodate the proposed haul road. The culvert designs were completed by Wood (drawing No. 100264-320-DD10-GRD-2005). This memo outlines the details and technical rational supporting the design of a low flow channel design within the culvert structures.

2. Design Objectives

The objectives of the low flow channel within the culvert are a) to provide a channel that accommodates fish passage and b) create a stable channel that mitigates erosion risk to the adjacent mine infrastructure. The target fish species have been identified through consultation with Minnow Environmental and Fisheries and Oceans Canada. The species are northern pike and burbot.

3. Design Criteria

3.1. New Lake Backwater

The channel has been designed as a trapezoidal shape with a floodplain bench, to be situated in the new culvert. The channel invert has been designed so that it will be backwatered by the downstream New Lake (average lake elevation of 385 MASL). The design will provide a depth of flow between 0.7-0.8 m in the culvert under average lake elevation conditions. Since the channel in the culvert will be in a backwater condition, velocities are expected to be minimal (near zero). The design profile and cross-section are illustrated with the New Lake elevation in Figure 1 and Figure 2.

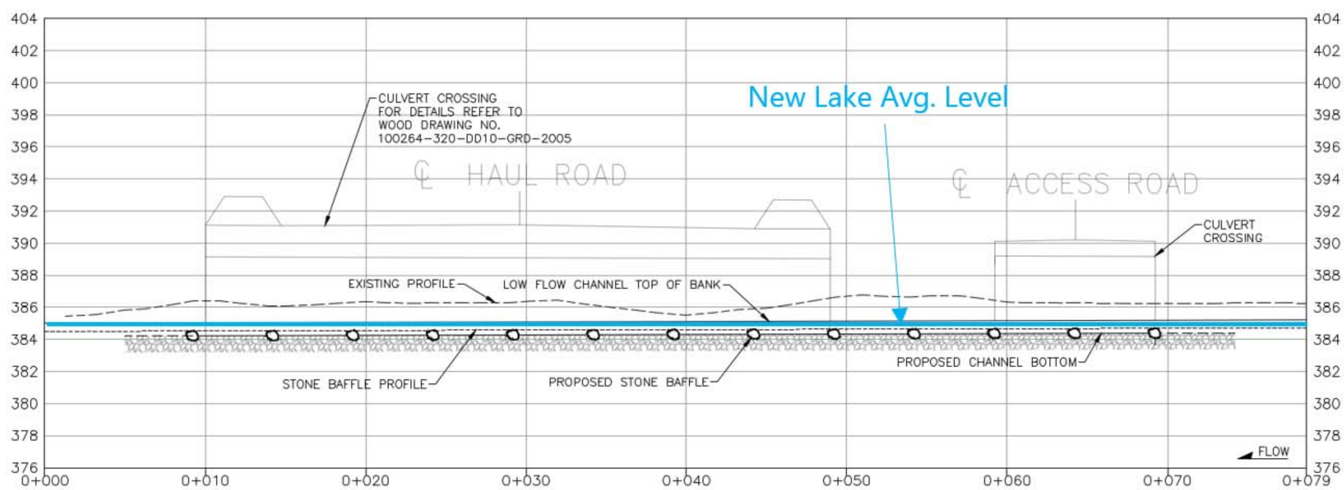


Figure 1: Design profile illustrating New Lake average elevation.

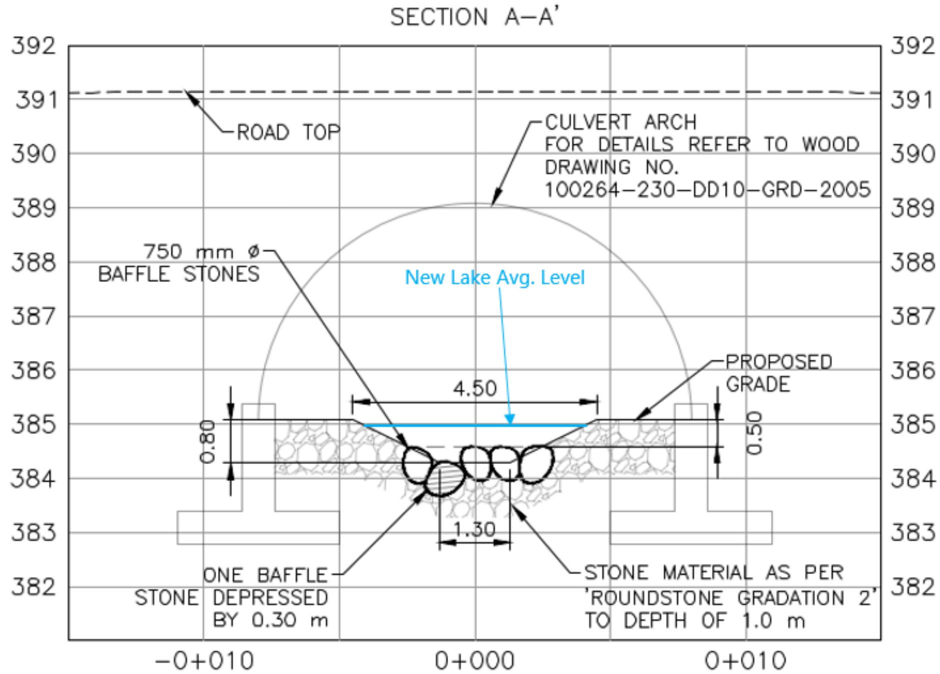


Figure 2: Typical cross-section illustrating New Lake average elevation.

3.2. Natural Baffles

As an added measure to improve fish passage under low water conditions where New Lake elevation drops below the channel invert, natural baffles were incorporated into the channel within the culvert. These baffles consist of 0.6-0.75 m boulders embedded along the channel bottom, with 0.3 m of the boulders' diameter to be exposed. One boulder per baffle will be fully embedded into the channel to create a low flow depression. The embedded boulders will be offset in each baffle to promote a sinuous thalweg (Figure 3).

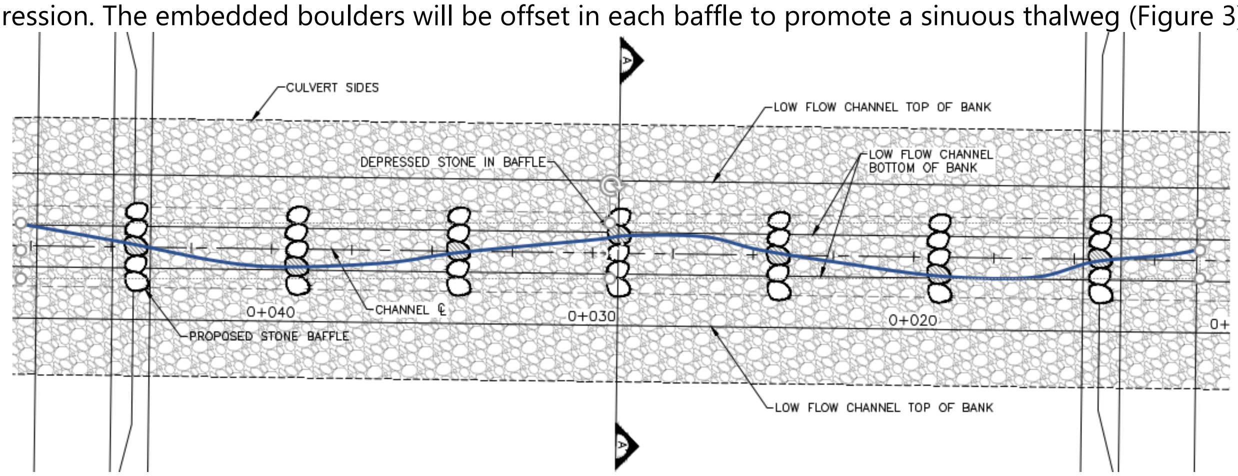


Figure 3: Plan view illustrating offset baffles to promote a sinuous thalweg.

The baffles achieve the following:

- additional stability for the channel in the culvert.
- fish passage if the downstream lake level drops below the channel invert, by creating a series of backwater zones
- areas of low velocity along the channel bed during periods of high flows

4. Performance Evaluation (Fish Passage Analysis)

It is anticipated that during periods of average and high flow, the downstream lake level will be correspondingly high so that backwater floods the culvert low flow channel and velocities will be low. During periods of low flow, the channel will remain backwatered by New Lake. However, to ensure the design accommodates fish passage under rare, extreme conditions, the scenarios where the New Lake elevation is lower than the channel outlet (under both low and high flows) were investigated. Table 1 summarizes the average adult lengths used in the fish passage analysis. These lengths were obtained from the Swim Performance Online Tools length database (fishprotectiontools.ca).

Table 1: Target Species Criteria

Species	Average Mature Length (cm)
Northern Pike	340
Burbot	370

4.1. Average Lake Level Conditions (Normal Case)

4.1.1. Low Flow

Golder (2014) provided estimates for low flow indices using a watershed area proration of existing regional gauge stations. Their results are summarized in Table 2. The low flow statistics presented in the form XQ_y represent the X-day low flow with a return period of y-years. The $7Q_{20}$ is considered an extreme low flow value (sometimes associated with extinction flows or minimum flows required to maintain an ecosystem) and the $30Q_2$ is considered an estimate of annual average baseflow in a given year (Pyrce, 2004). An average of these flows was used (0.065 m^3/s), which is considered to be representative of a low baseflow year.

Table 2: Low flows for Chester Lake (from Golder, 2014)

$7Q_{20}$ (m^3/s)	$30Q_2$ (m^3/s)
0.04	0.09

This flow was compared to the average cross-sectional area in backwater (approx. 1.53 m^2) in the channel based on the average New Lake elevation of 385 MASL. The velocity was estimated by dividing the discharge by this cross-sectional area. The resulting average low-flow velocity was estimated to be 0.04 m/s, with a depth ranging between 0.7-0.8 m.

4.1.2. High Flow

The 2-year-24 hour storm event of 6.36 m^3/s (provided by Wood) was used to demonstrate fish passage under high flows. The cross-sectional flow area was estimated using an at-a-station model with cross-sectional geometry representative of the baffle geometry (discussed in more detail below). This area (5.55 m^2) was added to the cross-sectional area already occupied by the backwatered portion from New Lake (1.53 m^2). The velocity was estimated by dividing the discharge by this cross-sectional area. The resulting average high-flow velocity was estimated to be 0.9 m/s. In the main channel, fish would need to swim approximately 5 m to arrive at the refuge of next upstream baffle as they move upstream. The fish swimming performance curves (Katopodis and Gervais, 2016) were used to estimate the length that the target species could swim at a velocity of 0.9 m/s. The swimming distance of 5 m in the main channel and floodplain bench were exceeded for the 87.5th and 50thth percentile for the pike and burbot, respectively (see output in Appendix A). It should be noted that the interaction between the backwatered portion and the higher velocity portion were not considered in this approach. In periods of higher flows, the New Lake elevation would also rise, which would further reduce the velocity in the culvert. Moreover, the velocity estimated (average cross-sectional velocity) here does not consider the inherent velocity distribution in the channel which would be lower towards the channel bottom where backwater conditions dominate. Nonetheless, even with the conservative assumptions built into this exercise, the fish swimming performance criteria indicate, at minimum, that the median population of the species can pass.

4.2. Low Lake Level Conditions (Extreme Case)

4.2.1. Low Flow

The low flow discussed above was modelled in an at-a-station hydraulic model with a cross-section representing a baffle crest (including the 0.3 m depressed boulder) and a model without the baffles for comparison. The models both assumed a slope equal to the culvert design slope (0.3%) and a Manning coefficient of 0.035. The resulting flow depths and velocities are summarized in Table 3.

Table 3: Low flow modelling results

Scenario	Flow Depth (cm)	Velocity (m/s)
Without Baffles	8	0.28
With Baffles	21	0.41

The results indicate an increase in flow depth of 13 cm with the natural baffle design. The model conservatively assumed an energy slope equal to the bed slope, which (in reality) would be less with the baffles due to the backwater zone upstream. As such, the flow depth will likely be higher. The higher velocity estimated for the baffle configuration corresponds to the "pinch point" where the water is flowing through the depressed boulder area (Figure 2). This will only be approximately 0.75 m in length. The fish swimming performance curves (Katopodis and Gervais, 2016) were used to estimate the length that the target species could swim at a velocity of 0.41 m/s. For both target species, the swimming distance greatly exceeds 0.75 m for the 97.5th percentile (see output in Appendix A).

4.2.2. High Flow

Using the same at-a-station model as above (with the baffle geometry), the velocity in the main channel and floodplain bench were estimated to be 1.15 m/s and 0.79 m/s, respectively. In the main channel, fish would need to swim approximately 5 m to arrive at the refuge of next upstream baffle as they move upstream. The fish swimming performance curves (Katopodis and Gervais, 2016) were used to estimate the length that the target species could swim at a velocity of 1.15 m/s. For both target species, the swimming distance of 5 m in the main channel and floodplain bench were exceeded for the 50th and 87.5th (4.4 m for Burbot) percentile, respectively (see output in Appendix A). It should be noted that the velocity distribution in the vicinity of the baffles will be less than the average channel velocity estimated in a 1-dimensional hydraulic model and the 5 m distance is considered a conservative estimate. Fish will be able to transition between the floodplain bench and the main channel as they migrate upstream.

5. Summary

A low flow channel has been designed through two culverts to accommodate fish passage. For most scenarios, the channel will remain in backwater such that both flow depths and velocities will be conducive to passage. Under extreme conditions (low and high flows combined with low lake levels), natural baffles have been incorporated and have been demonstrated to support fish passage for the target species using fish swimming performance design curves.

6. References

Golder Associates (2014). Côté Gold Project, Environmental Assessment Report, Technical Support Document: Hydrology, Version R2. Prepared for IAMGOLD Corporation. November 7, 2014.

Katopodis, C. and Gervais, R. (2016). Fish swimming performance database and analyses, Fisheries and Oceans Canada, Central and Arctic Region, Winnipeg, MB.

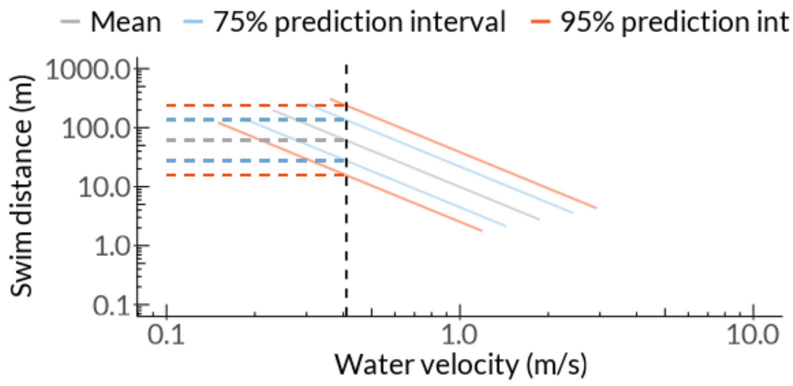
Pyrce, R.S. (2004). Hydrological Low Flow Indices and their Uses. WSC Report No.04-2004. Watershed Science Centre, Peterborough, Ontario, 33 p.

Appendix A

Fish Swimming Performance Output

Low Flow Scenario (Low Lake Level)

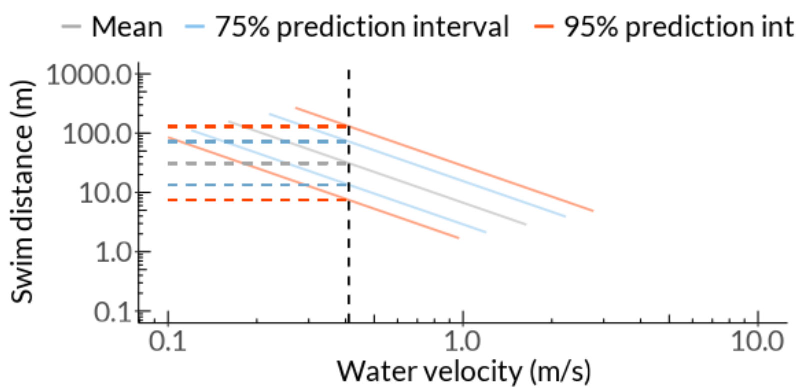
Pike (derived) Group



Estimates

2.5% of 340 mm Pike (derived) in 0.41 m/s current can swim 240 m
12.5% of 340 mm Pike (derived) in 0.41 m/s current can swim 130 m
50% of 340 mm Pike (derived) in 0.41 m/s current can swim 61 m
87.5% of 340 mm Pike (derived) in 0.41 m/s current can swim 28 m
97.5% of 340 mm Pike (derived) in 0.41 m/s current can swim 16 m

Eel Group

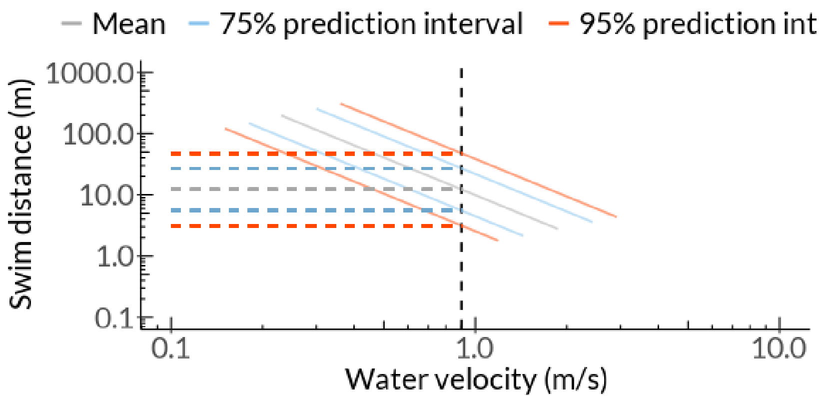


Estimates

2.5% of 370 mm Eel in 0.41 m/s current can swim 130 m
12.5% of 370 mm Eel in 0.41 m/s current can swim 72 m
50% of 370 mm Eel in 0.41 m/s current can swim 31 m
87.5% of 370 mm Eel in 0.41 m/s current can swim 13 m
97.5% of 370 mm Eel in 0.41 m/s current can swim 7.5 m

High Flow Scenario (Average Lake Level)

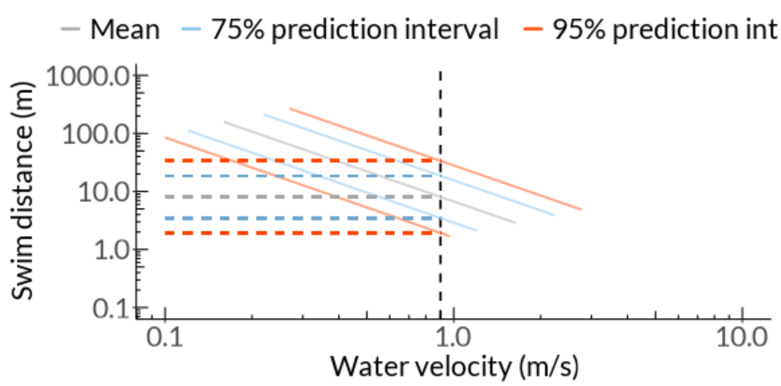
Pike (derived) Group



Estimates

2.5% of 340 mm Pike (derived) in 0.9 m/s current can swim 48 m
12.5% of 340 mm Pike (derived) in 0.9 m/s current can swim 27 m
50% of 340 mm Pike (derived) in 0.9 m/s current can swim 12 m
87.5% of 340 mm Pike (derived) in 0.9 m/s current can swim 5.5 m
97.5% of 340 mm Pike (derived) in 0.9 m/s current can swim 3.1 m

Eel Group

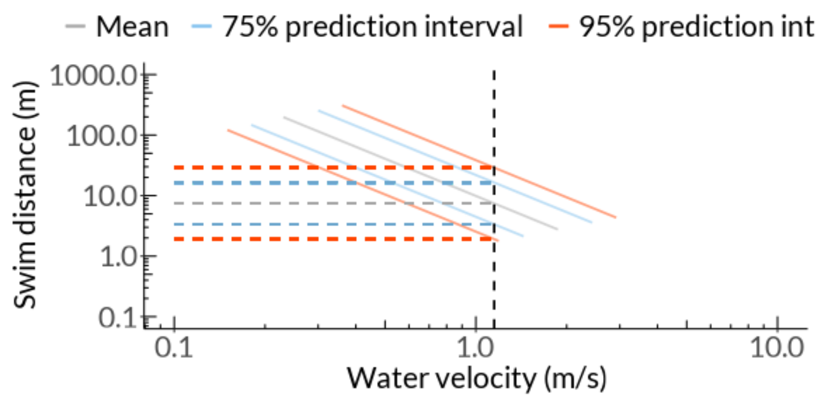


Estimates

2.5% of 370 mm Eel in 0.9 m/s current can swim 34 m
12.5% of 370 mm Eel in 0.9 m/s current can swim 19 m
50% of 370 mm Eel in 0.9 m/s current can swim 8.1 m
87.5% of 370 mm Eel in 0.9 m/s current can swim 3.5 m
97.5% of 370 mm Eel in 0.9 m/s current can swim 1.9 m

High Flow Scenario (Low Lake Level)

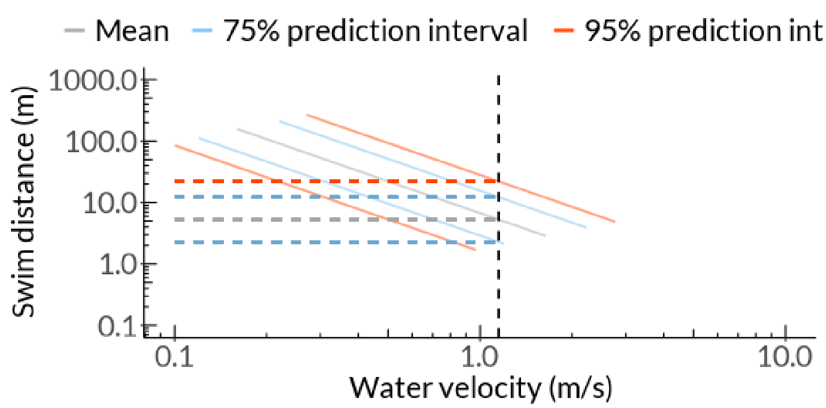
Pike (derived) Group



Estimates

2.5% of 340 mm Pike (derived) in 1.15 m/s current can swim 29 m
12.5% of 340 mm Pike (derived) in 1.15 m/s current can swim 16 m
50% of 340 mm Pike (derived) in 1.15 m/s current can swim 7.4 m
87.5% of 340 mm Pike (derived) in 1.15 m/s current can swim 3.4 m
97.5% of 340 mm Pike (derived) in 1.15 m/s current can swim 1.9 m

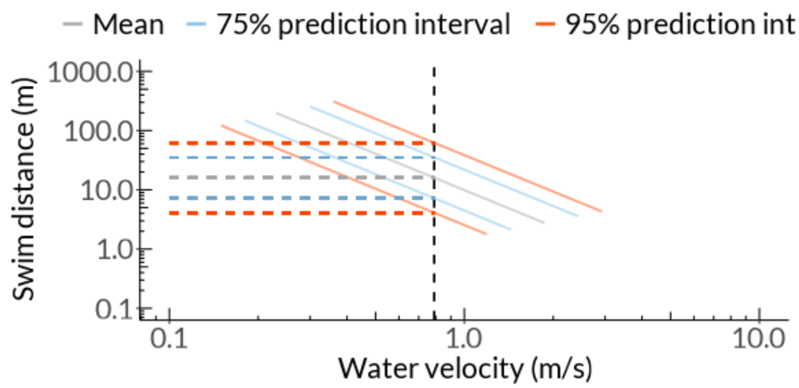
Eel Group



Estimates

2.5% of 370 mm Eel in 1.15 m/s current can swim 22 m
12.5% of 370 mm Eel in 1.15 m/s current can swim 12 m
50% of 370 mm Eel in 1.15 m/s current can swim 5.3 m
87.5% of 370 mm Eel in 1.15 m/s current can swim 2.3 m
97.5% of 370 mm Eel cannot swim against 1.15 m/s current

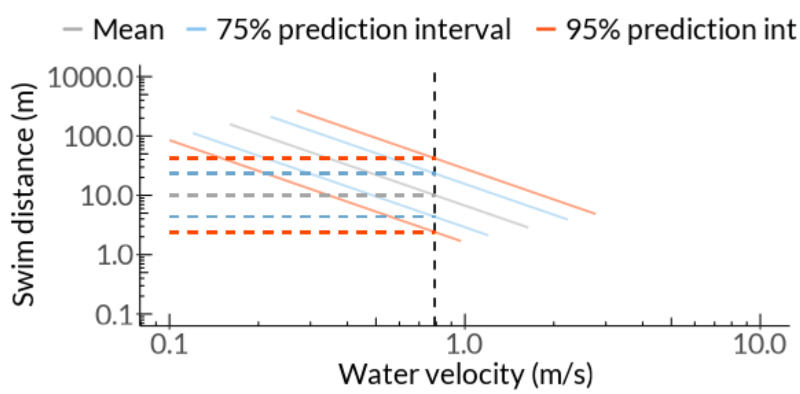
Pike (derived) Group



Estimates

2.5% of 340 mm Pike (derived) in 0.79 m/s current can swim 62 m
12.5% of 340 mm Pike (derived) in 0.79 m/s current can swim 35 m
50% of 340 mm Pike (derived) in 0.79 m/s current can swim 16 m
87.5% of 340 mm Pike (derived) in 0.79 m/s current can swim 7.2 m
97.5% of 340 mm Pike (derived) in 0.79 m/s current can swim 4.1 m

Eel Group



Estimates

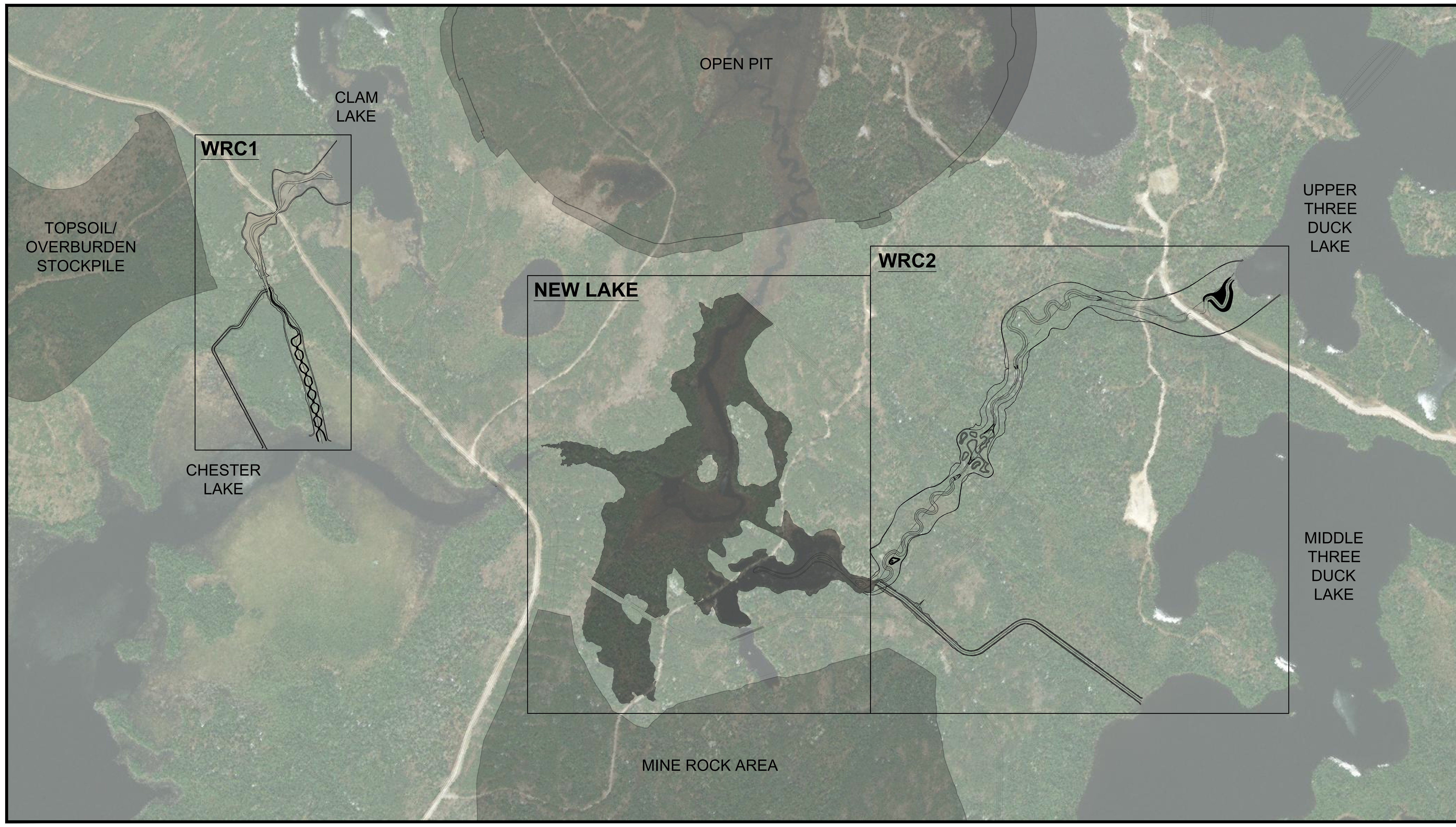
2.5% of 370 mm Eel in 0.79 m/s current can swim 42 m
12.5% of 370 mm Eel in 0.79 m/s current can swim 23 m
50% of 370 mm Eel in 0.79 m/s current can swim 10 m
87.5% of 370 mm Eel in 0.79 m/s current can swim 4.4 m
97.5% of 370 mm Eel in 0.79 m/s current can swim 2.4 m

WRC1
DESIGN DRAWINGS

IAMGOLD CÔTÉ MINE

WATERCOURSE REALIGNMENT CHANNEL

WRC1



NO.	DESCRIPTION
S - 1	STAGING AND ESC - PHASE 1
S - 2	STAGING AND ESC - PHASE 2
P - 1	PLAN AND PROFILE [0+000 - 0+380]
P - 2	PLAN AND PROFILE [0+380 - 0+760]
P - 3	PLAN AND PROFILE [0+760 - 0+886]
C - 1	SECTIONS [5+025 - 5+175]
C - 2	SECTIONS [5+225 - 5+400]
C - 3	SECTIONS [5+425 - 5+550]
C - 4	SECTIONS [5+575 - 5+700]
C - 5	SECTIONS [5+725 - 5+850]
R - 1	REVEGETATION AND RESTITUTION [0+000 - 0+450]
R - 2	REVEGETATION AND RESTITUTION [0+450 - 0+886]
B - 1	BY-PASS CHANNEL PLAN AND PROFILE [9+000 - 9+300]
B - 2	BY-PASS CHANNEL PLAN AND PROFILE [9+300 - 9+552]
B - 3	BY-PASS CHANNEL SECTIONS
T - 1	TYPICAL DETAILS
T - 2	TYPICAL DETAILS

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SCALES	No.	REVISIONS	DATE	INITIAL
0 250 500	C	Issued for DFO Review	2019-02-04	JPH
	D	Revised as per DFO Comments	2019-07-10	JPH
	E	Issued for Construction	2019-08-26	JPH
	F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1		
Wood Dwg. No.: 100264-846-DW00-PLN-2000	Client Dwg. No.: 846-C-2000	
Scale: 1:7500	Drawn By: CWM	Drawing No. WRC1-KEY
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

PHASE 1: CONSTRUCTION OF LAKE EXTENSION AND BY-PASS CHANNEL

P1-1. CLEAR & GRUB BY-PASS CHANNEL CORRIDOR, FROM THE CLAM LAKE EXTENSION TO CHESTER LAKE.

P1-2. CONSTRUCT TEMPORARY ROCK FLOW CHECK DAMS (OPSD 219.211) AT DOWNSTREAM LIMITS OF BY-PASS CHANNEL. DIMENSIONS WILL VARY PER PLAN AND SITE CONDITIONS, SUBJECT TO CONFIRMATION BY THE CONSTRUCTION SUPERVISOR.

P1-3. CONSTRUCT TEMPORARY SEDIMENTATION POND (OPSD 219.220). DIMENSIONS WILL VARY BASED ON SITE CONDITIONS, SUBJECT TO CONFIRMATION BY THE CONSTRUCTION SUPERVISOR.

P1-4. INSTALL DEWATERING PUMP AT TEMP SEDIMENTATION POND. PUMP DISCHARGE TO BE DIRECTED TO THE FLOODPLAIN AND LET FLOW OVERLAND TO CHESTER LAKE.

P1-5. CONSTRUCT THE BYPASS CHANNEL FROM DOWNSTREAM TO UPSTREAM.

P1-6. CONSTRUCT CLAM LAKE EXTENSION. ENSURE LAKE EXTENSION SHORELINE IS STABILIZED.

P1-7. ENSURE ROAD CROSSINGS HAVE BEEN BUILT AND STABILIZED.

P1-8. FINAL CONDITION OF LAKE EXTENSION AND BYPASS CHANNEL TO BE INSPECTED AND CERTIFIED BY CONSTRUCTION SUPERVISOR, ENVIRONMENTAL MONITOR AND PROJECT ENGINEER.

P1-9. INSTALL SEDIMENT CURTAIN (OPSD 219.260) AT DOWNSTREAM END OF CORRIDOR.

P1-10. DECOMMISSION TEMPORARY SEDIMENTATION POND AND ROCK CHECK DAMS. REMOVE EARTHEN PLUG. ALLOW SEDIMENT TO SETTLE AND REMOVE SEDIMENT CURTAIN.

P1-11. REMOVE THE CLAM LAKE EARTHEN PLUG IN CENTRE OF LOW FLOW CHANNEL, IN INCREMENTAL LIFTS. ALLOW THE UPSTREAM LAKE LEVEL TO STABILIZE PRIOR TO INITIATING EXCAVATING THE NEXT LIFT.

P1-12. INSTALL SEDIMENT CURTAIN (OPSD 219.260) AROUND REMAINDER OF EARTHEN PLUG. REMOVE PLUG.

P1-13. FOLLOWING THE DECONSTRUCTION OF THE TEMPORARY ROCK FLOW CHECK DAM REMOVE ALL OTHER TEMPORARY MATERIALS.

GENERAL STAGING NOTES:

G-1. NO WORK TO BE COMPLETED UNTIL THE UPSTREAM AND DOWNSTREAM CONTROLS HAVE BEEN INSTALLED.

G-2. CONSTRUCTION TO BE COMPLETED IN THE DRY. WORK PHASES WILL BE COMPLETED IN ISOLATION. A LONG TERM FLOW BY-PASS IS NOT PROPOSED. DEWATERING OF GROUNDWATER INFILTRATION AND RAINFALL IS REQUIRED, PER EROSION AND SEDIMENTATION CONTROL BEST MANAGEMENT PRACTICES.

G-3. ALL STAGING AND STOCKPILE AREAS ARE TO BE OUTSIDE OF THE PROPOSED CORRIDOR. EROSION AND SEDIMENT PERIMETER CONTROLS TO BE INSTALLED AROUND ALL STOCKPILES. LOCATIONS AND LIMITS OF THE STAGING AND STOCKPILING AREAS TO BE CONFIRMED BY THE ENVIRONMENTAL MONITOR.

G-4. THE CONSTRUCTION OF ALL RIVER AND HABITAT FEATURES IS TO BE OVERSEEN BY THE CONSTRUCTION SUPERVISOR.

G-5. ALL DISTURBED AREAS ARE TO BE RESTORED TO EXISTING OR BETTER CONDITIONS AFTER THE COMPLETION OF CONSTRUCTION. DISTURBANCE TO THE SURROUNDING NATURAL AREAS IS TO BE MINIMIZED DURING CONSTRUCTION.

G-6. THE CHANNEL WORKS ARE TO BE UNDERTAKEN IN TWO (2) PHASES. STAGING AND SEQUENCING FOR EACH PHASE ARE PROVIDED.

G-7. FOLLOWING THE REVEGETATION, THE STREAM VALLEY CORRIDOR IS TO REMAIN DRY TO ALLOW FOR VEGETATION TO ESTABLISH. DEWATERING OF THE CHANNEL (OF SURFACE RUNOFF AND GRONDWATER SEEPAGE) WILL BE REQUIRED DURING THIS PERIOD.

G-8. WRC1-LG CONSTRUCTION IS TO OCCUR DURING WINTER MONTHS WITH ADEQUATE DEPTH OF FROST LINE, SUBJECT TO OVERALL CONSTRUCTION SCHEDULE PROGRESS.

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- SILT FENCE
- STAGING/STOCKPILE AREA
- TEMPORARY ACCESS ROUTE
- DEWATERING PUMP

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523569 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

0 30 60

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
STAGING AND ESC - PHASE 1

Wood Dwg. No.: 100264-846-DW00-PLN-2001 | Client Dwg. No.: 846-C-2001

Scale: 1:1000 | Drawn By: CWM | Drawing No. WRC1-S-1

Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

EROSION AND SEDIMENT CONTROL

GENERAL:

ESC-1. ALL IN-WATER AQUATIC HABITAT RESTORATION TO BE SUPERVISED BY THE CONSTRUCTION SUPERVISOR HAVING EXPERIENCE IN NATURAL CHANNEL CONSTRUCTION TECHNIQUES.

ESC-2. QUANTITIES OF MATERIALS FOR SALVAGE AND DISPOSAL ARE ESTIMATES ONLY AND THE CONTRACTOR IS RESPONSIBLE TO REVIEW SITE AND VERIFY QUANTITIES IN SITU.

ESC-3. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.

ESC-4. ALL ACTIVITIES ON SITE SHALL BE CONDUCTED IN A LOGICAL SEQUENCE TO MINIMIZE THE AREA OF BARE SOIL EXPOSED AT ANY ONE TIME; AND DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.

ESC-5. ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE ESC MEASURES.

ESC-6. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.

ESC-7. AT THE END OF EACH DAY, STABILIZE EXPOSED BANK SOILS. SUBJECT TO APPROVAL BY THE ENVIRONMENTAL MONITOR.

ESC-8. THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. IN ADDITION TO THE DETAILS LISTED BELOW, THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.

ESC-9. AN ENVIRONMENTAL MONITOR WILL INSPECT ALL ESC MEASURES AT REGULAR INTERVALS, INCLUDING FOLLOWING RAIN/SNOWMELT EVENT, DURING DEWATERING, RESTORATION AND IN OR NEAR- WATER WORKS.

ESC-10. STOCKPILED MATERIAL SHALL BE ISOLATED FROM THE WATERCOURSE AND VALLEY CORRIDOR WITHIN THE RECOMMENDED STAGING/STOCKPILE LOCATIONS AND CONTAINED WITHIN THE APPROPRIATE PERIMETER ESC.

ESC-11. ESC TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.

ESC-12. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE AMENDED AS SITE CONDITIONS WARRANT TO MINIMIZE SEDIMENT ENTERING THE WATERCOURSE OR LAKE. IF THE PRESCRIBED MEASURES ARE NOT EFFECTIVE IN PREVENTING SEDIMENTATION IN THE NATURAL SYSTEM THEN MITIGATION MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS.

DEWATERING:

ESC-13. THE SEDIMENT LADEN WATER WILL NOT BE ALLOWED TO DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG (OR APPROVED EQUIVALENT) IN THE FLOODPLAIN.

ESC-14. IN THE EVENT OF RAINFALL OR SEEPAGE INTO THE WORK SITE, ADDITIONAL DEWATERING MAY BE REQUIRED.

ESC-15. RECOMMENDED DEWATERING ARRANGEMENT: THE INLET PUMP HEAD IS TO BE COVERED WITH FILTER FABRIC OR CLEAR STONE. THE OUTLET PUMP HEAD IS TO DISCHARGE TO A SEDIMENT BAG OR BASIN. DISCHARGE FROM THE BAG IS TO BE RELEASED TO A VEGETATED LOCATION OR IF A VEGETATED LOCATION IS NOT AVAILABLE, A FLOW DISSIPATING STRUCTURE SHOULD BE PROVIDED THE SEDIMENT BAG SHOULD BE LOCATED AT LEAST 15M AWAY FROM THE WATERBODY. THE FINAL DEWATERING PLAN IS TO BE CONFIRMED BY THE ONSITE PROJECT ENGINEER.

SPILLS CONTROL NOTES:

ESC-16. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.

ESC-17. IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
a. IMMEDIATELY NOTIFY THE APPROPRIATE FEDERAL, PROVINCIAL AND LOCAL GOVERNMENT MINISTRIES, DEPARTMENTS, AGENCIES AND AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH ALL CURRENT LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
b. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE, AND TAKE SUCH MEASURES AS THEY DEEM APPROPRIATE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
c. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, ALL TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.

CONTINGENCY FOR STORM EVENT:

ESC-18. THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REALIGNMENT CORRIDOR THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G., FUEL TANKS, PORTAPOTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.

ESC-19. IN THE EVENT OF A FORECASTED MAJOR STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE STREAM CORRIDOR WORKING AREA.

ENVIRONMENTAL COMPLIANCE:

ESC-20. AN ENVIRONMENTAL MONITOR WILL AVAILABLE ON SITE TO ENSURE THAT ACTIVITIES THAT COULD HAVE A NEGATIVE IMPACT TO THE NATURAL ENVIRONMENT ARE EFFECTIVELY MITIGATED. THE ENVIRONMENTAL MONITOR SHALL LIAISE WITH BOTH THE OWNER AND THE CONSTRUCTOR AND, IF NECESSARY, ENFORCEMENT OFFICERS.

WRC1 COMPLIANCE AND OVERSIGHT

THE FOLLOWING PERSONS WILL OVERSEE VARIOUS COMPONENTS OF CONSTRUCTION:
- ENVIRONMENTAL MONITOR: QUALIFIED PERSON EXPERIENCED IN ENVIRONMENTAL COMPLIANCE AND ESC MEASURES.
- CONSTRUCTION SUPERVISOR: QUALIFIED PERSON EXPERIENCED IN NATURAL CHANNEL DESIGN IMPLEMENTATION.
- PROJECT ENGINEER: QUALIFIED PERSON FROM THE EPCM TEAM

PHASE 2: CONSTRUCTION OF WRC1

PHASE 2A: CONSTRUCTION OF REACH WRC1-LG1

P2-1. CLEAR ACCESS ROUTES AND ESTABLISH STAGING AND STOCKPILE AREAS, AS SHOWN IN THE DRAWINGS.

P2-2. CONSTRUCT THE TEMPORARY ROCK FLOW CHECK DAM (OPSD 219.211) AND TEMPORARY SEDIMENTATION POND (OPSD 219.220) AT CHESTER LAKE. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.

P2-3. INSTALL DEWATERING PUMPS AT TEMP POND. DEWATER TO THE FLOODPLAIN AND FLOW TO CHESTER LAKE.

P2-4. CLEAR WRC1-LG1 STREAM CORRIDOR, ROUGH GRADING THE LOW FLOW CHANNEL TO PROVIDE POSITIVE DRAINAGE DURING CONSTRUCTION.

P2-5. CONSTRUCT THE LOW FLOW CHANNEL FROM THE DOWNSTREAM TO UPSTREAM.

P2-6. COMPLETE GRADING AND STABILIZATION OF THE CORRIDOR.

PHASE 2B: CONSTRUCTION OF REACH WRC1-HG1

P2-7. CLEAR ACCESS ROUTE THROUGH THE CORRIDOR.

P2-8. CLEARING AND GRUB CORRIDOR.

P2-9. CONSTRUCT LOW FLOW CHANNEL FROM DOWNSTREAM TO UPSTREAM.

P2-10. WHERE REQUIRED, PRECISION ROCK BLASTING IS TO BE OVERSEEN BY THE PROJECT ENGINEER AND ELEVATIONS ARE TO BE CONFIRMED WITH THE CONSTRUCTION SUPERVISOR.

PHASE 2C: REVEGETATION AND LONG-TERM DEWATERING

P2-11. UNDERTAKE MODIFICATIONS TO THE DEWATERING SYSTEM TO ESTABLISH THE LONG-TERM DEWATERING SYSTEM.

P2-12. THE DEWATERING SYSTEM IS TO BE MONITORED DAILY TO ENSURE THE CHANNEL REMAINS DRY FOR THE DURATION OF THE YEAR.

PHASE 2D: COMMISSIONING OF WRC1

P2-13. REMOVE ALL TEMPORARY MEASURES

P2-14. REMOVE DAM AT DOWNSTREAM LOW FLOW LOCATION (AT CHESTER LAKE IN CENTRE OF CHANNEL. ALLOW LAKE LEVEL TO STABILIZE

P2-15. INSTALL SEDIMENT CURTAIN.

P2-16. REMOVE REMAINDER OF EARTHEN PLUG

P2-17. REMOVE PARTITION BERM AT UPSTREAM END.

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- SILT FENCE
- STAGING/STOCKPILE AREA
- TEMPORARY ACCESS ROUTE
- DEWATERING PUMP

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

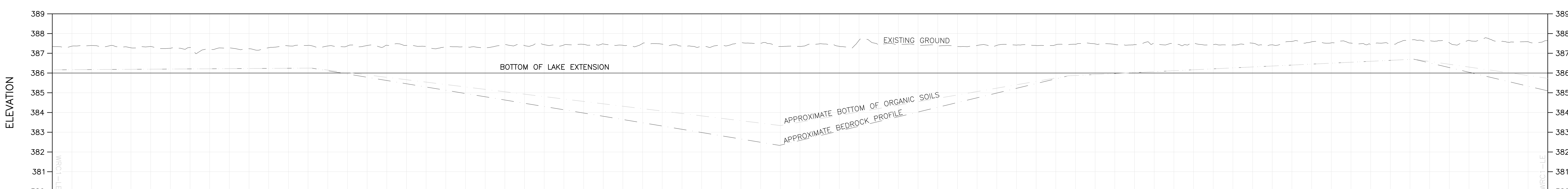
VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 30 60

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
STAGING AND ESC - PHASE 2

Wood Dwg. No.: 100264-846-DW00-PLN-2002
Client Dwg. No.: 846-C-2002
Scale: 1:1000
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-S-2



STATION	LAKE BOT. ELEV. (DEPTH)
0+010	386.00 (1.39)
0+020	386.00 (1.28)
0+030	386.00 (1.26)
0+040	386.00 (1.21)
0+050	386.00 (1.23)
0+060	386.00 (1.38)
0+070	386.00 (1.37)
0+080	386.00 (1.39)
0+090	386.00 (1.40)
0+100	386.00 (1.32)
0+110	386.00 (1.27)
0+120	386.00 (1.39)
0+130	386.00 (1.42)
0+140	386.00 (1.47)
0+150	386.00 (1.50)
0+160	386.00 (1.36)
0+170	386.00 (1.41)
0+180	386.00 (1.50)
0+190	386.00 (1.35)
0+200	386.00 (1.35)
0+210	386.00 (1.42)
0+220	386.00 (1.41)
0+230	386.00 (1.34)
0+240	386.00 (1.40)
0+250	386.00 (1.39)
0+260	386.00 (1.46)
0+270	386.00 (1.45)
0+280	386.00 (1.51)
0+290	386.00 (1.54)
0+300	386.00 (1.42)
0+310	386.00 (1.43)
0+320	386.00 (1.58)
0+330	386.00 (1.52)
0+340	386.00 (1.47)
0+350	386.00 (1.65)
0+360	386.00 (1.65)
0+370	386.00 (1.56)

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 15 30
HORIZONTAL
0 15 30
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
PLAN AND PROFILE [0+000 - 0+380]

Wood Dwg. No.: 100264-846-DW00-PLN-2003
Client Dwg. No.: 846-C-2003
Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-P-1

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES: HORIZONTAL 0 15 30; VERTICAL 0 3 6

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

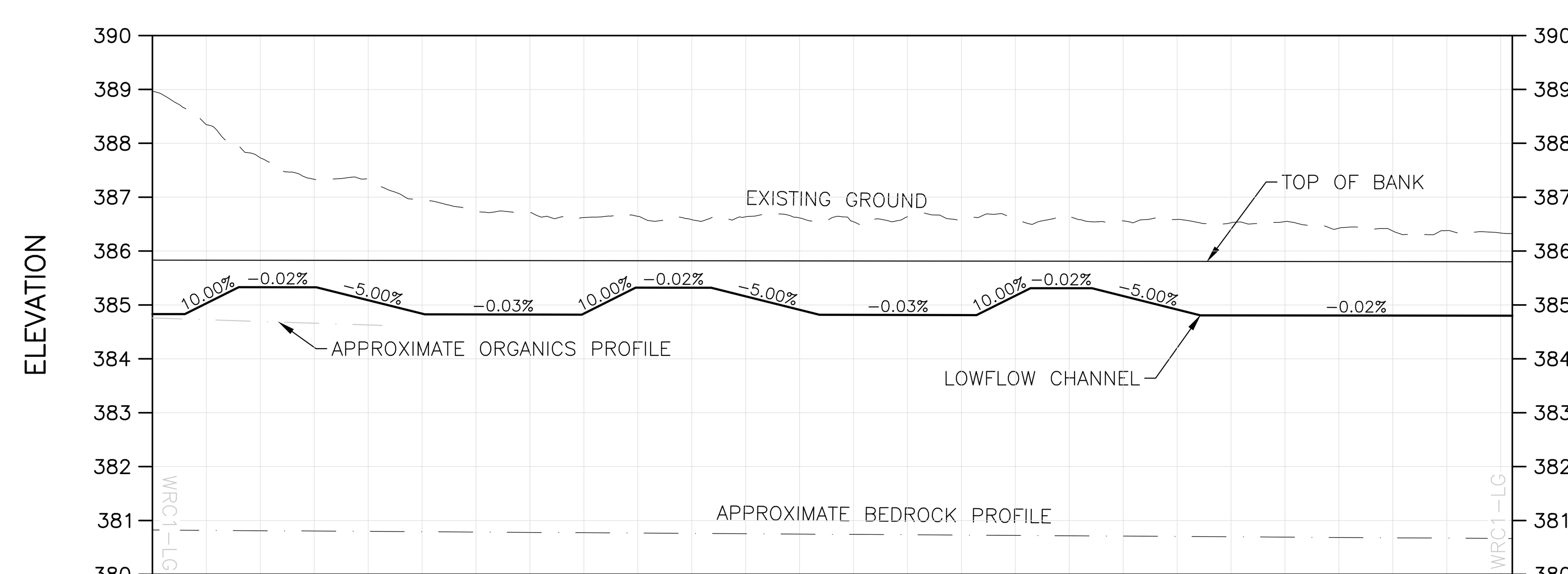
IAMGOLD COTE MINE - WRC1
PLAN AND PROFILE [0+380 - 0+760]

Wood Dwg. No.: 100264-846-DW00-PLN-2004 | Client Dwg. No.: 846-C-2004

Scale: 1:500 | Drawn By: CWM | Drawing No. WRC1-P-2

Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

1:1 HORIZONTAL
5:1 VERTICAL



STATION	0+770	0+780	0+790	0+800	0+810	0+820	0+830	0+840	0+850	0+860	0+870	0+880
TOB ELEV. CL ELEV. (DEPTH)	385.83 385.33 (0.50)	385.83 385.09 (0.74)	385.82 384.82 (1.00)	385.82 384.84 (0.98)	385.82 385.32 (0.50)	385.82 384.91 (0.91)	385.81 384.81 (1.00)	385.81 385.17 (0.64)	385.81 385.17 (0.64)	385.81 384.81 (1.00)	385.80 384.80 (1.00)	385.80 384.80 (1.00)

RIFF/RUN STATIONS	RIFF/RUN ELEVS.
0+763	384.83
0+768.00	385.33
0+775.20	385.33
0+785.25	384.83
0+799.80	384.82
0+804.80	385.32
0+811.80	385.32
0+821.85	384.82
0+836.40	384.81
0+841.40	385.31
0+847.10	385.31
0+857.15	384.81

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

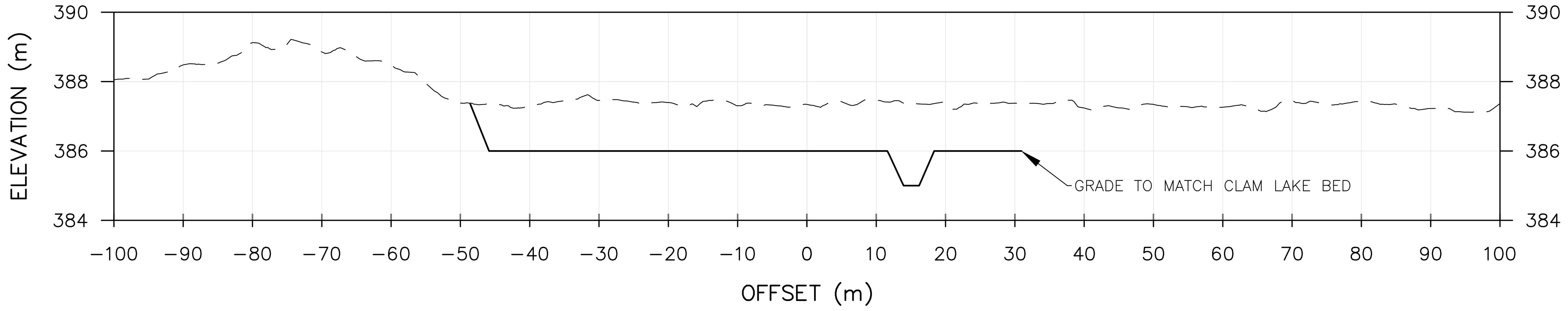
SCALES
HORIZONTAL: 0 15 30
VERTICAL: 0 3 6

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

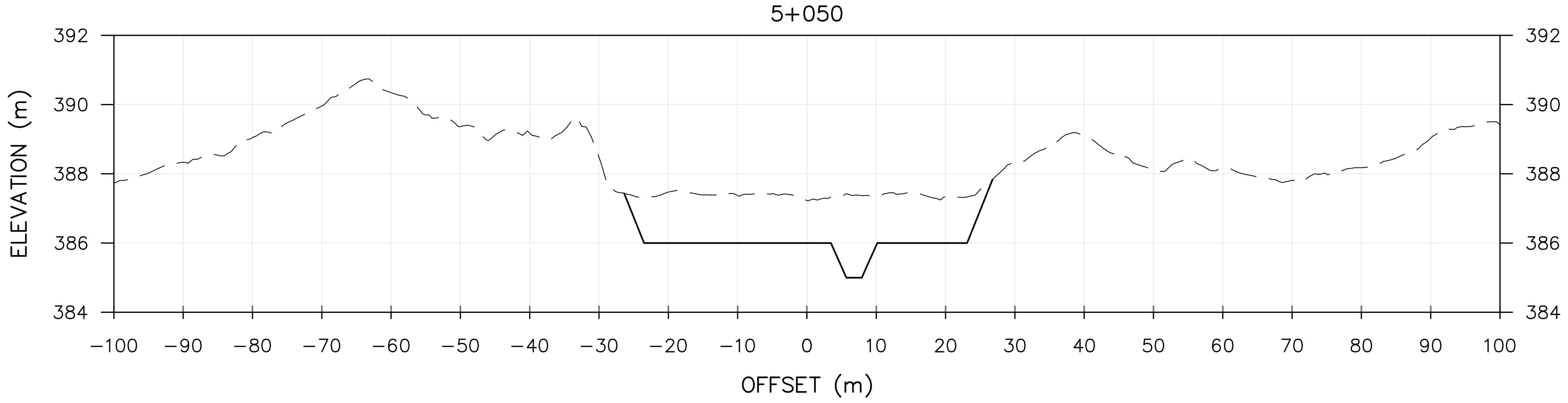
IAMGOLD COTE MINE - WRC1
PLAN AND PROFILE [0+760 - 0+886]

Wood Dwg. No.: 100264-846-DW00-PLN-2005
Client Dwg. No.: 846-C-2005
Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-P-3

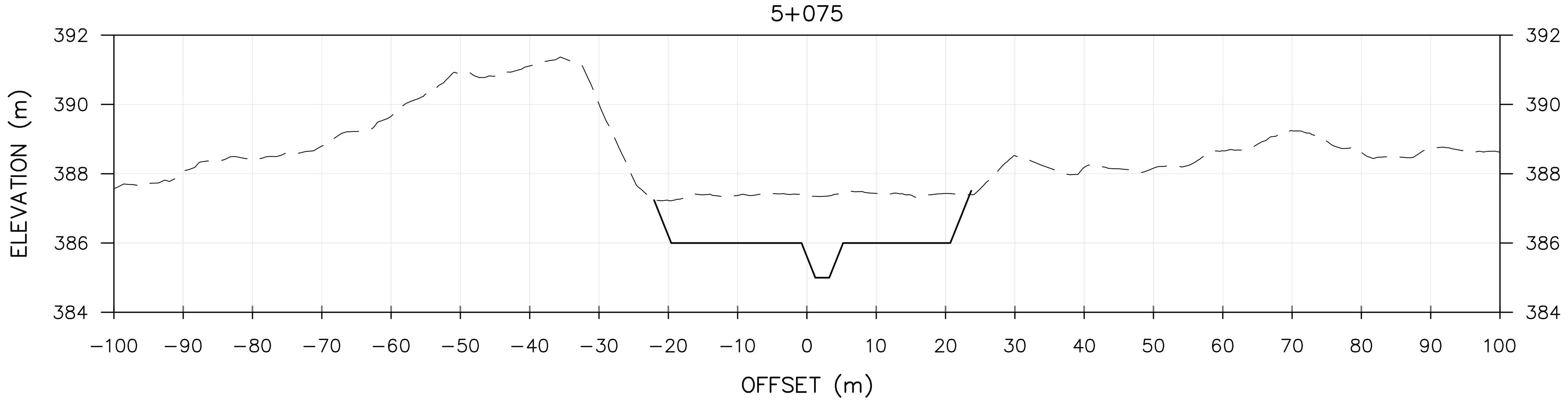
5+025



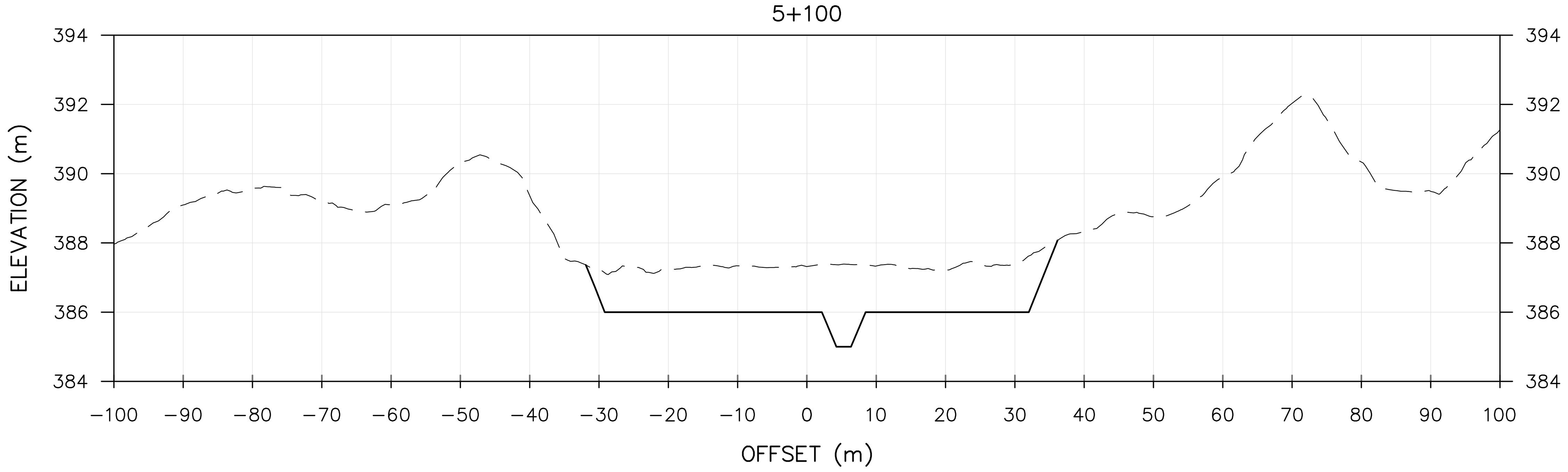
5+050



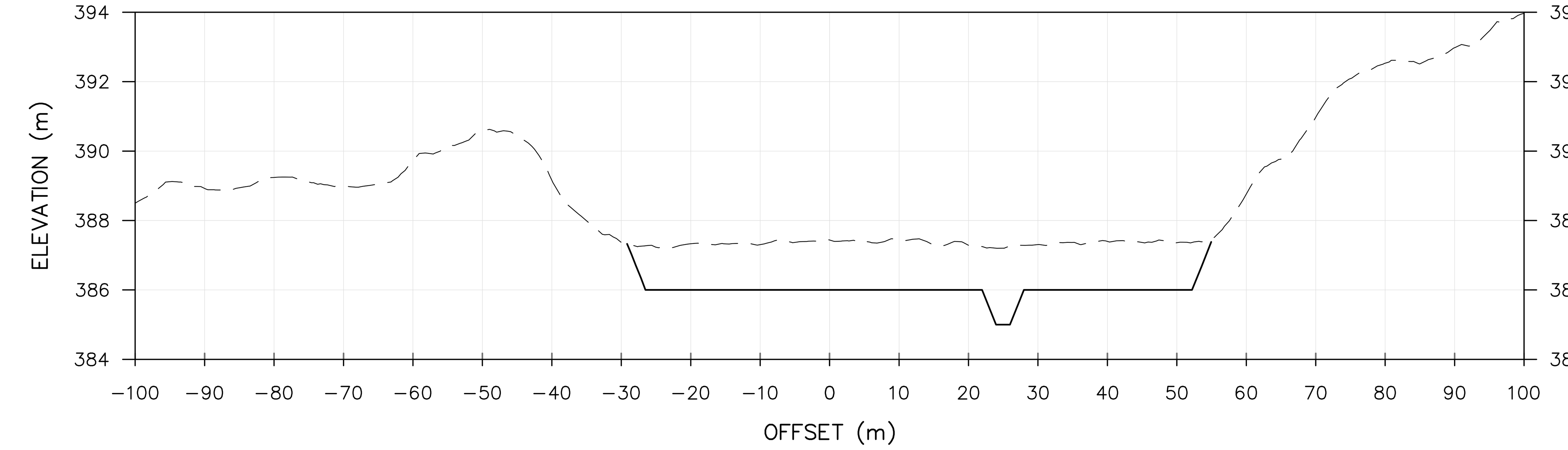
5+075



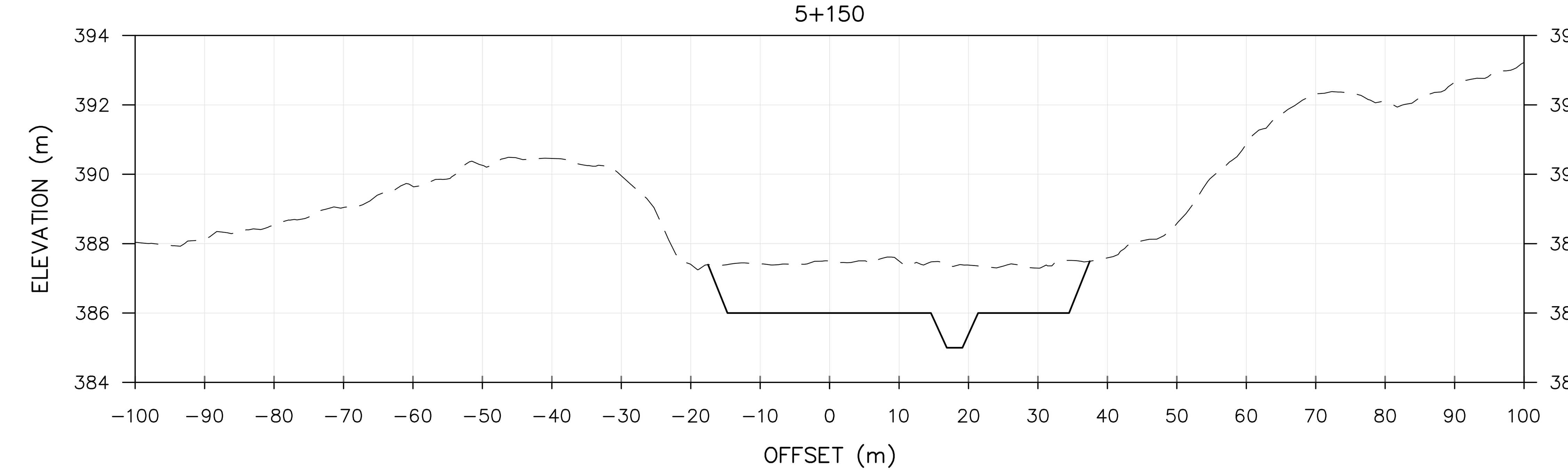
5+100



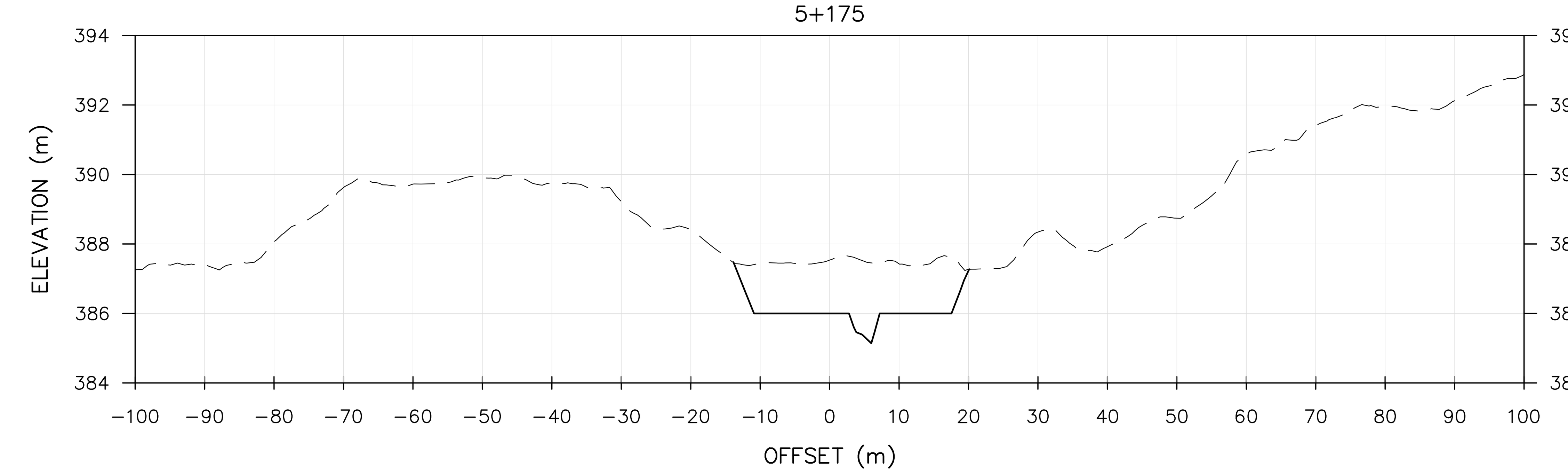
5+125



5+150



5+175



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
PROPOSED GRADE
EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 20 40 HORIZONTAL
0 4 8 VERTICAL

No.	REVISIONS	DATE	INITIAL
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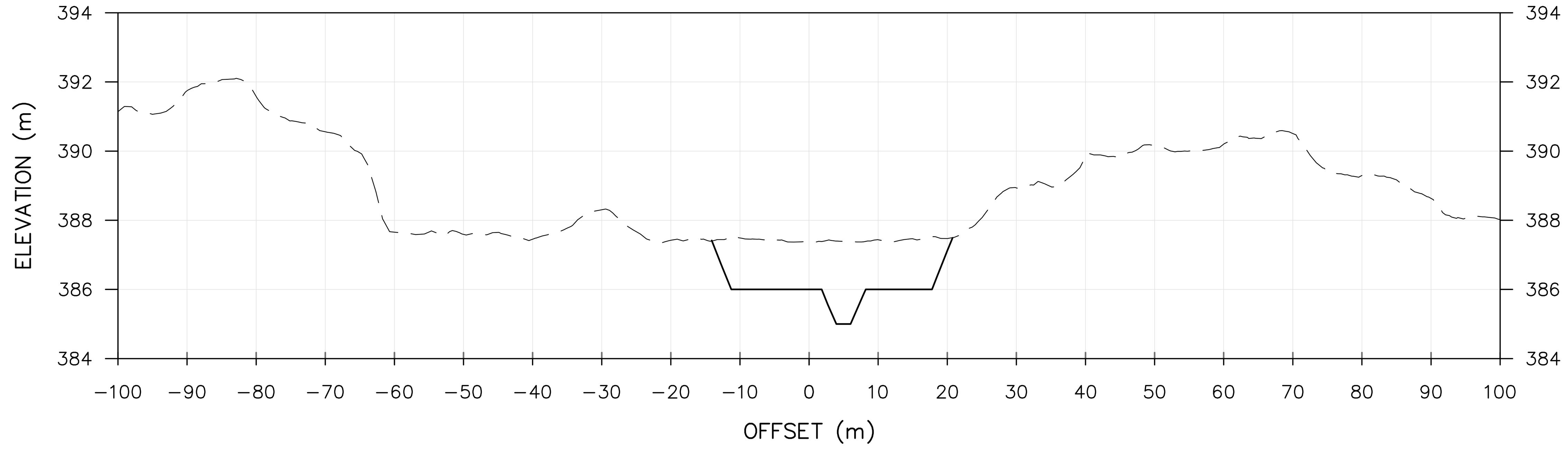
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
SECTIONS [5+025 - 5+175]

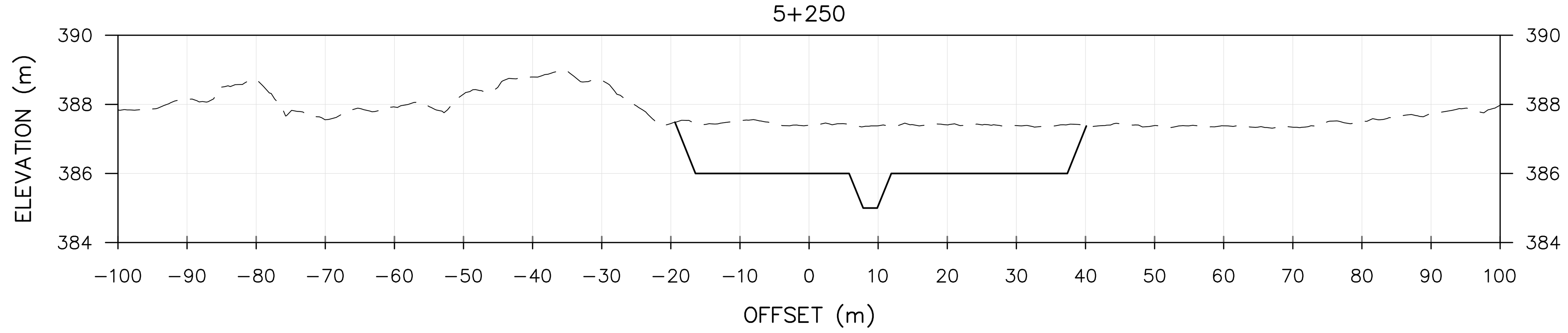
Wood Dwg. No.: 100264-846-DW00-PLN-2006
Client Dwg. No.: 846-C-2006

Scale: 1:600	Drawn By: CWM	Drawing No. WRC1-C-1
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

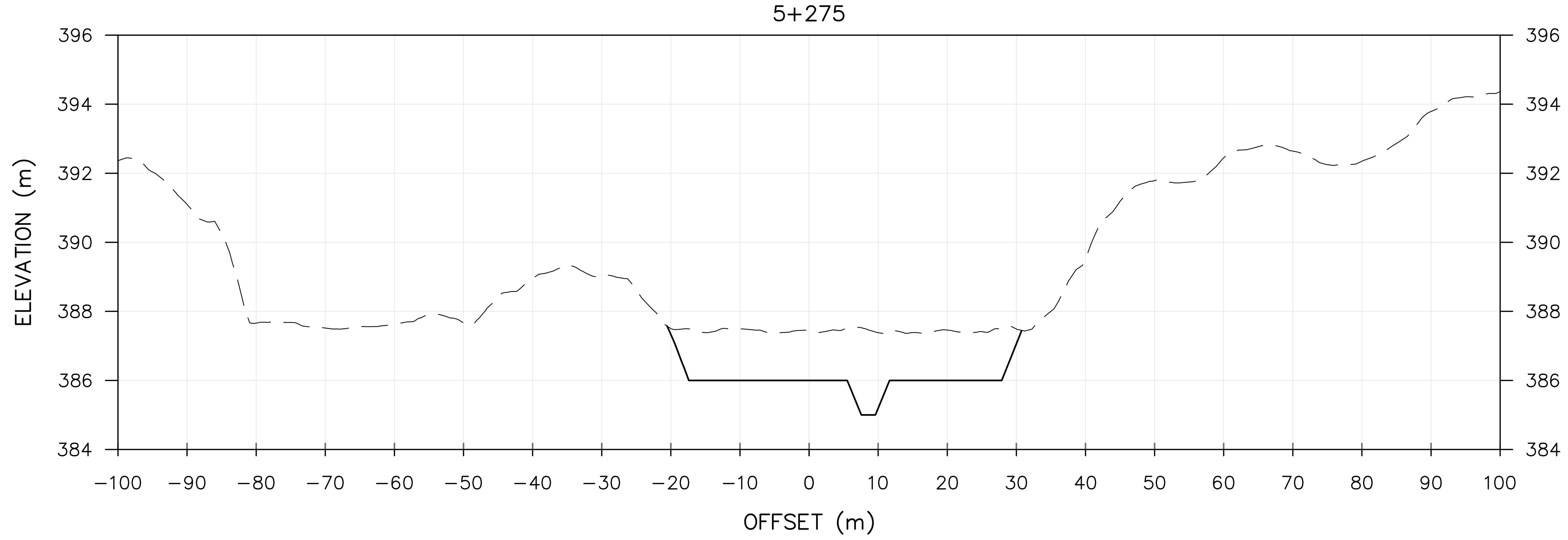
5+225



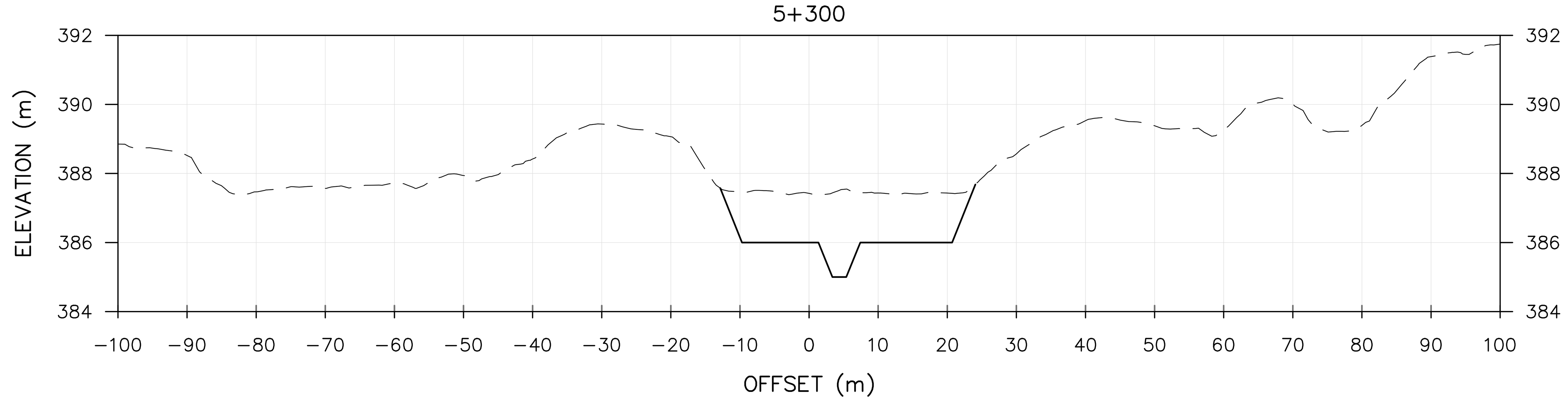
5+250



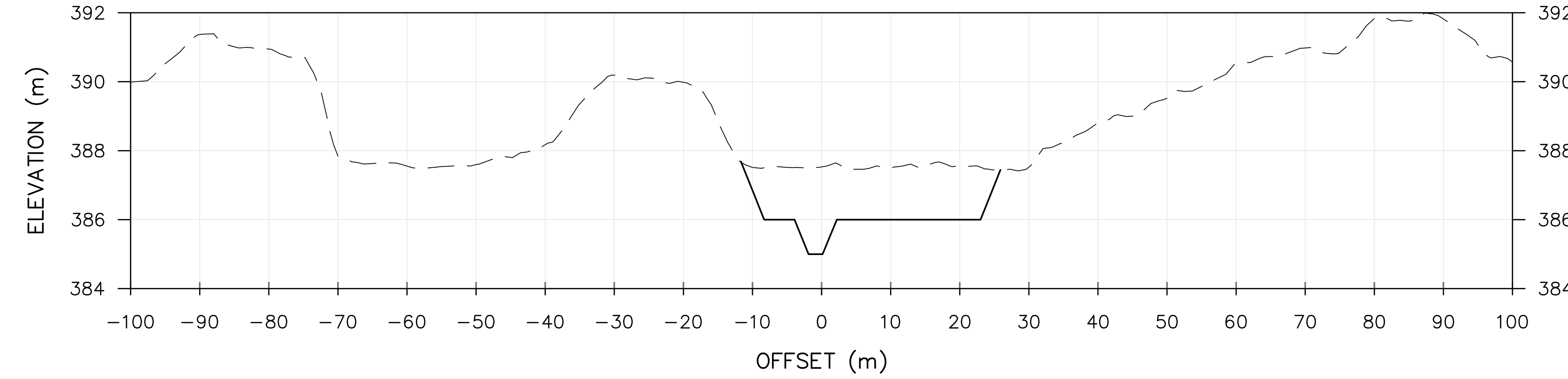
5+275



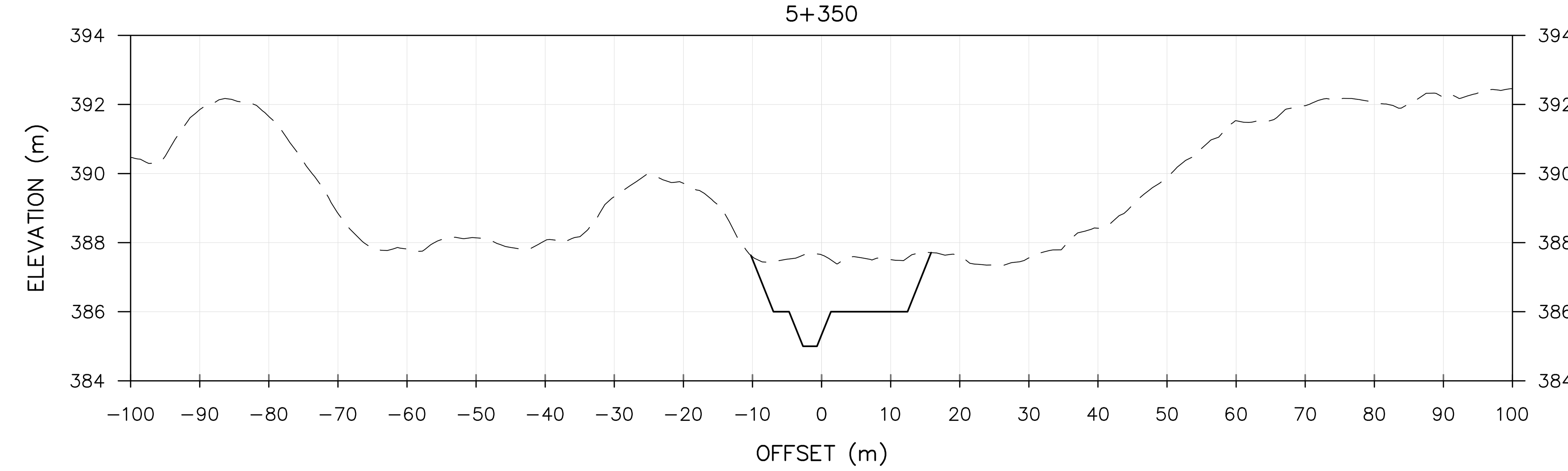
5+300



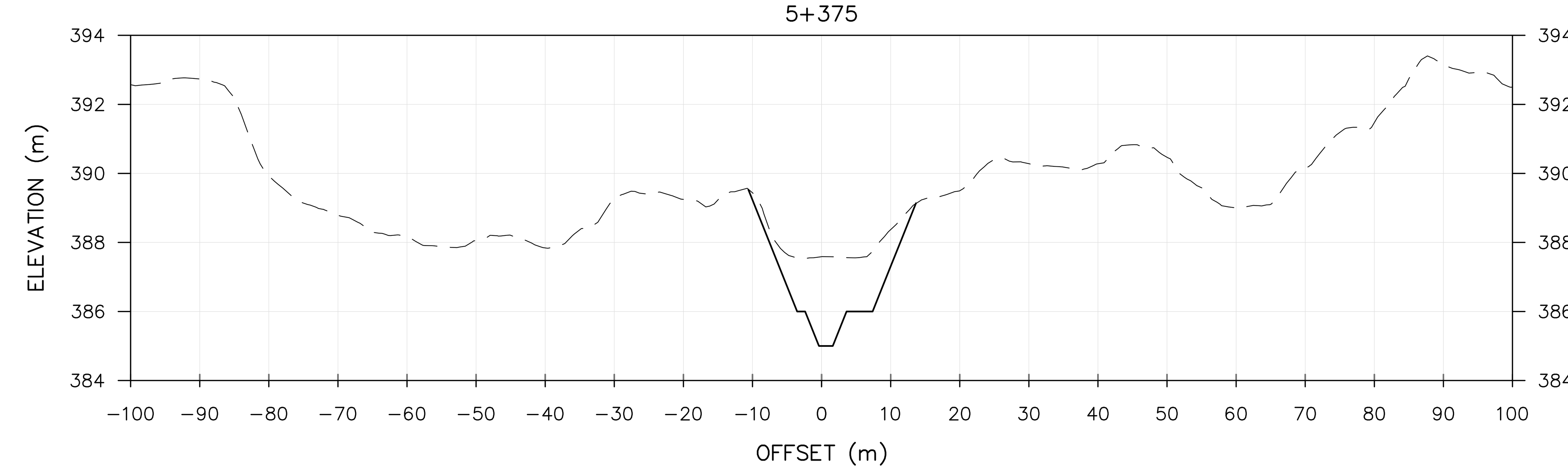
5+325



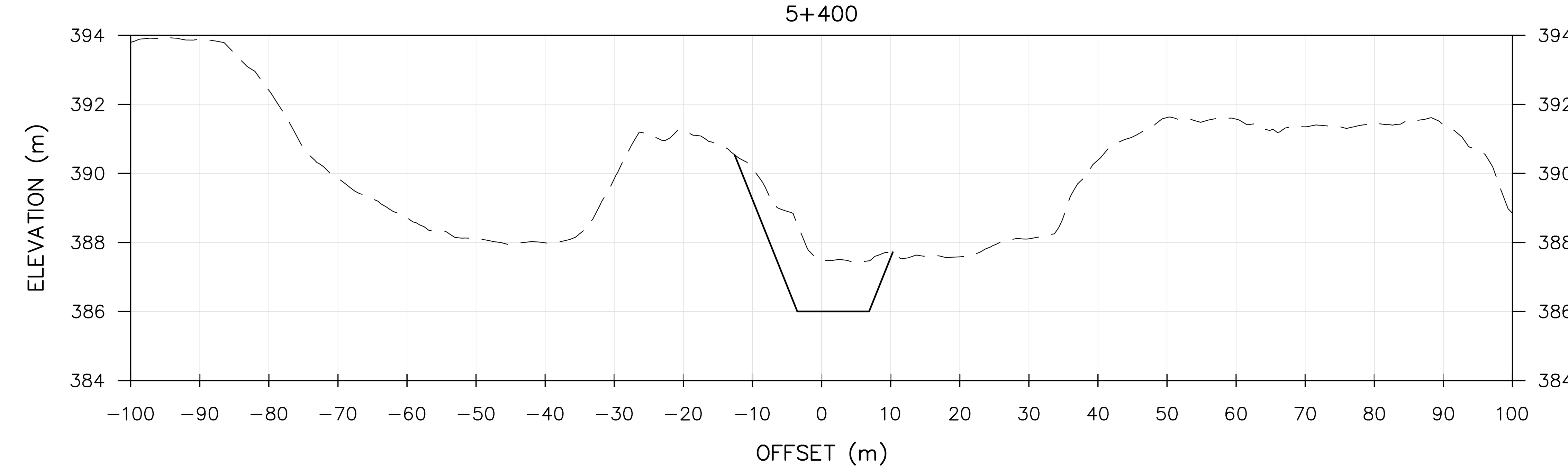
5+350



5+375



5+400



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
—— PROPOSED GRADE
– – EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 20 40 HORIZONTAL
0 4 8 VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
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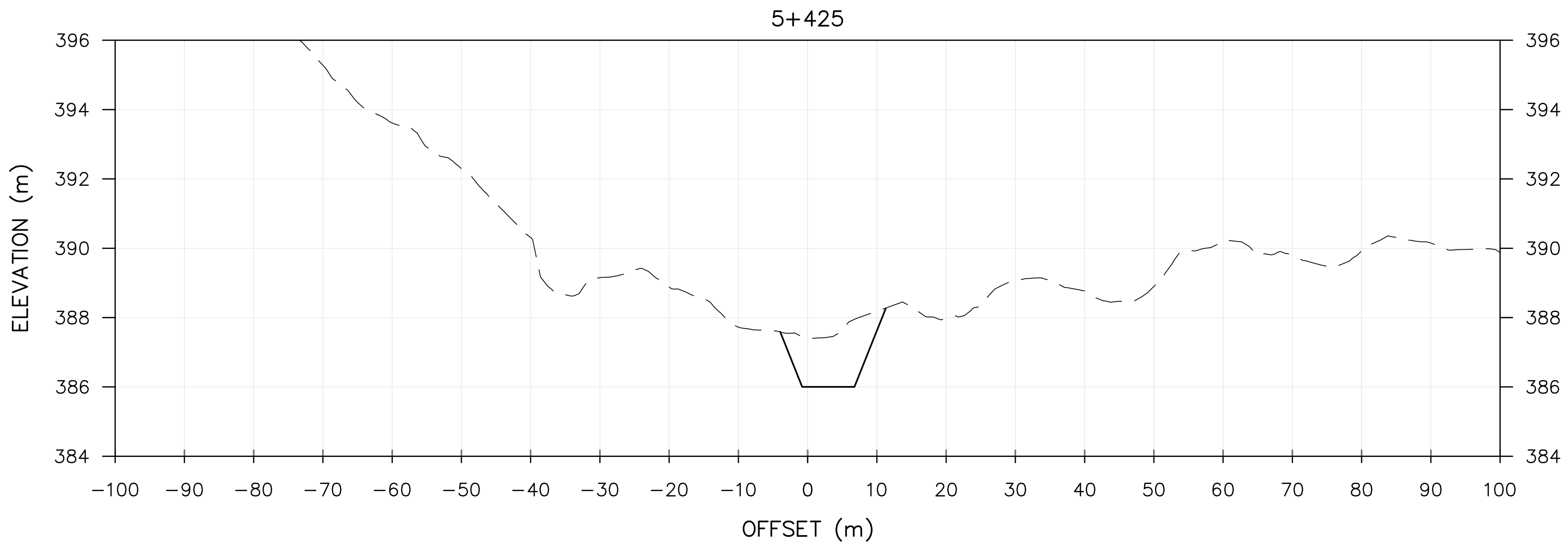
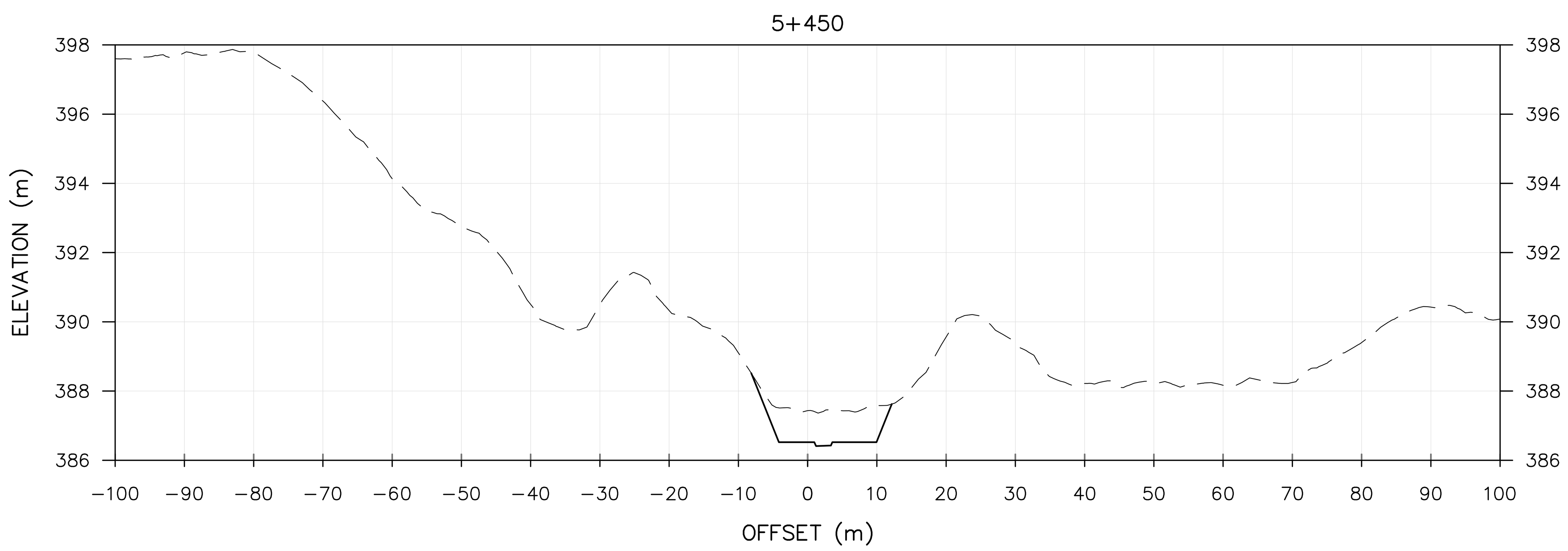
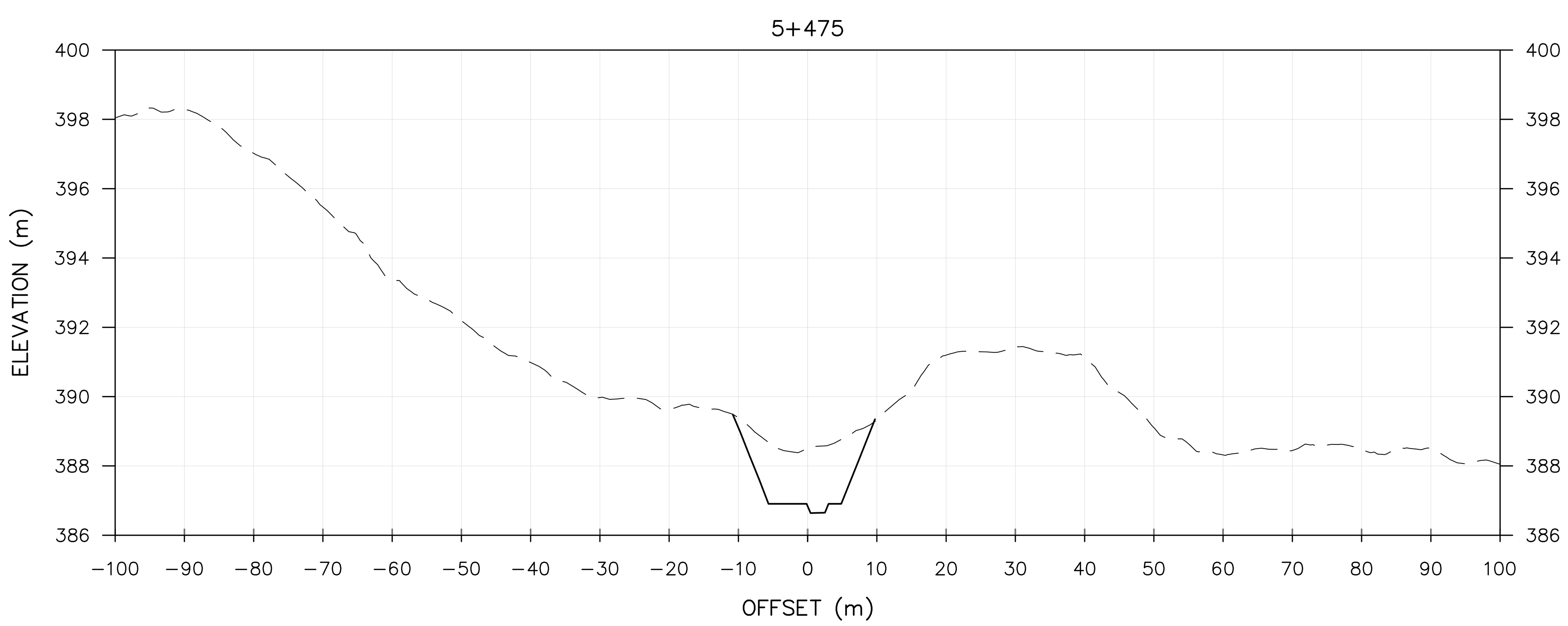
F	Issued for Construction (Updated)	2020-02-14	JPH

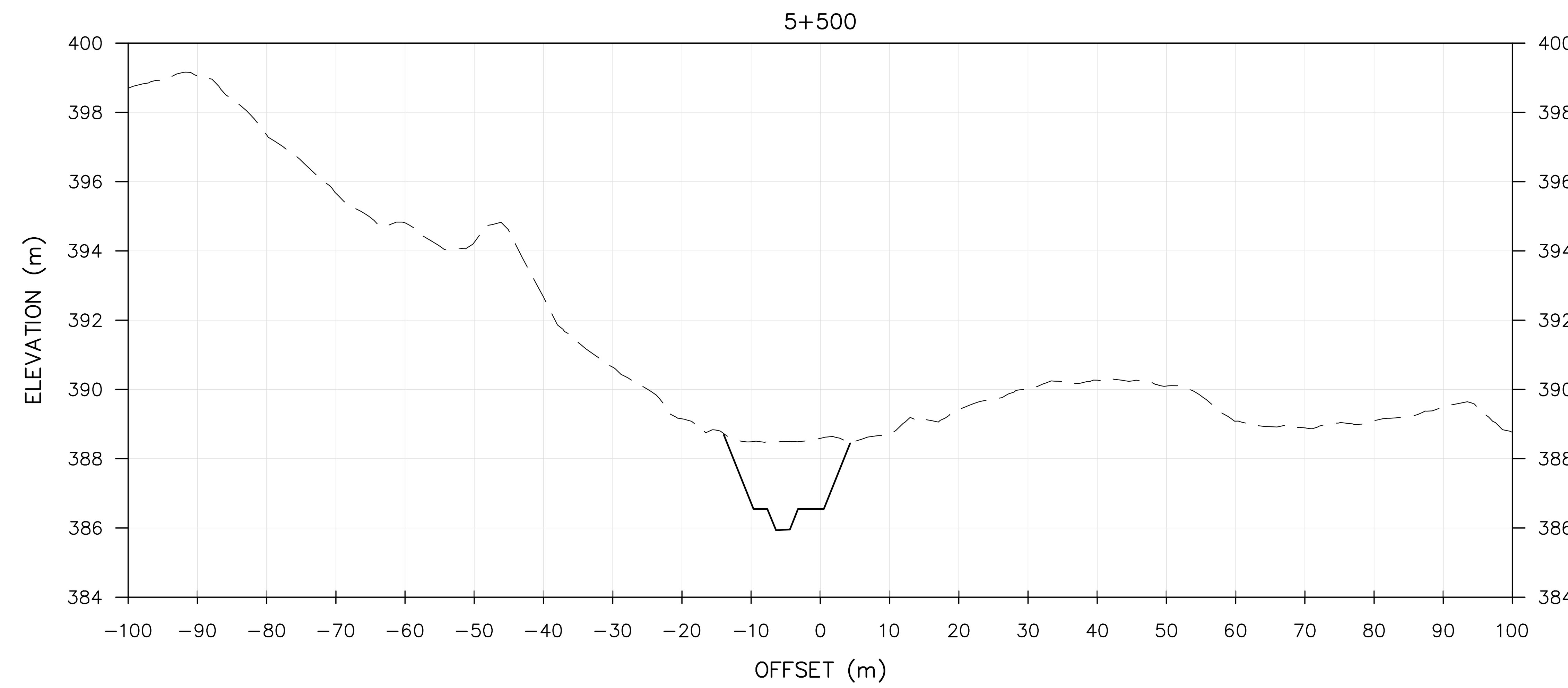
IAMGOLD COTE MINE - WRC1
SECTIONS [5+225 - 5+400]

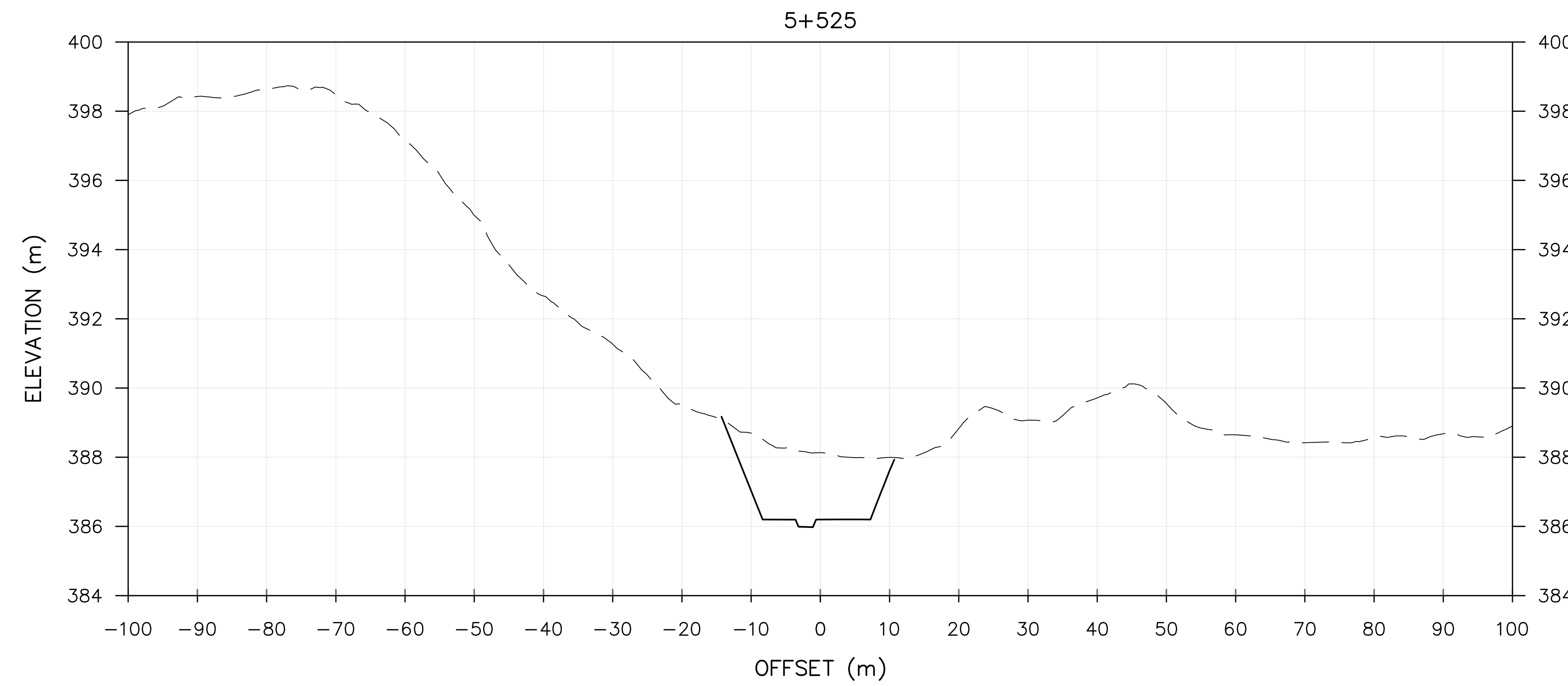
Wood Dwg. No.: 100264-846-DW00-PLN-2007	Client Dwg. No.: 846-C-2007	
Scale: 1:600	Drawn By: CWM	Drawing No. WRC1-C-2
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

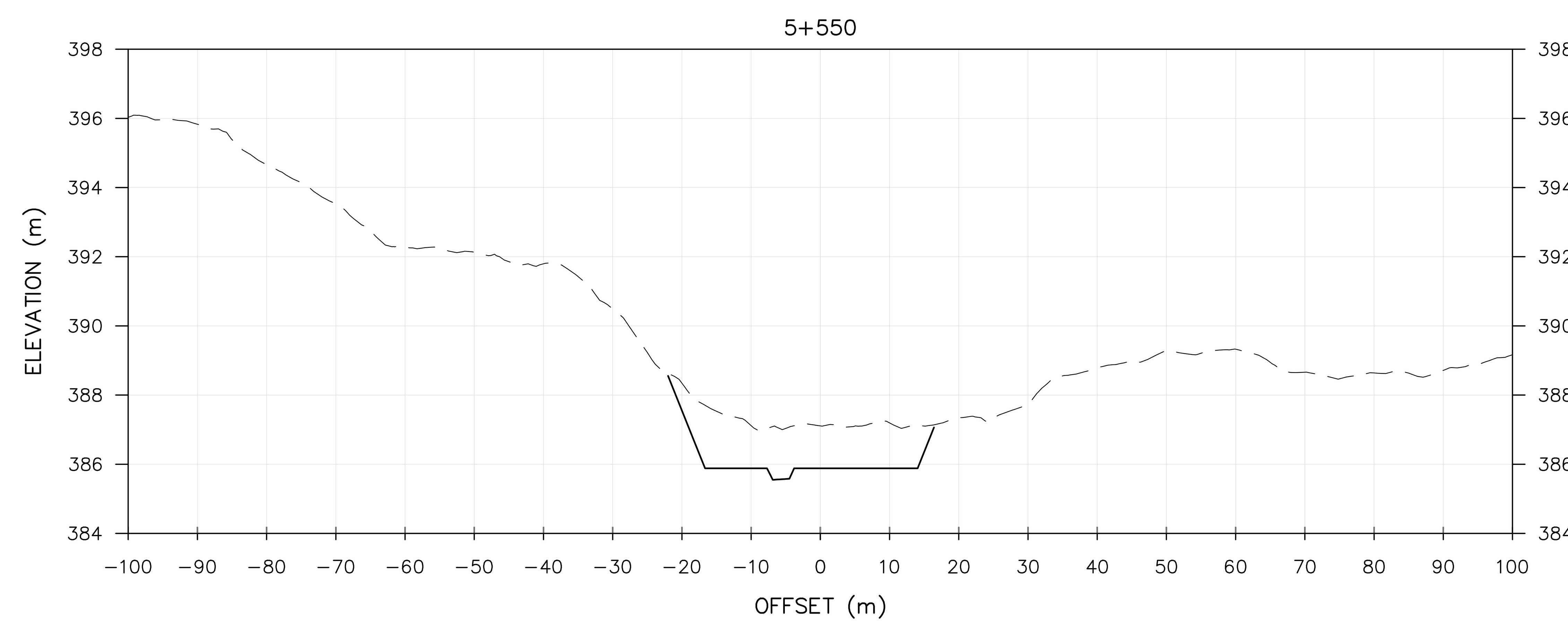












1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
—— PROPOSED GRADE
– – EXISTING GROUND

B. D. PLUMB
100523599
14/02/20

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

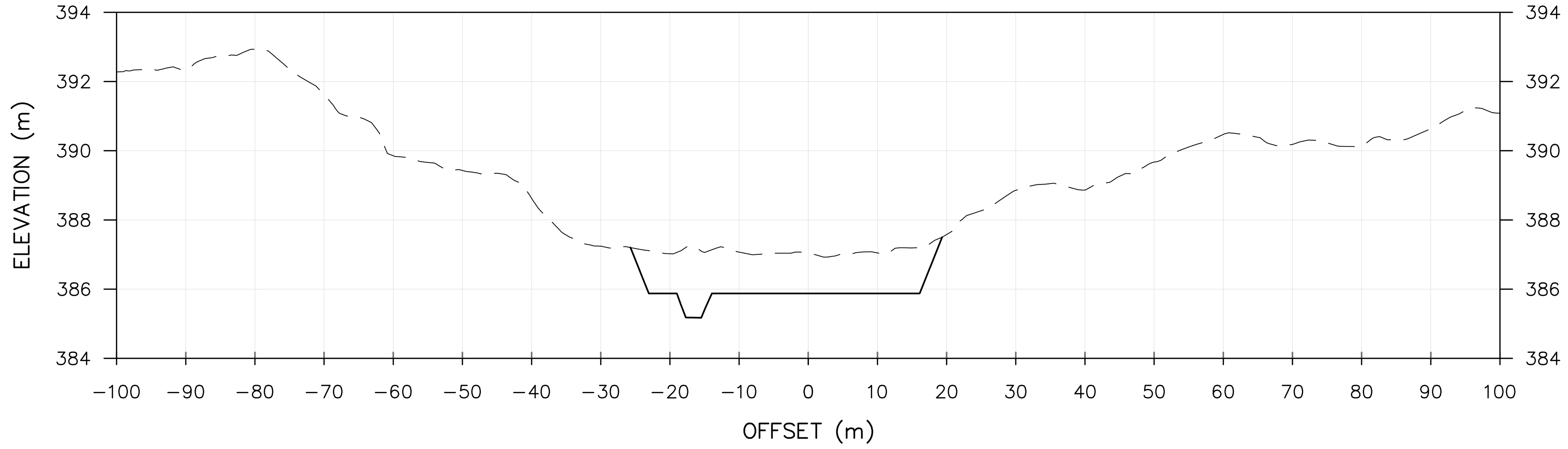
No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
SECTIONS [5+425 - 5+550]

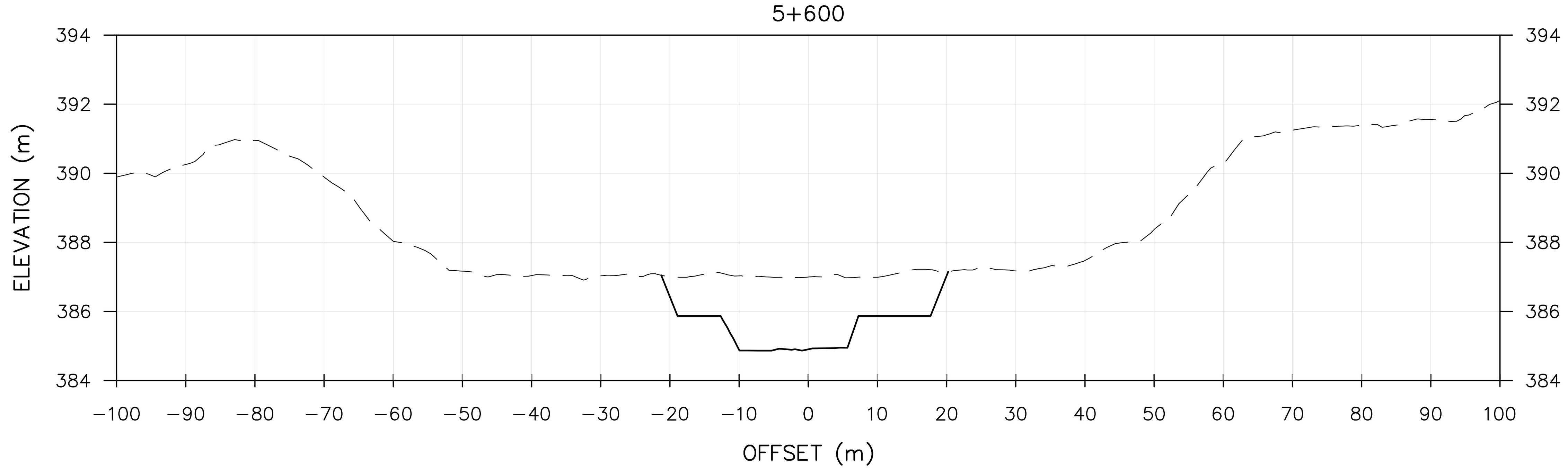
Wood Dwg. No.: 100264-846-DW00-PLN-2008
Client Dwg. No.: 846-C-2008

Scale: 1:600	Drawn By: CWM	Drawing No. WRC1-C-3
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

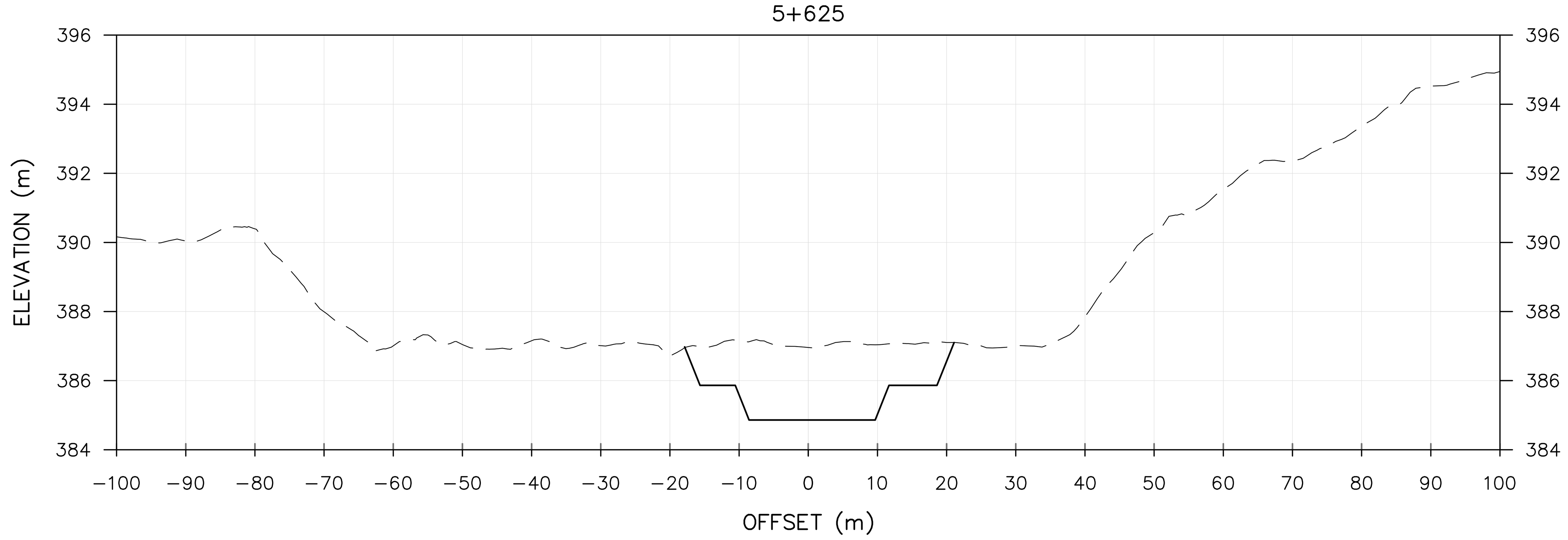
5+575



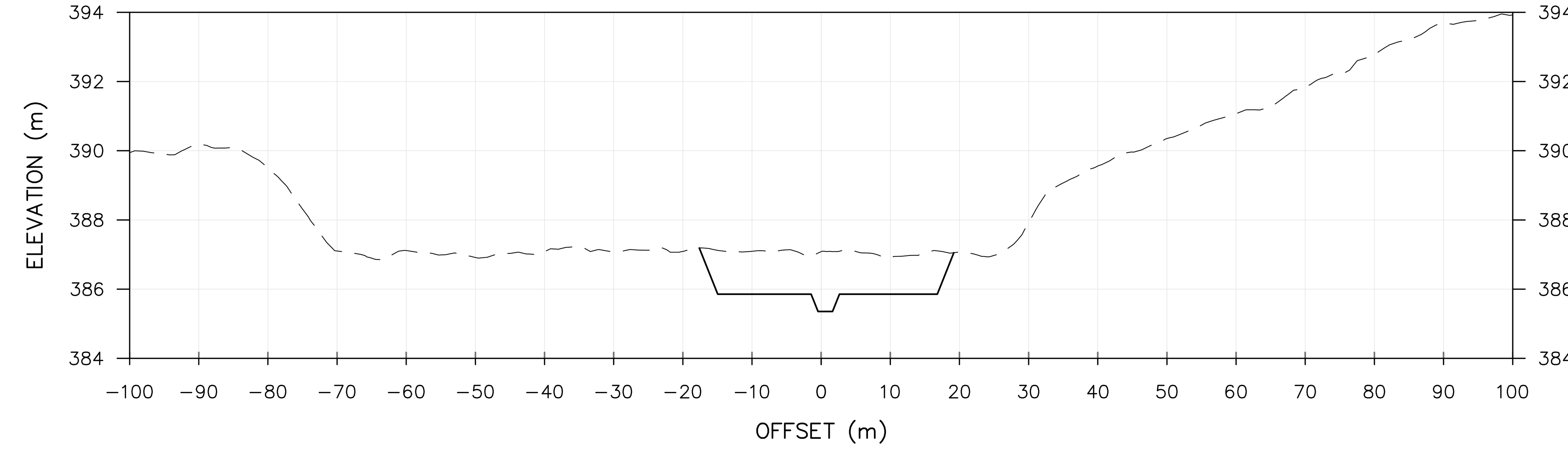
5+600



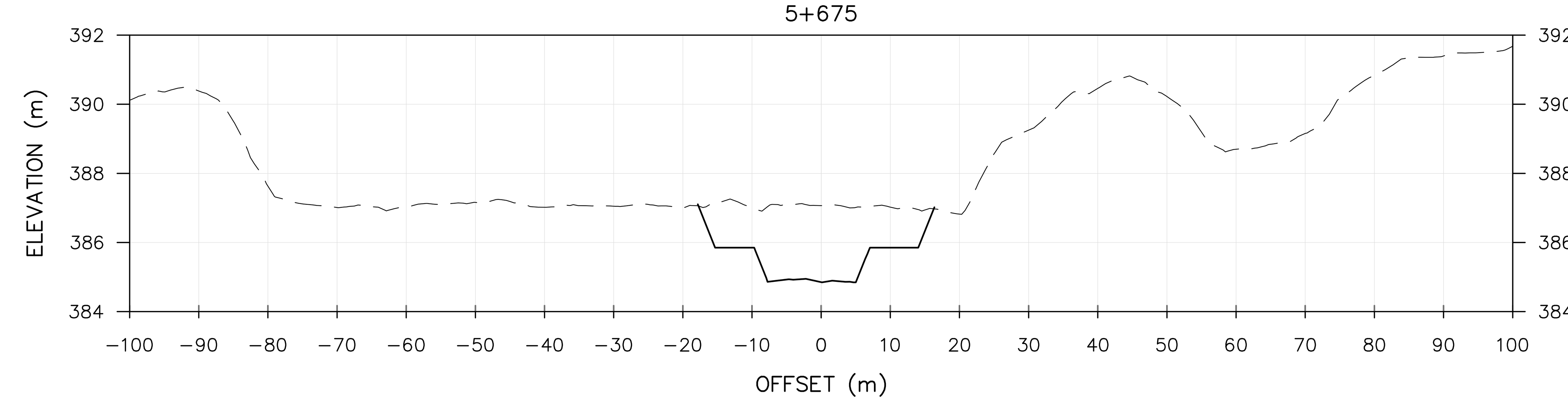
5+625



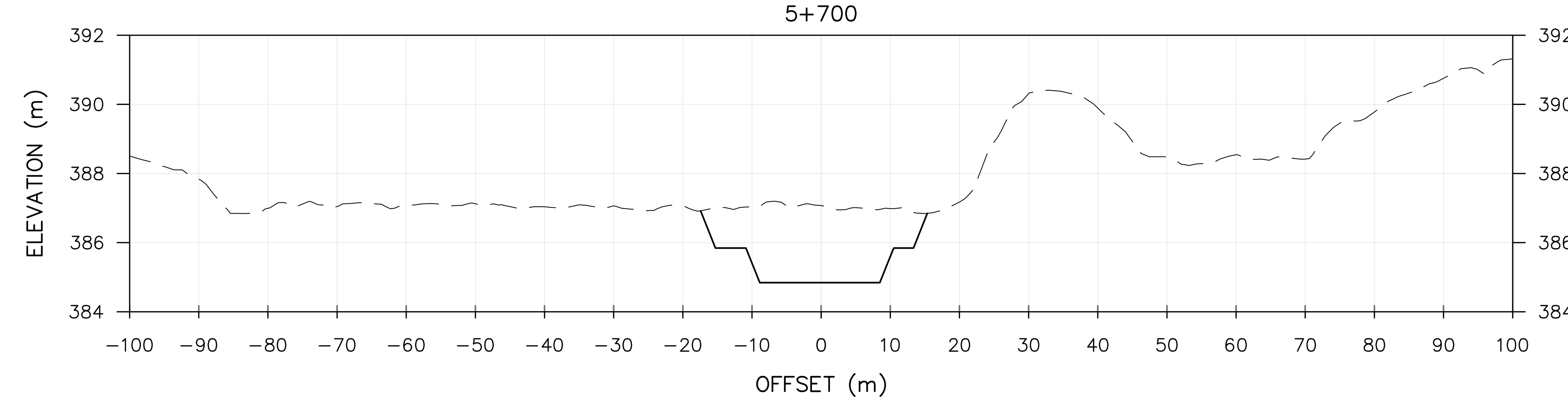
5+650



5+675



5+700



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
——— PROPOSED GRADE
– – – EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
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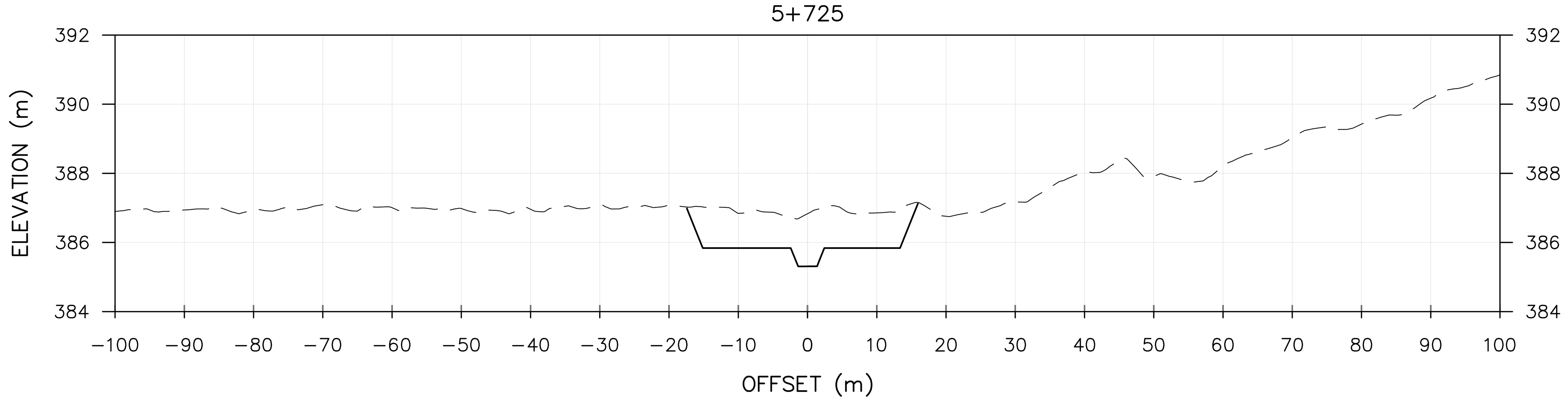
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
SECTIONS [5+575 - 5+700]

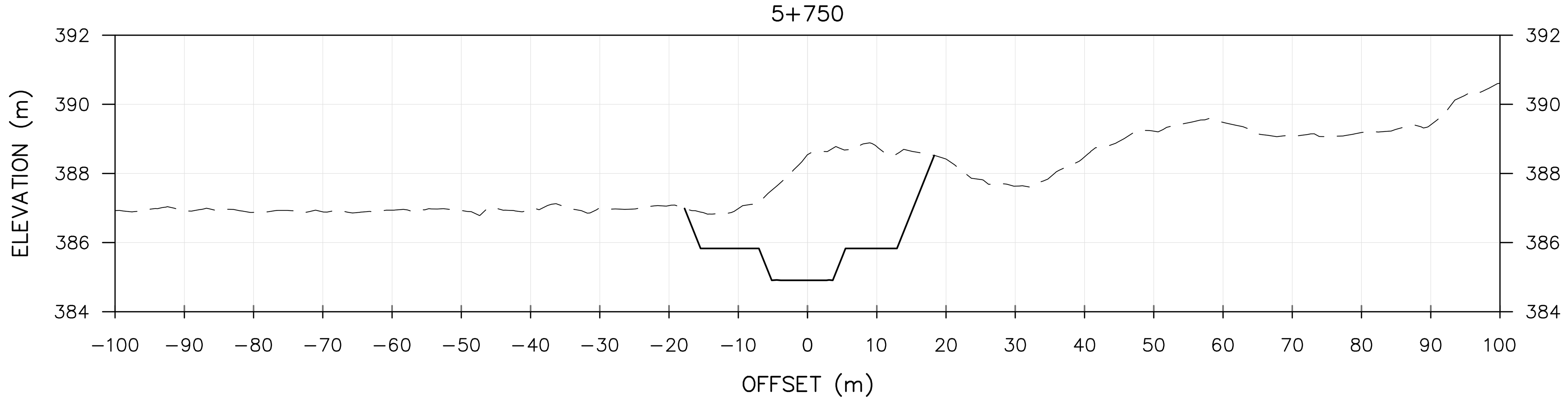
Wood Dwg. No.: 100264-846-DW00-PLN-2009
Client Dwg. No.: 846-C-2009

Scale: 1:600	Drawn By: CWM	Drawing No. WRC1-C-4
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

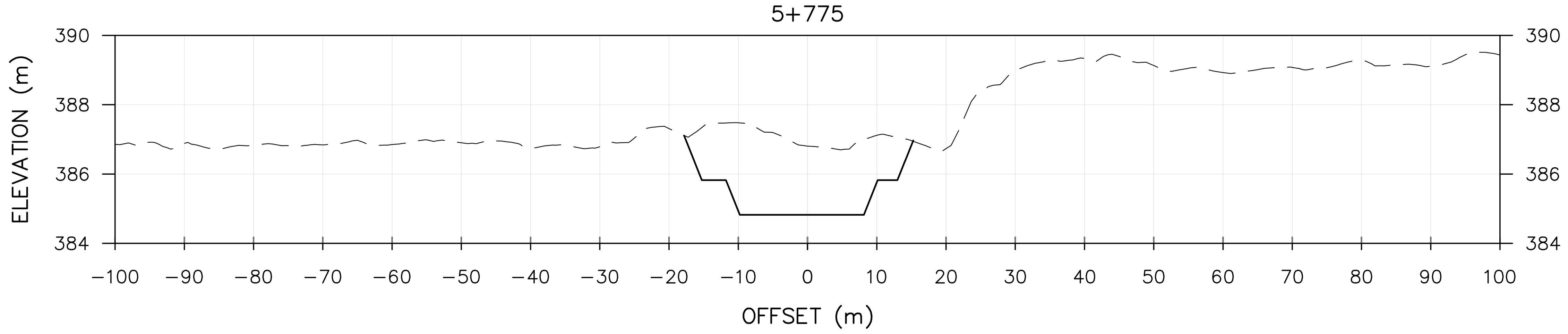
5+725



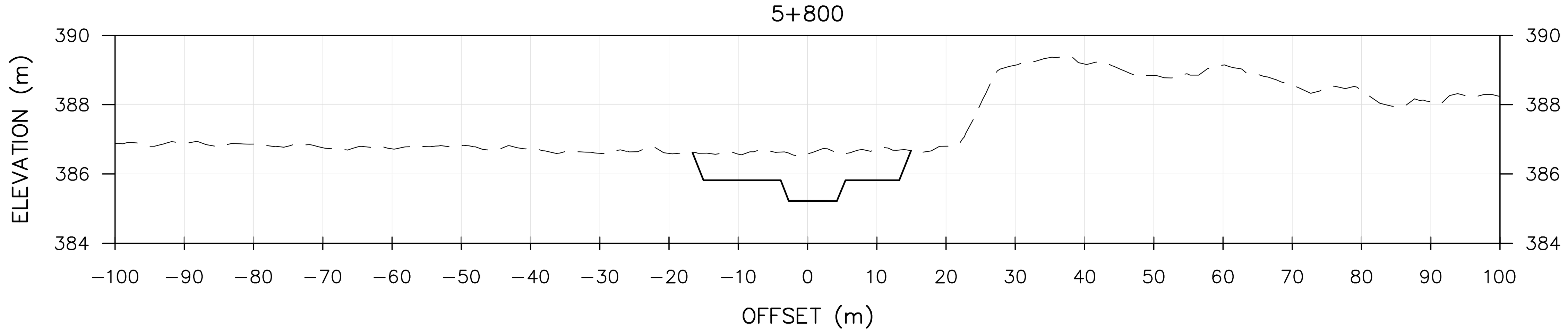
5+750



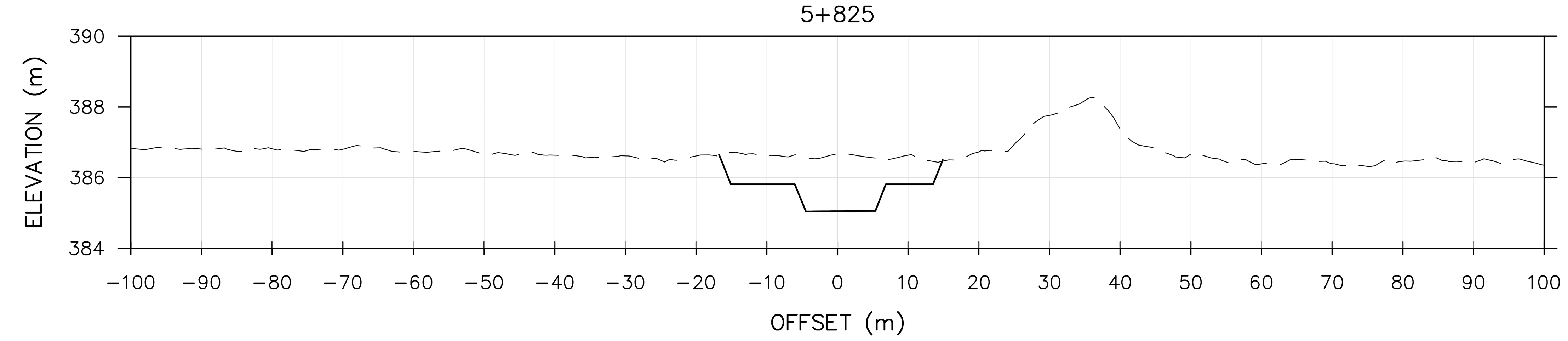
5+775



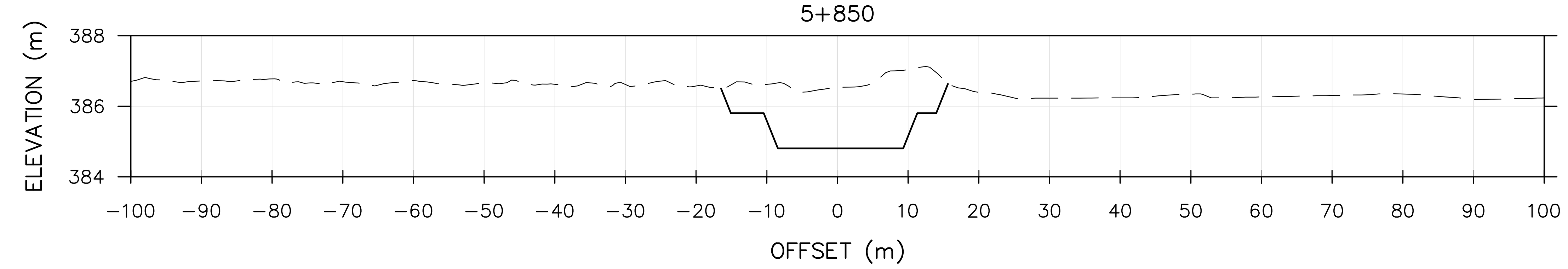
5+800



5+825



5+850



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
—— PROPOSED GRADE
— — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
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100523569
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
SECTIONS [5+725 - 5+850]

Wood Dwg. No.: 100264-846-DW00-PLN-2010
Client Dwg. No.: 846-C-2010

Scale: 1:600
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-C-5

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- SHORELINE GROWTH MEDIUM AND ECB
- RIFFLE STONE PLACEMENT

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- ALDER PLANTINGS AT 3 m O.C.
- EXPOSED TREE STUMPS

LICENSED PROFESSIONAL ENGINEER
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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 15 30

No.	REVISIONS	DATE	INITIAL
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IAMGOLD COTE MINE - WRC1
REVEGETATION AND RESTITUTION [0+000 - 0+450]

Wood Dwg. No.: 100264-846-DW00-PLN-2011
Client Dwg. No.: 846-C-2011

Scale: 1:500
Drawn By: CWM
Drawing No. WRC1-R-1
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

PLANTING NOTES:

GENERAL PLANTING NOTES:

- PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONES.
- THERE ARE TWO PLANTING ZONES WITH EACH THEIR OWN SPECIES PRESCRIPTION; ZONE 1 AND ZONE 2.
- ZONE 1 IS LOCATED FROM TOP OF BANK TO 4 m.
- ZONE 2 IS LOCATED BETWEEN 4 m FROM TOP OF BANK AND THE EXISTING FOREST EDGE.
- PLANTING OF SEEDLINGS AND WHIPS IS TO BE COMPLETED BY HAND, BY EXPERIENCED PROFESSIONALS.
- THE SCHEDULE OF SPECIES AND STOCK IS TO BE TO FOLLOWED PRECISELY, IF SUBSTITUTIONS ARE REQUIRED IT MUST BE AUTHORIZED BY A REGISTERED FORESTER.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN TREES AND SHRUBS.
- THE PLANTING SCHEDULES PRESCRIBE A 50% TREE AND 50% SHRUB COVER FOR ZONE 1, AND 75% TREE COVER WITH 25% OPEN SPACES FOR ZONE 2.
- ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK (300 TOTAL PLANTINGS).
- SALVAGED MATERIAL RECOVERED FROM THE MOLLIE RIVER (SEE NL–G–1) TO BE INCORPORATED INTO THE ZONE 1 PLANTINGS, AT THE DIRECTION OF THE CONSTRUCTION SUPERVISOR.
- THE PLANTING PLAN FOR WRC1–LG MAY NEED TO BE ADAPTED DEPENDING ON THE FINAL GRADED SITE CONDITIONS, AT THE DIRECTION OF THE CONSTRUCTION SUPERVISOR.

Zone 1: Adjacent to Watercourse (0.4 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Trees (50% cover)				
Black Spruce	Picea mariana	10	40	Seedling Plugs
Balsam Fir	Abies balsamea	10	40	Seedling Plugs
Tamarack	Larix laricina	20	80	Seedling Plugs
Eastern White Cedar	Thuja occidentalis	30	100	Bare Root Seedlings
Trembling Aspen	Populus tremuloides	30	100	Whips
	Total	100	360	
Shrubs (50% cover)				
Green Alder	Alnus crispa	20	80	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	50	180	12" Live Stakes, Locally Harvested
Red–Osier Dogwood	Cornus stolonifera	30	100	12" Live Stakes, Locally Harvested
	Total	100	360	

Zone 2: General Floodplain (0.5 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Trees (75% cover)				
Black Spruce	Picea mariana	30	200	Seedling Plugs
Balsam Fir	Abies balsamea	10	70	Seedling Plugs
White Spruce	Picea glauca	20	135	Seedling Plugs
Tamarack	Larix laricina	10	70	Seedling Plugs
Jack Pine	Pinus banksiana	30	200	Seedling Plugs
	Total	100	675	
25% open space to represent natural openings in the floodplain canopy cover				

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- RIFFLE STONE PLACEMENT

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- ALDER PLANTINGS AT 3 m O.C.
- EXPOSED TREE STUMPS

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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

0 15 30

No.	REVISIONS	DATE	INITIAL
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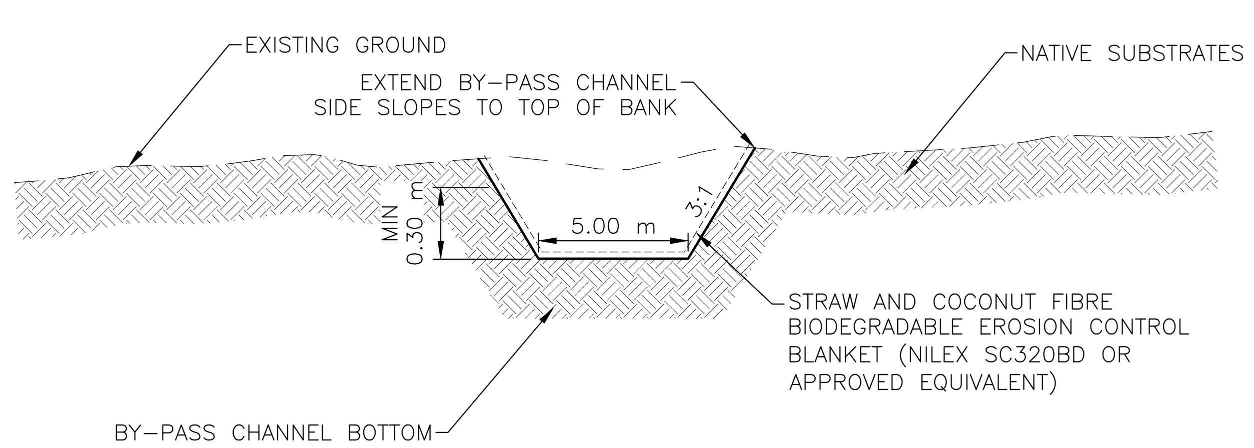
F	Issued for Construction (Updated)	2020-02-14	JPH

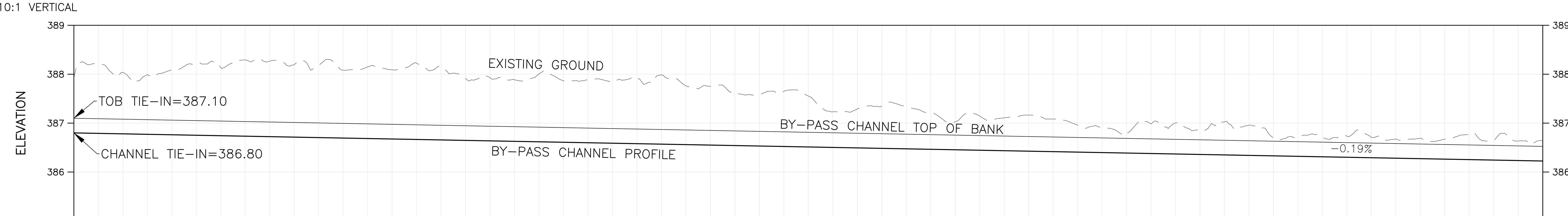
IAMGOLD COTE MINE - WRC1
REVEGETATION AND RESTITUTION [0+450 - 0+886]

Wood Dwg. No.: 100264-846-DW00-PLN-2012
Client Dwg. No.: 846-C-2012
Scale: 1:500
Drawn By: CWM
Drawing No. WRC1-R-2
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD



1:1 HORIZONTAL
10:1 VERTICAL



STATION	9+025	9+050	9+075	9+100	9+125	9+150	9+175	9+200	9+225	9+250	9+275
TOB ELEV.	387.05	387.00	386.96	386.91	386.86	386.81	386.76	386.72	386.67	386.62	386.57
CL ELEV.	386.75	386.70	386.66	386.61	386.56	386.51	386.46	386.42	386.37	386.32	386.27
(DEPTH)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523569 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 15 30
HORIZONTAL
0 1.5 3
VERTICAL

No.	REVISIONS	DATE	INITIAL
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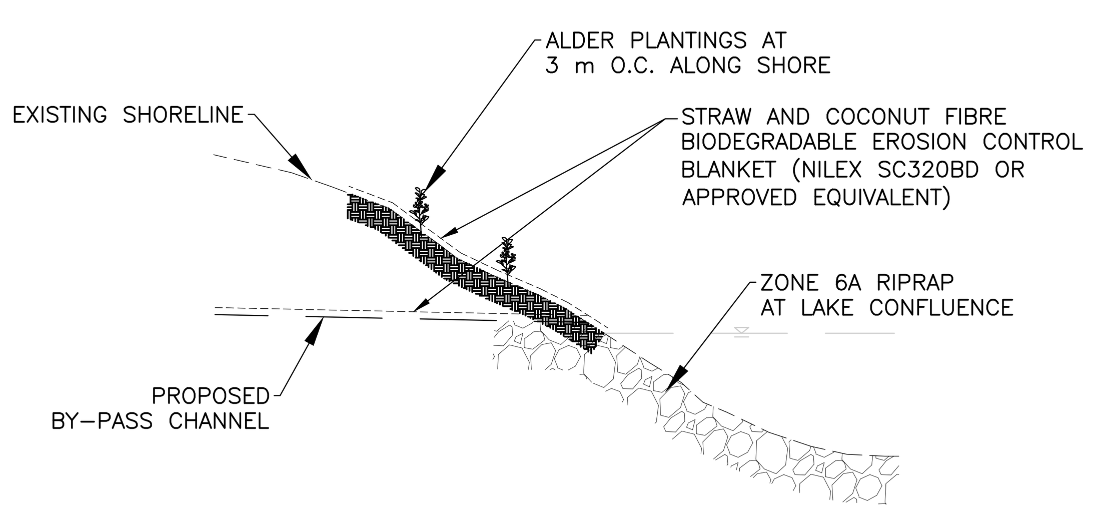
IAMGOLD COTE MINE - WRC1
BY-PASS CHANNEL PLAN AND PROFILE [9+000 - 9+300]

Wood Dwg. No.: 100264-846-DW00-PLN-2013 | Client Dwg. No.: 846-C-2013

Scale: 1:500 | Drawn By: CWM | Drawing No. WRC1-B-1

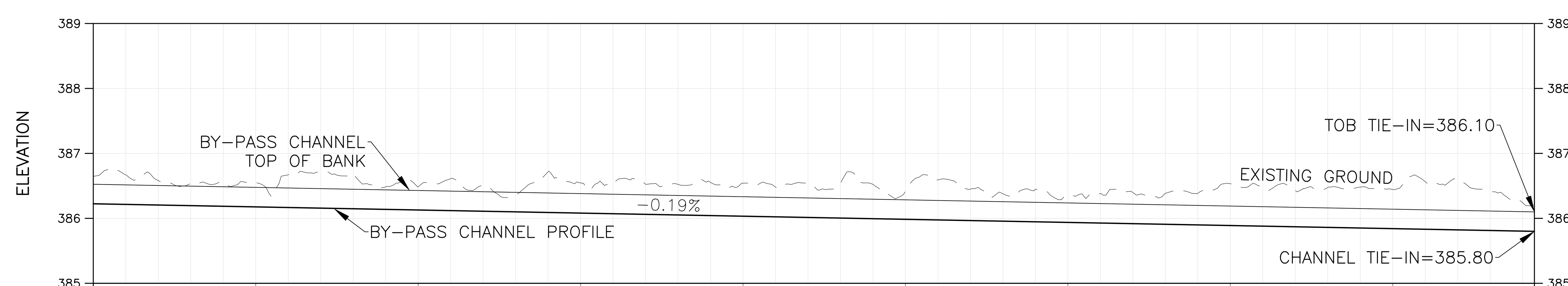
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

Bypass Rip Rap Gradation – 0.4 % Reaches (Riprap Zone 6A)	
Particle Size (mm)	*% Passing by Weight*
200	100
150	50-100
100	5-50
90	0-40
45	0-8



BY-PASS CHANNEL-CONFLUENCE STABILIZATION

1:1 HORIZONTAL
5:1 VERTICAL



STATION	9+325	9+350	9+375	9+400	9+425	9+450	9+475	9+500
TOB ELEV.	386.48	386.43	386.38	386.33	386.29	386.24	386.19	386.14
CL ELEV.	386.18	386.13	386.08	386.03	385.99	385.94	385.89	385.84
(DEPTH)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD

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LEGEND
PROPOSED CHANNEL BOTTOM
PROPOSED TOP OF BANK
EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
HORIZONTAL: 0 15 30
VERTICAL: 0 1.5 3

No.	REVISIONS	DATE	INITIAL
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F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
BY-PASS CHANNEL PLAN AND PROFILE [9+300 - 9+552]

Wood Dwg. No.: 100264-846-DW00-PLN-2014
Client Dwg. No.: 846-C-2014
Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-B-2

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD

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LEGEND
PROPOSED BY-PASS CHANNEL
EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
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PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 7.5 15
HORIZONTAL
0 1.5 3
VERTICAL

No.	REVISIONS	DATE	INITIAL
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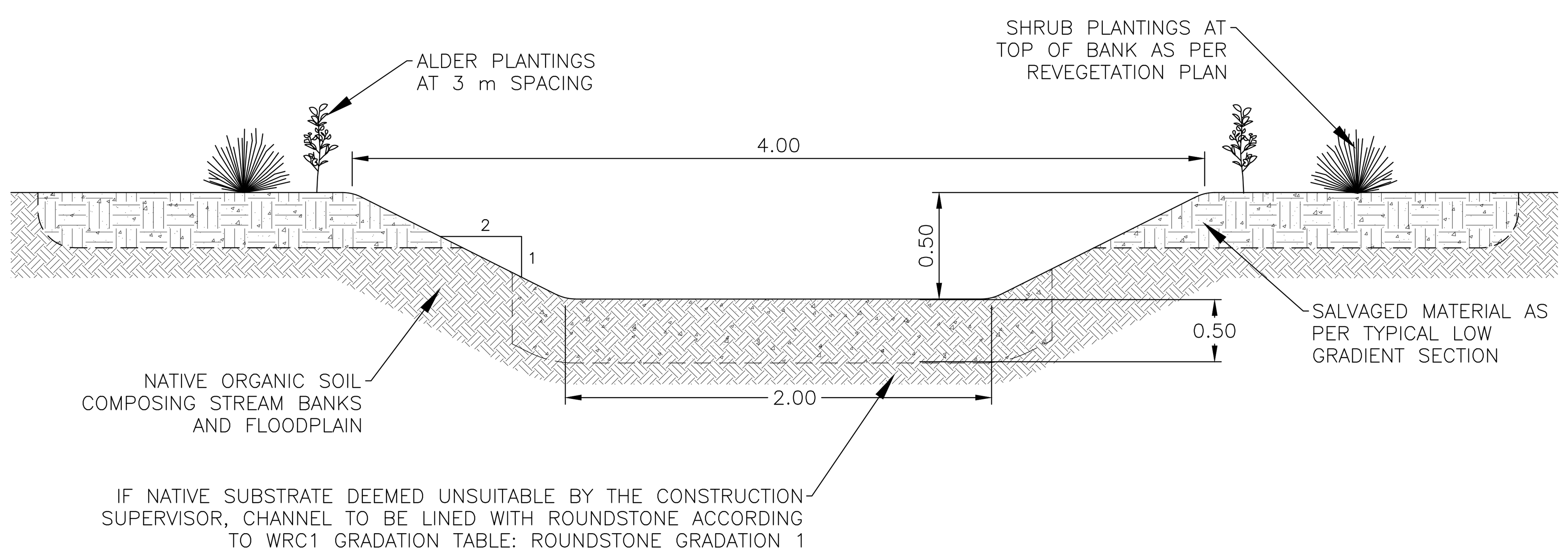
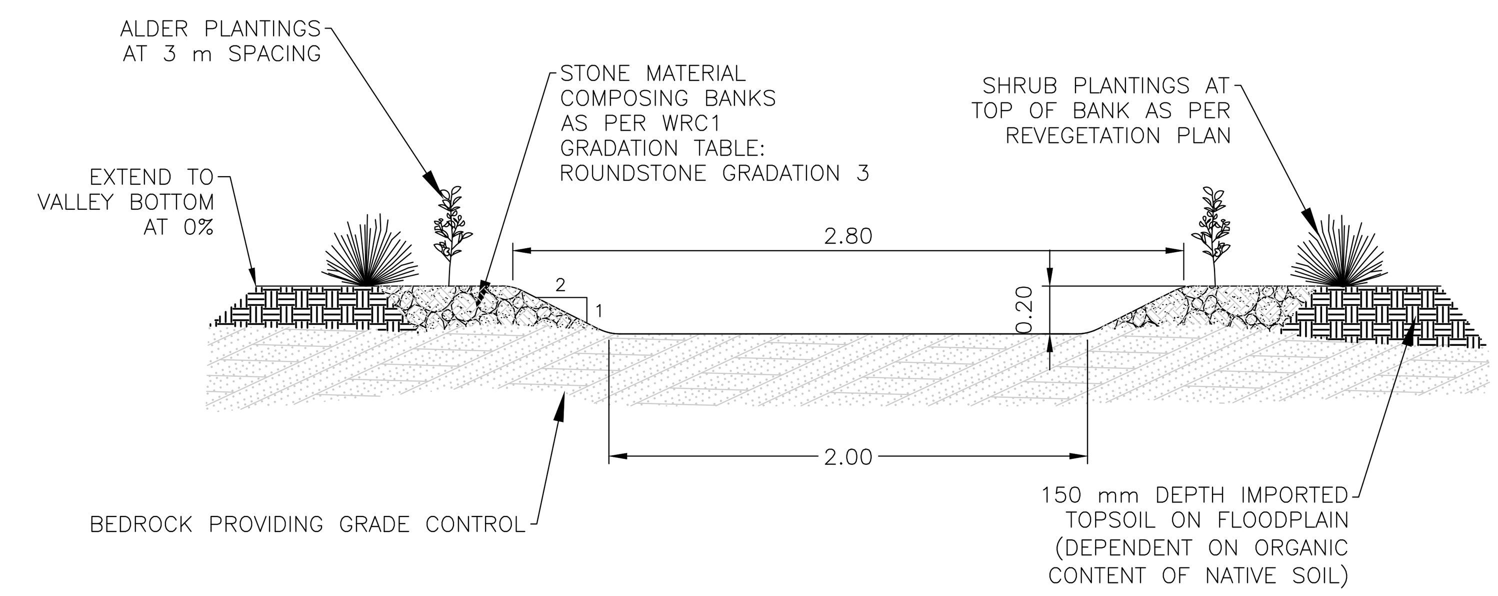
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC1
BY-PASS CHANNEL SECTIONS

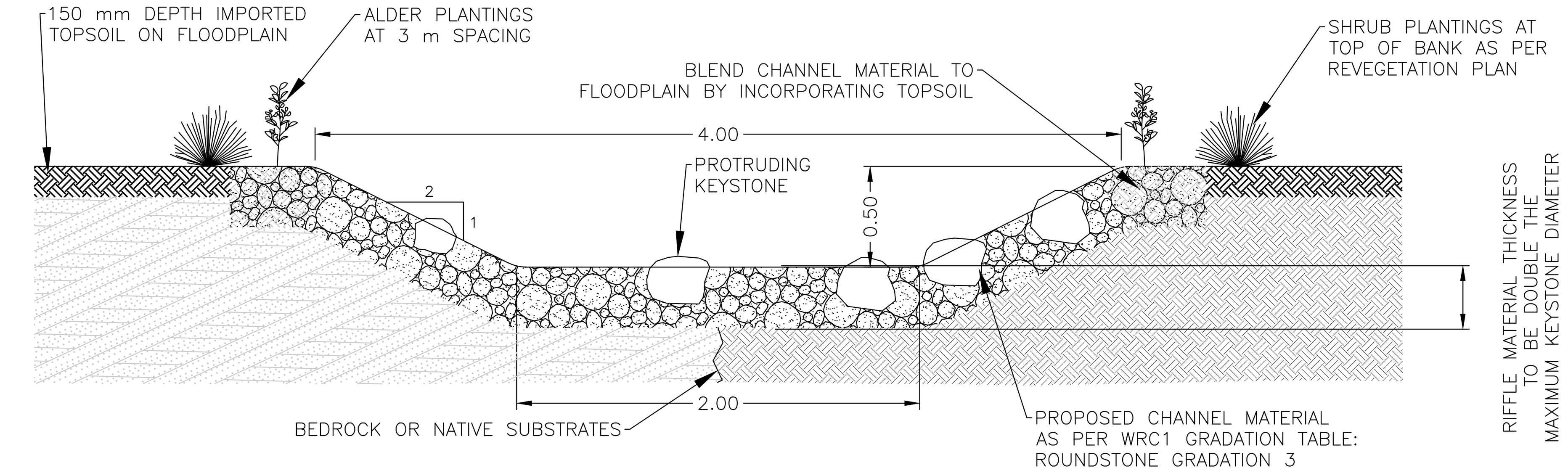
Wood Dwg. No.: 100264-846-DW00-PLN-2015
Client Dwg. No.: 846-C-2015
Scale: 1:250
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC1-B-3



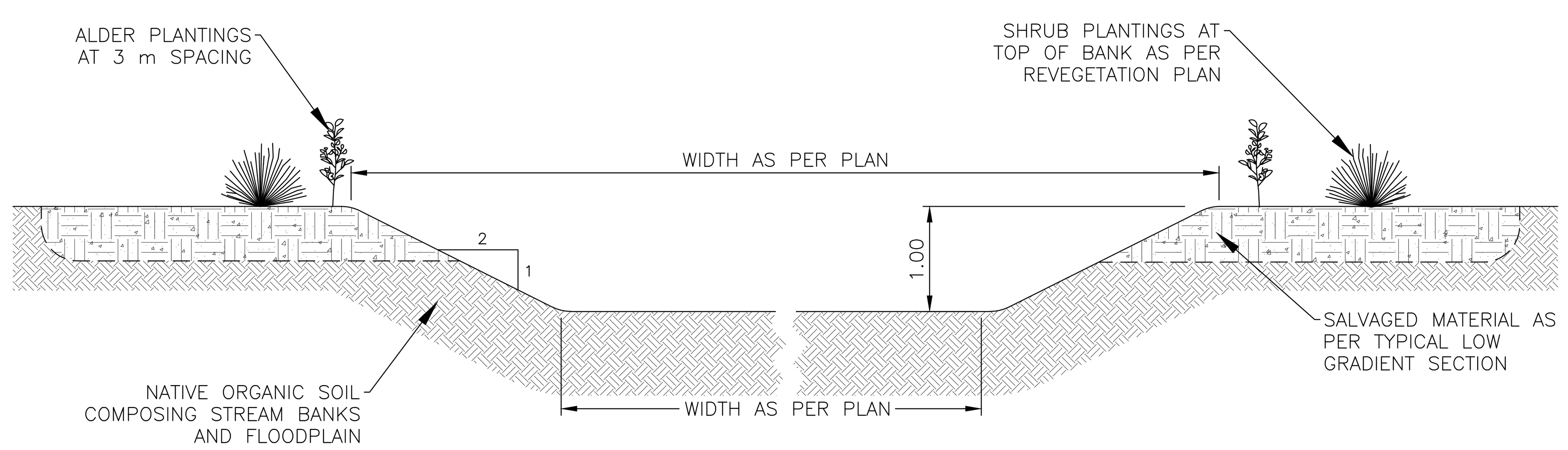
WRC1–LG TYPICAL RUN SECTION



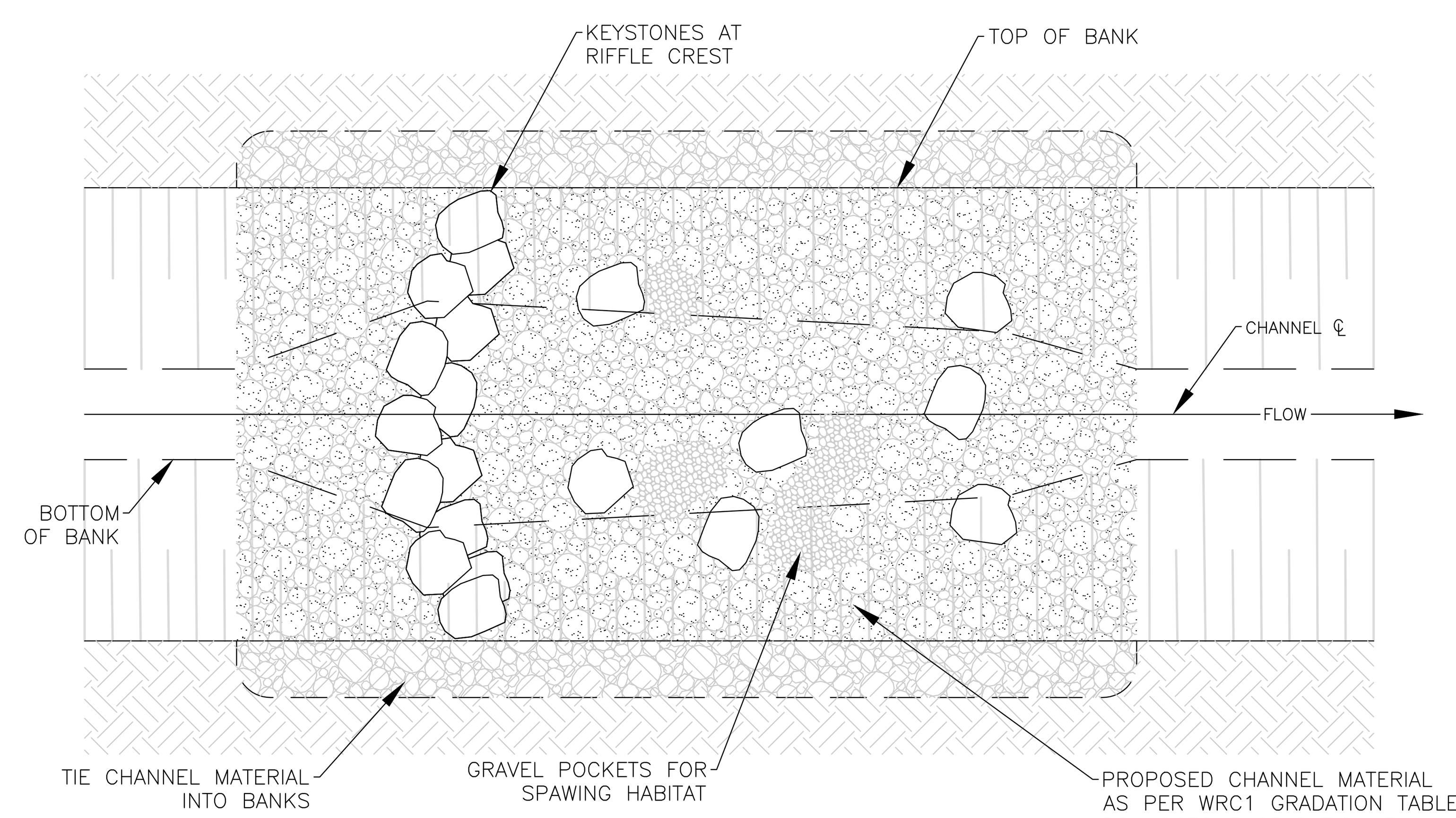
WRC1–HG TYPICAL BEDROCK UPSTREAM CREST SECTION



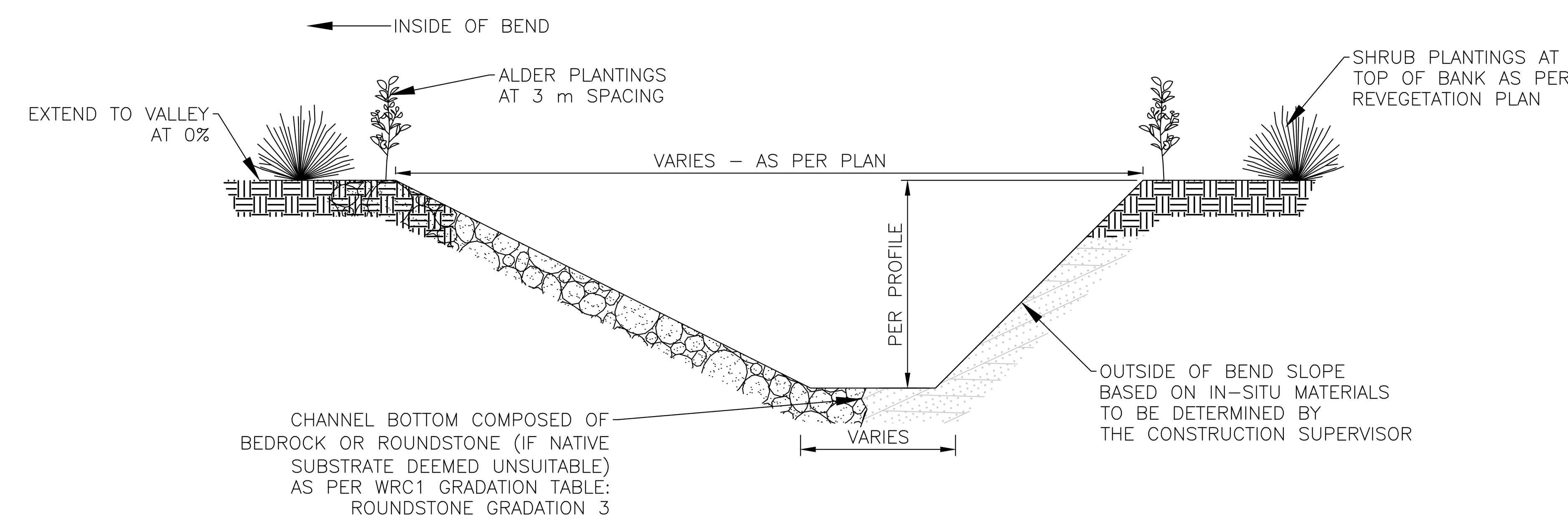
WRC1–HG TYPICAL HIGH GRADIENT RIFFLE SECTION



WRC1–LG TYPICAL POOL SECTION



WRC1–HG TYPICAL RIFFLE PLAN

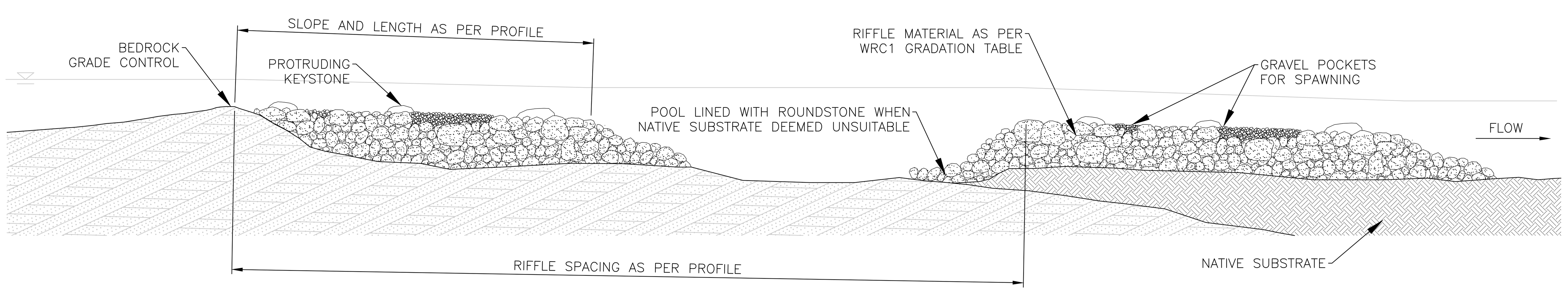


WRC1–HG TYPICAL POOL SECTION

WRC1 GRADATION TABLE

Roundstone Gradation 1	Roundstone Gradation 2	Roundstone Gradation 3
20% - clay	10% - clay[1]	15% - clay[1]
40% - sand	10% - <25 mm ø[2]	15% - <25 mm ø[2]
20% - <25 mm ø[2]	10% - 25 to 100 mm ø	15% - 25 to 50 mm ø
	10% - 100 to 200 mm ø	30% - 50 to 100 mm ø
	30% - 200 to 300 mm ø	25% - 100 to 200 mm ø
	30% - 300 to 500 mm ø	Keystone - 300 to 400 mm ø
	Keystone - 600 to 750 mm ø	

NOTES:
1. Clay or approved equivalent
2. Granular fill material
3. Boulders to be used for feature crests
4. % indicates the percent of the mixture by volume



WRC1 TYPICAL HIGH GRADIENT RIFFLE PROFILE

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LEGEND

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SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

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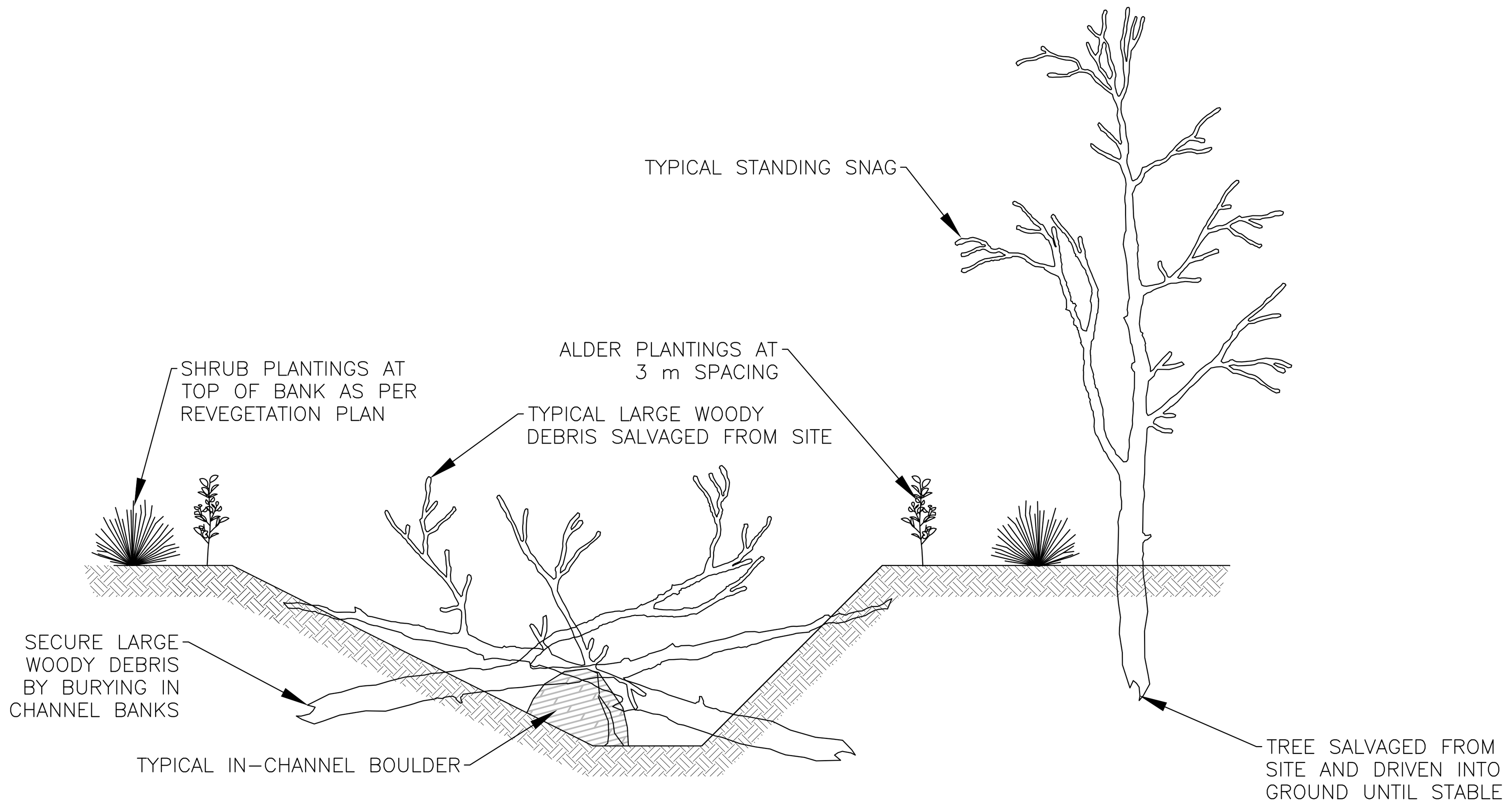
IAMGOLD COTE MINE - WRC1
TYPICAL DETAILS

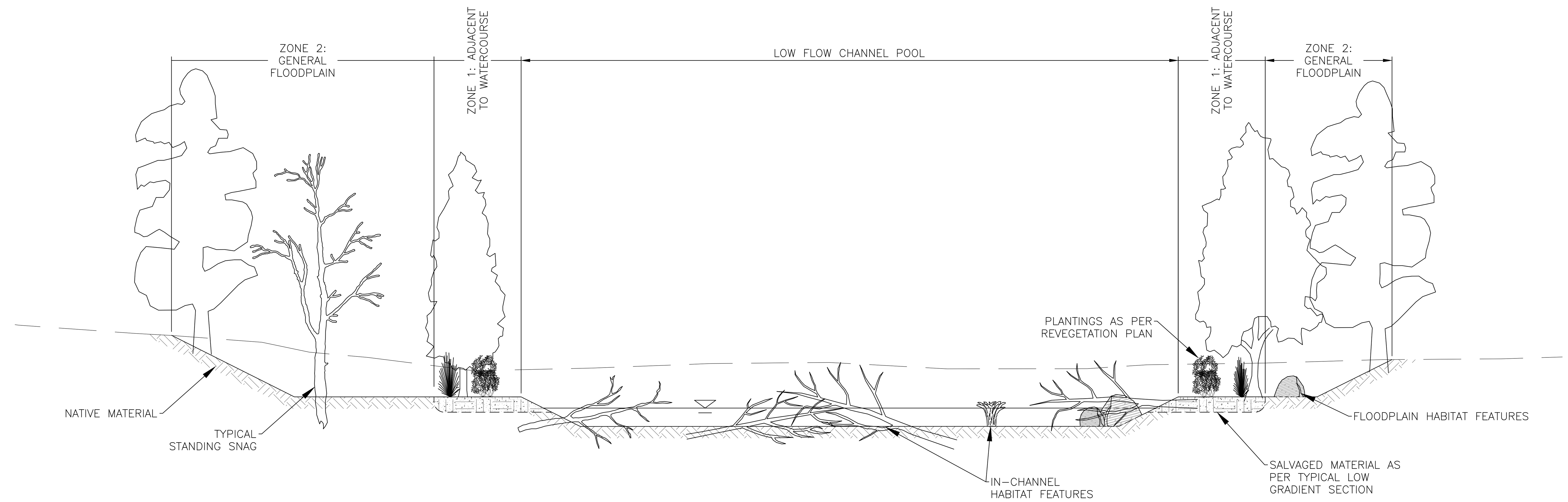
Wood Dwg. No.: 100264-846-DW00-PLN-2016 | Client Dwg. No.: 846-C-2016

Scale: NOT TO SCALE | Drawn By: CWM | Drawing No. WRC1-T-1

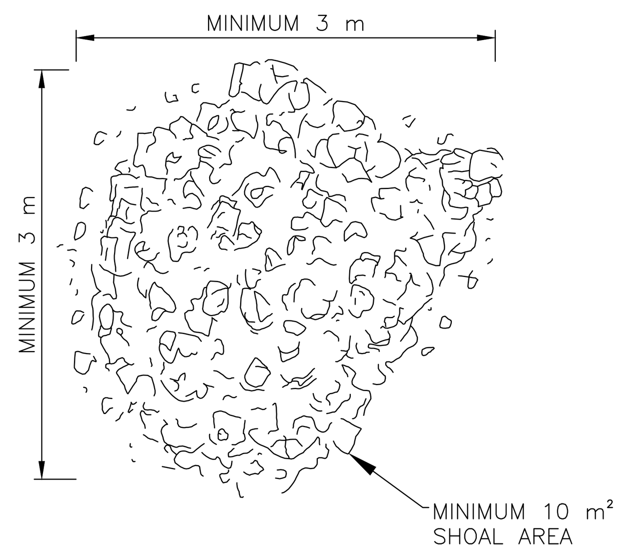
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH



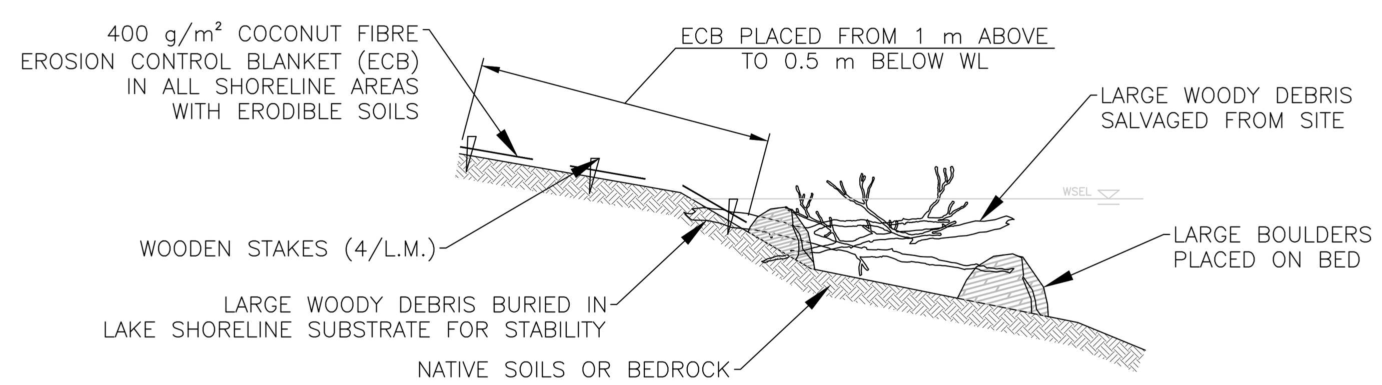
WRC1 TYPICAL HABITAT REVETMENT



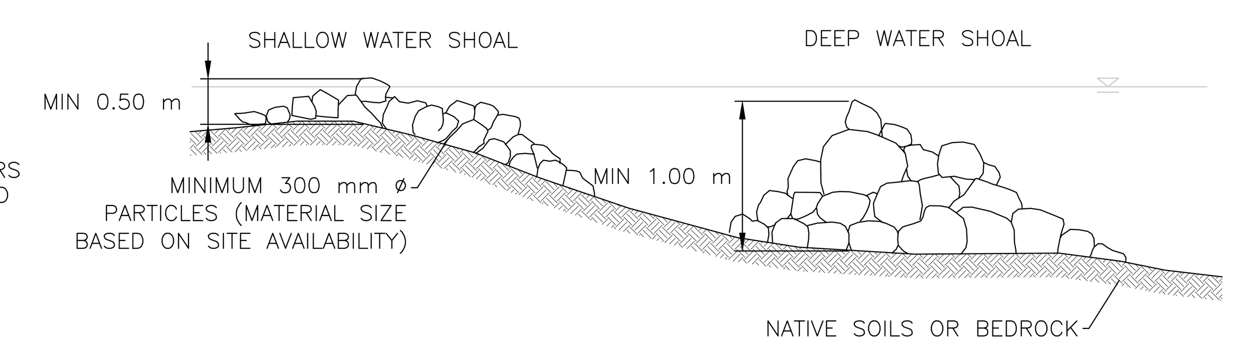
WRC1 VEGETATED LG POOL AND VALLEY TYPICAL



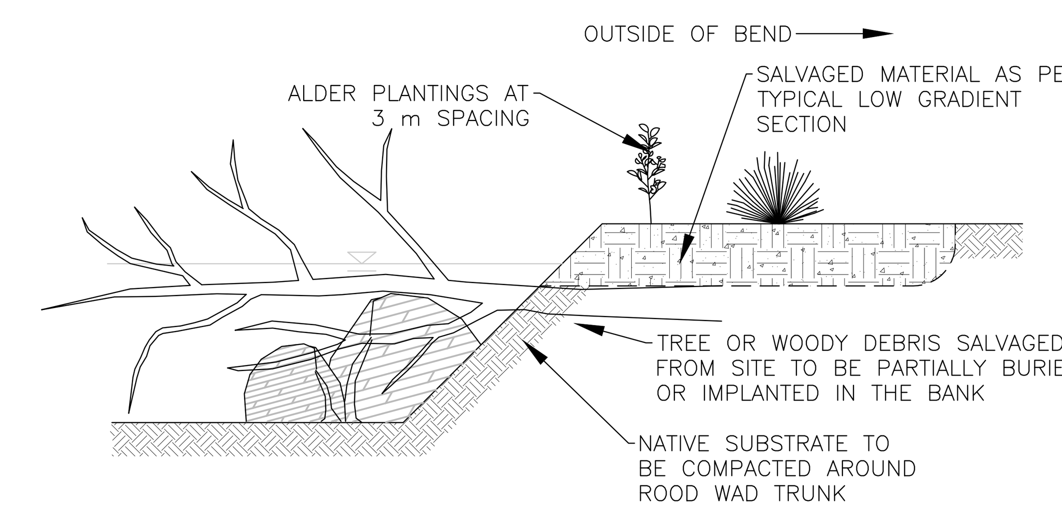
TYPICAL SHOAL PLAN



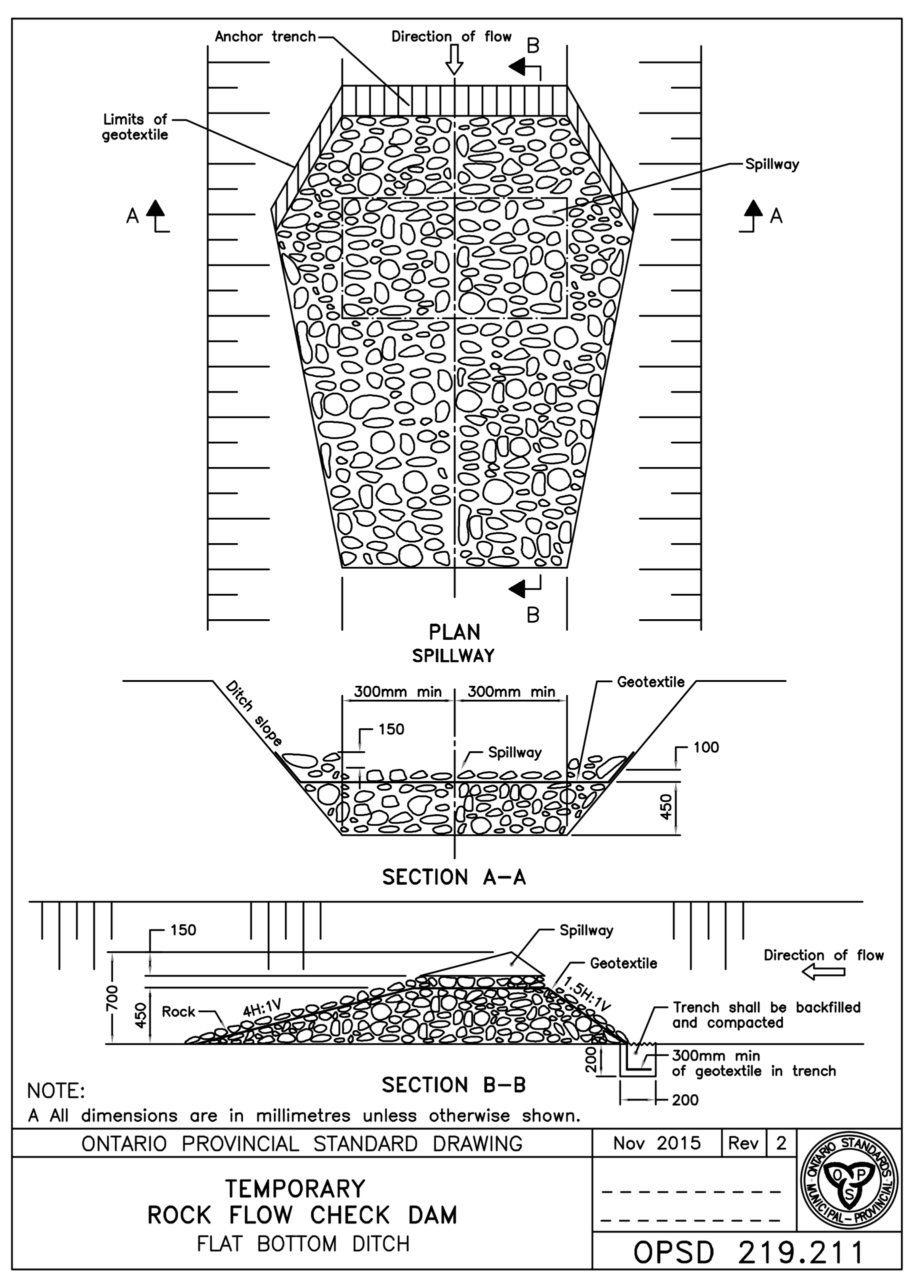
WRC1 TYPICAL NEAR SHORE HABITAT AND EROSION PROTECTION

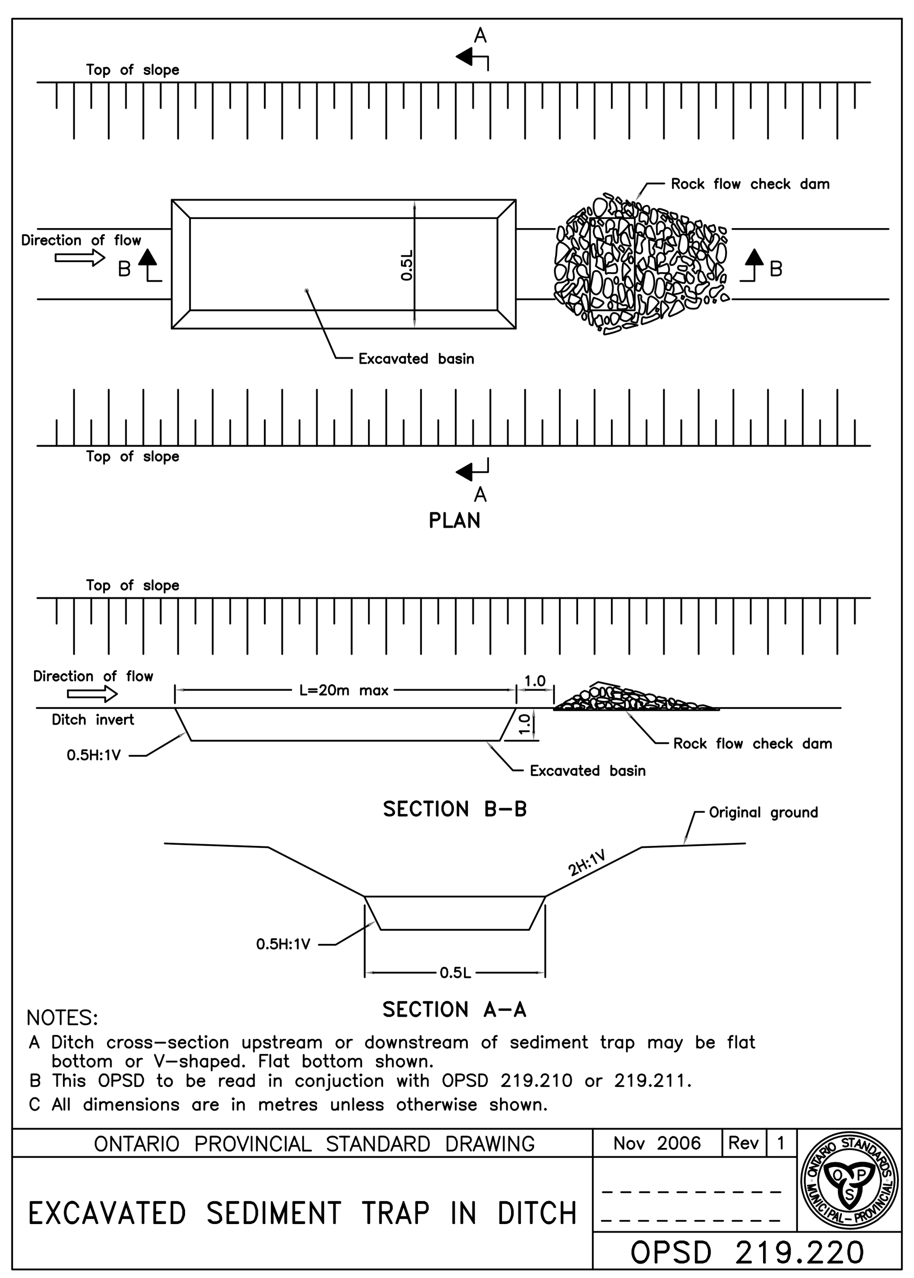


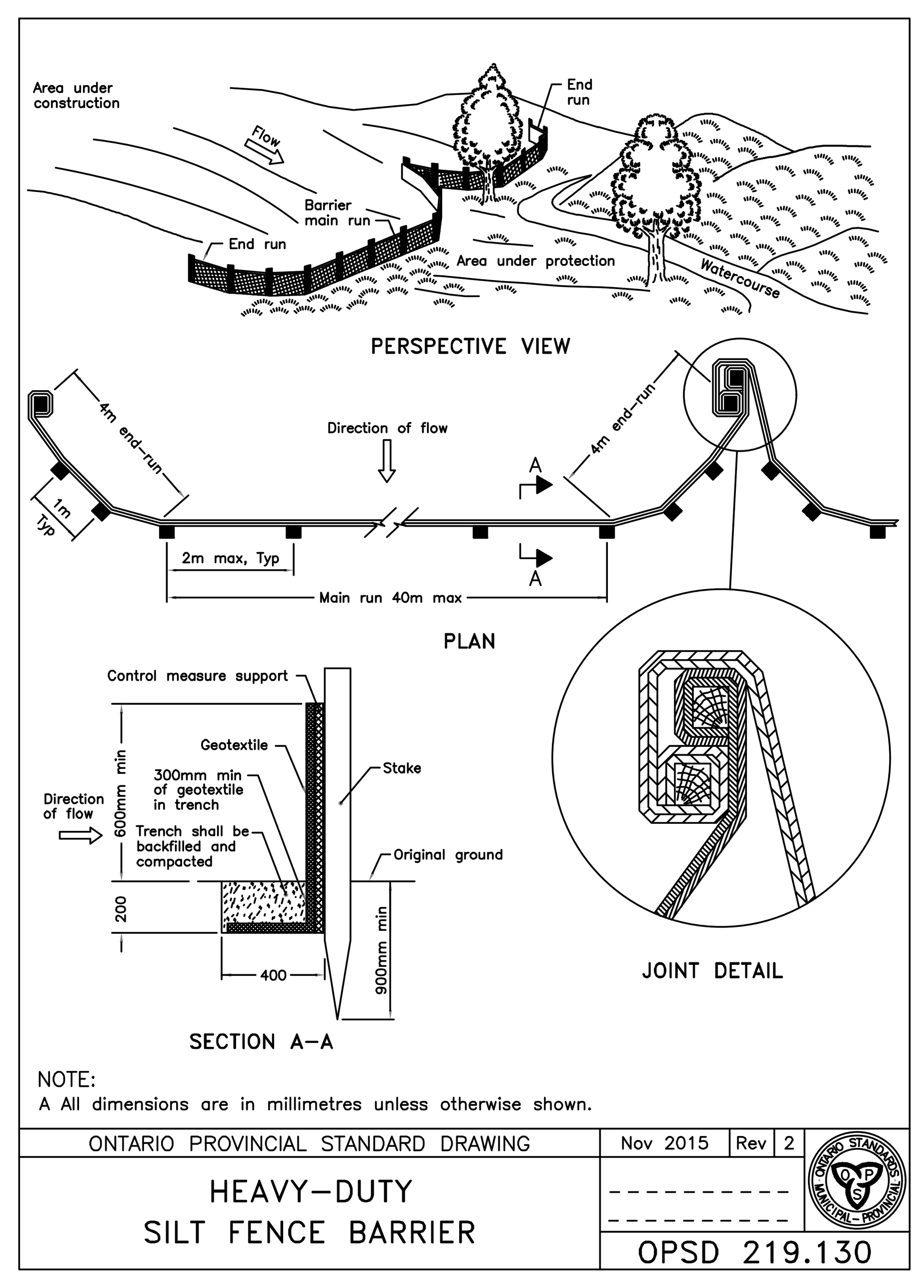
WRC1 TYPICAL SHOAL SECTIONS

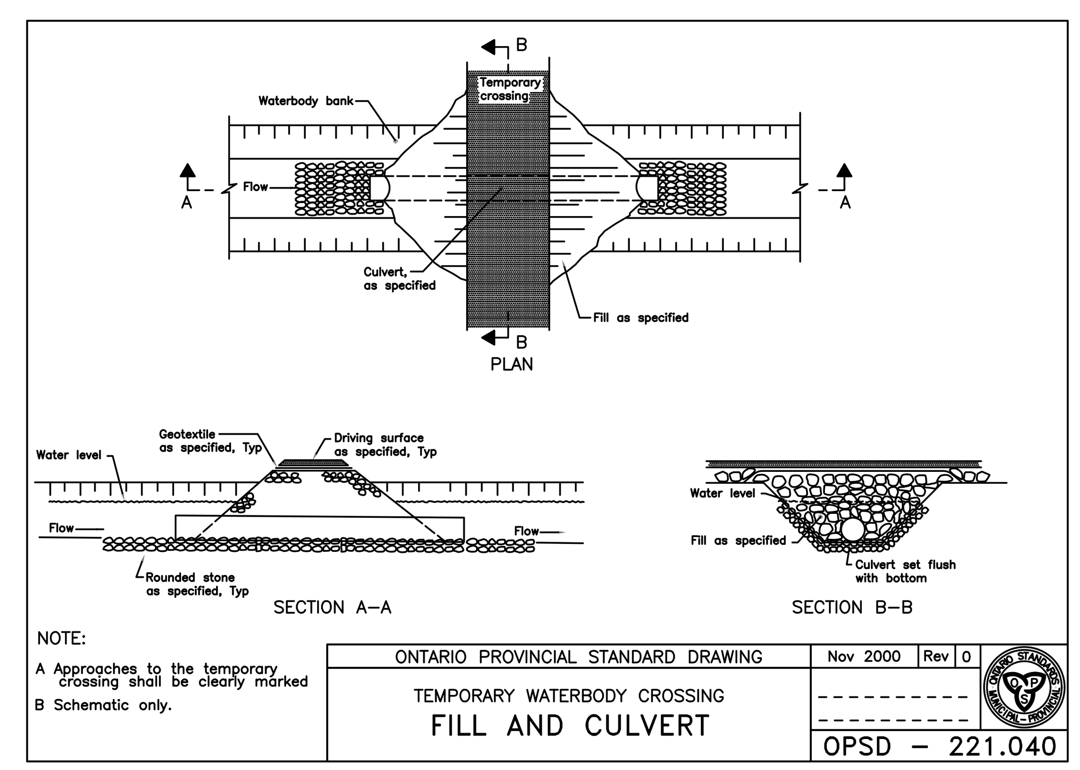


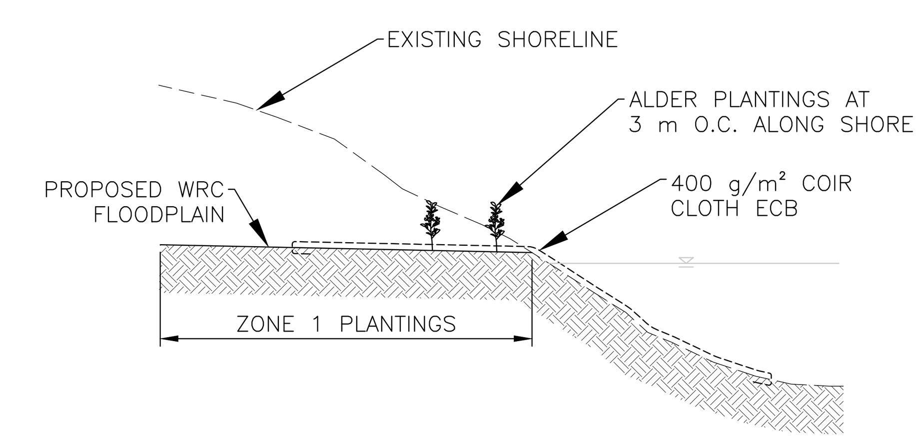
WRC1 TYPICAL FLOW DEFLECTOR











WRC1-CONFLUENCE STABILIZATION

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LEGEND

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PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
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VERTICAL DATUM:
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SCALES

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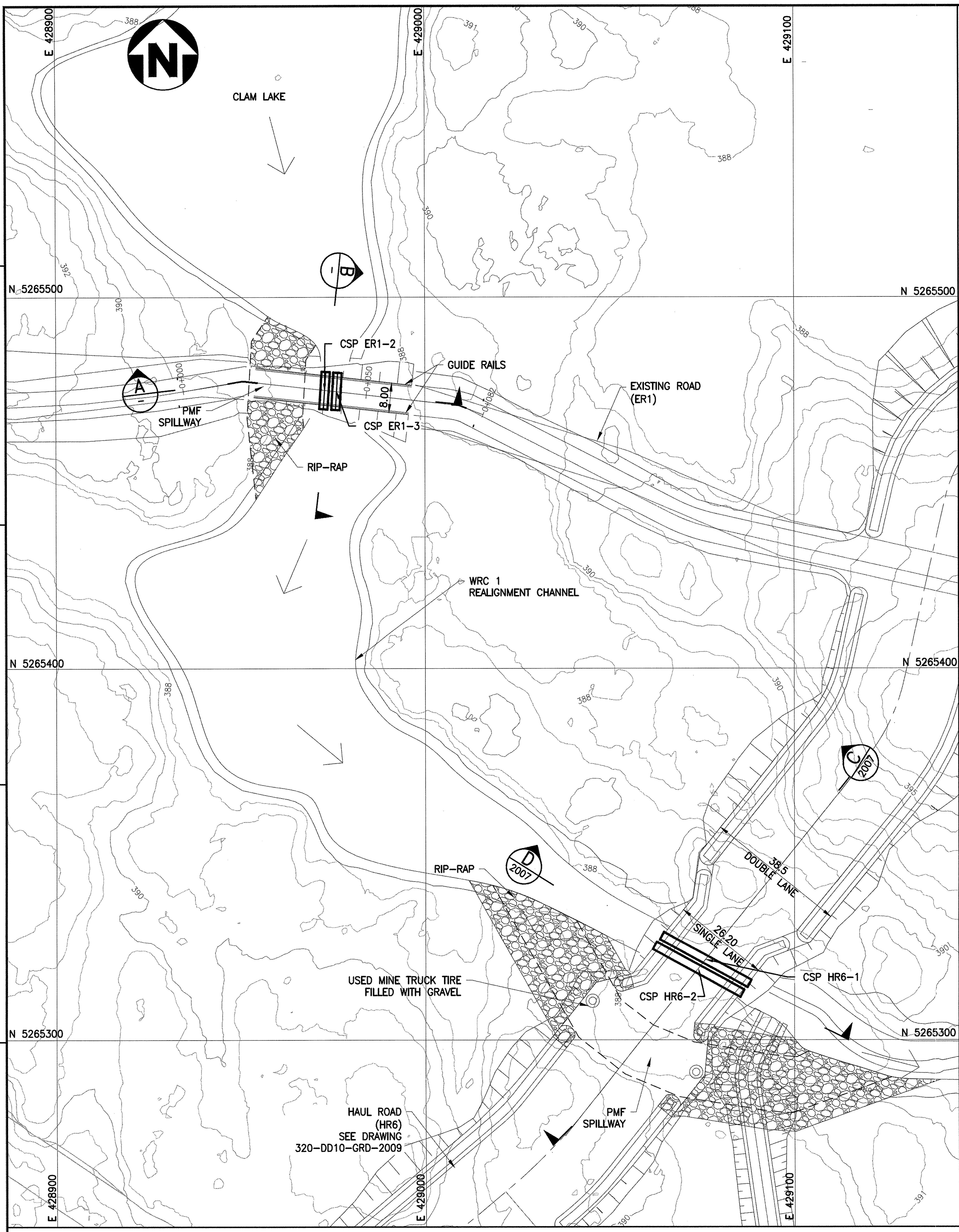
IAMGOLD COTE MINE - WRC1
TYPICAL DETAILS

Wood Dwg. No.: 100264-846-DW00-PLN-2017
Client Dwg. No.: 846-C-2017

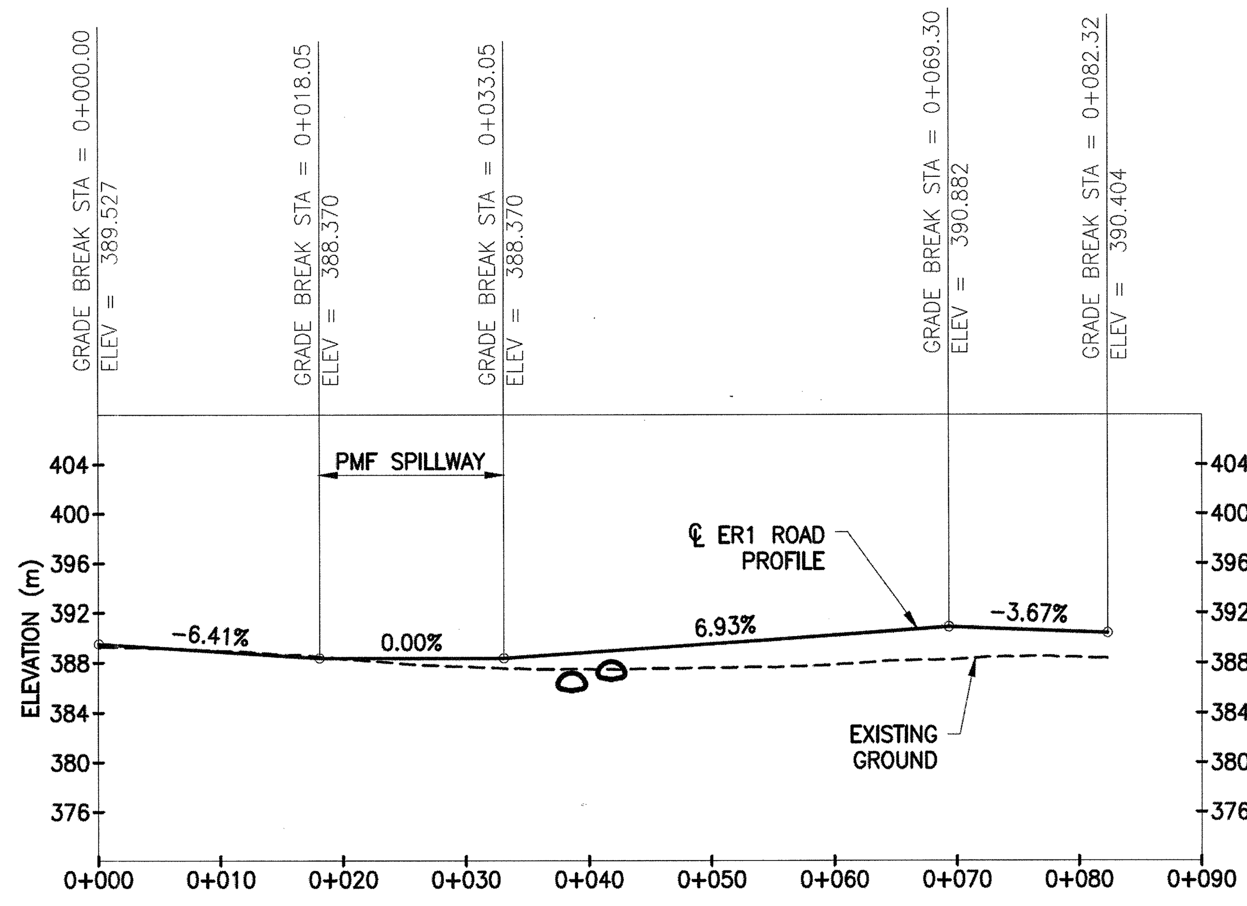
Scale: NOT TO SCALE | Drawn By: CWM | Drawing No. WRC1-T-2
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

WRC1 CULVERT
DESIGN DRAWINGS



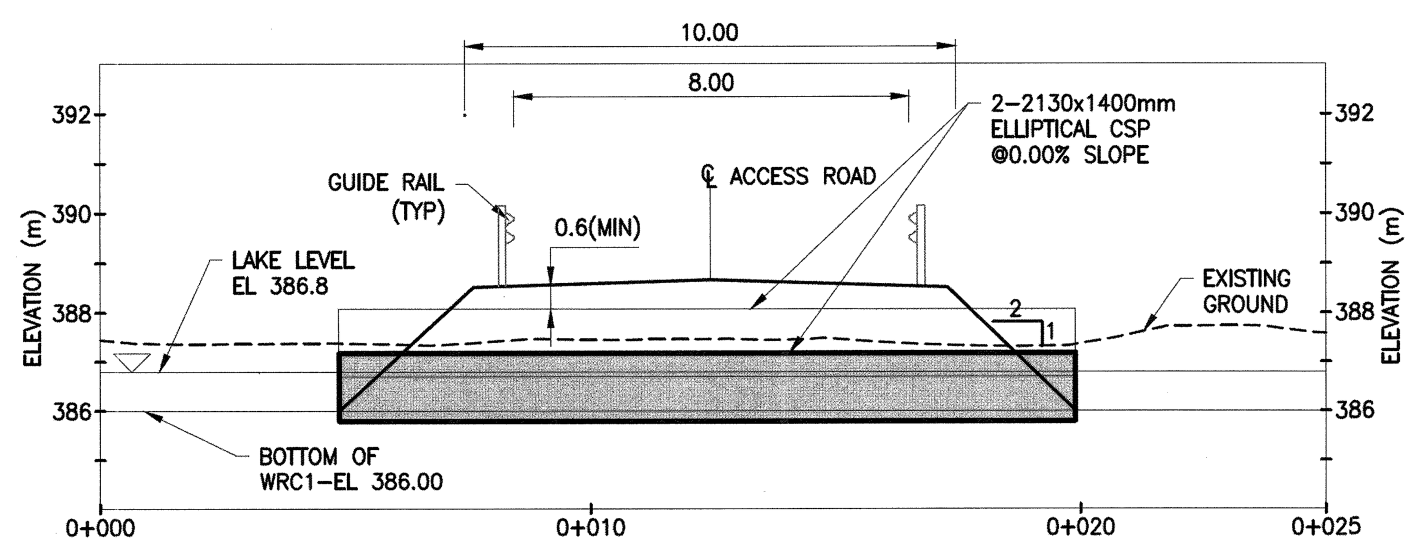
CROSSING AT WRC1 PLAN

1:750



SECTION A

1:500



SECTION B

1:125

CULVERT TABLE				
NAME	UPSTREAM INVERT	DOWNSTREAM INVERT	LENGTH	SLOPE
CSP ER1-2	385.80	385.80	10.0 m	0.00%
CSP ER1-3	386.70	386.70	10.0 m	0.00%
CSP HR6-1	386.70	386.70	27.0 m	0.00%
CSP HR6-2	385.80	385.80	27.0 m	0.00%

SEDIMENTATION CONTROL:

1. ALL WORK TO BE CONDUCTED IN ISOLATION FROM FLOWING WATERS WITH FLOW BY-PASS SYSTEMS AND APPROPRIATE CONTROLS TO PREVENT SEDIMENT FROM ENTERING ANY ACTIVE WATERCOURSE.
2. CONTRACTOR IS REQUIRED TO DEVELOP A SITE-SPECIFIC WATER MANAGEMENT AND EROSION SEDIMENTATION CONTROL (ESC) PLAN FOR APPROVAL BY THE ENVIRONMENTAL COORDINATOR AND AREA CONSTRUCTION MANAGER PRIOR TO COMMENCEMENT OF WORK.
3. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES TO BE DEVELOPED IN ACCORDANCE WITH THE OVERALL PROJECT E&S PLAN. MEASURES TO BE APPROVED PRIOR BY THE ENGINEER PRIOR TO INSTALLATION. WORK SEQUENCE SHALL BE AS FOLLOWS: INSTALL EROSION AND SEDIMENT CONTROL MEASURES, CONSTRUCT CULVERT AND INLET/OUTLET TREATMENTS, RESTORE FLOW THROUGH CULVERT, AND REMOVE EROSION AND SEDIMENT CONTROL MEASURES ONCE THE AREA IS STABILIZED.
4. EROSION AND SEDIMENT CONTROL MEASURES WILL BE MAINTAINED THROUGHOUT INSTALLATION.
5. WORK MAY BE CONDUCTED IN WINTERTIME. CONTRACTOR TO ADJUST MEASURES AS REQUIRED. CONTRACTOR MUST WORK WITH THE ENGINEER TO DEVELOP SUITABLE ESC PLAN.

RIP-RAP:

1. RIP-RAP SHALL BE AS PER OPSS.MUNI.1004.
2. GEOTEXTILE SHALL BE NON-WOVEN, CLASS II CONFORMING TO OPSS 1860, WITH AN FOS OF 75 – 150 µm.

GENERAL NOTES:

1. ALL WORK AND MATERIALS SHALL CONFORM TO CURRENT ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND STANDARDS.
2. ALL DIMENSIONS, ELEVATIONS AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT" AND REGULATIONS FOR CONSTRUCTION PROJECTS.
4. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL CONFIRM THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED PRIOR TO ANY CONSTRUCTION. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER BEFORE PROCEEDING.
6. GUIDE RAIL SHALL BE AS PER OPSD 912.145 C/W ENERGY ATTENUATORS AS PER OPSD 922.180 AT ALL TERMINAL POINTS AND SNOW PLOW MARKERS POSTS,(BOTH ENDS).

CULVERTS:

1. CULVERT DIAMETER AND LENGTHS SHALL BE AS NOTED ON THE DRAWINGS.
2. CULVERT SHALL BE SINGLE RADIUS ARCH, STRUCTURAL PLATE CORRUGATED STEEL PILE,GALVANIZED, 8.03m SPAN BY ATLANTIC INDUSTRIES LIMITED OR APPROVED EQUIVALENT.
3. FOUNDATION AND STRUCTURAL DESIGN BY MANUFACTURER. DESIGN TO INCLUDE STAMPED & SEALED ENGINEERING DRAWINGS, CONSTRUCTION METHODS, BACKFILLING PROCEDURES AND ETC.
4. DESIGN VEHICLE FOR HR4 & HR6 SHALL BE A FULLY LOADED CATERPILLAR 793F HAUL TRUCK OR SIMILAR SIZED TRUCK. LOADING FOR ER1 SHALL BE CL-625-ONT HIGHWAY LOADING.

ABBREVIATIONS:

m	– METER	N	– NORTHING
TYP	– TYPICAL	E	– EASTING
EL	– ELEVATION	℄	– CENTRELINE
INV.	– INVERT	ø	– DIAMETER
MIN	– MINIMUM	µm	– MICRO METER
C/W	– COMPLETE WITH		
H:V	– HORIZONTAL : VERTICAL		
D_{50}	– MEDIUM VALUE OF PARTICLE SIZE DISTRIBUTION		
CSP	– CORRUGATED STEEL PIPE		
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OPSS	– ONTARIO PROVINCIAL STANDARD SPEC.		
SPMDD	– STANDARD PROCTOR MAXIMUM DRY DENSITY		
HR	– HAUL ROAD		
ER	– EXISTING ROAD		

LEGEND:

- 460 — EXISTING CONTOUR
- DIRECTION OF FLOW
- 460.00 — PROPOSED GROUND ELEVATION
- X:1 (H:V) SLOPE
- RIP-RAP
- CULVERT EMBEDMENT
- COMPACTED GRANULAR 'A' BEDDING
- BOREHOLE
- DRILL HOLE

0m 5 10 15 20 25
1:500

0m 10 20 30 40
1:750

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP
0	10MAY19	ISSUED FOR CONSTRUCTION	RS	NA	JJ	PH
B	29APR19	ISSUED FOR REVIEW	RS	NA	JJ	PH
A	05APR19	ISSUED FOR SQUAD CHECK	RS	NA	JJ	PH

REF	NUMBER	TITLE
2	320-DD10-GRD-2009	PLAN & PROFILE-HAUL ROADS HR6
1	320-DD10-GRD-2007	HAUL ROADS-WRC1 CROSSING

STAMP/SEAL

LICENSED PROFESSIONAL ENGINEER
J. E. J. JACKSON
5/10/19
PROVINCE OF ONTARIO

APPROVED FOR ______

CLIENT PROJECT MGR | DEPARTMENT MGR | PROJECT MGR

PROJECT PHASE: EPCM

PROJECT NO.: 100264

SCALE: AS SHOWN

	BY	DDMMMYY
DES	JJ	05MAR19
DRN	RS	05MAR19
CHK	NA	05MAR19
APP	PH	05MAR19

CÔTÉ GOLD

SUBJECT: CIVIL
CULVERTS AT WRC1 CROSSINGS
PLAN AND SECTIONS

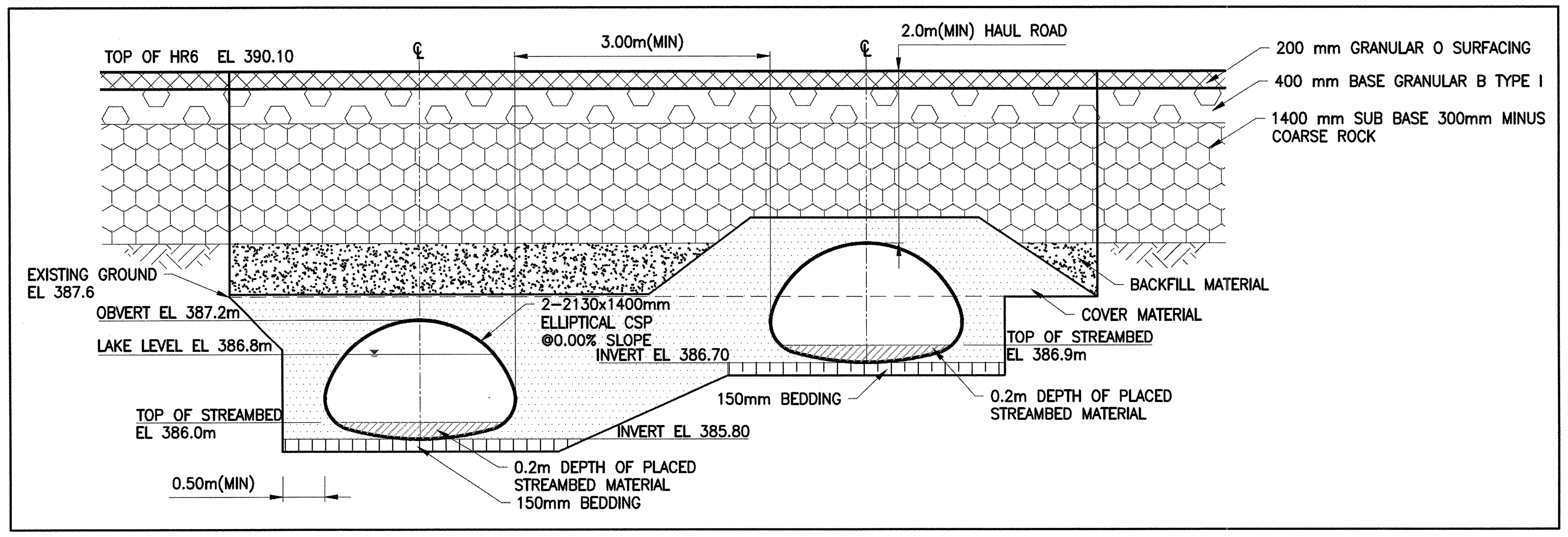
wood.

AREA 500 — CÔTÉ GOLD PROJECT CACO-A

CLIENT DWG NO. 320-C-2006 — REV 0

DRAWING NO. 100264-320-DD10-GRD-2006 — REV 0

SAVED: 10-May-19 10:34 AM PLOTTED: 10-May-19 10:37 AM USER: SAFARI, REZA



CULVERTS HR6–1 & HR6–2 SECTION
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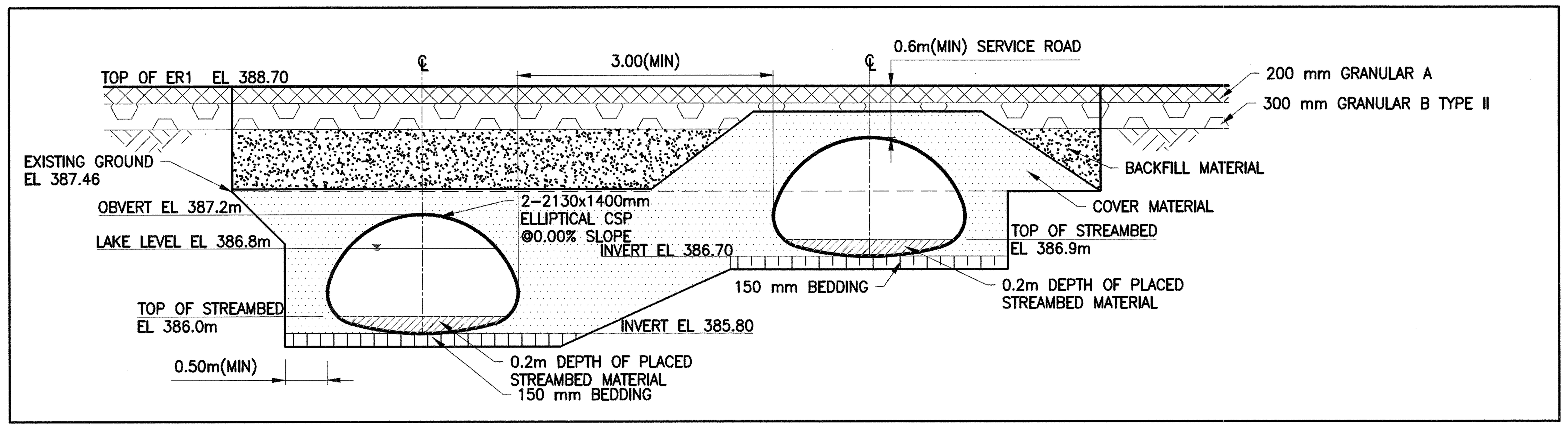

CULVERTS ER1–2 & ER1–3 SECTION
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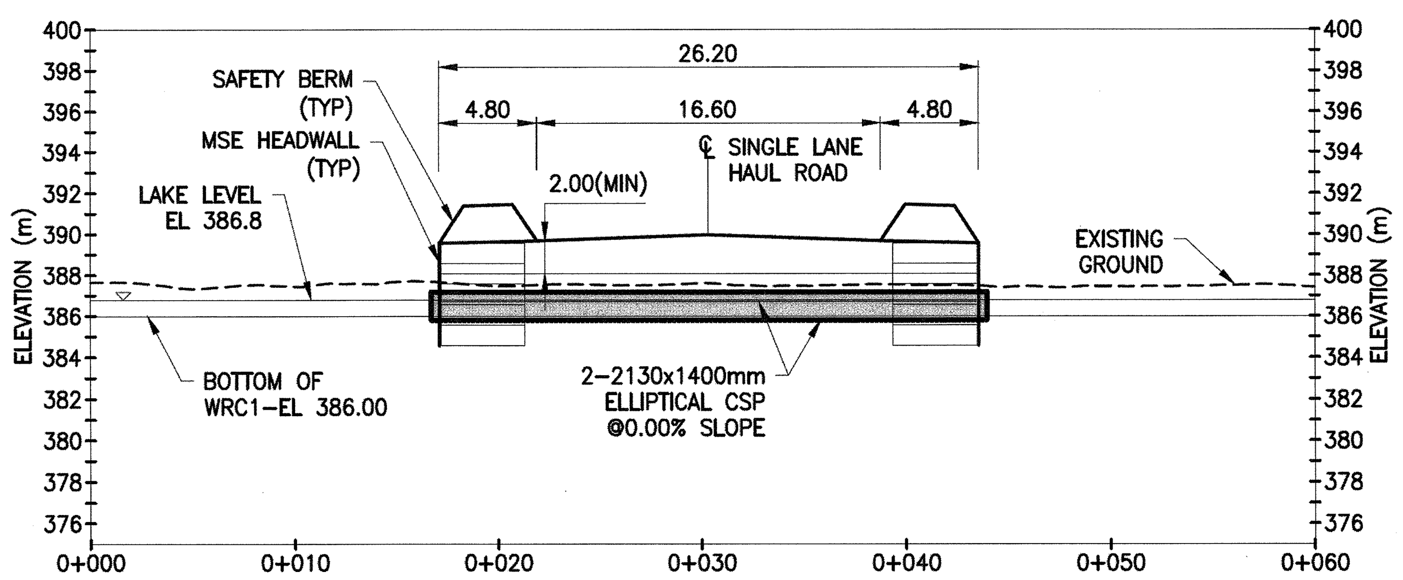

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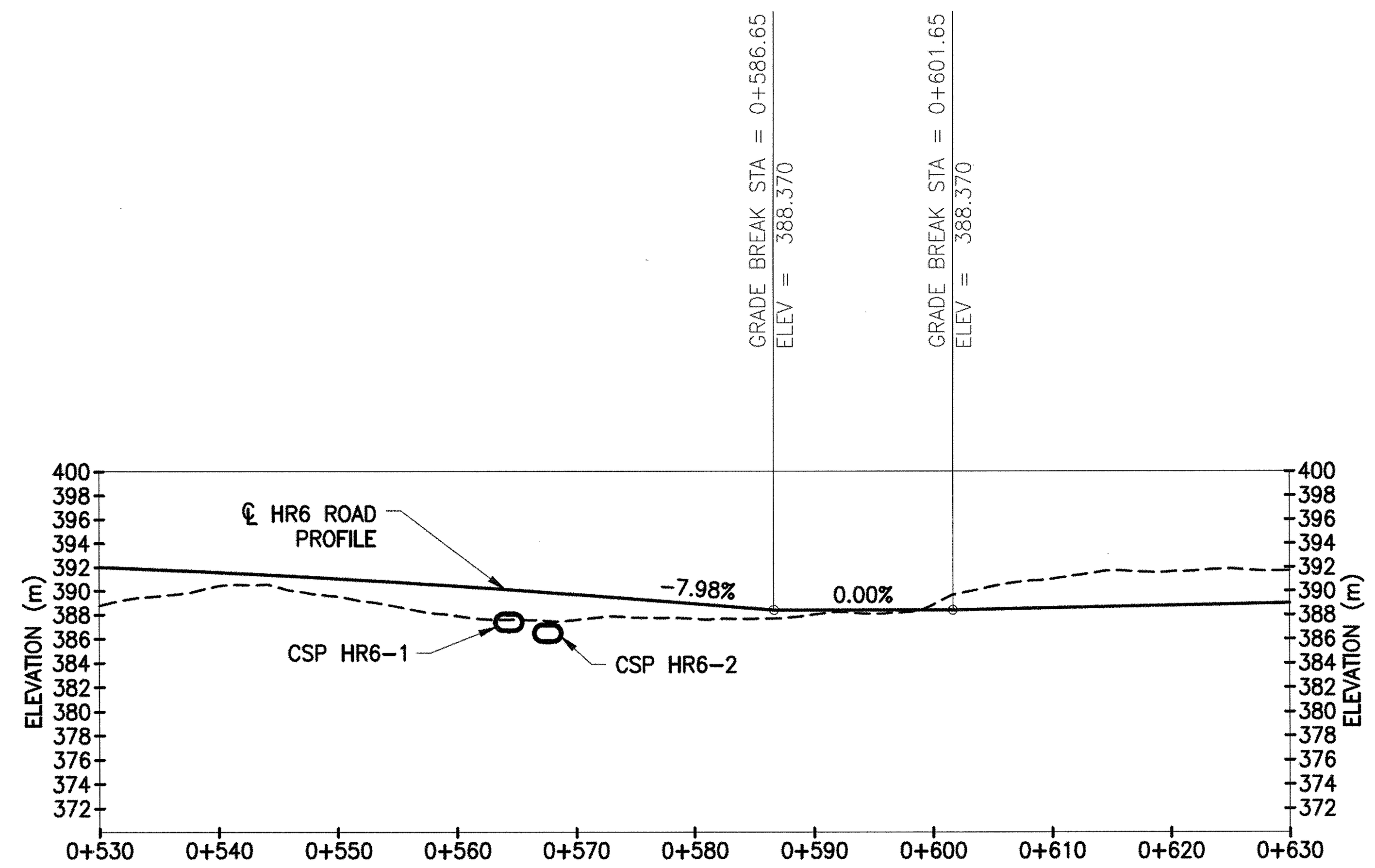

SECTION C 2006
1:500

Om 3 6 9 12 15
1:300

Om 5 10 15 20 25
1:500

Om 0.5 1 1.5 2 2.5
1:50

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LEGEND:

460	EXISTING CONTOUR
	DIRECTION OF FLOW
460.00	PROPOSED GROUND ELEVATION
	X:1 (H:V) SLOPE
	RIP–RAP
	CULVERT EMBEDMENT
	COMPACTED GRANULAR 'A' BEDDING
	BOREHOLE
	DRILL HOLE

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
0	10MAY19	ISSUED FOR CONSTRUCTION	RS	NA		PH		
B	29APR19	ISSUED FOR REVIEW	RS	NA	JJ	PH		
A	05APR19	ISSUED FOR SQUAD CHECK	RS	NA	JJ	PH		

REF	NUMBER	TITLE
2	320-DD10-GRD-2009	PLAN & PROFILE-HAUL ROADS HR6
1	320-DD10-GRD-2006	HAUL ROADSS-WRC1 CROSSING

REFERENCES

STAMP/SEAL
LICENSED PROFESSIONAL ENGINEER
J. E. J. JACKSON
5/10/19
PROVINCE OF ONTARIO

APPROVED FOR ________
CLIENT PROJECT MGR | DEPARTMENT MGR | PROJECT MGR

PROJECT PHASE: EPCM

PROJECT NO.: 100264

SCALE: AS SHOWN

	BY	DDMMMYY
DES	JJ	05MAR19
DRN	RS	05MAR19
CHK	NA	05MAR19
APP	PH	05MAR19

SUBJECT
CIVIL
CULVERTS AT WRC1 CROSSINGS
SECTIONS

CÔTÉ GOLD

wood.

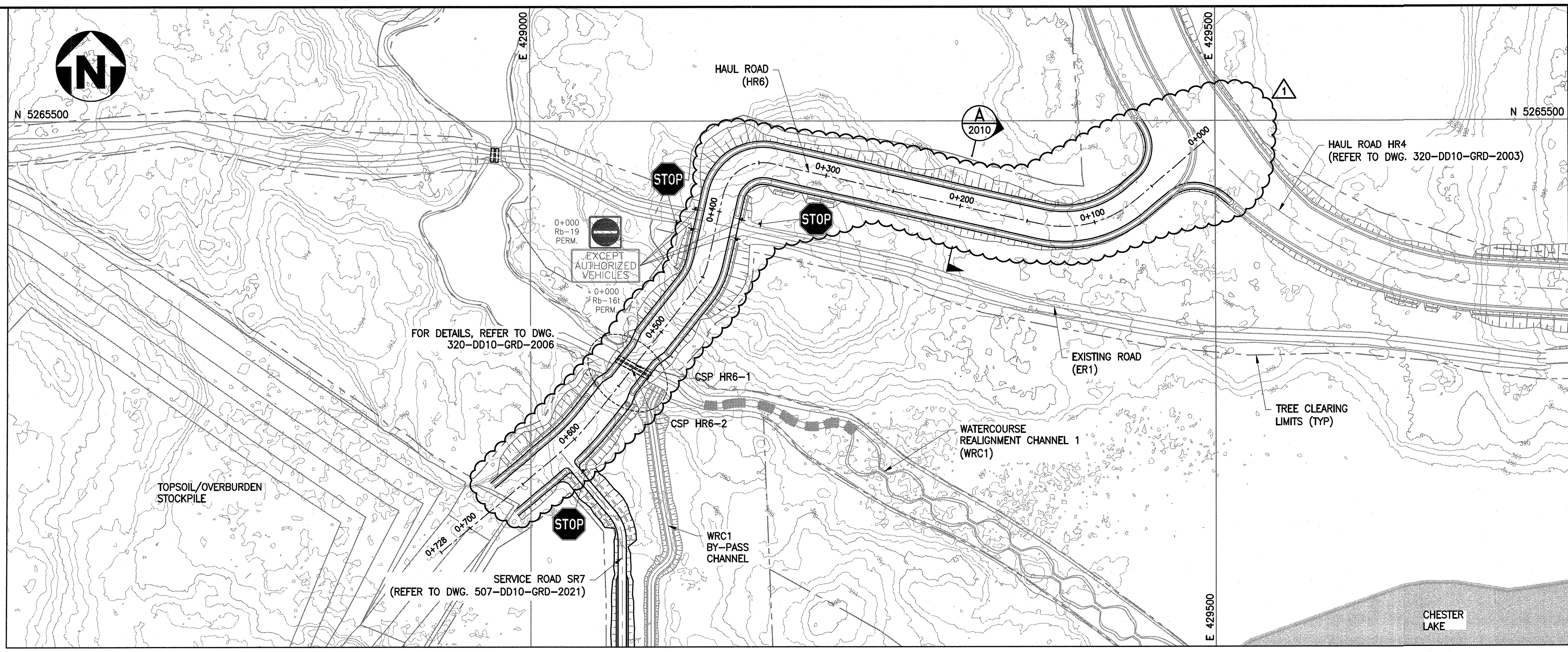
AREA 500 — CÔTÉ GOLD PROJECT CACO-A

CLIENT DWG NO. 320-C-2007 — 0

DRAWING NO. 100264-320-DD10-GRD-2007 — REV 0

CAD FILE: P:\CAD\CIVIL\100264-320-DD10-GRD-2006.DWG

SAVED: 10-May-19 10:34 AM PLOTTED: 10-May-19 10:39 AM USER: SAFARI, REZA



PLAN
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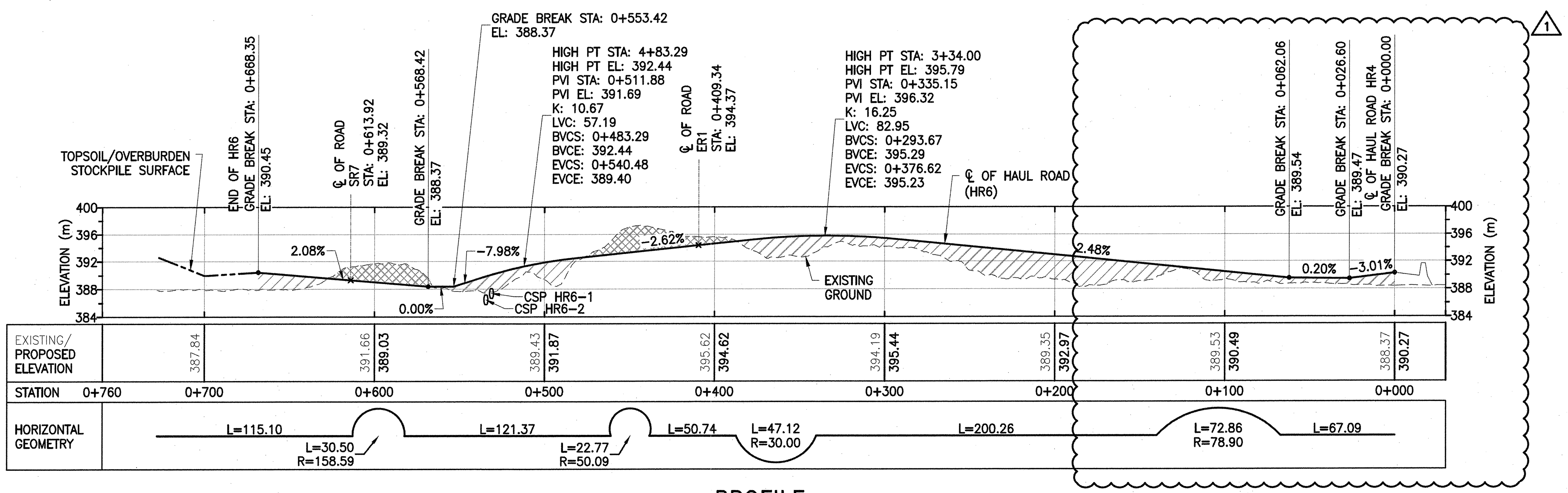

PROFILE
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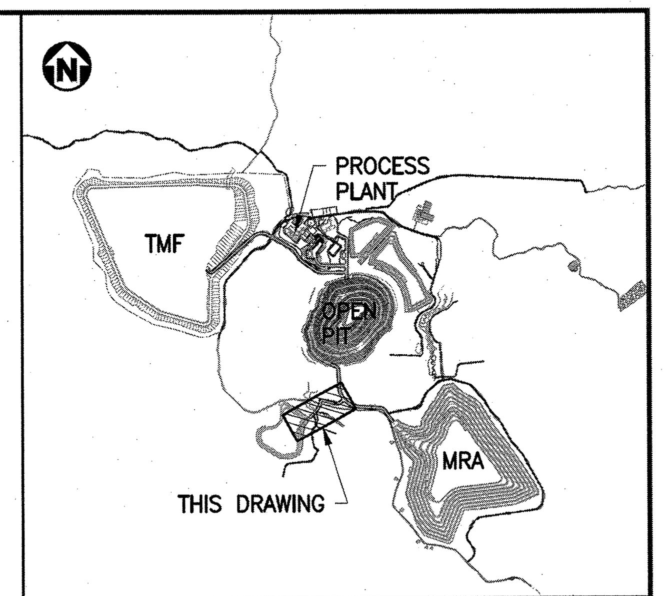


KEY PLAN
NTS

NOTES:

1. FOR KEY PLAN, GENERAL NOTES, ABBREVIATIONS AND LEGEND, REFER TO DRAWING: 100264-500-DD10-GRD-2000.
2. TERRAIN MAPPING PROVIDED BY IAMGOLD CORP. (2016)
3. CONTOUR INTERVAL IS 1m.

LEGEND:

- LIDAR SURVEY CONTOUR
- PROPOSED CULVERT
- CUT MATERIAL
- FILL MATERIAL
- TREE CLEARING LIMITS
- LAKE/POND

1:500
1:2000

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
1	19FEB20	RE-ISSUED FOR CONSTRUCTION	AR	NA	PH			
0	15NOV19	ISSUED FOR CONSTRUCTION	AR	NA	JJ	PH		
B	10MAY19	ISSUED FOR REVIEW	AR	NA	JJ	PH		
A	30APR19	ISSUED FOR SQUAD CHECK	AR	NA	JJ			

REF	NUMBER	TITLE
3	320-DD10-GRD-2006	CULVERTS AT WRC1 CROSSINGS - PLAN & SECTIONS
2	320-DD10-GRD-2003	PLAN & PROFILE - HAUL ROAD HR4
1	500-DD10-GRD-2000	KEY PLAN - SITE ROADS

REFERENCES

STAMP/SEAL: LICENSED PROFESSIONAL ENGINEER N. FARZANEHAZAD 100125950 19 Feb 20 PROVINCE OF ONTARIO

APPROVED FOR ________
CLIENT PROJECT MGR | DEPARTMENT MGR | PROJECT MGR

PROJECT PHASE: EPCM

PROJECT NO.		BY	DDMMMYY
100264	DES	JJ	23APR19
SCALE	DRN	AR	23APR19
AS SHOWN	CHK	NA	23APR19
	APP	PH	23APR19

SUBJECT: CIVIL PLAN & PROFILE HAUL ROAD HR6 1 OF 2

CÔTÉ GOLD

wood.

AREA 320 — CÔTÉ GOLD PROJECT CACO-A
CLIENT DWG NO. 320-C-2009 — 1
DRAWING NO. 100264-320-DD10-GRD-2009 — REV 1

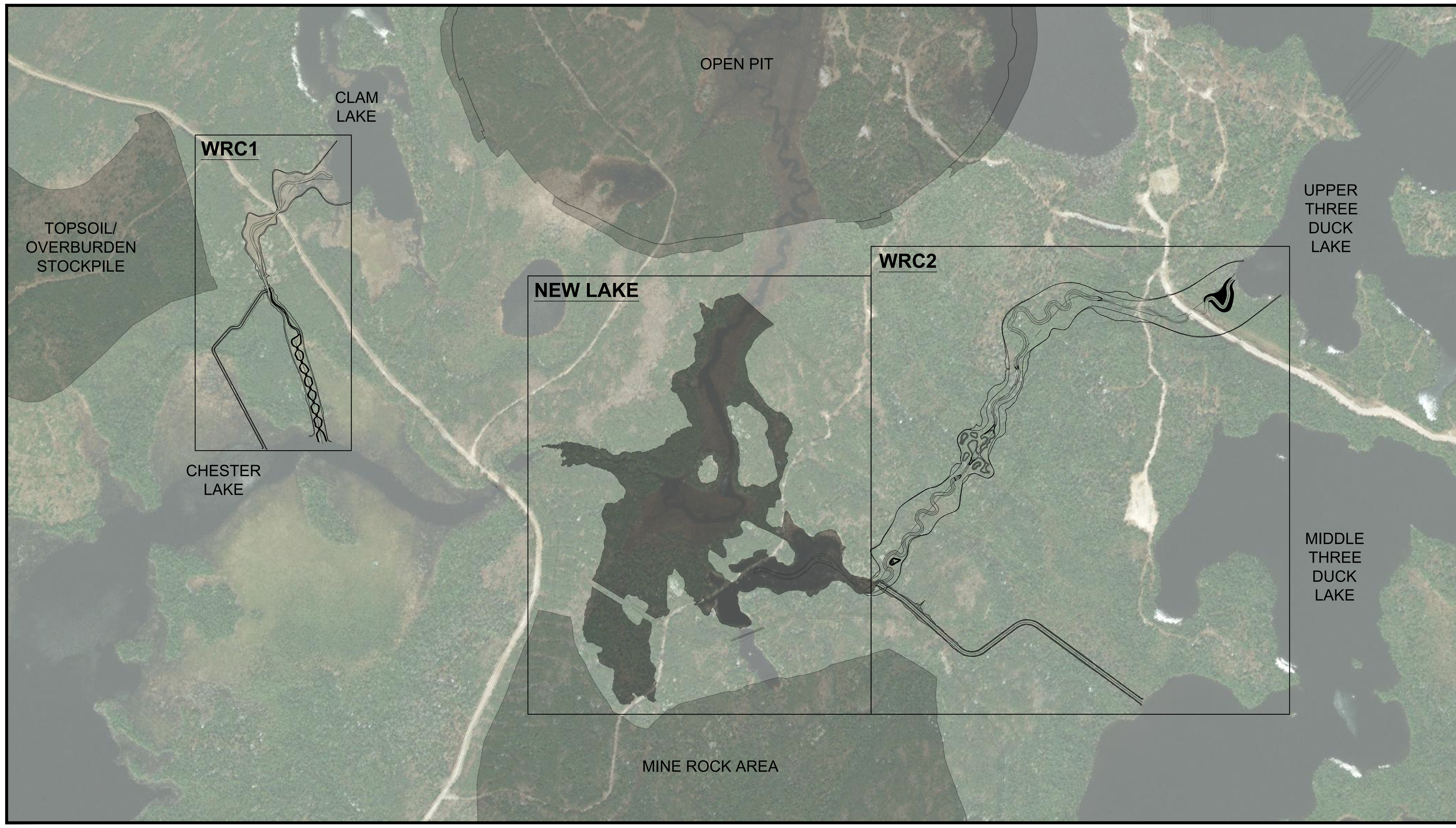
SAVED: 19-Feb-20 10:33 AM PLOTTED: 19-Feb-20 10:49 AM USER: RODRIGUEZ, ACHILLES

WRC2
DESIGN DRAWINGS

IAMGOLD CÔTÉ MINE

WATERCOURSE REALIGNMENT CHANNEL

WRC2



NO.	DESCRIPTION
S - 1	STAGING AND ESC - PHASE 1
S - 2	STAGING AND ESC - PHASE 2
P - 1	PLAN AND PROFILE [0+000 - 0+400]
P - 2	PLAN AND PROFILE [0+400 - 0+800]
P - 3	PLAN AND PROFILE [0+800 - 1+200]
P - 4	PLAN AND PROFILE [1+200 - 1+600]
P - 5	PLAN AND PROFILE [1+600 - 1+860]
C - 1	SECTIONS [5+025 - 5+150]
C - 2	SECTIONS [5+175 - 5+300]
C - 3	SECTIONS [5+325 - 5+450]
C - 4	SECTIONS [5+475 - 5+575]
C - 5	SECTIONS [5+600 - 5+700]
C - 6	SECTIONS [5+725 - 5+875]
C - 7	SECTIONS [5+900 - 6+050]
C - 8	SECTIONS [6+075 - 6+225]
C - 9	SECTIONS [6+250 - 6+400]
R - 1	REVEGETATION AND RESTITUTION [0+000 - 0+400]
R - 2	REVEGETATION AND RESTITUTION [0+400 - 0+800]
R- 3	REVEGETATION AND RESTITUTION [0+800 - 1+200]
R - 4	REVEGETATION AND RESTITUTION [1+200 - 1+600]
R - 5	REVEGETATION AND RESTITUTION [1+600 - 1+860]
B - 1	BY-PASS CHANNEL [9+000 - 9+425]
B - 2	BY-PASS CHANNEL [9+425 - END]
B - 3	BY-PASS CHANNEL SECTIONS
T - 1	TYPICAL DETAILS
T - 2	TYPICAL DETAILS

GeoProcess
RESEARCH ASSOCIATES

Knowledge
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Consulting

PO Box 65506
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www.geoprocessresearch.com

SCALES	No.	REVISIONS	DATE	INITIAL
0 250 500	C	Issued for DFO Review	2019-02-04	JPH
	D	Revised as per DFO Comments	2019-07-10	JPH
	E	Issued for Construction	2019-08-26	JPH
	F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2

Wood Dwg. No.: 100264-846-DW00-PLN-2018	Client Dwg. No.: 846-C-2018	
Scale: 1:7500	Drawn By: CWM	Drawing No. WRC2-KEY
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

EROSION AND SEDIMENT CONTROL

GENERAL:

ESC-1. ALL IN-WATER AQUATIC HABITAT RESTORATION TO BE SUPERVISED BY CONSTRUCTION SUPERVISOR HAVING EXPERIENCE IN NATURAL CHANNEL CONSTRUCTION TECHNIQUES.

ESC-2. QUANTITIES OF MATERIALS FOR SALVAGE AND DISPOSAL ARE ESTIMATES ONLY AND THE CONTRACTOR IS RESPONSIBLE TO REVIEW SITE AND VERIFY QUANTITIES IN SITU.

ESC-3. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.

ESC-4. ALL ACTIVITIES ON SITE SHALL BE CONDUCTED IN A LOGICAL SEQUENCE TO MINIMIZE THE AREA OF BARE SOIL EXPOSED AT ANY ONE TIME; AND DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.

ESC-5. ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE ESC MEASURES.

ESC-6. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.

ESC-7. AT THE END OF EACH DAY, STABILIZE EXPOSED BANK SOILS. SUBJECT TO APPROVAL BY THE ENVIRONMENTAL MONITOR.

ESC-8. THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. IN ADDITION TO THE DETAILS LISTED BELOW, THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.

ESC-9. THE PROPONENT/CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR WILL REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW, E.G., FUEL TANKS, PORTAPOTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIALS, ETC.

ESC-10. AN ENVIRONMENTAL MONITOR WILL INSPECT ALL ESC MEASURES AT REGULAR INTERVALS, INCLUDING FOLLOWING RAIN/SNOWMELT EVENT, DURING DEWATERING, RESTORATION AND IN OR NEAR- WATER WORKS.

ESC-11. STOCKPILED MATERIAL SHALL BE ISOLATED FROM THE WATERCOURSE AND VALLEY CORRIDOR WITHIN THE RECOMMENDED STAGING/STOCKPILE LOCATIONS AND CONTAINED WITHIN THE APPROPRIATE PERIMETER ESC.

ESC-12. ESC TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.

ESC-13. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE AMENDED AS SITE CONDITIONS WARRANT TO MINIMIZE SEDIMENT ENTERING THE WATERCOURSE OR LAKE. IF THE PRESCRIBED MEASURES ARE NOT EFFECTIVE IN PREVENTING SEDIMENTATION IN THE NATURAL SYSTEM THEN MITIGATION MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS.

DEWATERING:

ESC-14. THE SEDIMENT LADEN WATER WILL NOT BE ALLOWED TO DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG (OR APPROVED EQUIVALENT) IN THE FLOODPLAIN.

ESC-15. IN THE EVENT OF RAINFALL OR SEEPAGE INTO THE WORK SITE, ADDITIONAL DEWATERING MAY BE REQUIRED.

ESC-16. RECOMMENDED DEWATERING ARRANGEMENT: THE INLET PUMP HEAD IS TO BE COVERED WITH FILTER FABRIC OR CLEAR STONE. THE OUTLET PUMP HEAD IS TO DISCHARGE TO A SEDIMENT BAG OR BASIN. DISCHARGE FROM THE BAG IS TO BE RELEASED TO A VEGETATED LOCATION OR IF A VEGETATED LOCATION IS NOT AVAILABLE, A FLOW DISSIPATING STRUCTURE SHOULD BE PROVIDED THE SEDIMENT BAG SHOULD BE LOCATED AT LEAST 15M AWAY FROM THE WATERBODY. THE FINAL DEWATERING PLAN IS TO BE CONFIRMED BY THE ONSITE PROJECT ENGINEER AND ENVIRONMENTAL MONITOR.

SPILLS CONTROL NOTES:

ESC-17. ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.

ESC-18. IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
a. IMMEDIATELY NOTIFY THE APPROPRIATE FEDERAL, PROVINCIAL AND LOCAL GOVERNMENT MINISTRIES, DEPARTMENTS, AGENCIES AND AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH ALL CURRENT LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
b. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE, AND TAKE SUCH MEASURES AS THEY DEEM APPROPRIATE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
c. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, ALL TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.

CONTINGENCY FOR STORM EVENT:

ESC-19. IN THE EVENT OF A FORECASTED MAJOR STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE STREAM CORRIDOR WORKING AREA.

ENVIRONMENTAL COMPLIANCE:

ESC-20. AN ENVIRONMENTAL MONITOR WILL BE AVAILABLE ON SITE TO ENSURE THAT ACTIVITIES THAT COULD HAVE A NEGATIVE IMPACT TO THE NATURAL ENVIRONMENT ARE EFFECTIVELY MITIGATED. THE ENVIRONMENTAL MONITOR SHALL LIAISE WITH BOTH THE OWNER AND THE CONSTRUCTOR AND, IF NECESSARY, ENFORCEMENT OFFICERS.

WRC2 COMPLIANCE AND OVERSIGHT

THE FOLLOWING PERSONS WILL OVERSEE VARIOUS COMPONENTS OF CONSTRUCTION:
- ENVIRONMENTAL MONITOR: QUALIFIED PERSON EXPERIENCED IN ENVIRONMENTAL COMPLIANCE AND ESC MEASURES.
- CONSTRUCTION SUPERVISOR: QUALIFIED PERSON EXPERIENCED IN NATURAL CHANNEL DESIGN IMPLEMENTATION.
- PROJECT ENGINEER: QUALIFIED PERSON FROM THE EPCM TEAM

GENERAL STAGING NOTES:

G-1. NO WORK TO BE COMPLETED UNTIL THE UPSTREAM AND DOWNSTREAM CONTROLS HAVE BEEN INSTALLED.

G-2. CONSTRUCTION TO BE COMPLETED IN THE DRY. WORK PHASES WILL BE COMPLETED IN ISOLATION. A LONG TERM FLOW BY-PASS IS NOT PROPOSED. DEWATERING OF GROUNDWATER INFILTRATION AND RAINFALL IS REQUIRED, PER EROSION AND SEDIMENTATION CONTROL BEST MANAGEMENT PRACTICES.

G-3. ALL STAGING AND STOCKPILE AREAS ARE TO BE OUTSIDE OF THE PROPOSED CORRIDOR. EROSION AND SEDIMENT PERIMETER CONTROLS TO BE INSTALLED AROUND ALL STOCKPILES. LOCATIONS AND LIMITS OF THE STAGING AND STOCKPILING AREAS TO BE CONFIRMED BY THE CONSTRUCTION SUPERVISOR.

G-4. THE CONSTRUCTION OF ALL RIVER AND HABITAT FEATURES IS TO BE OVERSEEN BY THE CONSTRUCTION SUPERVISOR.

G-5. ALL DISTURBED AREAS ARE TO BE RESTORED TO EXISTING OR BETTER CONDITIONS AFTER THE COMPLETION OF CONSTRUCTION. DISTURBANCE TO THE SURROUNDING NATURAL AREAS IS TO BE MINIMIZED DURING CONSTRUCTION.

G-6. THE CHANNEL WORKS ARE TO BE UNDERTAKEN IN TWO (2) PHASES. STAGING AND SEQUENCING FOR EACH PHASE ARE PROVIDED.

G-7. FOLLOWING THE REVEGETATION, THE STREAM VALLEY CORRIDOR IS TO REMAIN DRY TO ALLOW FOR FOR VEGETATION TO ESTABLISH. DEWATERING OF THE CHANNEL (OF SURFACE RUNOFF AND GRONDWATER SEEPAGE) WILL BE REQUIRED DURING THIS PERIOD.

PHASE 1: CONSTRUCTION OF BY-PASS CHANNEL

P1-1. CLEAR ACCESS ALONG BYPASS CHANNEL CENTRELINE FROM NEW LAKE TO MIDDLE THREE DUCK LAKE.

P1-2. CONSTRUCT TEMPORARY ROCK FLOW CHECK DAMS AT UPSTREAM AND DOWNSTREAM LIMITS (OPSD 219.211). DIMENSIONS MAY VARY BASED ON SITE CONDITIONS.

P1-3. CONSTRUCT THE TEMPORARY SEEPAGE AND SEDIMENTATION POND AT THE DOWNSTREAM LIMIT OF THE BYPASS CHANNEL (OPSD 219.220). DIMENSIONS MAY VARY BASED ON SITE CONDITIONS.

P1-4. INSTALL DEWATERING PUMP AT SEEPAGE POND. SEEPAGE POND IS TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO MIDDLE THREE DUCKS LAKE.

P1-5. CONSTRUCT THE LOW FLOW CHANNEL WORKING FROM DOWNSTREAM TO UPSTREAM

P1-6. ENSURE LOW FLOW CHANNEL AND BANKS ARE STABILIZED.

P1-7. FULLY DEWATER TEMPORARY SEEPAGE POND. REMOVE EXCESS SEDIMENT. REMOVE TEMPORARY MATERIALS AND EQUIPMENT FROM THE BYPASS CHANNEL.

P1-8. INSTALL SEDIMENT CURTAIN TO ISOLATE BYPASS FROM MIDDLE THREE DUCK LAKE.

P1-9. REMOVE ROCK FLOW CHECK DAM IN INCREMENTAL LIFTS. ALLOW THE UPSTREAM LAKE LEVEL TO STABILIZE PRIOR TO INITIATING EXCAVATING THE NEXT LIFT.

P1-10. FOLLOWING THE DECONSTRUCTION OF THE TEMPORARY ROCK FLOW CHECK DAM REMOVE ALL OTHER TEMPORARY MATERIALS.

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- SILT FENCE
- STAGING/STOCKPILE AREA
- TEMPORARY ACCESS ROUTE
- DEWATERING PUMP

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 60 120

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
STAGING AND ESC - PHASE 1

Wood Dwg. No.: 100264-846-DW00-PLN-2019
Client Dwg. No.: 846-C-2019
Scale: 1:2000
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-S-1

PHASE 2: CONSTRUCTION OF WRC2

PHASE 2A: CONSTRUCTION OF REACHES WRC2-LG1 AND WRC2-LG3

P2-1. CONSTRUCT THE TEMPORARY FLOW CHECK DAMS AND SEEPAGE PONDS FOR WRC2-LG1 AND WRC2-LG3 (OPSD 219.220 AND OPSD 219.211). DIMENSIONS MAY VARY BASED ON SITE CONDITIONS.

P2-2. INSTALL DEWATERING PUMPS AT SEEPAGE PONDS. PONDS TO BE DEWATERED TO THE FLOODPLAIN AND FLOW DIRECTED OVERLAND. WRC2-LG1 IS TO DEWATER TO NEW LAKE AND WRC2-LG3 TO UPPER THREE DUCK LAKE.

P2-3. COMPLETE LOW FLOW CHANNEL WORKING FROM DOWNSTREAM TO UPSTREAM.

P2-4. COMPLETE GRADING AND STABILIZATION OF THE CORRIDOR.

PHASE 2B: CONSTRUCTION OF REACH WRC2-HG3

P2-5. REPEATS STEPS 4 TO 6 FOR WRC2-HG3

P2-6. WHERE REQUIRED, PRECISION ROCK BLASTING IS TO BE OVERSEEN BY ENGINEER AND ELEVATIONS ARE TO BE CONFIRMED ON SITE BY CONSTRUCTION SUPERVISOR.

PHASE 2C: CONSTRUCTION OF REACHES WRC2-HG1 AND WRC2-WETLAND

P2-7. REPEATS STEPS 2 TO 7 FOR WRC2-HG1 AND WRC2-WETLAND.

P2-8. THE SEEPAGE POND IS TO DEWATER TO NEW LAKE.

P2-9. WHERE REQUIRED, PRECISION ROCK BLASTING IS TO BE OVERSEEN BY ENGINEER AND ELEVATIONS ARE TO BE CONFIRMED ON SITE BY CONSTRUCTION SUPERVISOR.

PHASE 2D: CONSTRUCTION OF REACHES WRC2-HG2 AND WRC2-LG2

P2-10. REPEATS STEPS 4 TO 6 FOR WRC2-HG2 AND WRC2-LG2.

P2-11. WHERE REQUIRED, PRECISION ROCK BLASTING IS TO BE OVERSEEN BY ONSITE PROJECT ENGINEER AND ELEVATIONS ARE TO BE CONFIRMED ON SITE BY CONSTRUCTION SUPERVISOR.

PHASE 2E: REVEGETATION AND STABILIZATION

P2-12. FOLLOWING REVEGETATION, UNDERTAKE MODIFICATIONS TO THE DEWATERING SYSTEM TO ESTABLISH THE LONG-TERM DEWATERING SYSTEM WITHIN THE WRC2-LG1 REACH.

P2-13. INSTALL ALL STABILIZATION MEASURES WITHIN THE LOW FLOW CHANNEL. CONSTRUCTION SUPERVISOR TO CONFIRM STABILITY OF LOW FLOW CHANNEL ON SITE.

PHASE 2F: BASEFLOW PUMPING THROUGH WRC2 LOW FLOW CHANNEL

P2-14. REMOVE EARTHEN PLUG AT DOWNSTREAM END OF WRC2 REALIGNMENT CHANNEL.

P2-15. INSTALL PUMP SYSTEM TO CONVEY BASE FLOW, WITH PUMP OUTLET TO BE PLACED IN THE WRC2-HG1 REACH. PUMP OUTLET INSTALLATION TO BE INSPECTED BY CONSTRUCTION SUPERVISOR PRIOR TO BASE FLOW CONVEYANCE.

P2-16. DURING BASEFLOW CONVEYANCE, WRC2 LOW FLOW CHANNEL AND PUMP OUTLET TO BE INSPECTED REGULARLY TO ENSURE DEGRADATION IS NOT OCCURRING.

PHASE 2G: COMMISSIONING OF WRC2

P2-17. DECOMMISSIONING BYPASS AND CONSTRUCT ASSOCIATED SPILLWAY STRUCTURE(S) (DESIGNED BY WOOD).

P2-18. ALL TEMPORARY ROCK FLOW CHECK DAMS AND SEEPAGE PONDS ARE TO BE DEWATERED AND REMOVED FROM THE CORRIDOR.

P2-19. FOLLOWING THE INSPECTION BY THE ONSITE PROJECT ENGINEER AND THE CONSTRUCTION SUPERVISOR, INSTALL SEDIMENT CURTAIN (OPSD 209.260) AND REMOVE THE EARTHEN BERM AT THE DOWNSTREAM (UPPER THREE DUCK LAKE) CONNECTION.

P2-20. REMOVAL OF THE UPSTREAM DAM AT NEW LAKE IS TO BE UNDERTAKEN IN INCREMENTAL LIFTS. ALLOW THE UPSTREAM LAKE LEVEL TO STABILIZE PRIOR TO INITIATING EXCAVATING THE NEXT LIFT.

P2-21. FOLLOWING THE DECONSTRUCTION OF DAM REMOVE ANY REMAINING TEMPORARY MATERIALS.

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- SILT FENCE (OPSD 219.130)
- STAGING/STOCKPILE AREA
- TEMPORARY ACCESS ROUTE
- DEWATERING PUMP

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 60 120

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
STAGING AND ESC - PHASE 2

Wood Dwg. No.: 100264-846-DW00-PLN-2020
Client Dwg. No.: 846-C-2020
Scale: 1:2000
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-S-2

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES: HORIZONTAL 0 15 30; VERTICAL 0 15 30

No.	REVISIONS	DATE	INITIAL
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E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
PLAN AND PROFILE [0+000 - 0+400]

Wood Dwg. No.: 100264-846-DW00-PLN-2021 | Client Dwg. No.: 846-C-2021

Scale: 1:500 | Drawn By: CWM | Drawing No. WRC2-P-1
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

HORIZONTAL: 0 — 15 — 30

VERTICAL: 0 — 3 — 6

No.	REVISIONS	DATE	INITIAL
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IAMGOLD COTE MINE - WRC2
PLAN AND PROFILE [0+400 - 0+800]

Wood Dwg. No.: 100264-846-DW00-PLN-2022
Client Dwg. No.: 846-C-2022

Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-P-2

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

HORIZONTAL 0 15 30

VERTICAL 0 3 6

No.	REVISIONS	DATE	INITIAL
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IAMGOLD COTE MINE - WRC2
PLAN AND PROFILE [0+800 - 1+200]

Wood Dwg. No.: 100264-846-DW00-PLN-2023 | Client Dwg. No.: 846-C-2023

Scale: 1:500 | Drawn By: CWM | Drawing No. WRC2-P-3

Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

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LEGEND

- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES: HORIZONTAL 0 15 30; VERTICAL 0 3 6

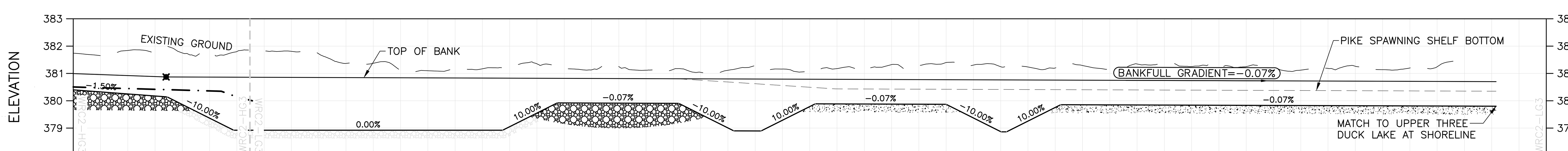
No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
PLAN AND PROFILE [1+200 - 1+600]

Wood Dwg. No.: 100264-846-DW00-PLN-2024 | Client Dwg. No.: 846-C-2024

Scale: 1:500 | Drawn By: CWM | Drawing No. WRC2-P-4

Date Issued: FEB 14, 2020 | Checked By: BDP, JPH



STATION	TOB ELEV. / CL ELEV. / (DEPTH)
1+610	380.25 / 380.92 / (−0.67)
1+620	379.86 / 380.87 / (−1.01)
1+630	378.92 / 380.86 / (−1.94)
1+640	378.92 / 380.85 / (−1.93)
1+650	378.92 / 380.85 / (−1.93)
1+660	378.92 / 380.84 / (−1.92)
1+670	378.92 / 380.83 / (−1.91)
1+680	379.05 / 380.83 / (−1.78)
1+690	379.92 / 380.82 / (−0.90)
1+700	379.91 / 380.81 / (−0.90)
1+710	379.91 / 380.81 / (−0.90)
1+720	379.00 / 380.80 / (−1.79)
1+730	379.29 / 380.79 / (−1.50)
1+740	379.88 / 380.78 / (−0.90)
1+750	379.88 / 380.78 / (−0.90)
1+760	379.87 / 380.77 / (−0.90)
1+770	378.87 / 380.76 / (−1.89)
1+780	379.76 / 380.76 / (−1.00)
1+790	379.85 / 380.75 / (−0.90)
1+800	379.84 / 380.74 / (−0.90)
1+810	379.84 / 380.74 / (−0.90)
1+820	379.83 / 380.73 / (−0.90)
1+830	379.82 / 380.72 / (−0.90)
1+840	379.81 / 380.71 / (−0.90)
1+850	379.81 / 380.71 / (−0.90)
1+860	379.80 / 380.70 / (−0.90)

RIFF/RUN STATIONS	RIFF/RUN ELEVS.
1+592.91	380.51
1+617.21	380.14
1+629.42	378.92
1+678.71	379.92
1+688.71	379.92
1+711.00	379.90
1+721.07	378.90
1+726.07	378.89
1+736.00	379.89
1+760.00	379.87
1+770.07	378.86
1+781.00	379.86
1+860.80	379.80

1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND
- BEDROCK
- RIFFLE STONE PLACEMENT
- BANKFULL CHANNEL GRADIENT REACH BREAK
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 15 30 HORIZONTAL
0 3 6 VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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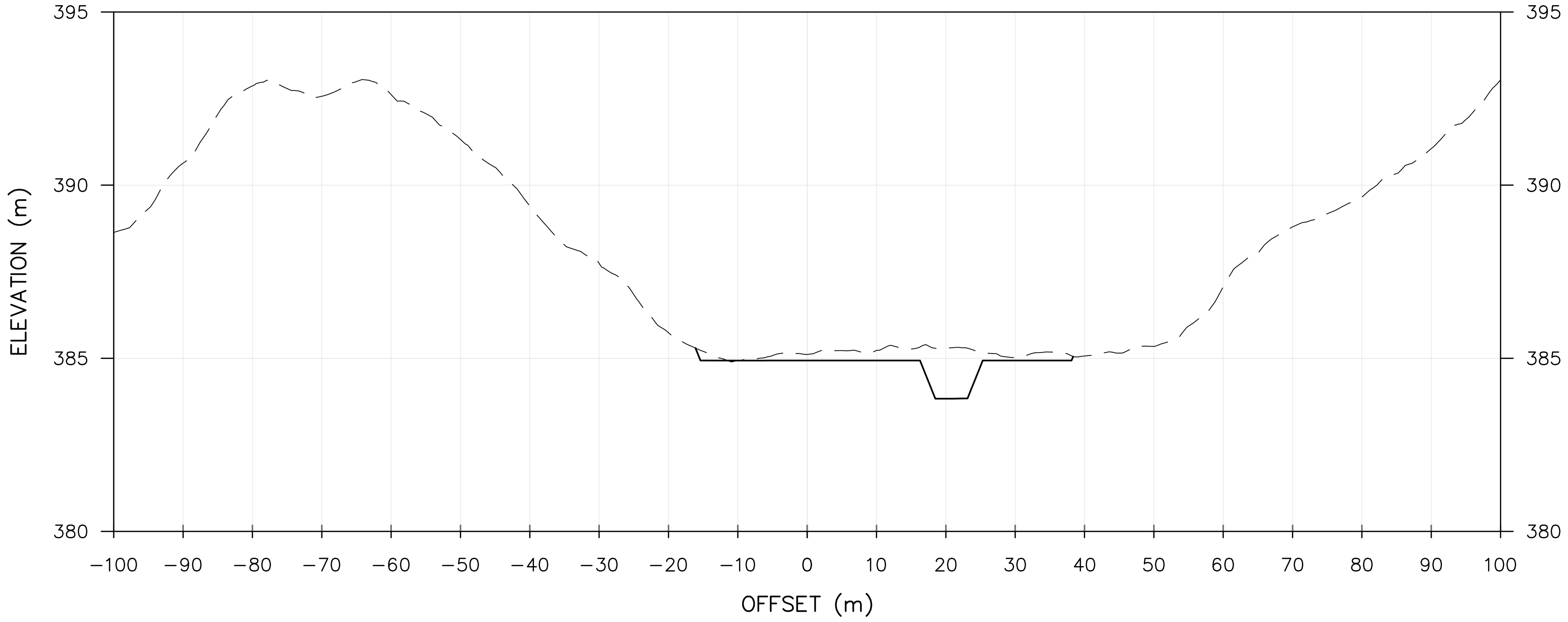
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
PLAN AND PROFILE [1+600 - 1+860]

Wood Dwg. No.: 100264-846-DW00-PLN-2025 | Client Dwg. No.: 846-C-2025
Scale: 1:500 | Drawn By: CWM | Drawing No. WRC2-P-5
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

5+025



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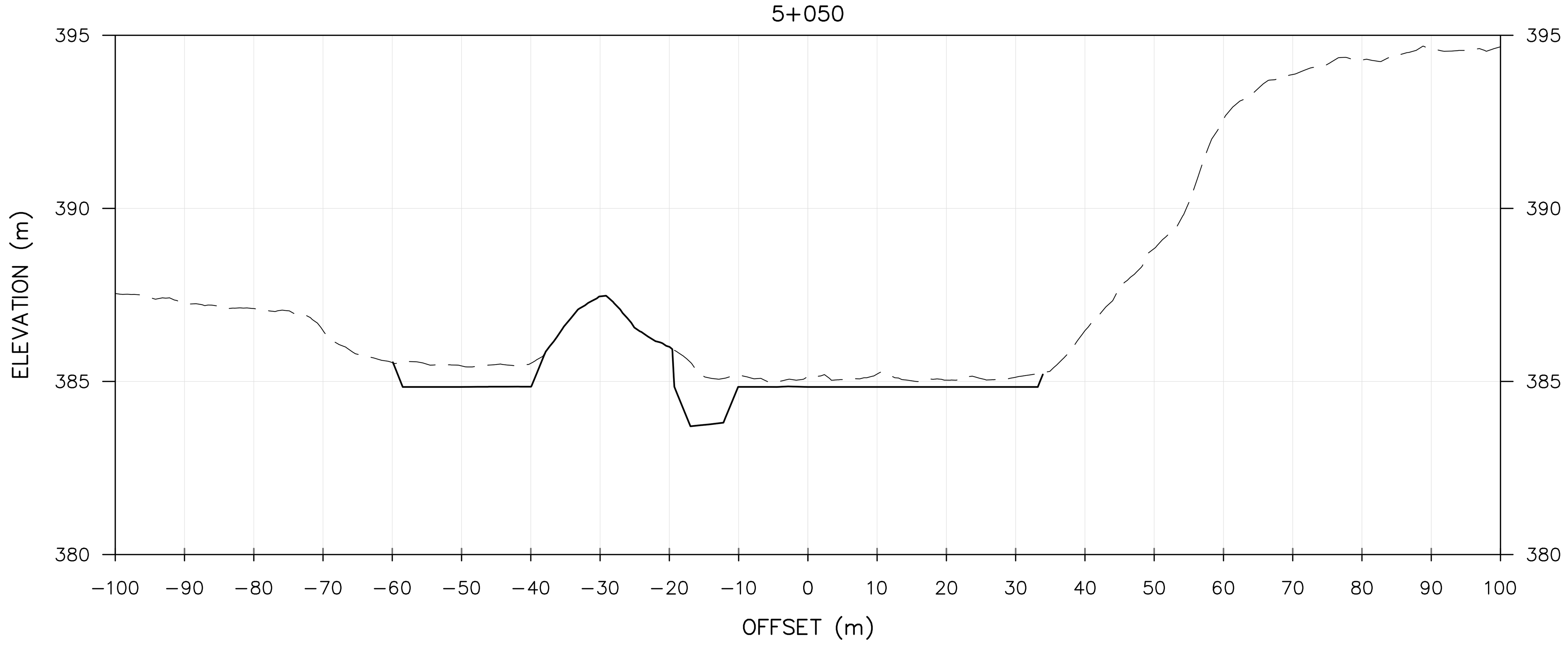
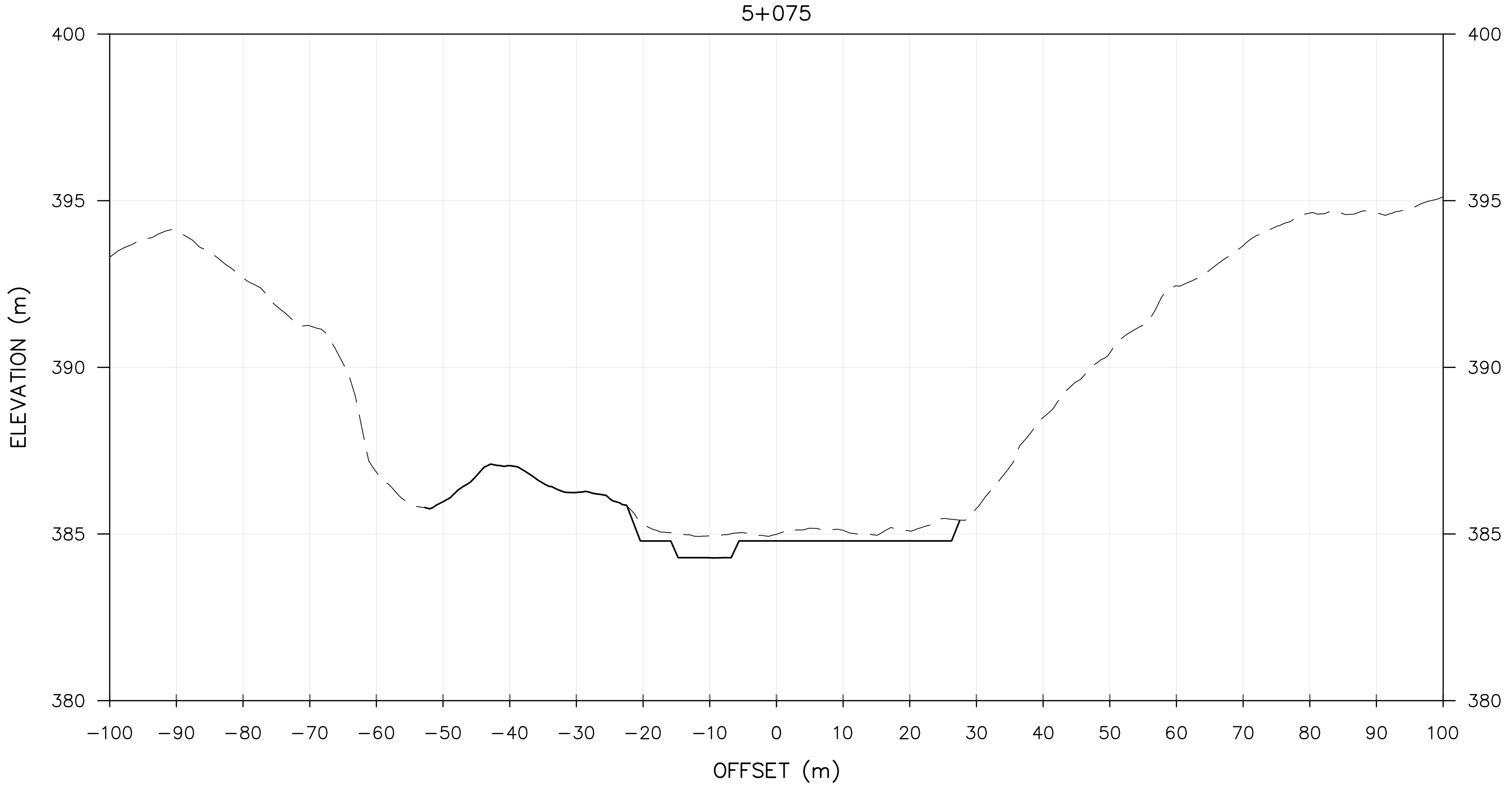
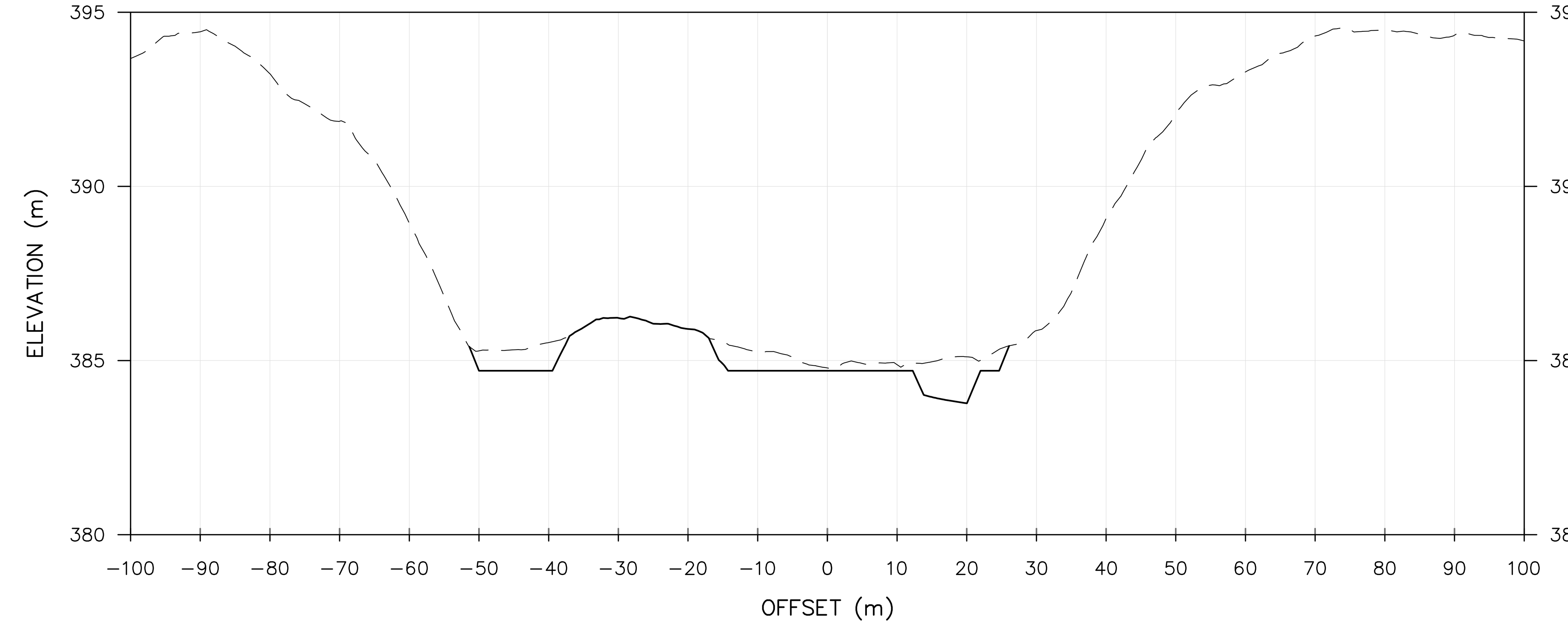


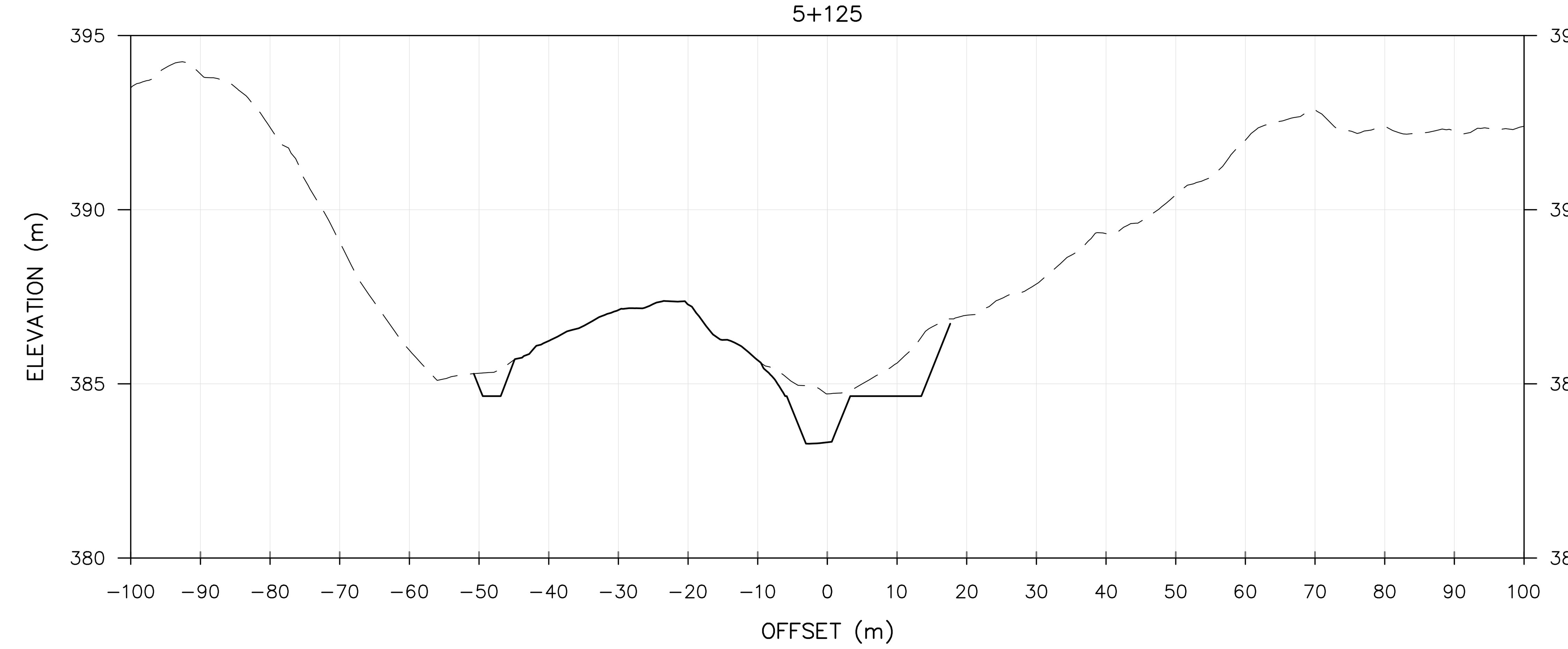
5+075



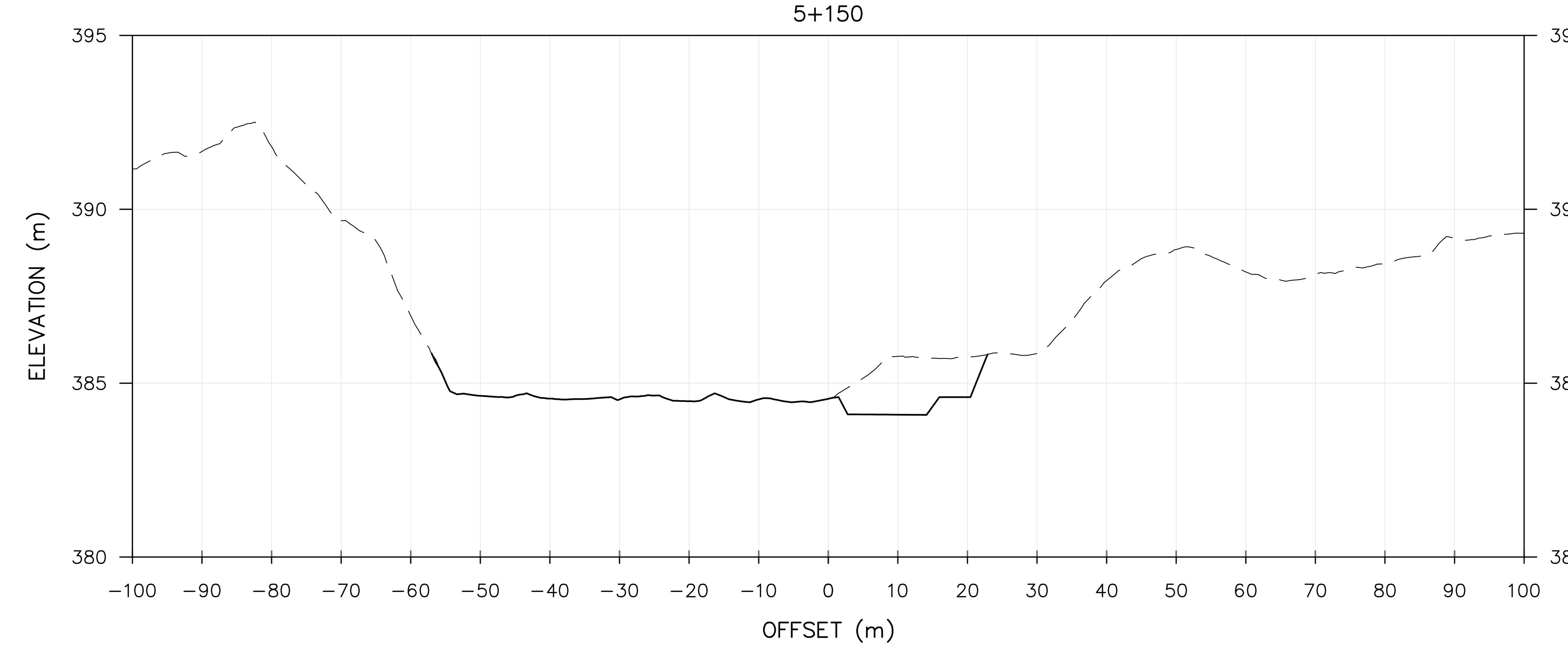
5+100



5+125



5+150



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
——— PROPOSED GRADE
— — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

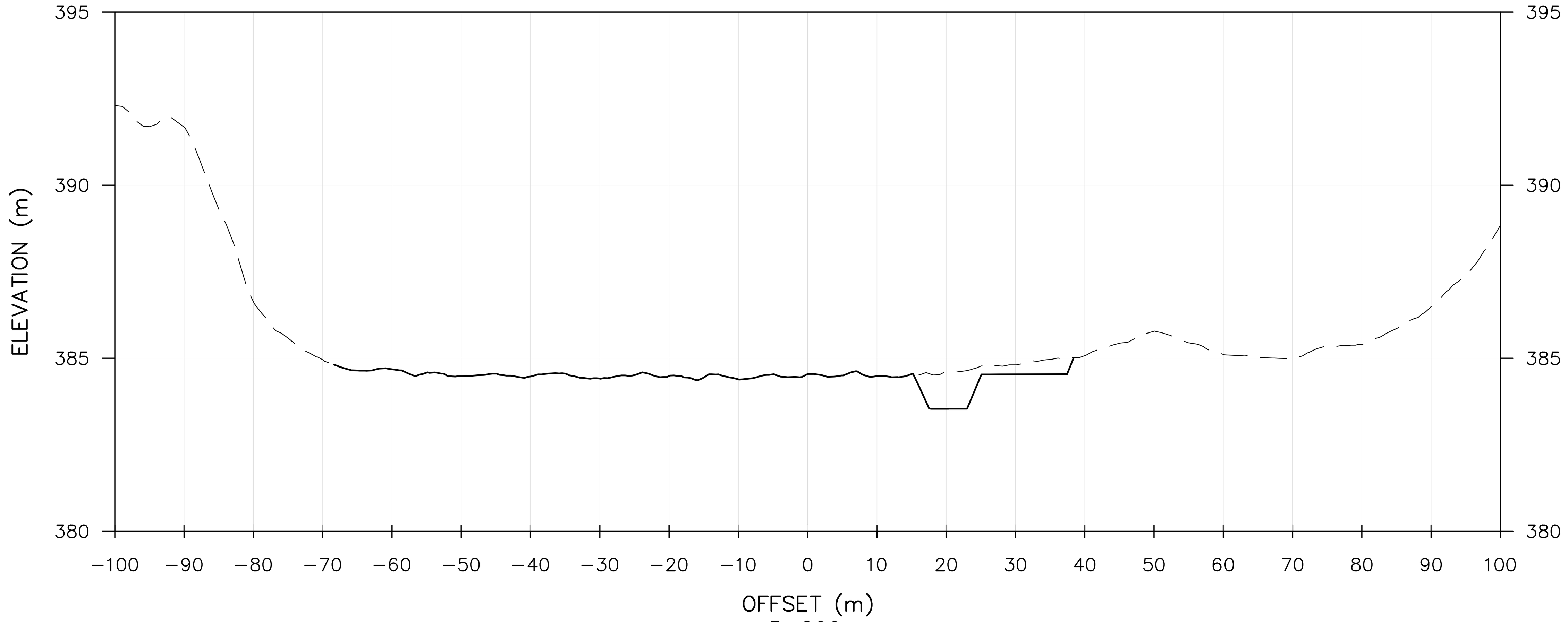
SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

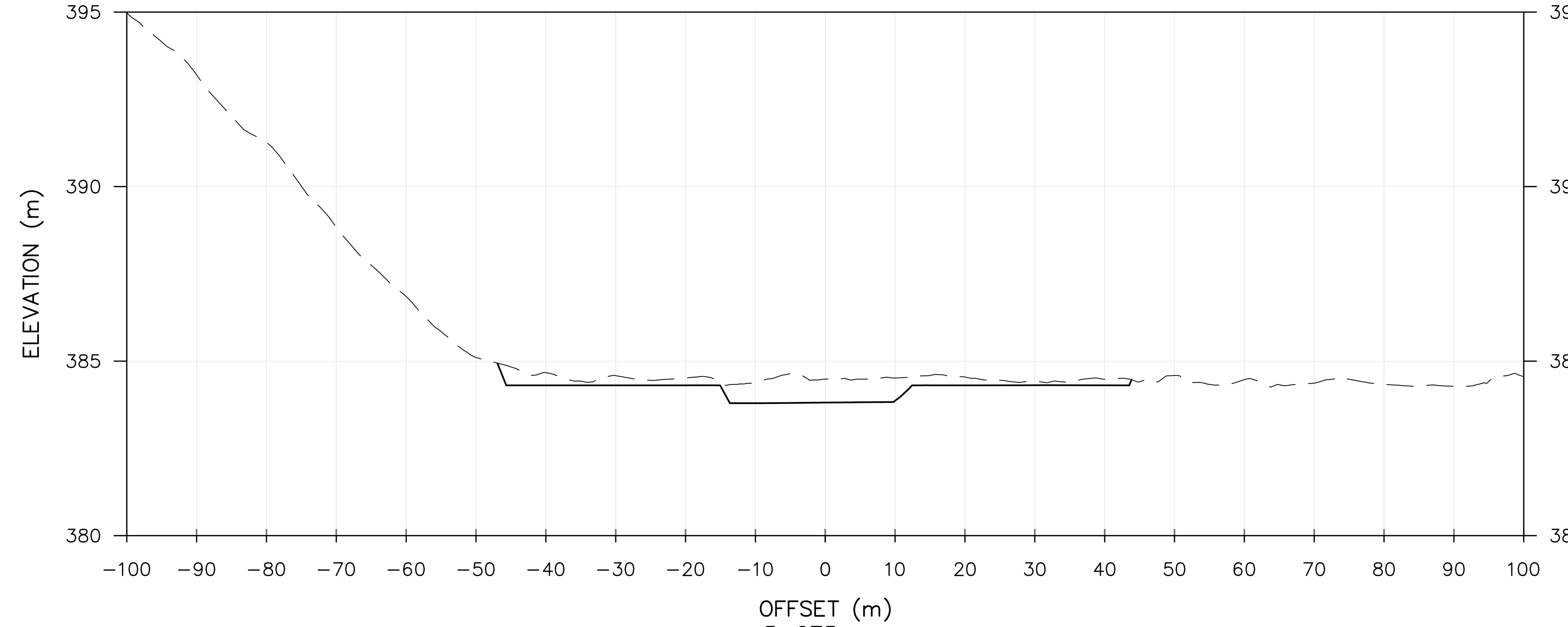
IAMGOLD COTE MINE - WRC2
SECTIONS [5+025 - 5+150]

Wood Dwg. No.: 100264-846-DW00-PLN-2026
Client Dwg. No.: 846-C-2026
Scale: 1:600
Drawn By: CWM
Drawing No. WRC2-C-1
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

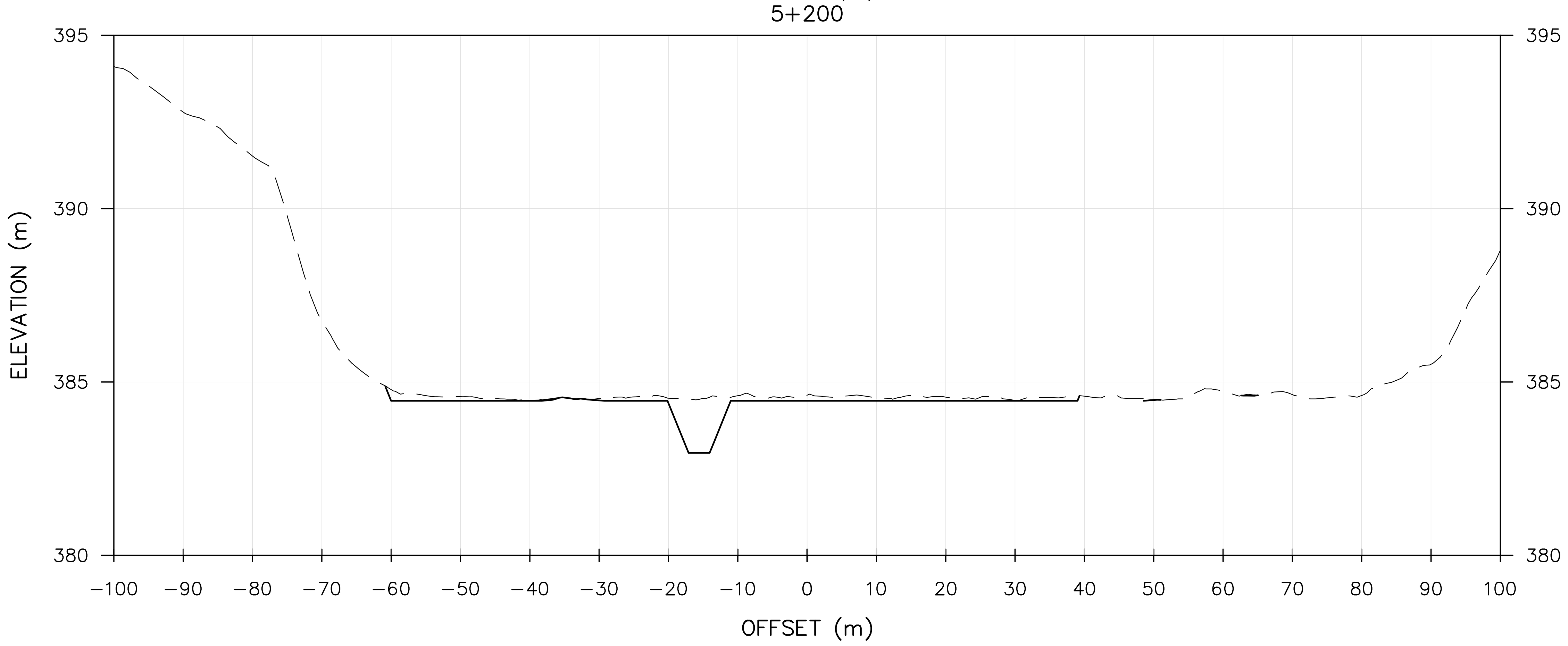
5+175



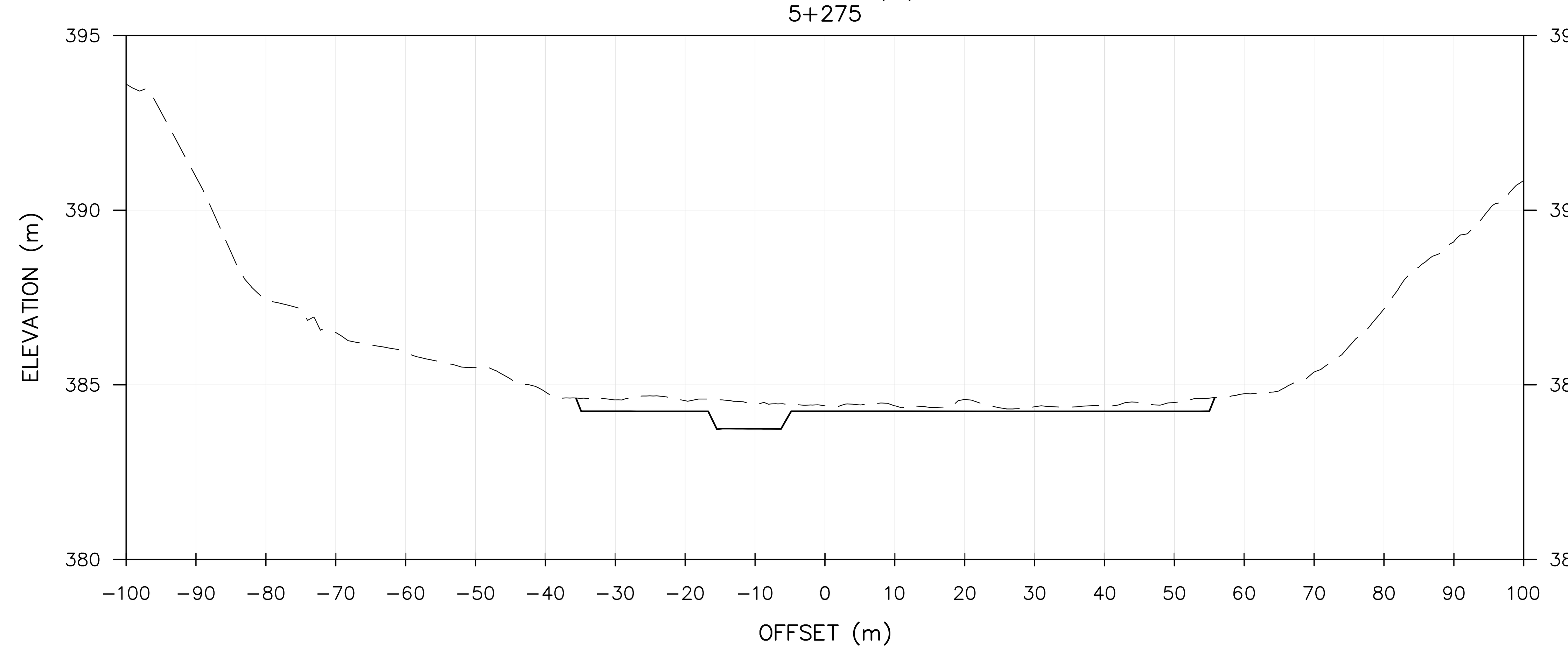
5+250



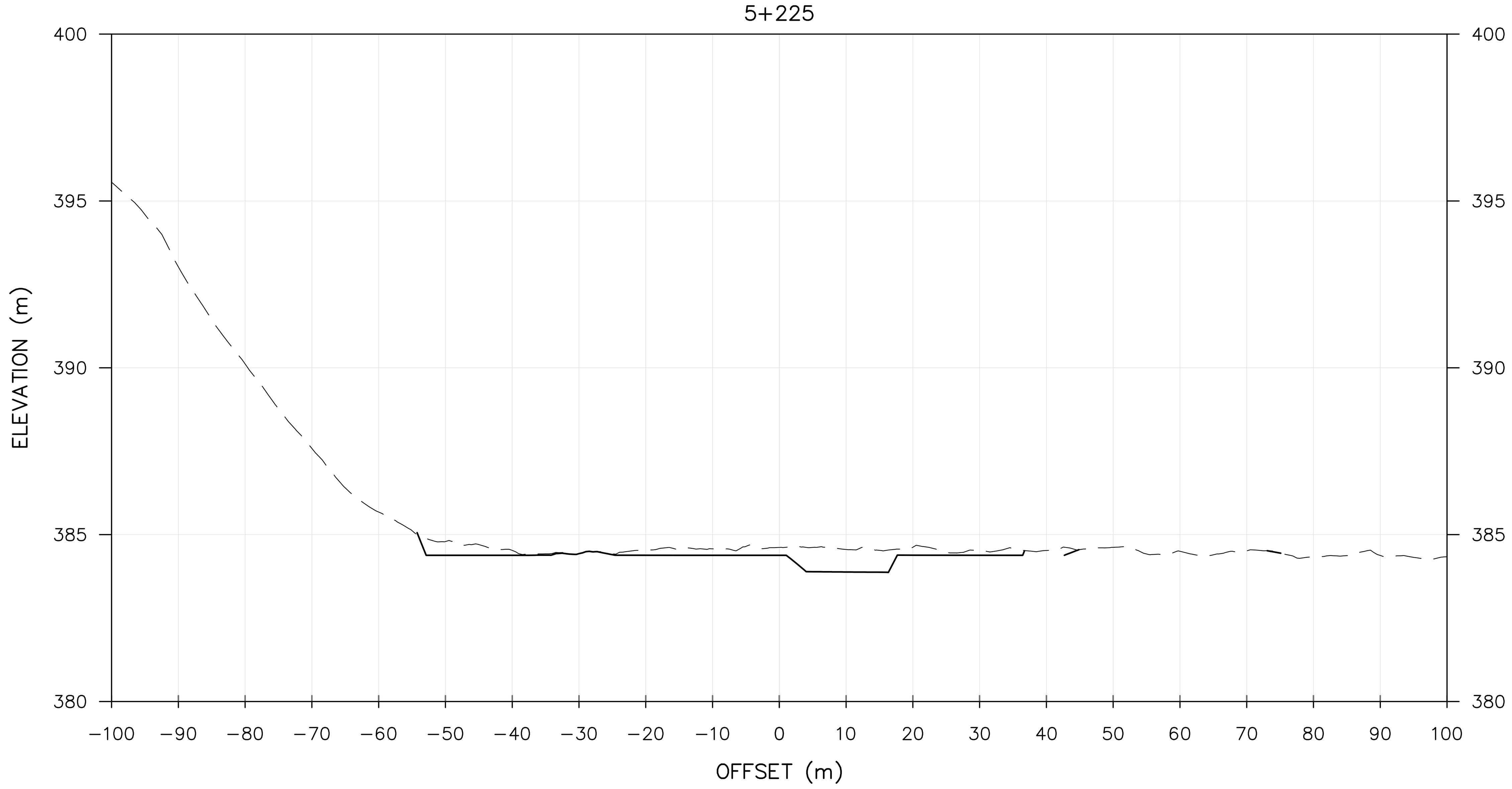
5+200



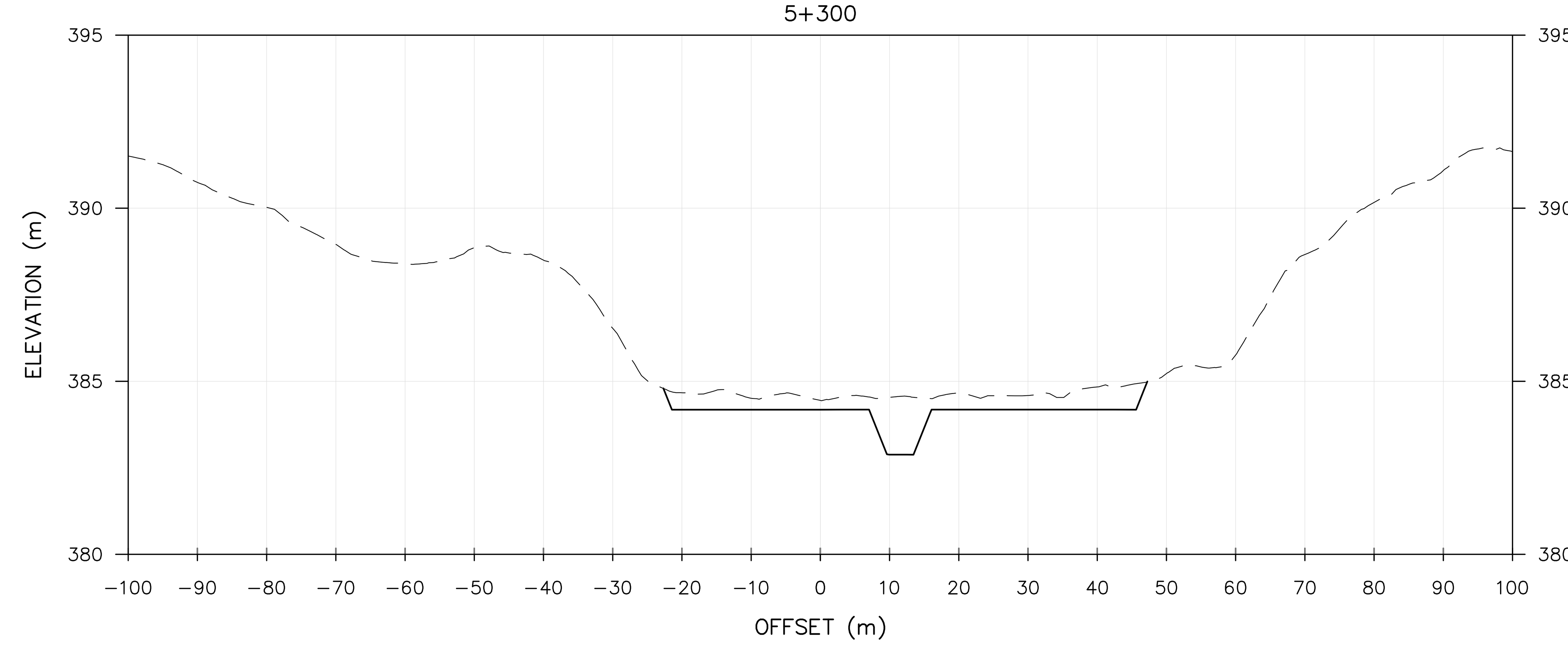
5+275



5+225



5+300



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
- PROPOSED GRADE
- EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
HORIZONTAL 0 20 40
VERTICAL 0 4 8

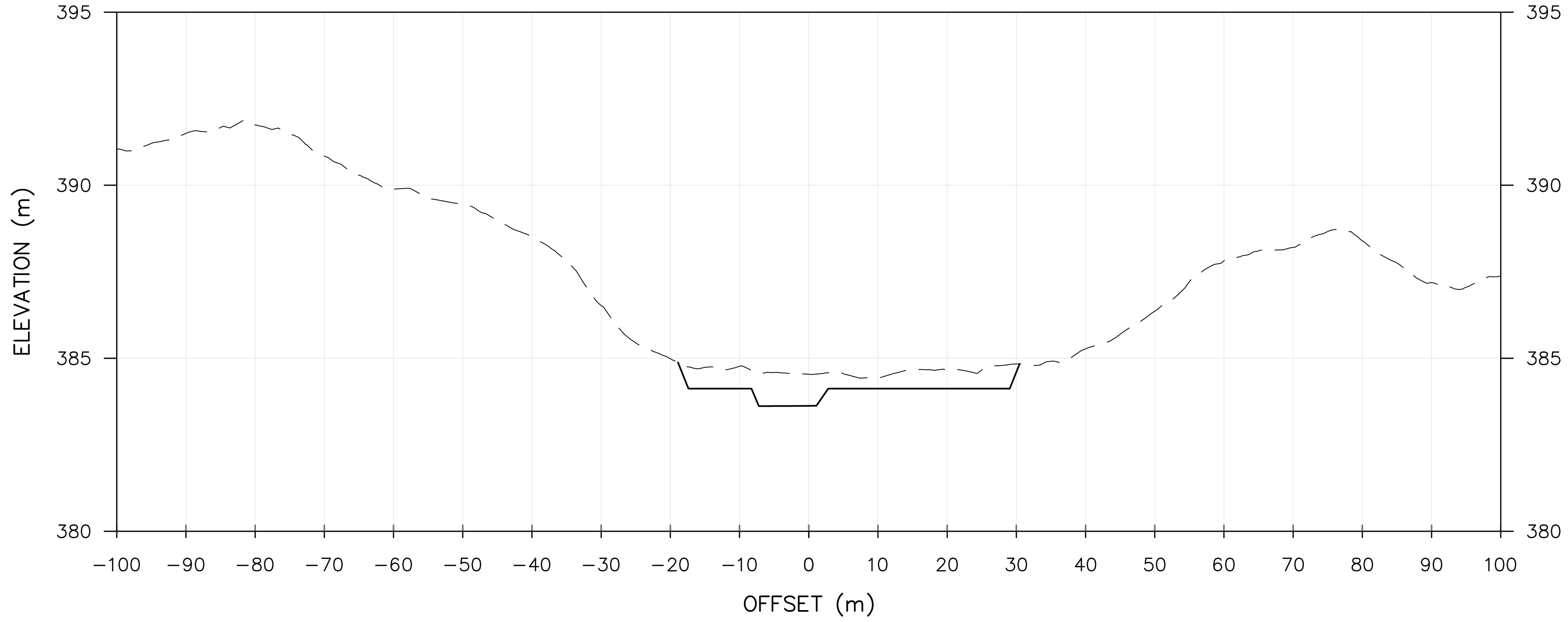
No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
SECTIONS [5+175 - 5+300]

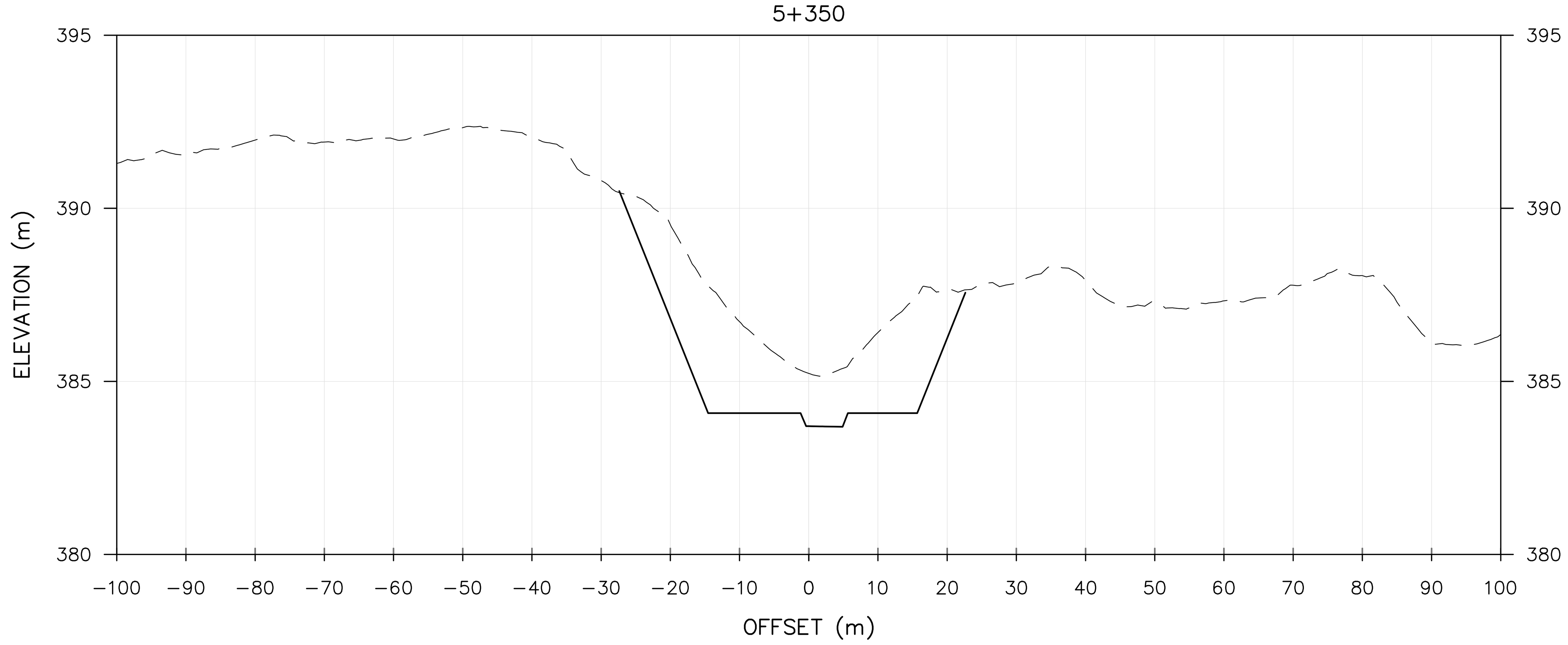
Wood Dwg. No.: 100264-846-DW00-PLN-2027
Client Dwg. No.: 846-C-2027

Scale: 1:600	Drawn By: CWM	Drawing No. WRC2-C-2
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

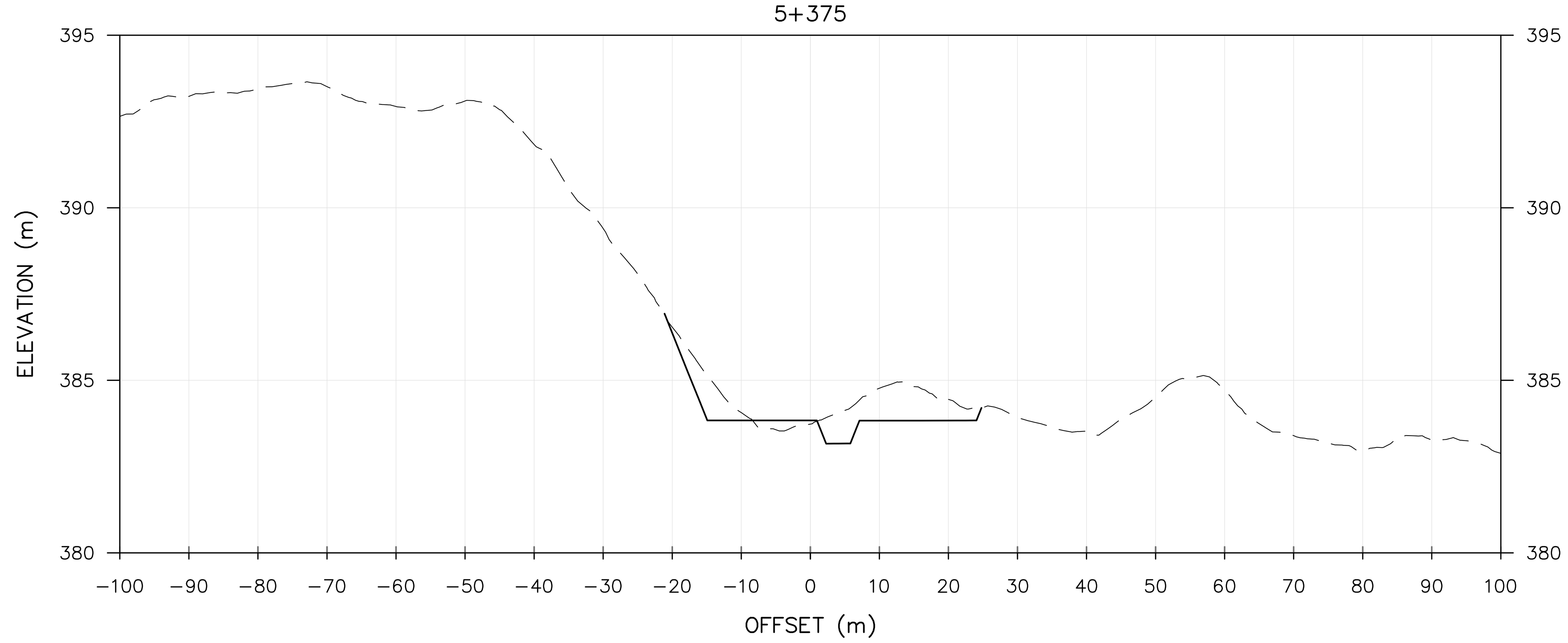
5+325



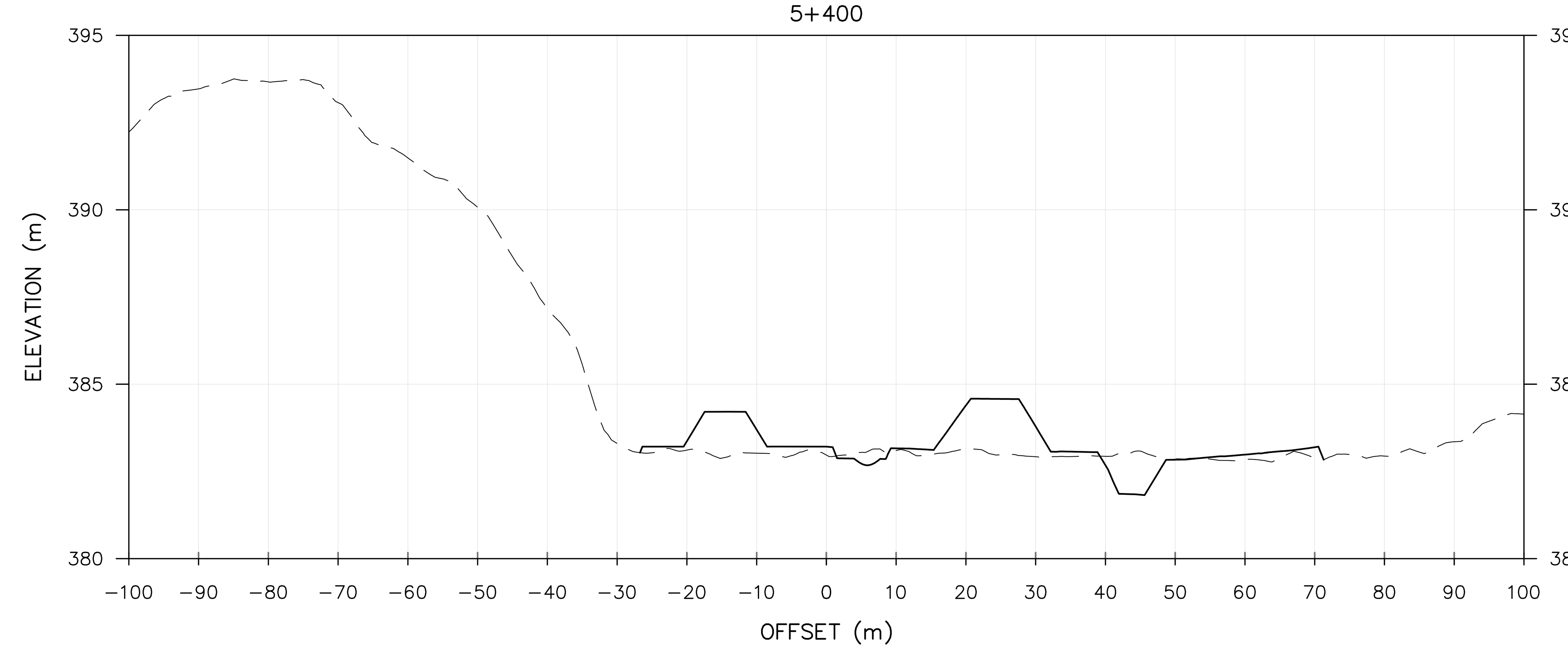
5+350



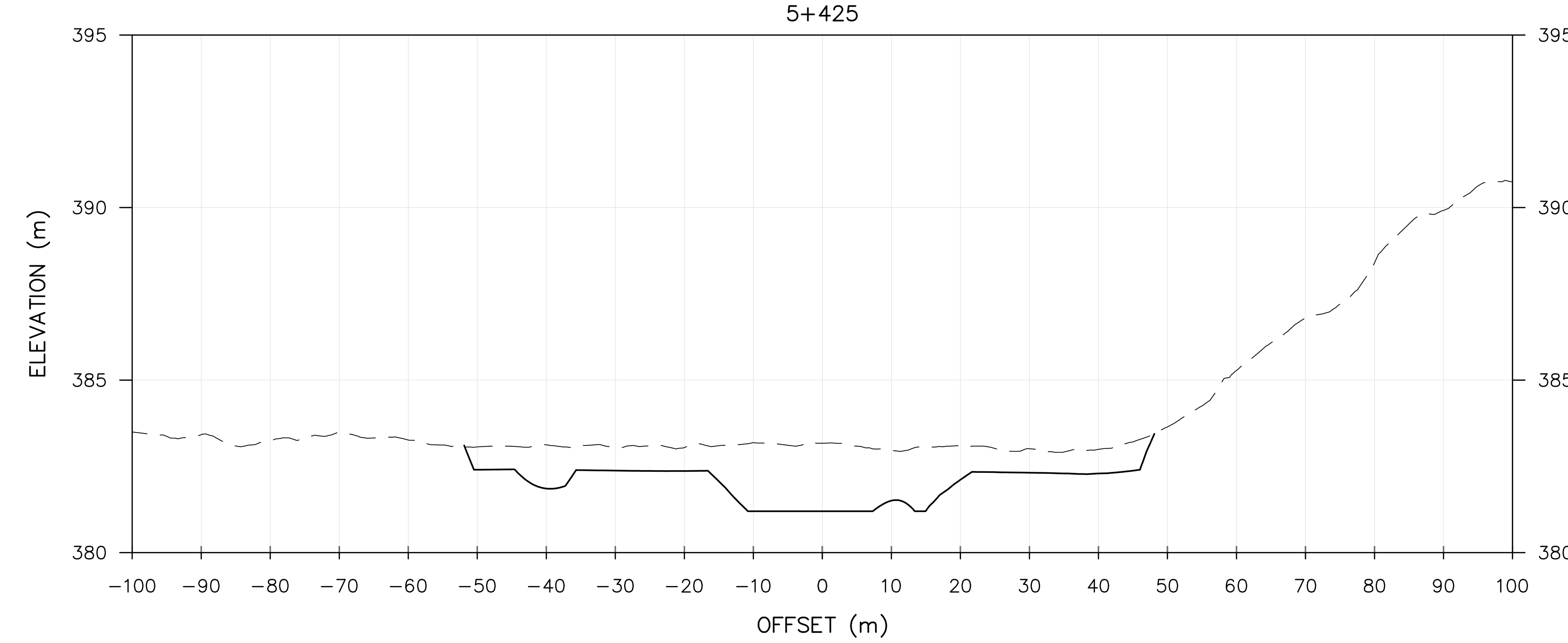
5+375



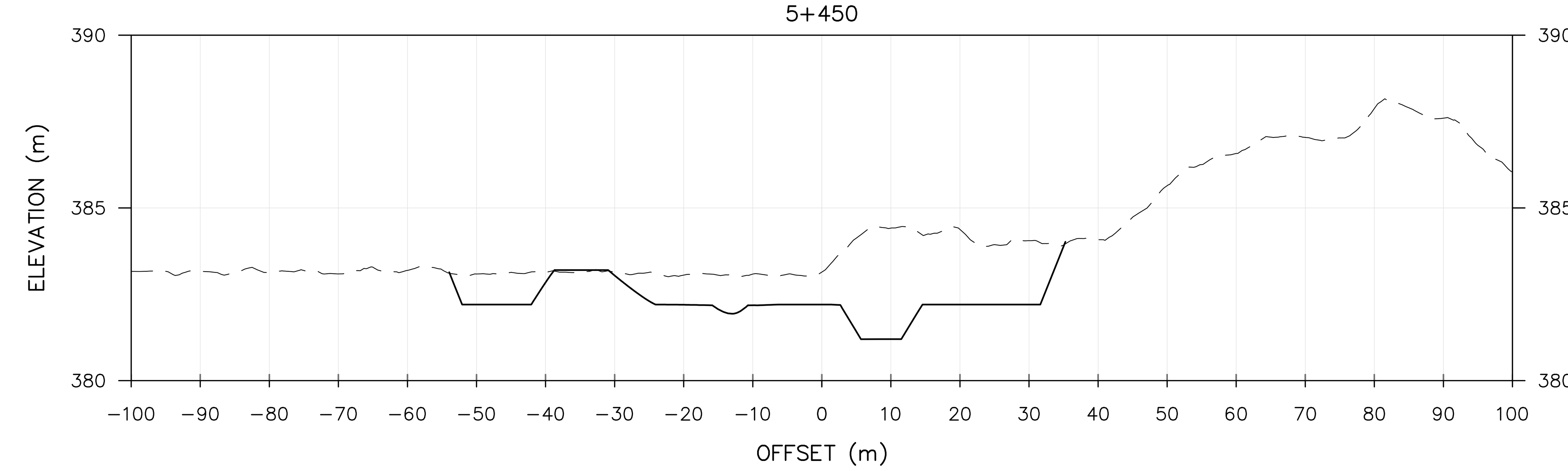
5+400



5+425



5+450



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND

——— PROPOSED GRADE
— — — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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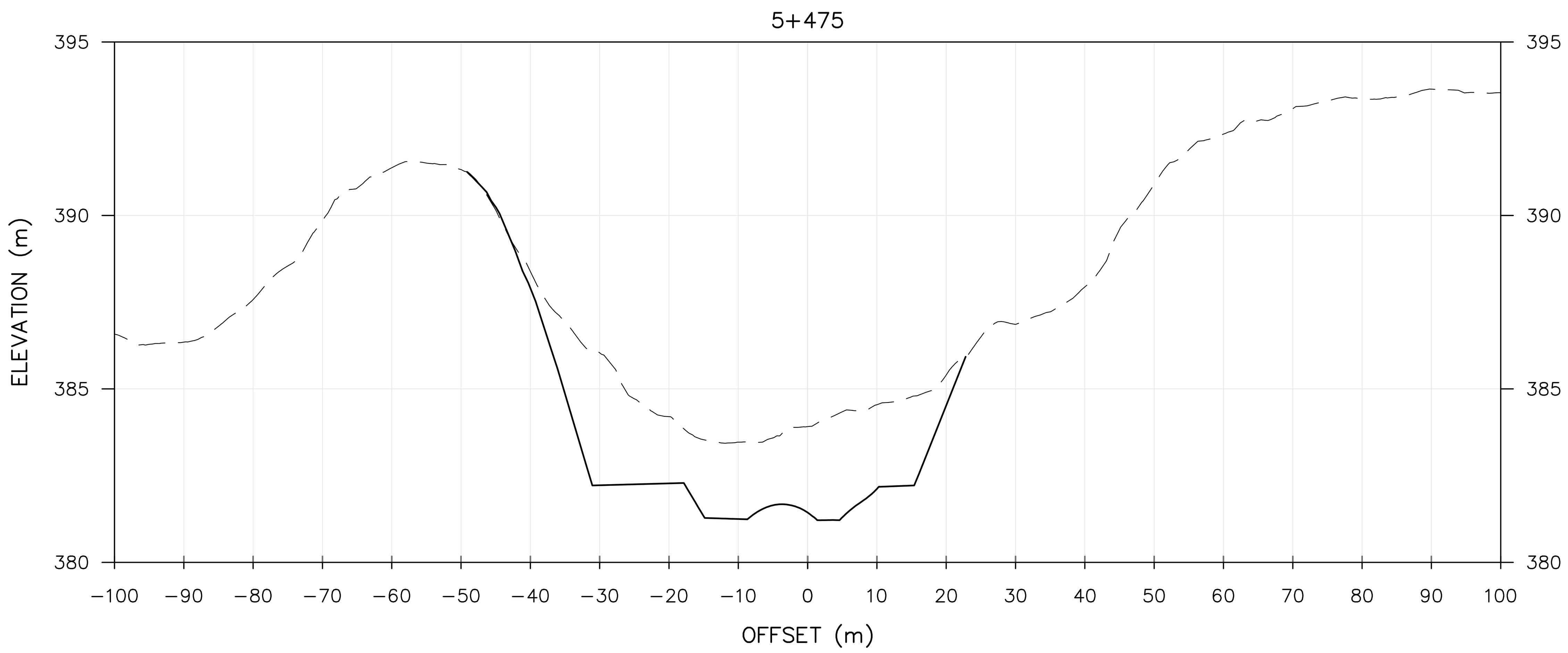
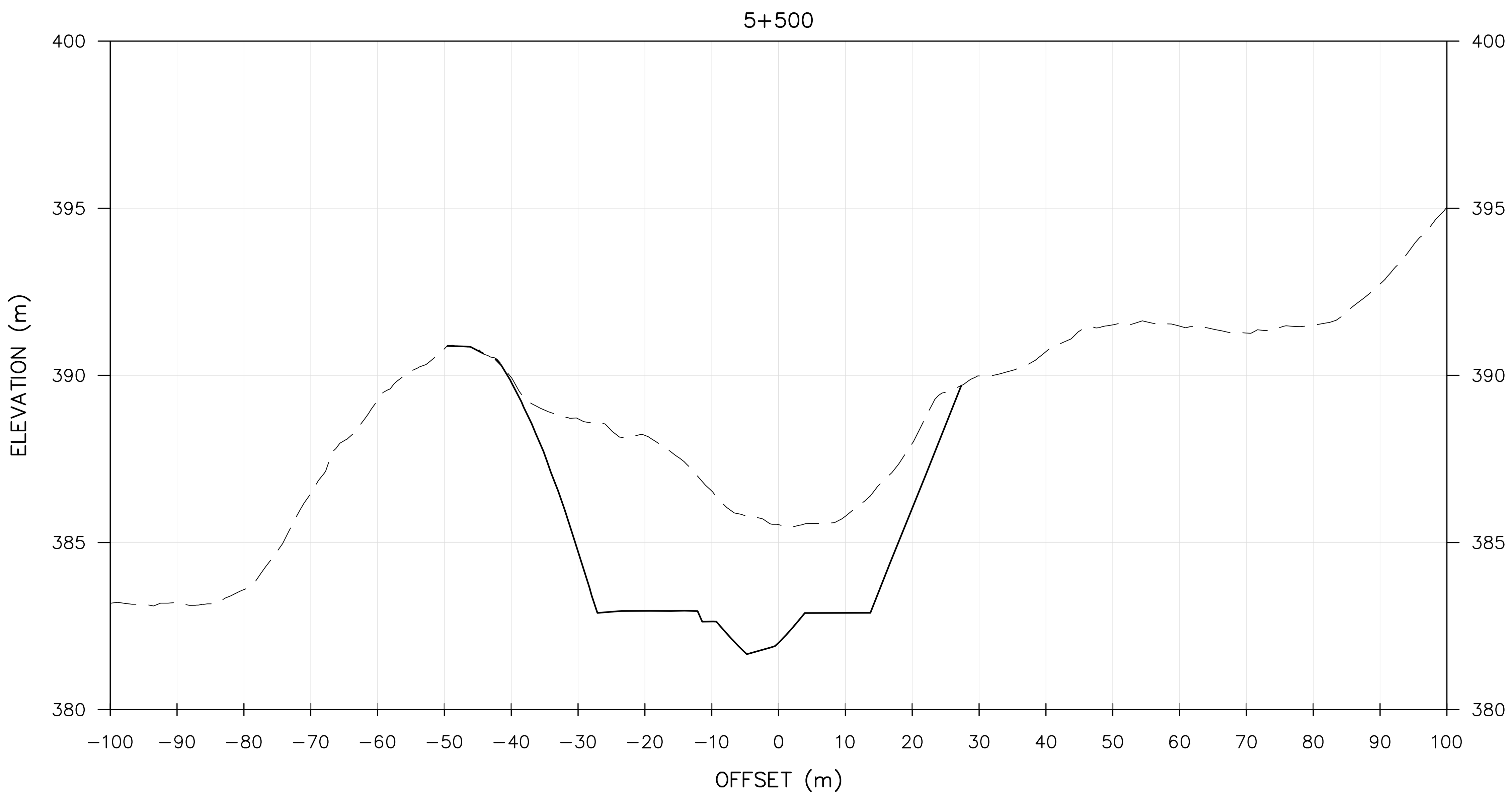
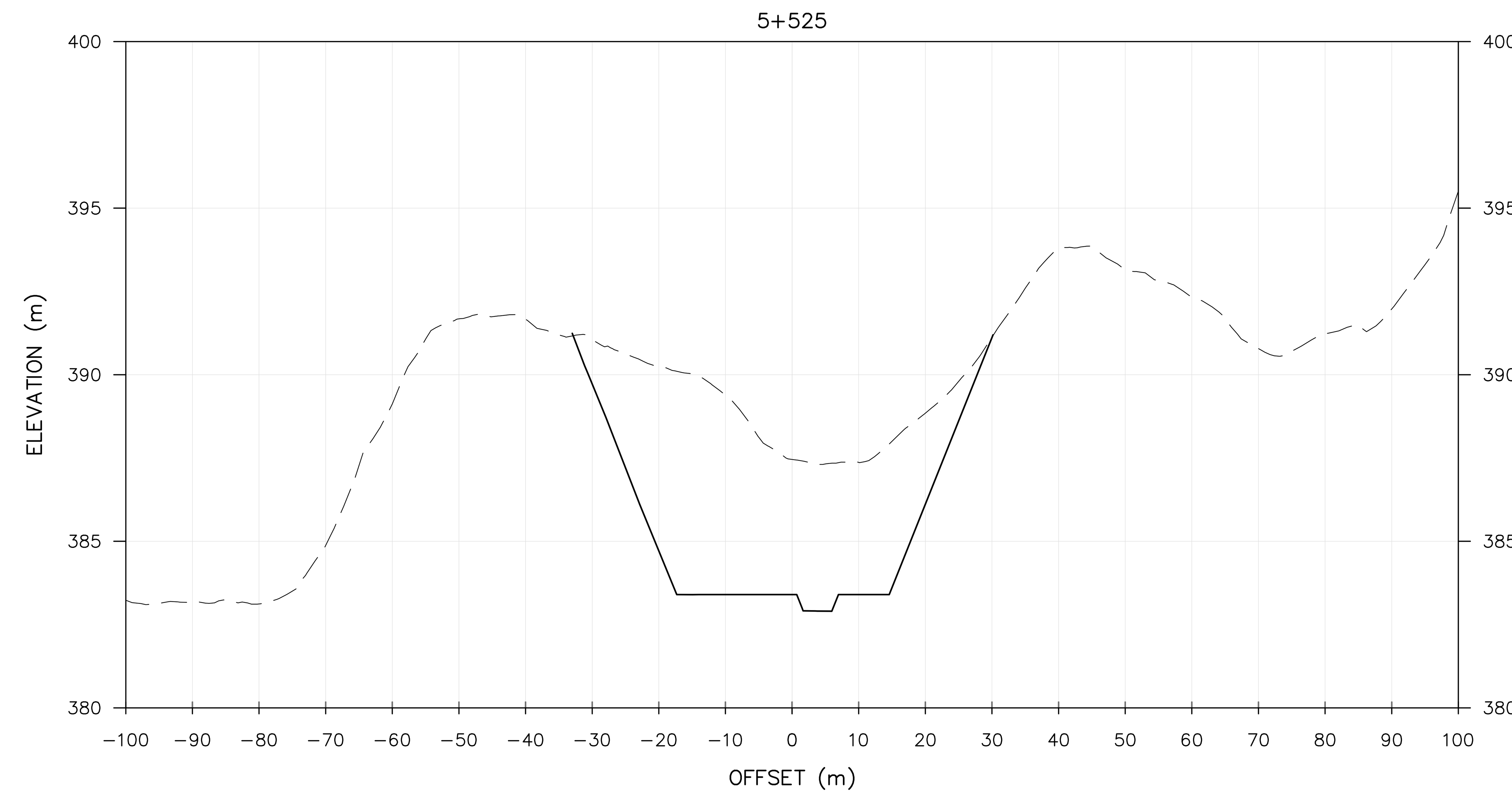
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

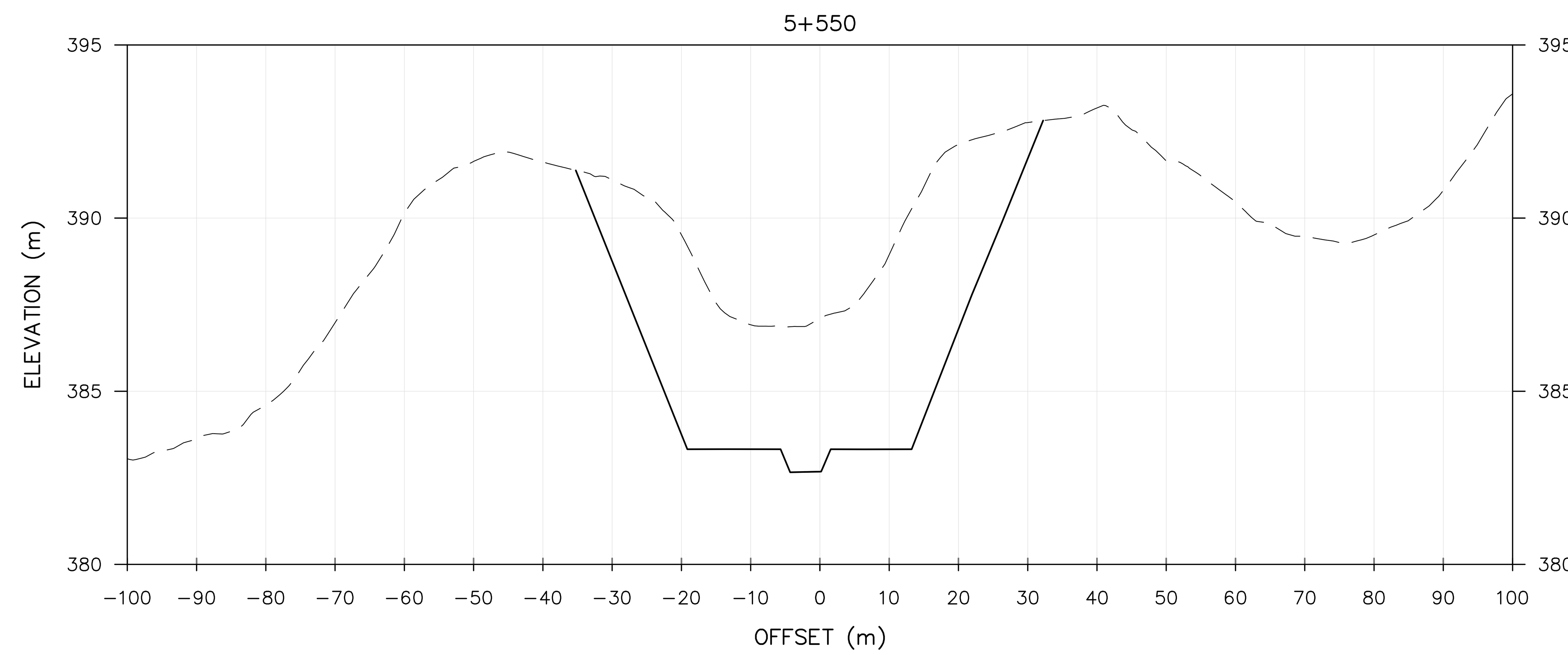
IAMGOLD COTE MINE - WRC2
SECTIONS [5+325 - 5+450]

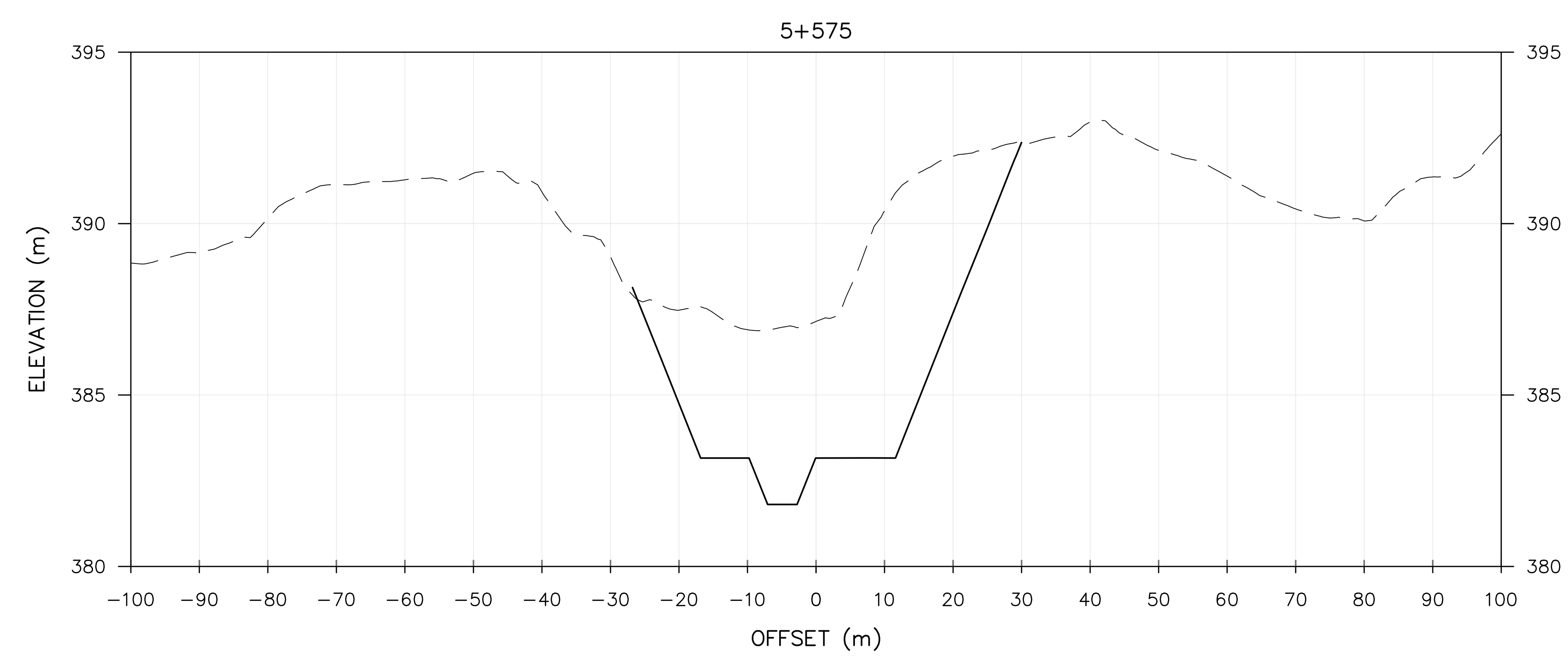
Wood Dwg. No.: 100264-846-DW00-PLN-2028
Client Dwg. No.: 846-C-2028
Scale: 1:600
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-C-3











1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND

——— PROPOSED GRADE
— — — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
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14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

HORIZONTAL: 0 20 40

VERTICAL: 0 4 8

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
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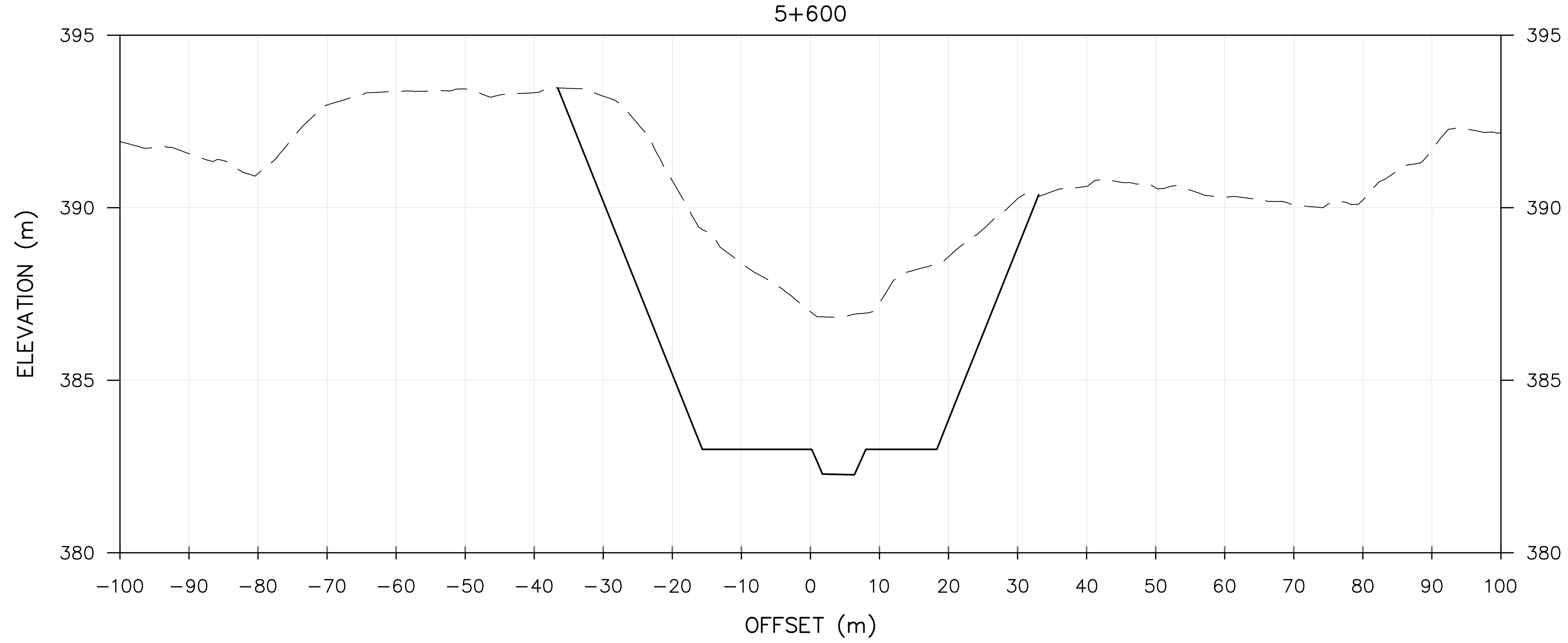
F	Issued for Construction (Updated)	2020-02-14	JPH

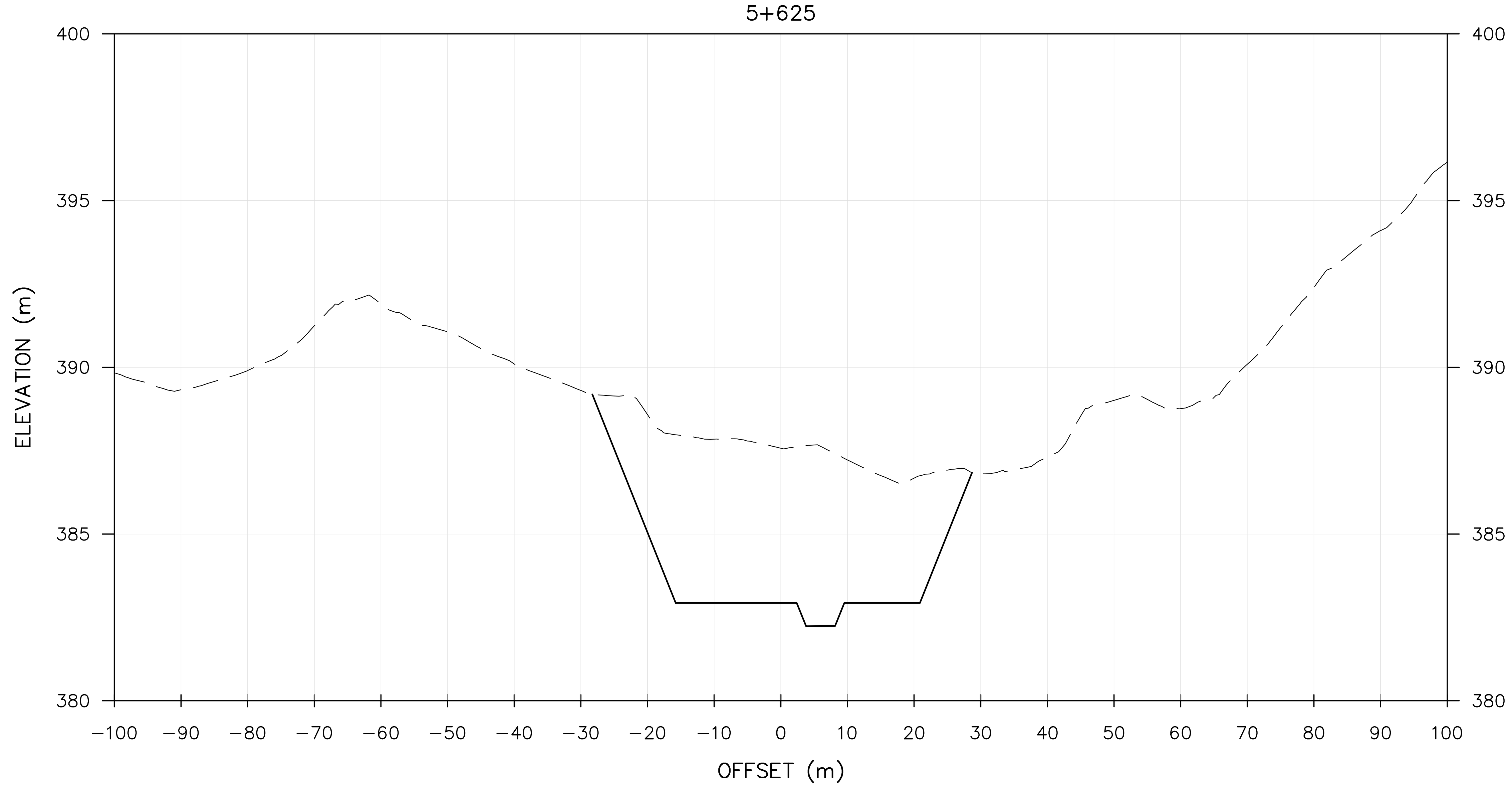
IAMGOLD COTE MINE - WRC2
SECTIONS [5+475 - 5+575]

Wood Dwg. No.: 100264-846-DW00-PLN-2029	Client Dwg. No.: 846-C-2029	
Scale: 1:600	Drawn By: CWM	Drawing No. WRC2-C-4
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

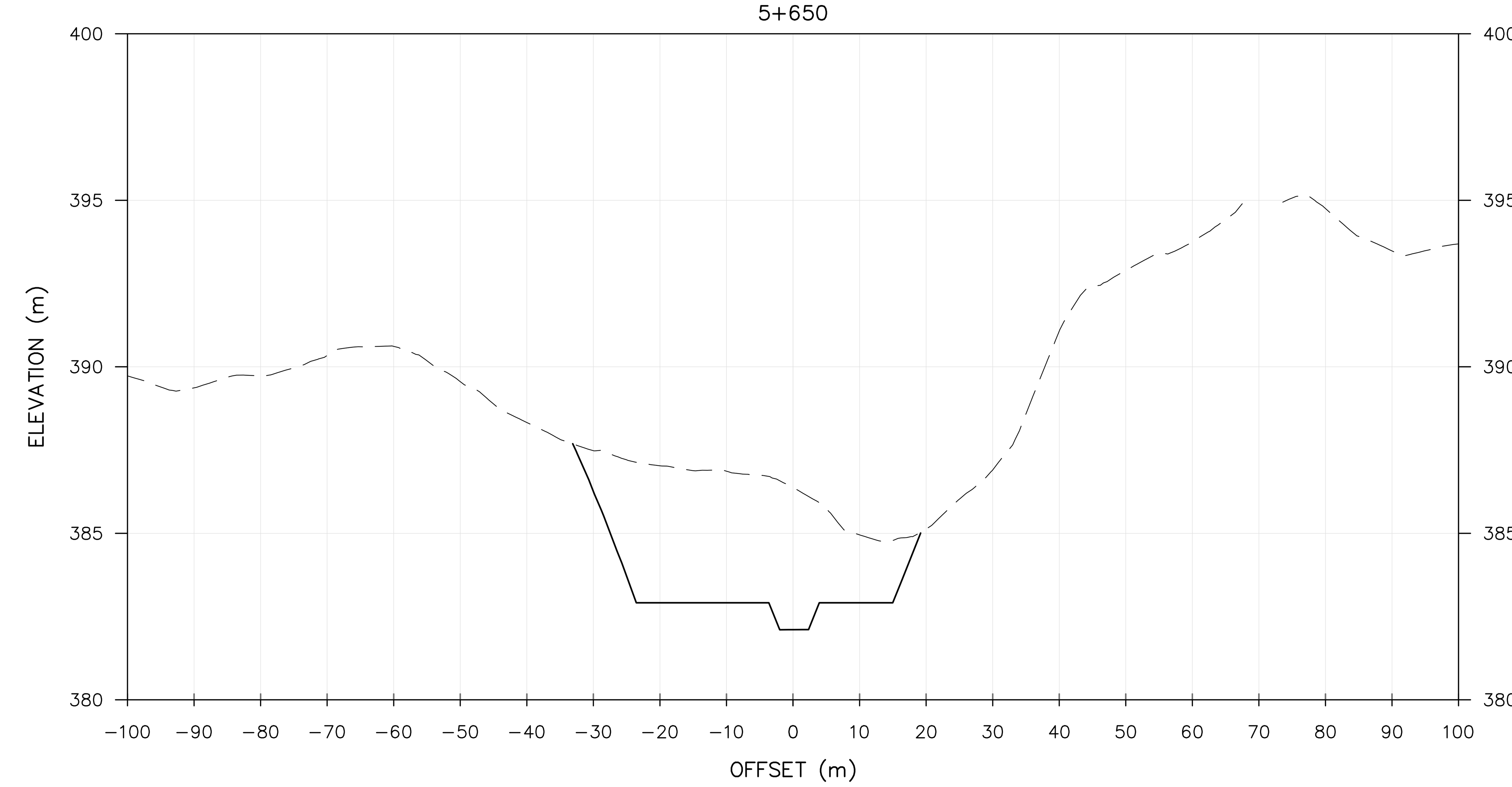
5+600



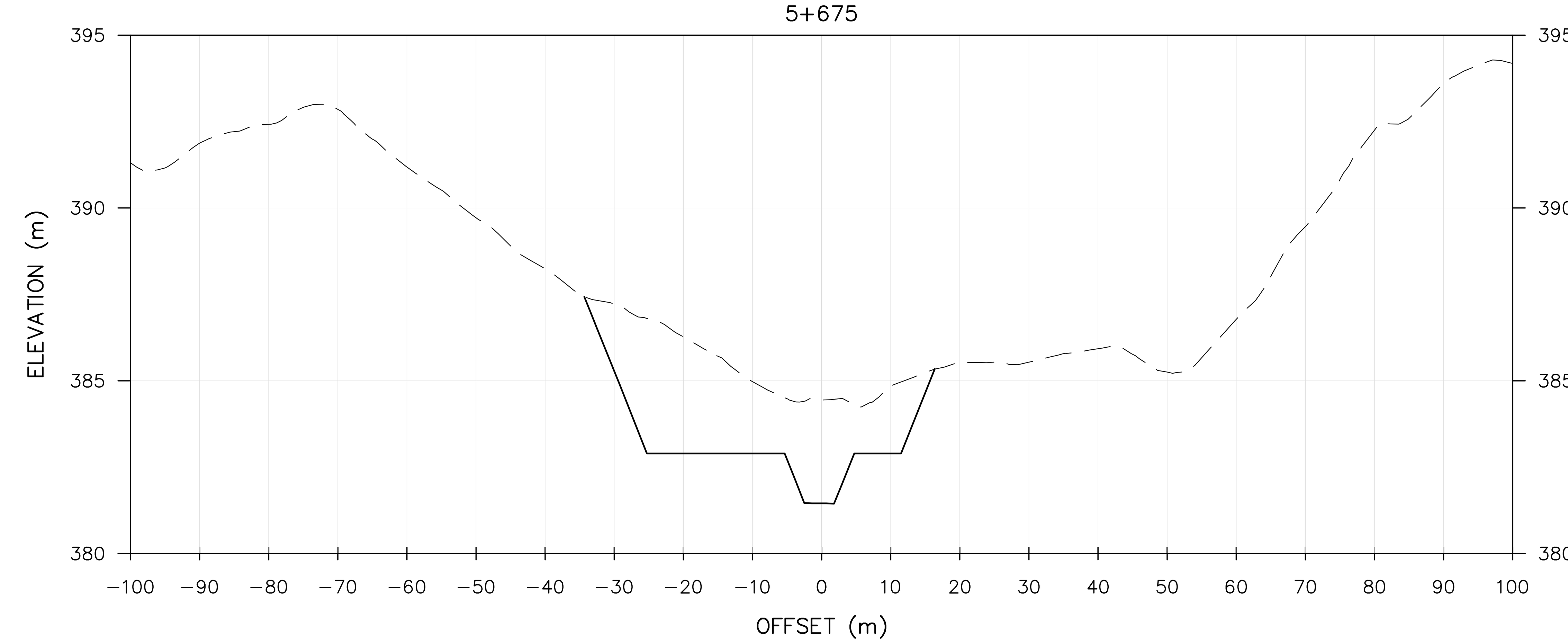
5+625



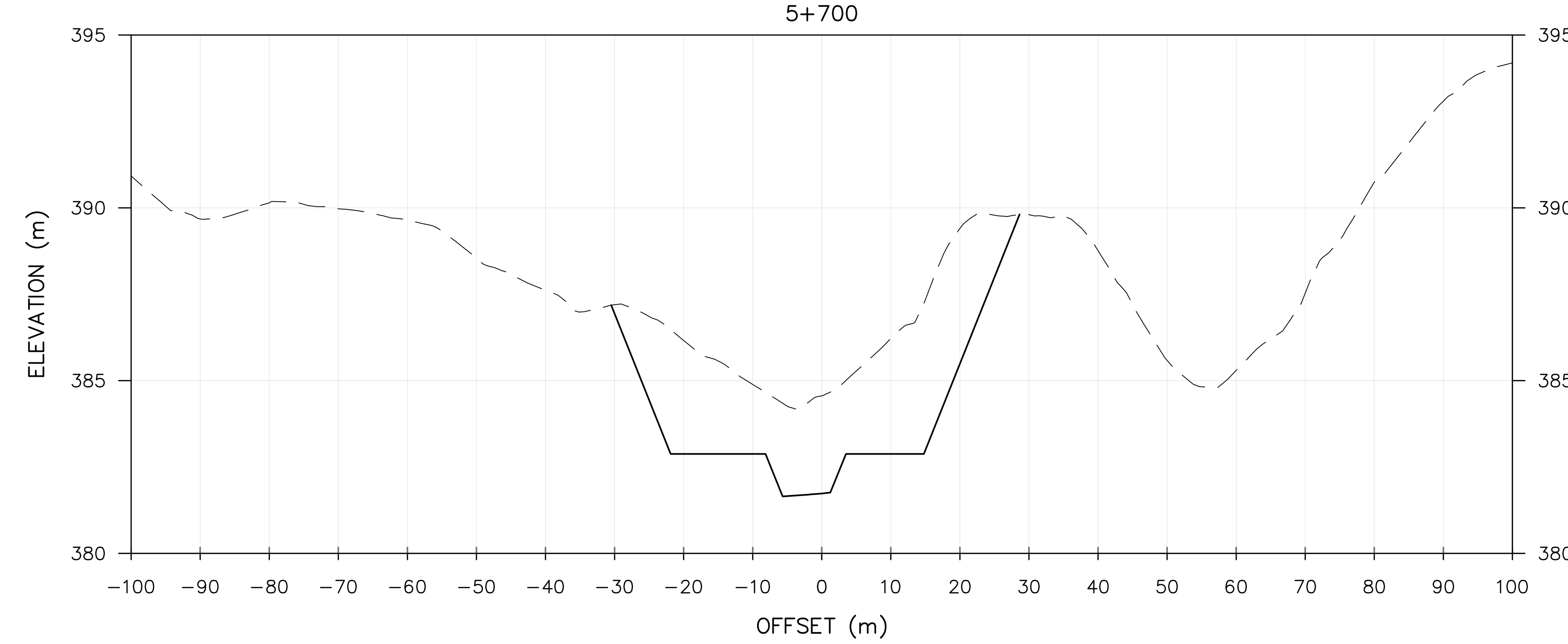
5+650



5+675



5+700



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
——— PROPOSED GRADE
— — — EXISTING GROUND

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PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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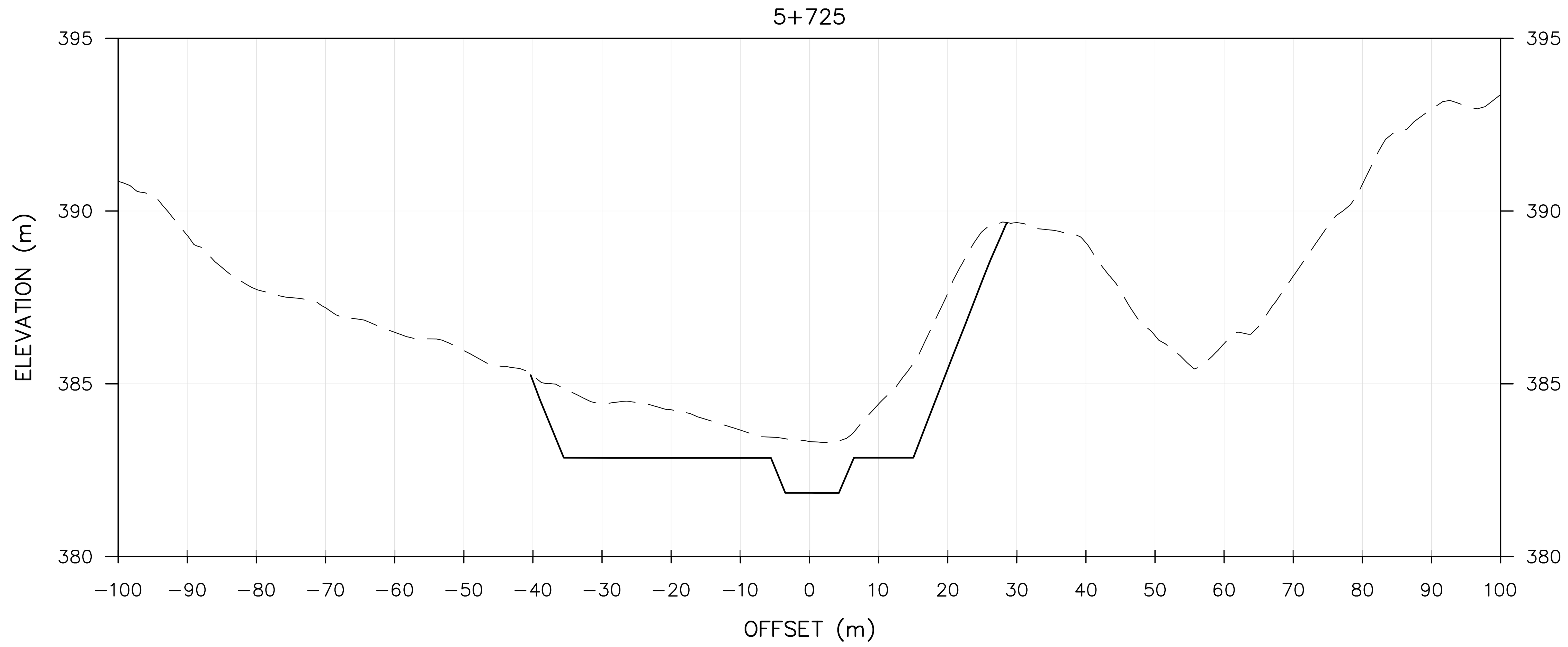
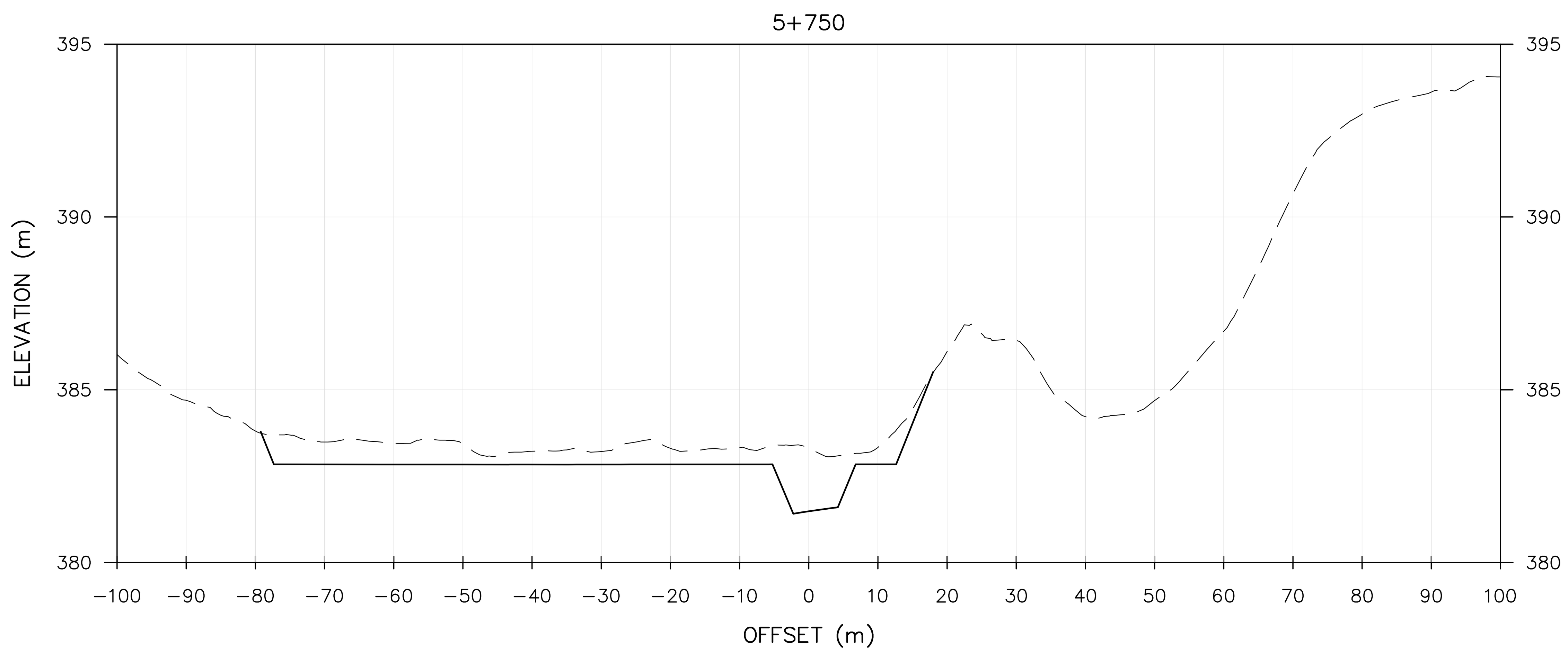
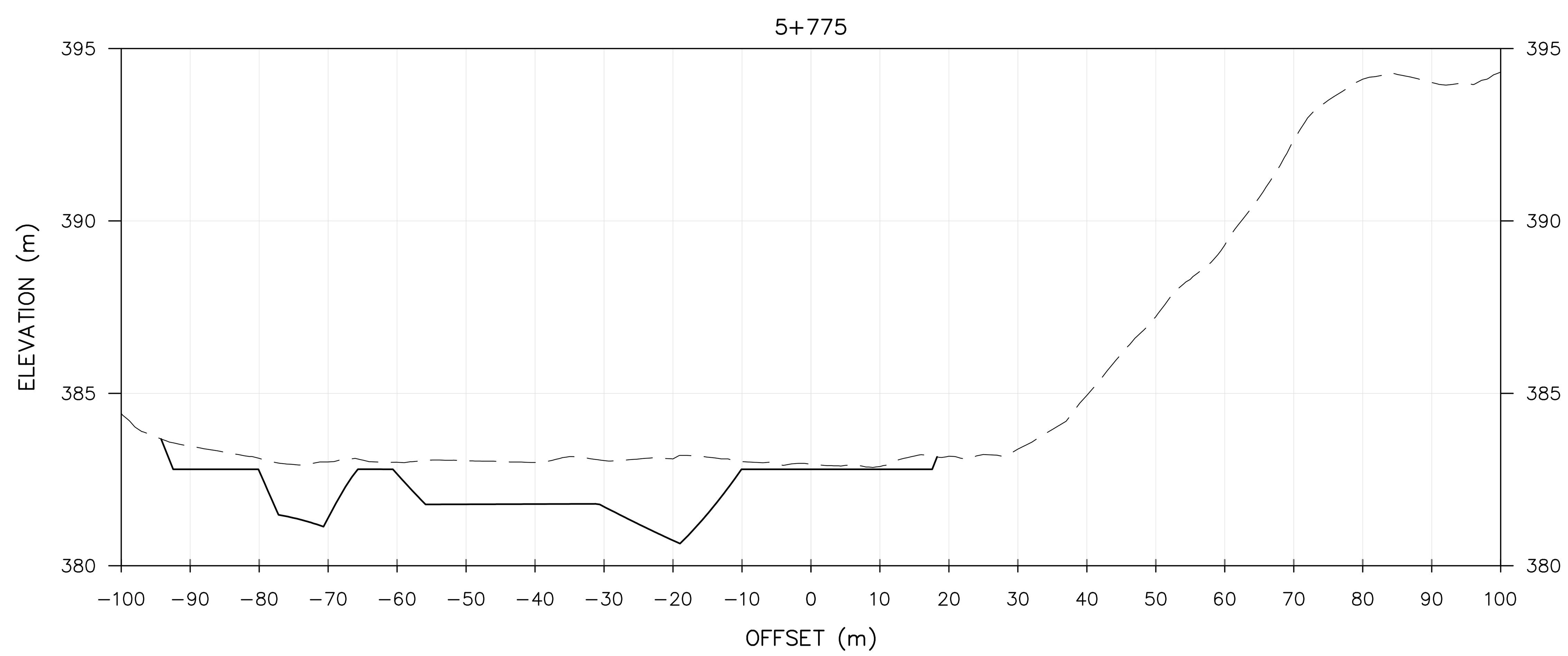
F	Issued for Construction (Updated)	2020-02-14	JPH

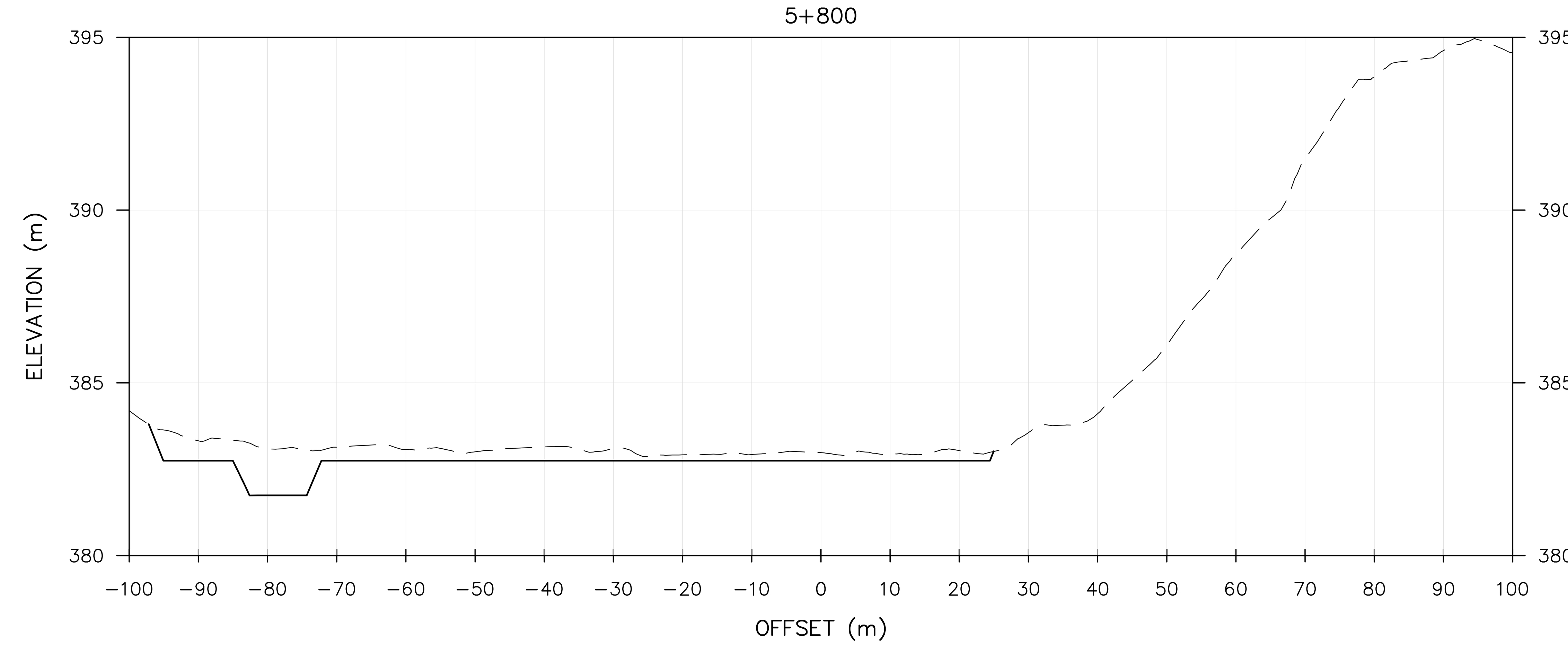
IAMGOLD COTE MINE - WRC2
SECTIONS [5+600 - 5+700]

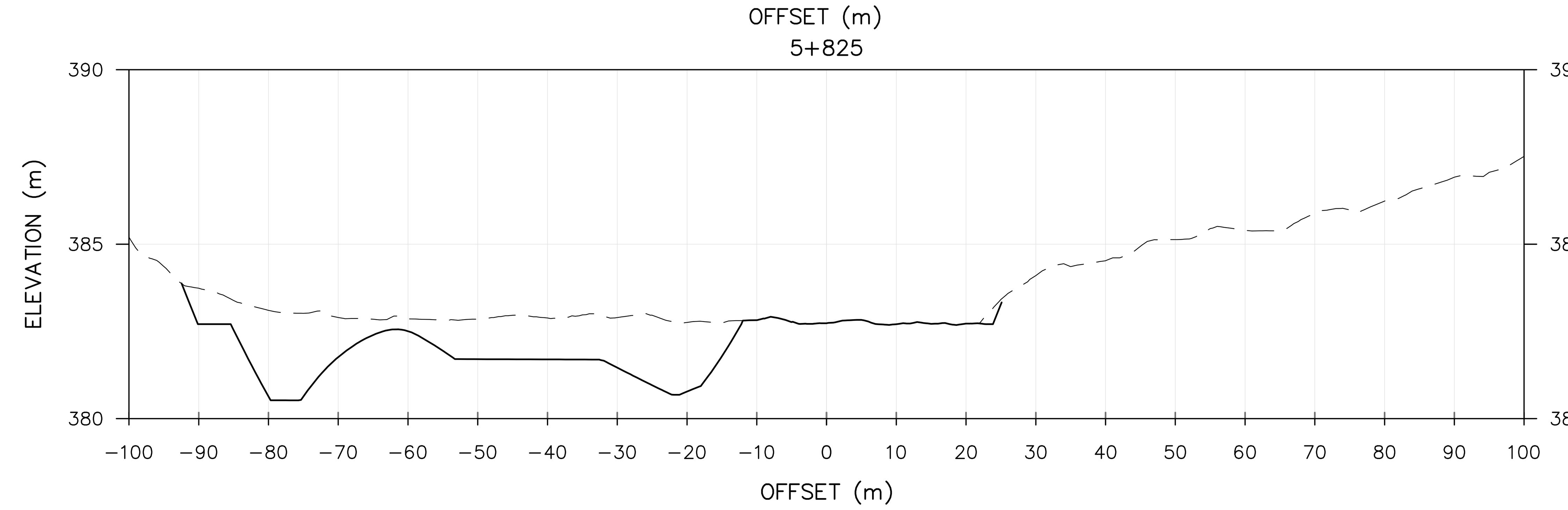
Wood Dwg. No.: 100264-846-DW00-PLN-2030
Client Dwg. No.: 846-C-2030
Scale: 1:600
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-C-5

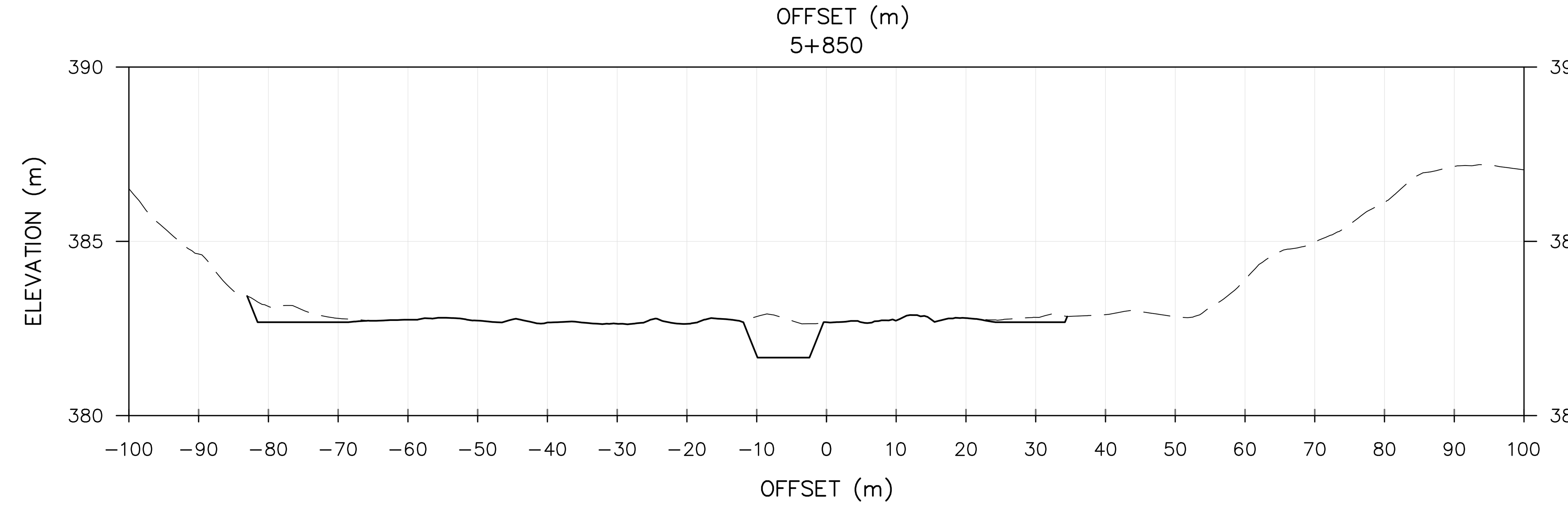


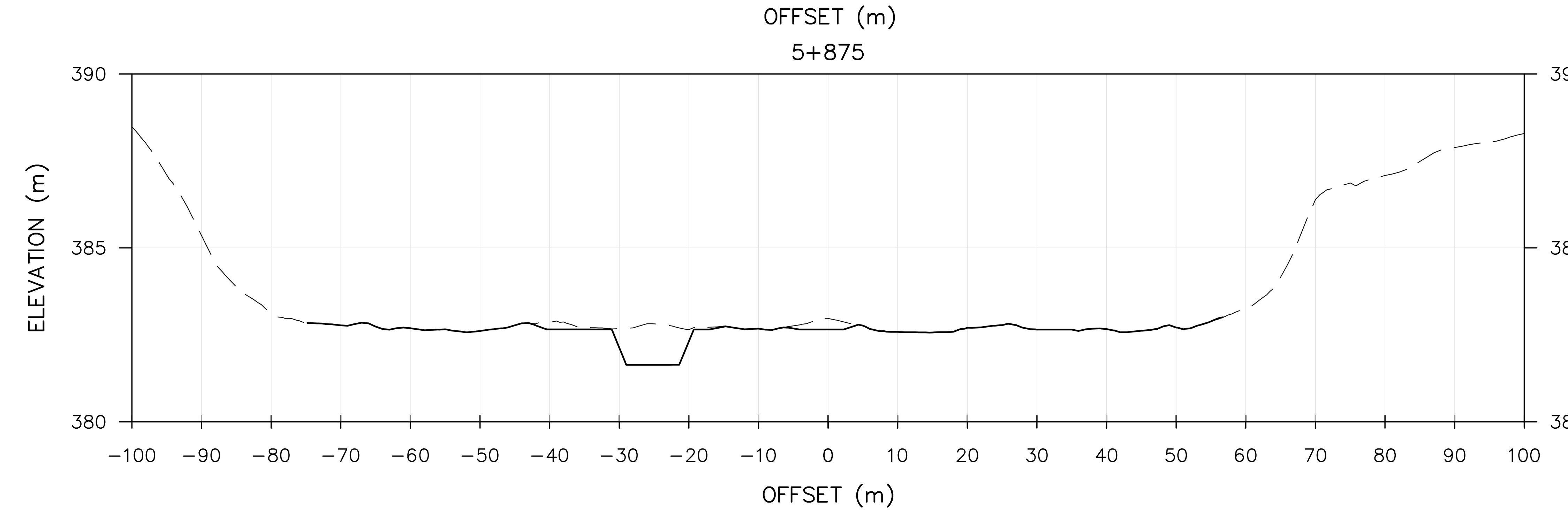












1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND

——— PROPOSED GRADE
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14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

0 20 40
HORIZONTAL

0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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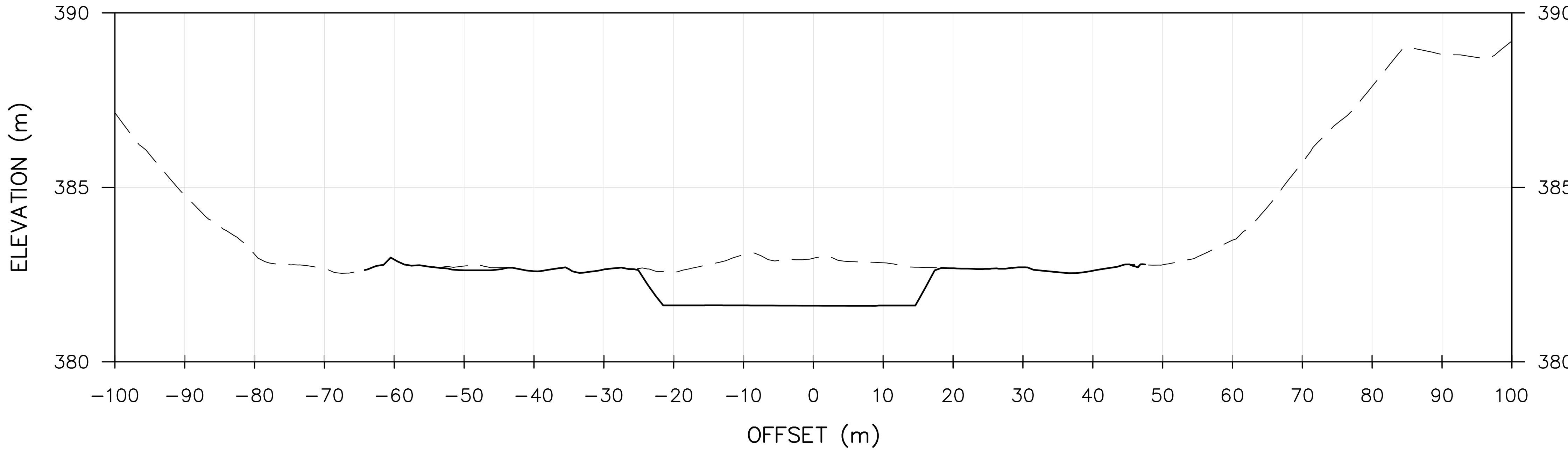
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
SECTIONS [5+725 - 5+875]

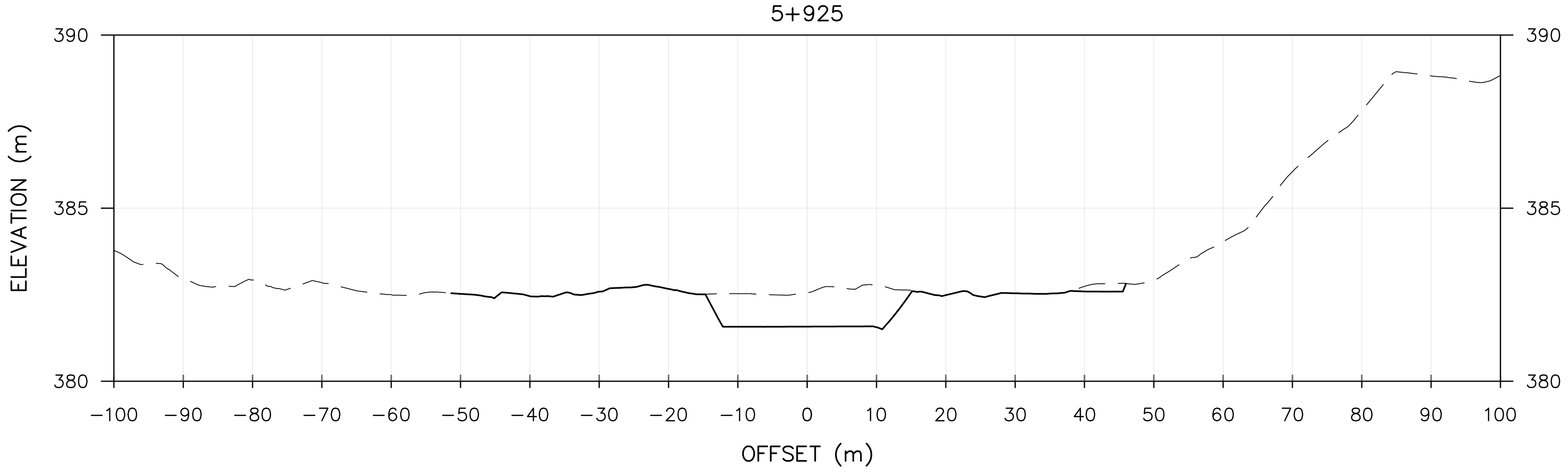
Wood Dwg. No.: 100264-846-DW00-PLN-2031
Client Dwg. No.: 846-C-2031

Scale: 1:600
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-C-6

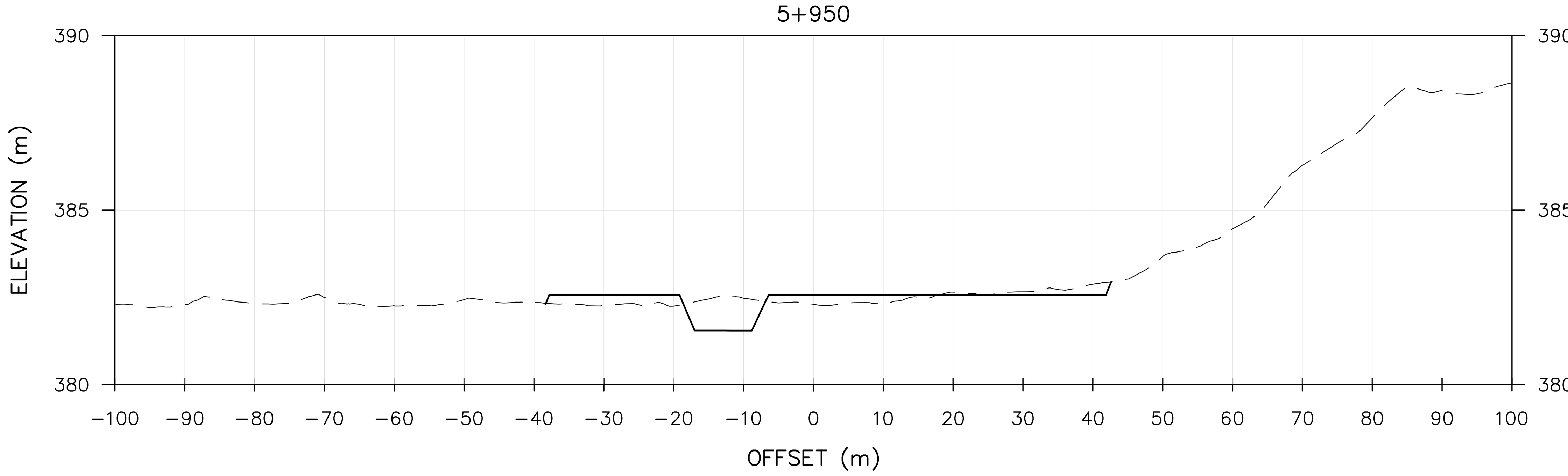
5+900



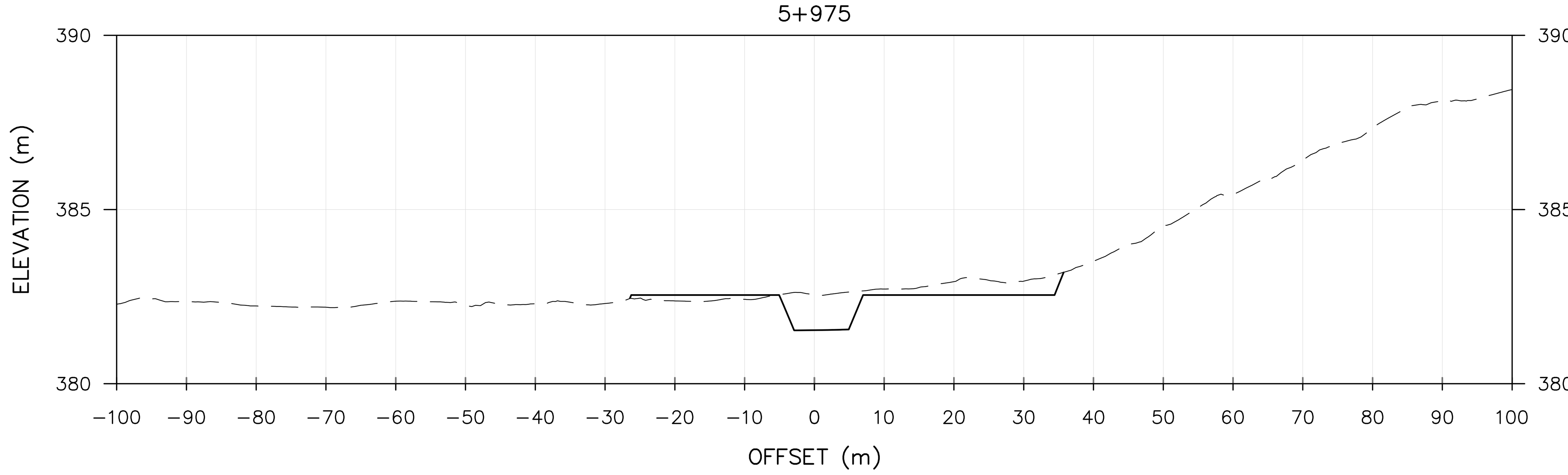
5+925



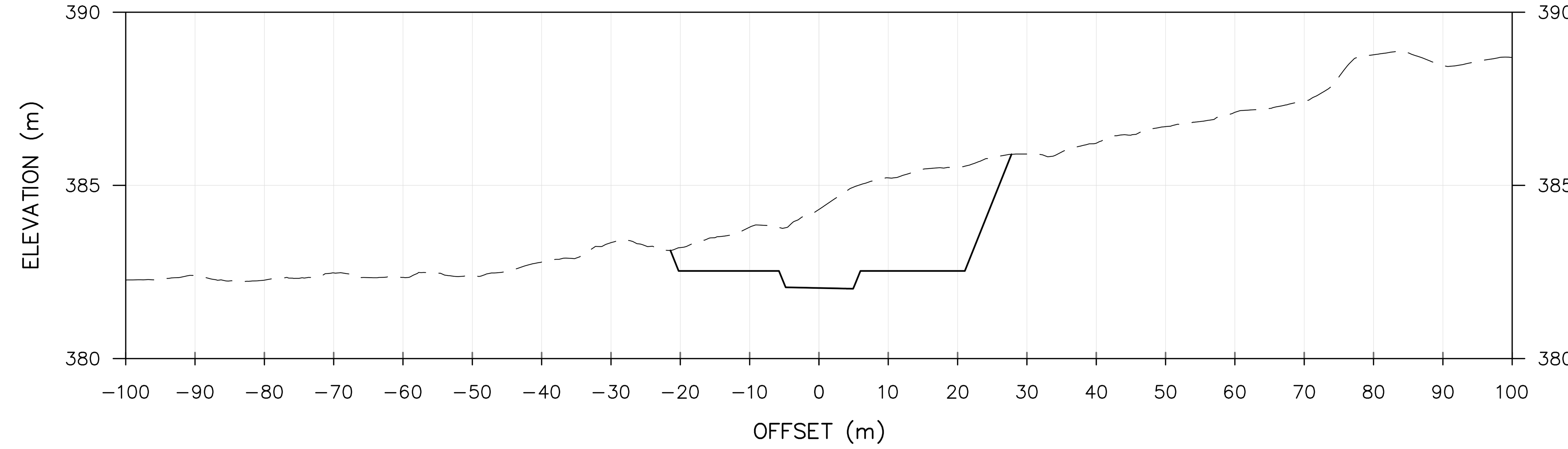
5+950



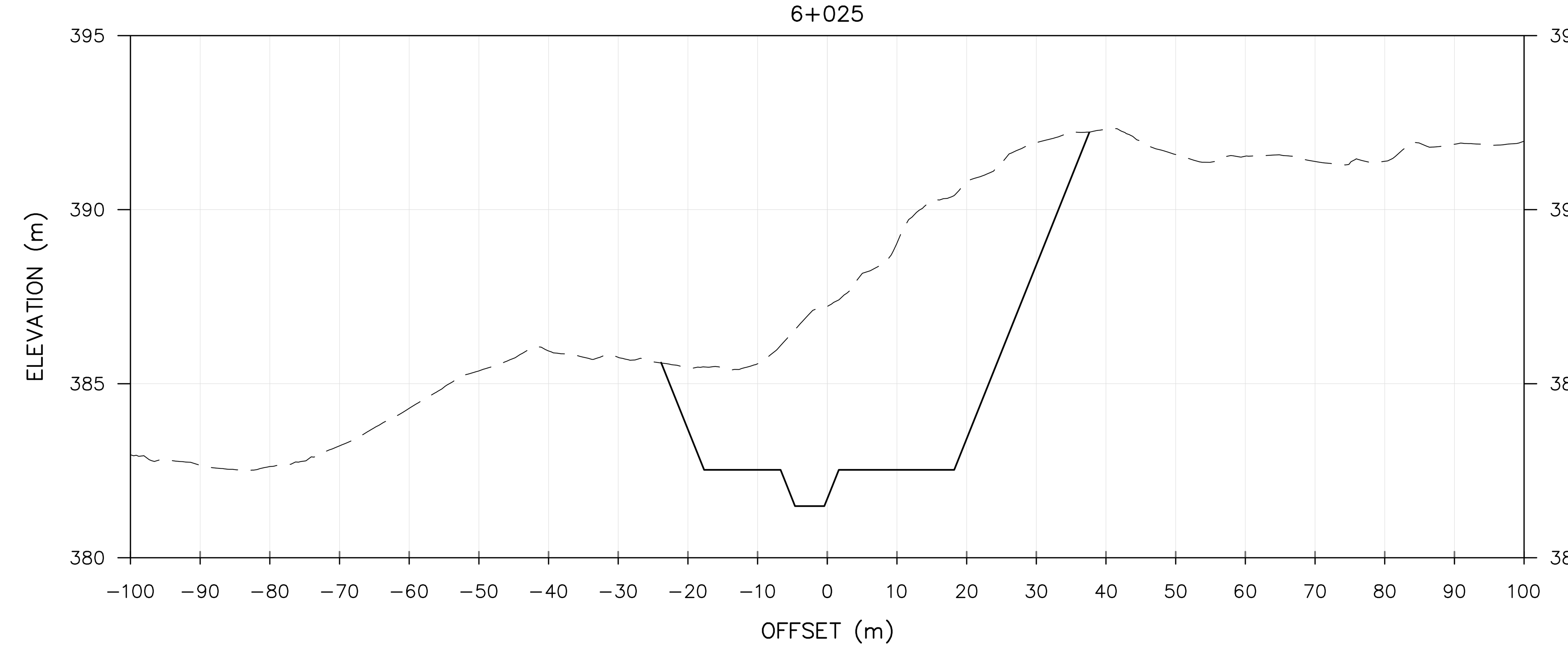
5+975



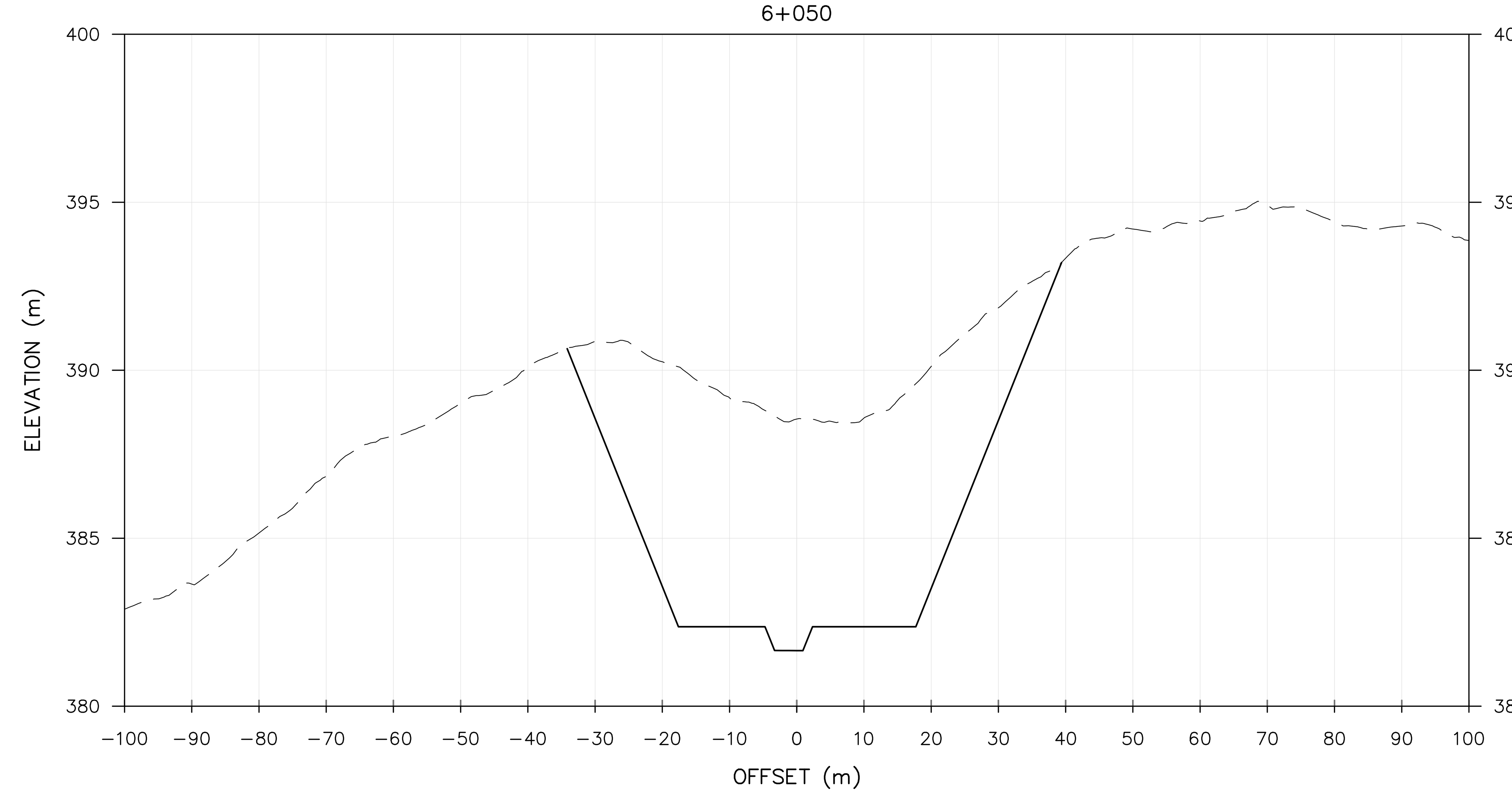
6+000



6+025



6+050



1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
PROPOSED GRADE
EXISTING GROUND

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14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
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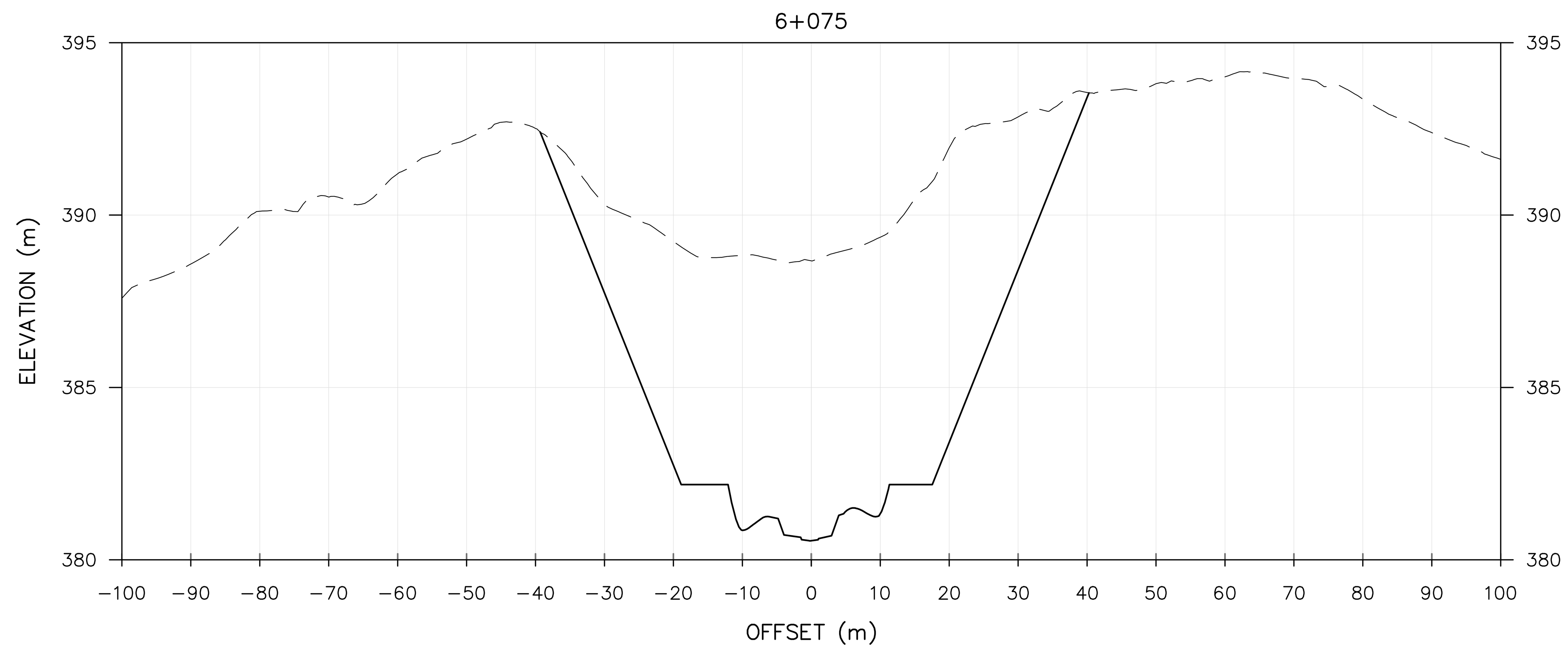
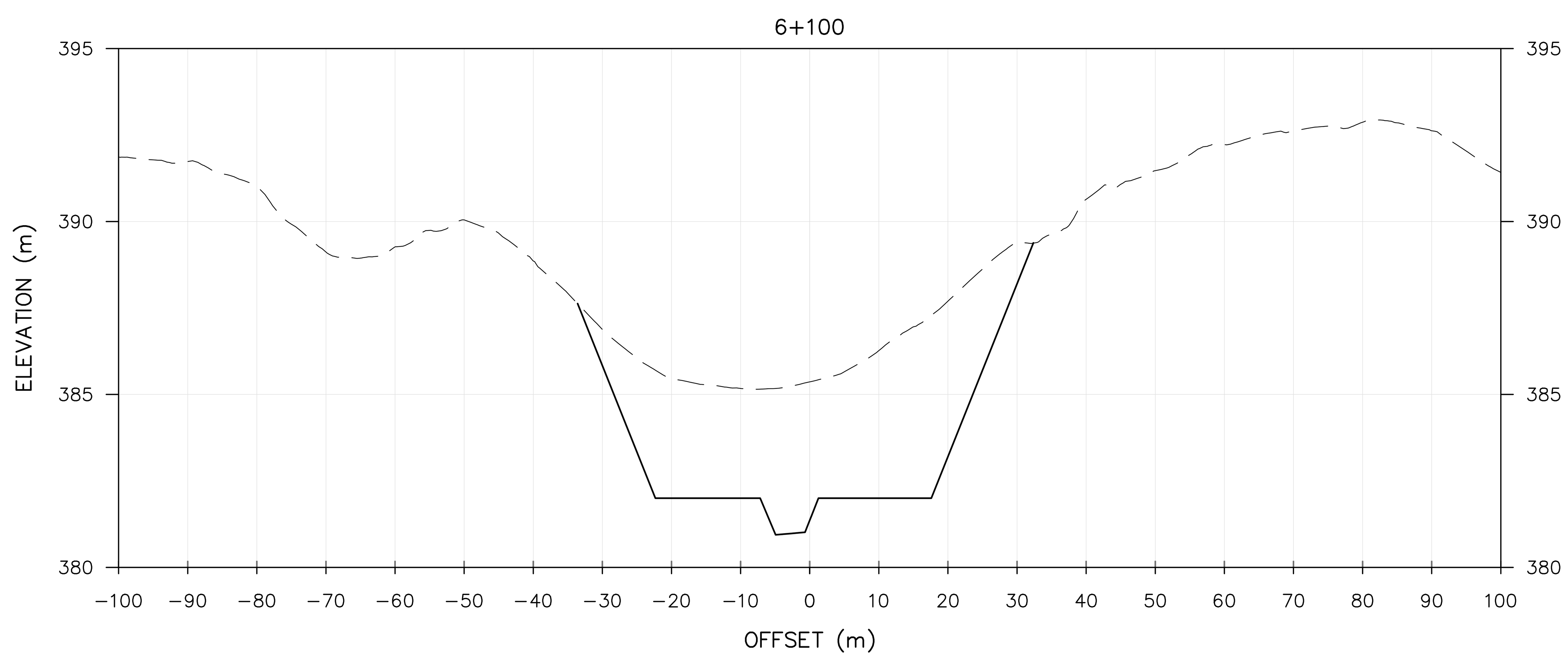
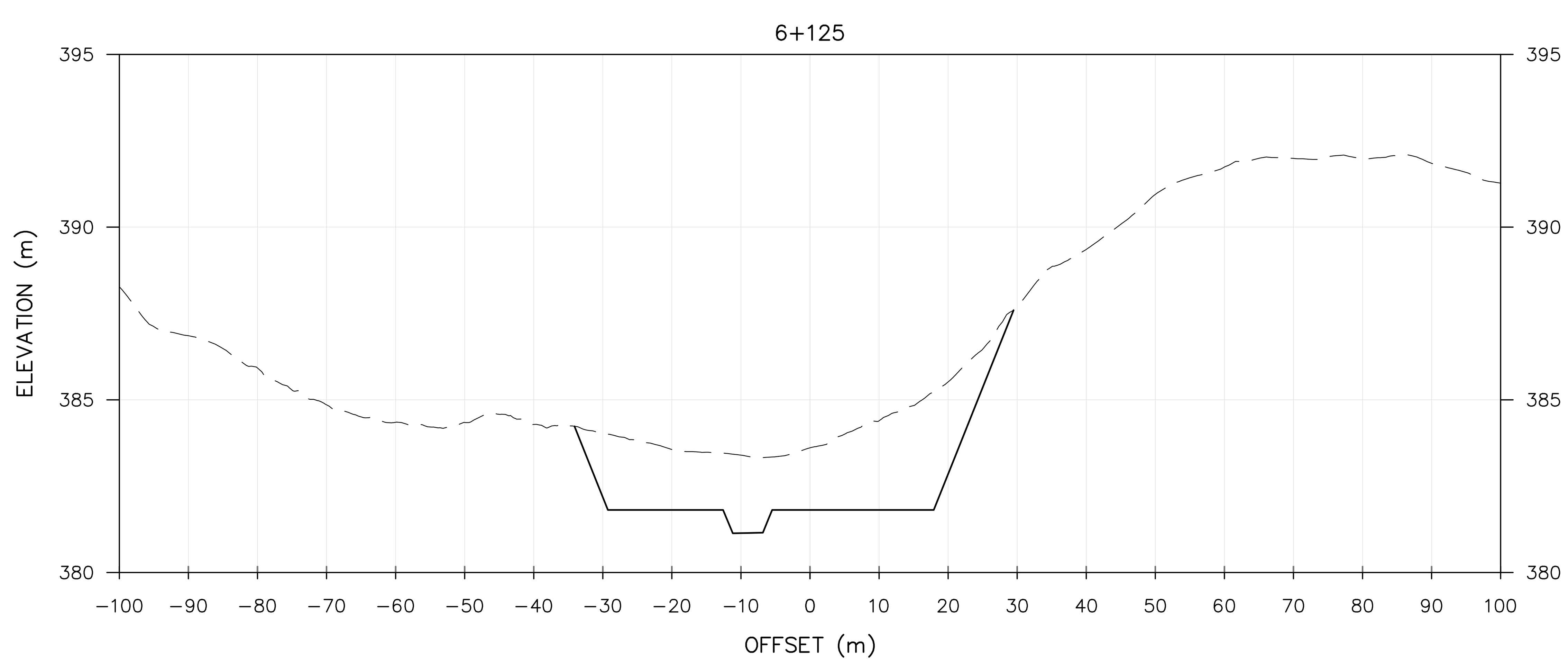
F	Issued for Construction (Updated)	2020-02-14	JPH

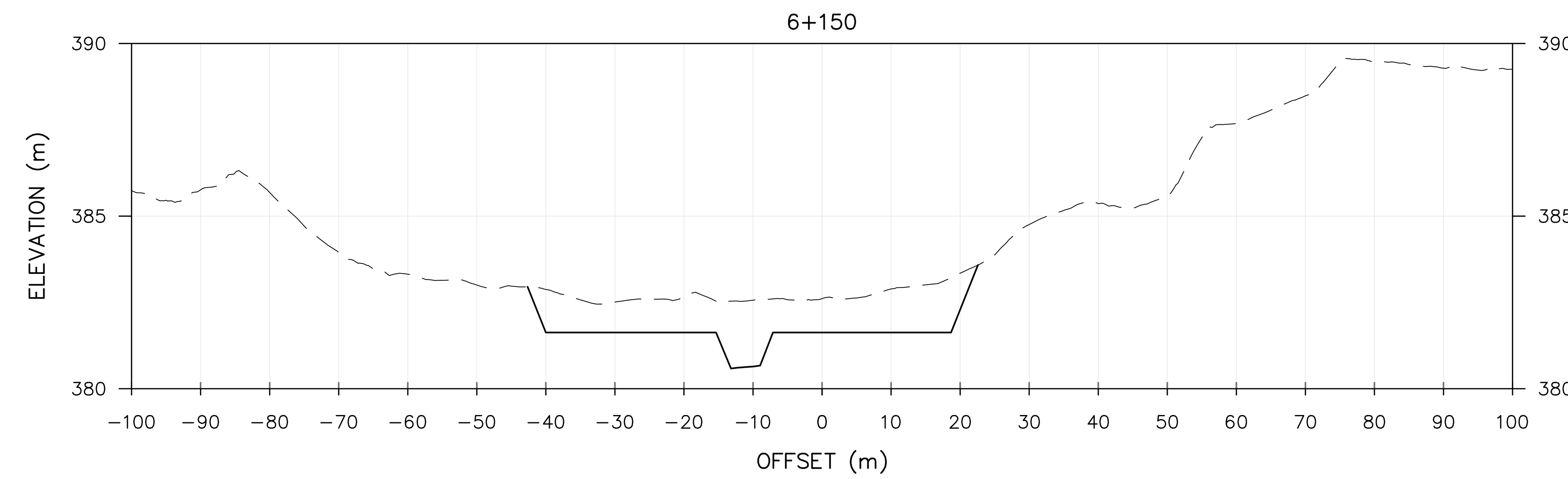
IAMGOLD COTE MINE - WRC2
SECTIONS [5+900 - 6+050]

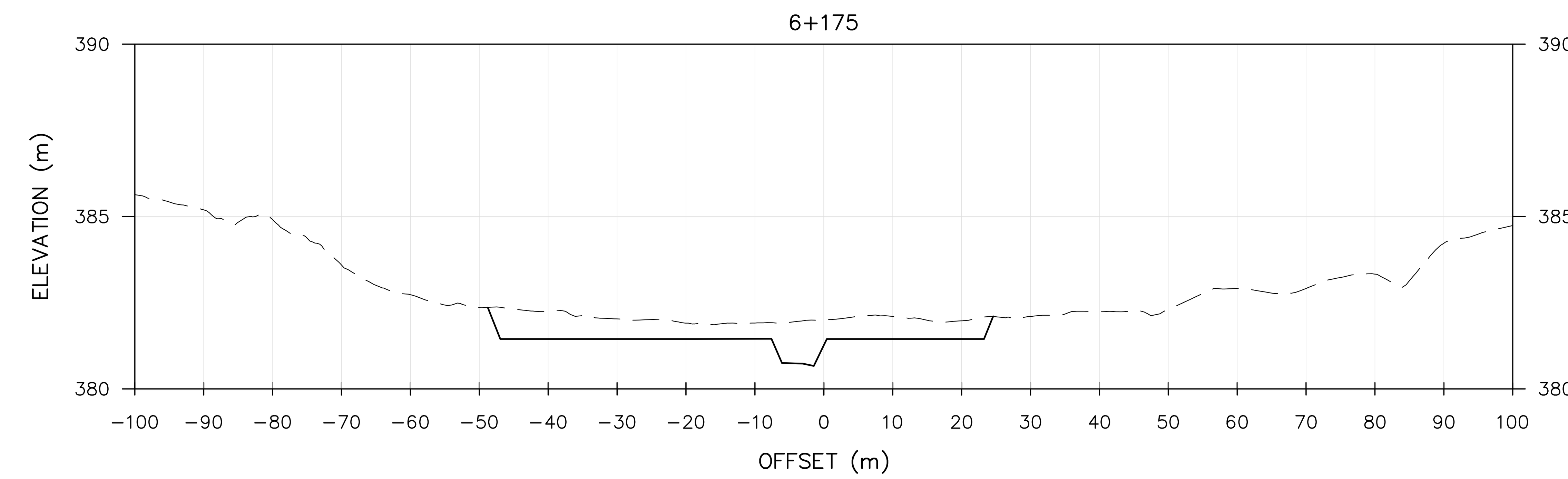
Wood Dwg. No.: 100264-846-DW00-PLN-2032
Client Dwg. No.: 846-C-2032
Scale: 1:600
Drawn By: CWM
Drawing No. WRC2-C-7
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

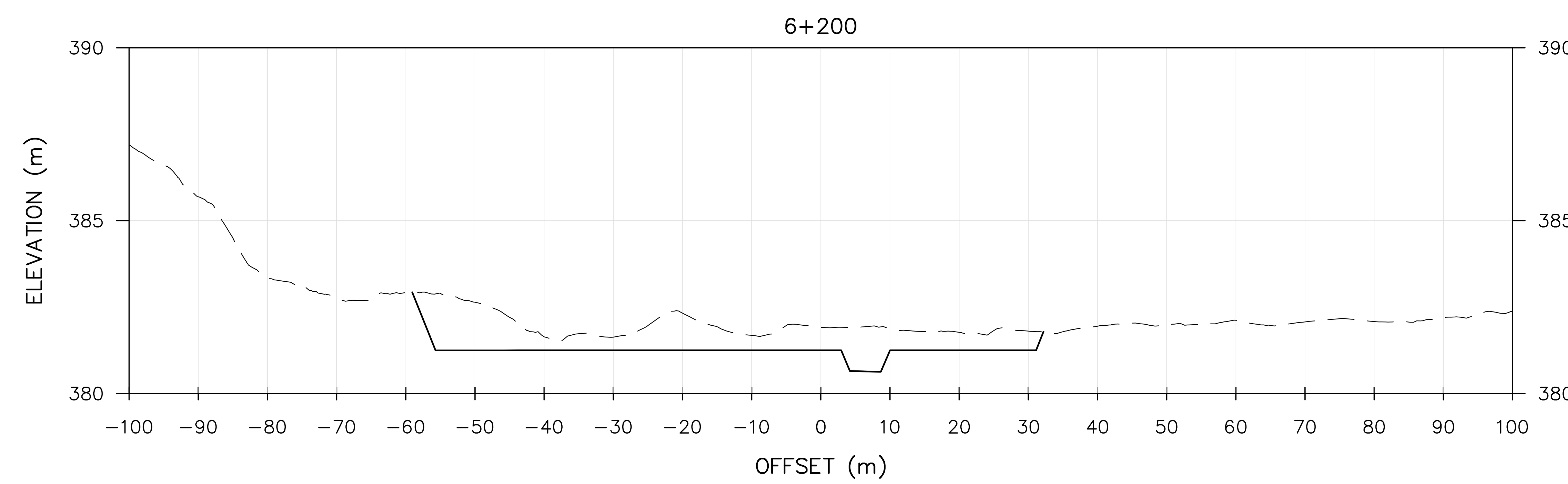


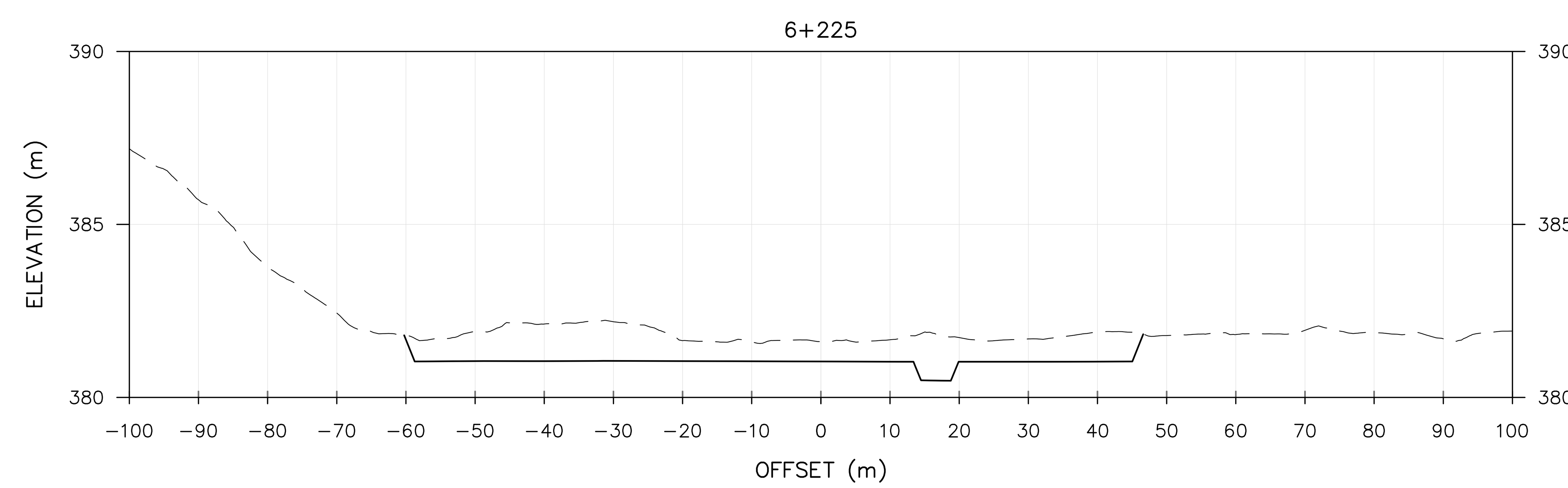












1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
—— PROPOSED GRADE
— — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

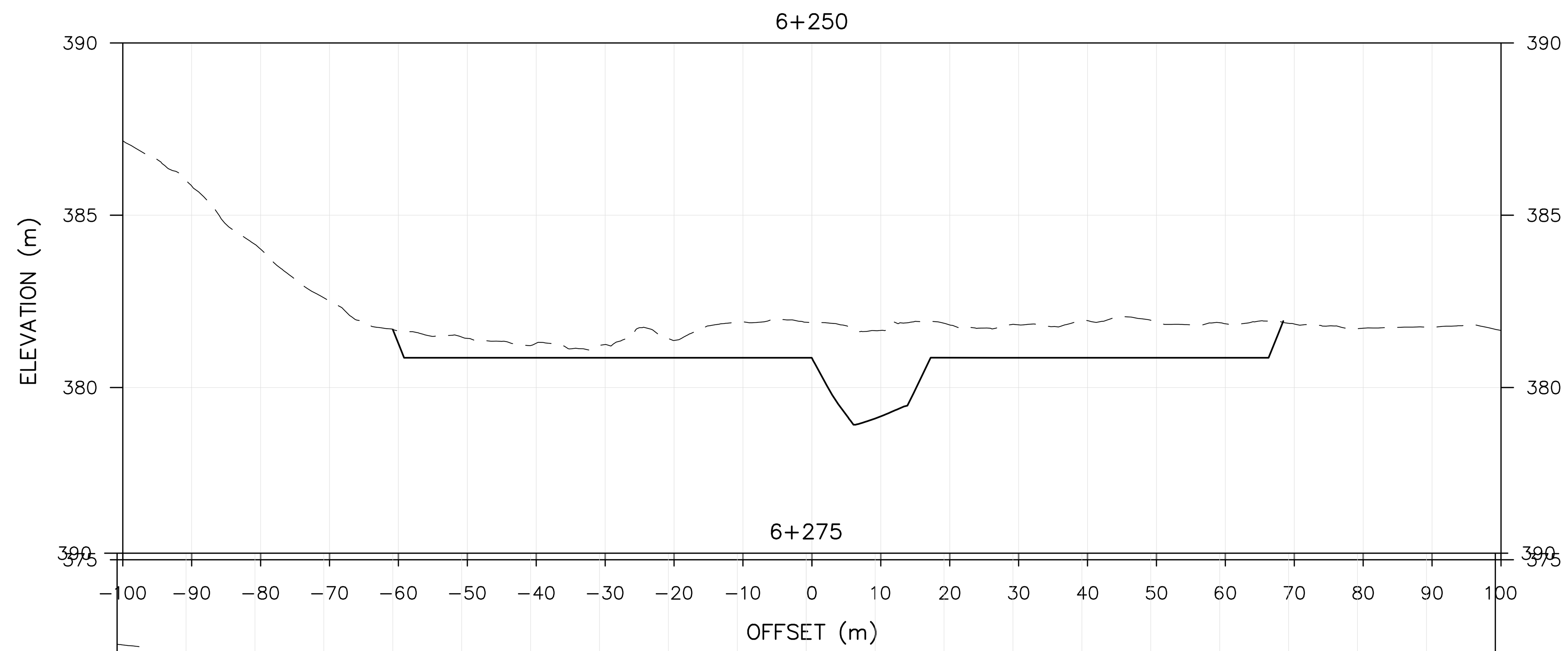
VERTICAL DATUM:
NAD83 (CSRS)

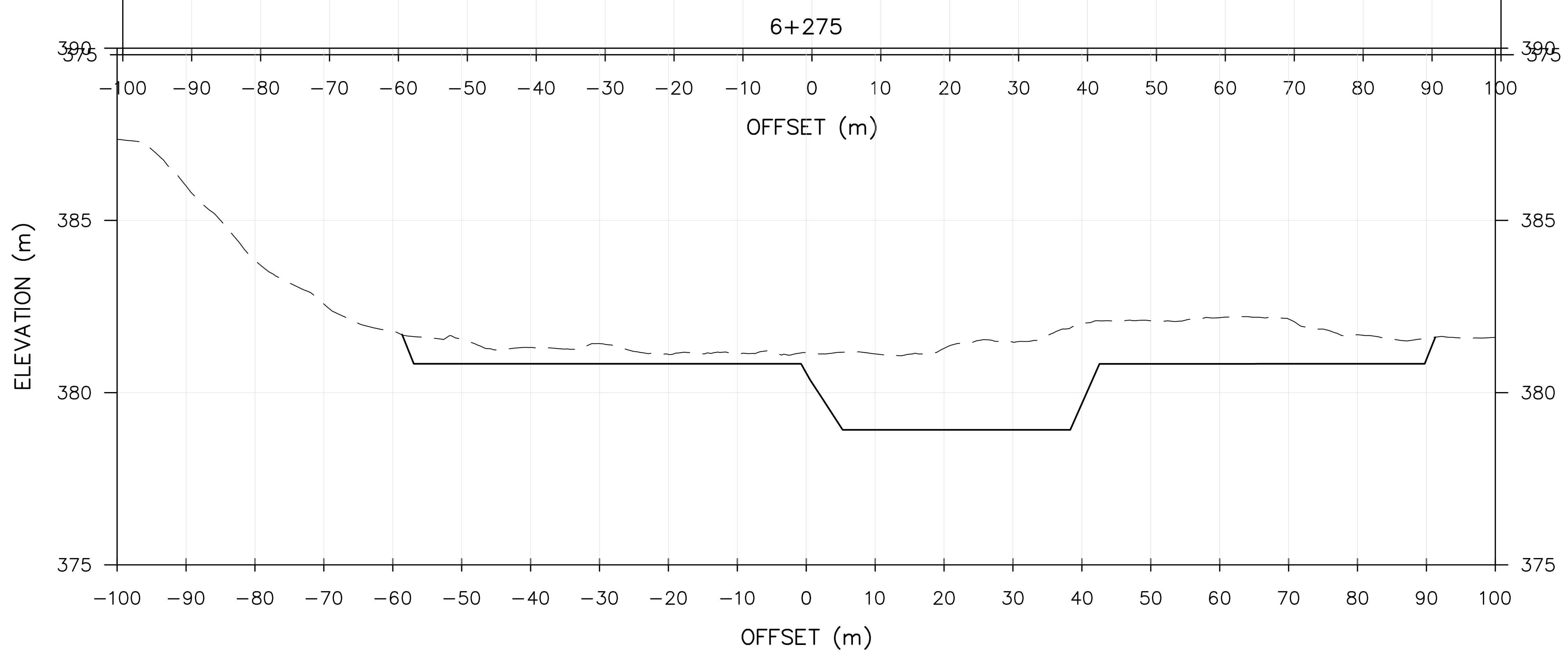
SCALES
HORIZONTAL: 0 20 40
VERTICAL: 0 4 8

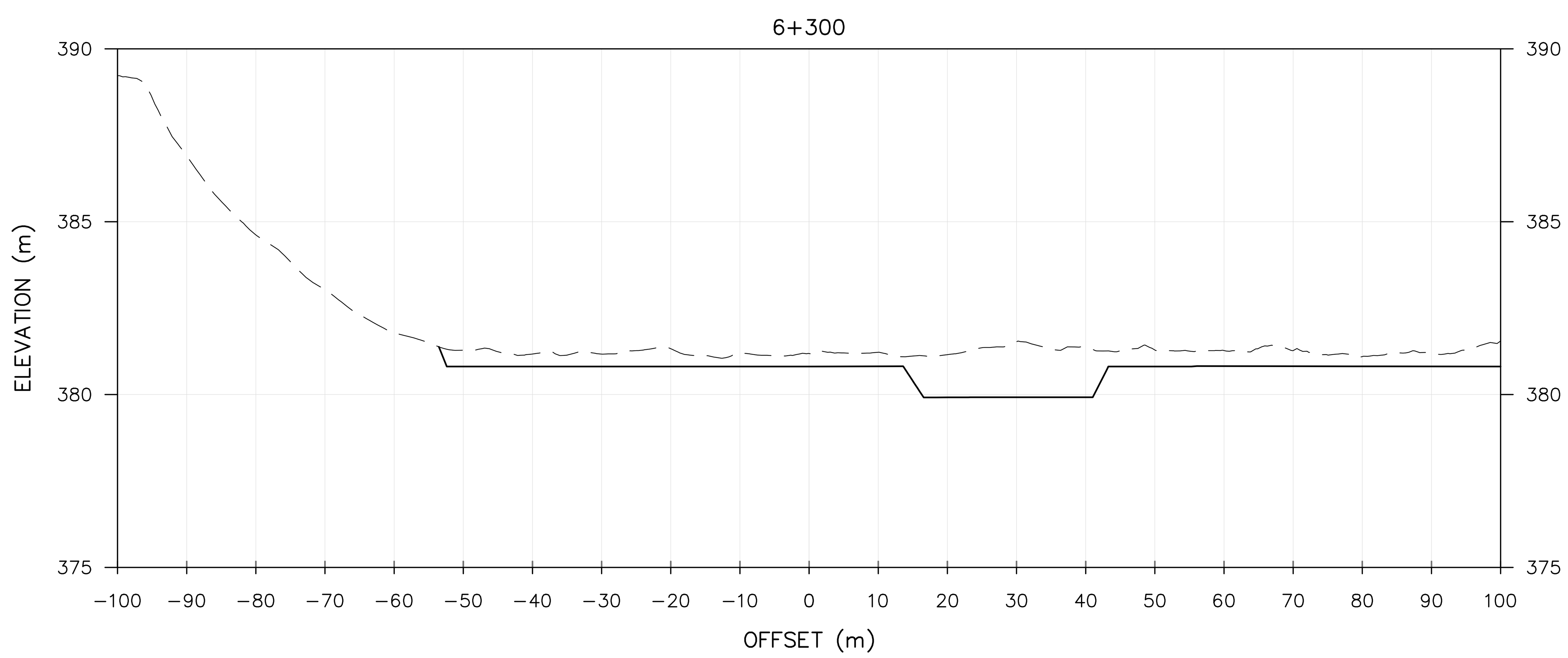
No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

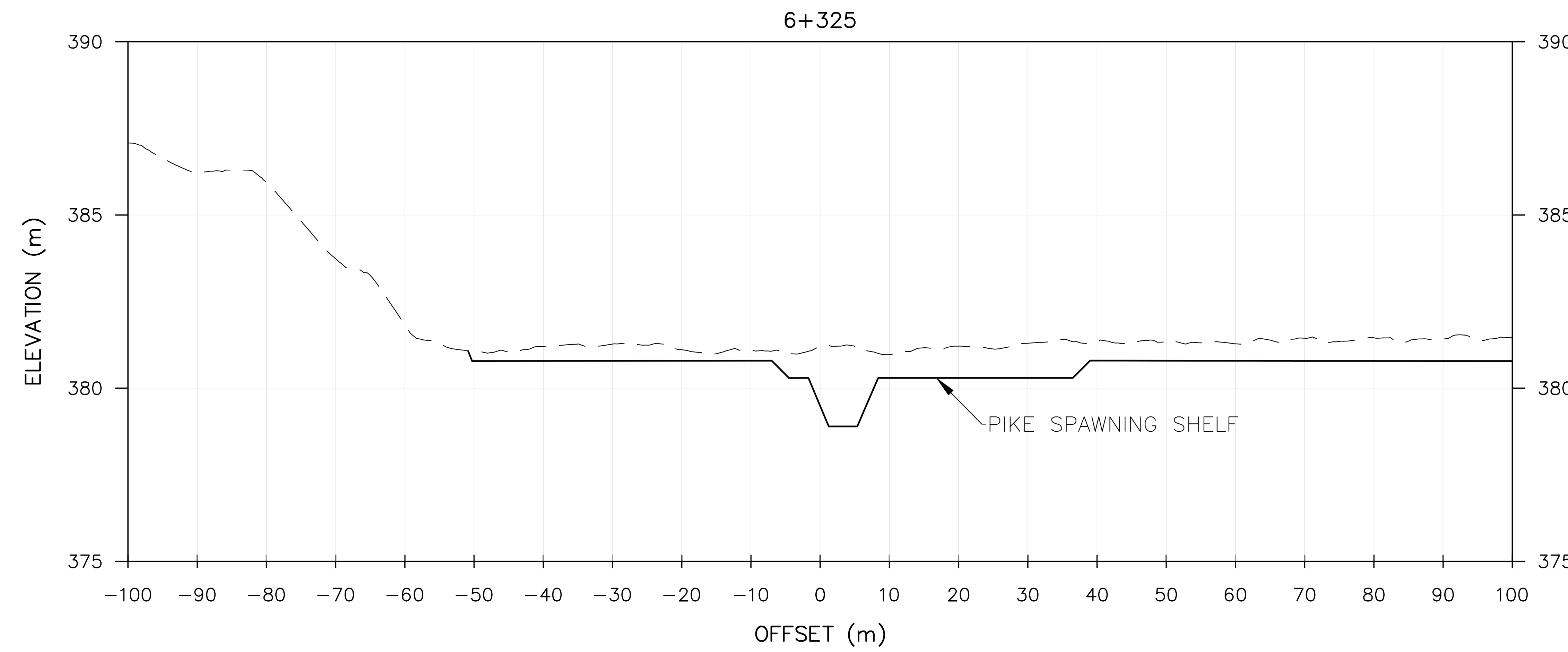
IAMGOLD COTE MINE - WRC2
SECTIONS [6+075 - 6+225]

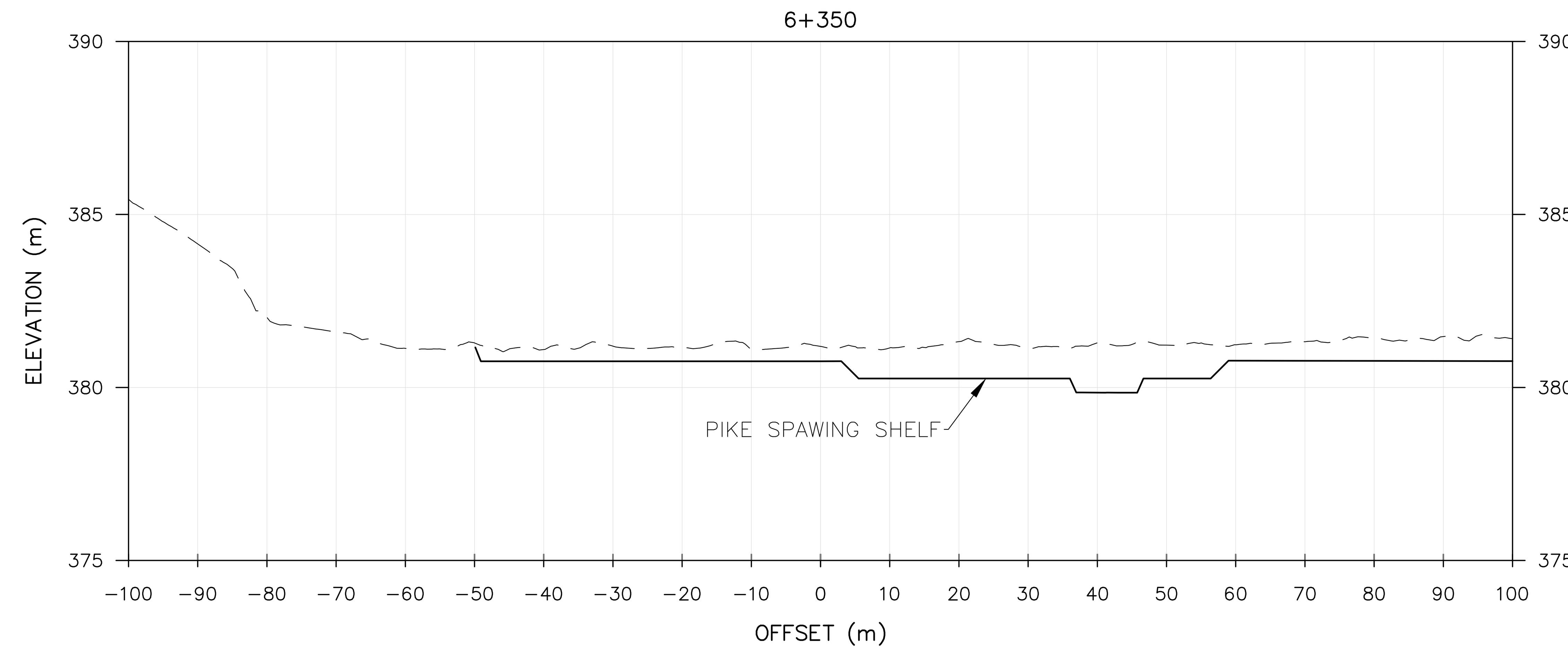
Wood Dwg. No.: 100264-846-DW00-PLN-2033
Client Dwg. No.: 846-C-2033
Scale: 1:600
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-C-8

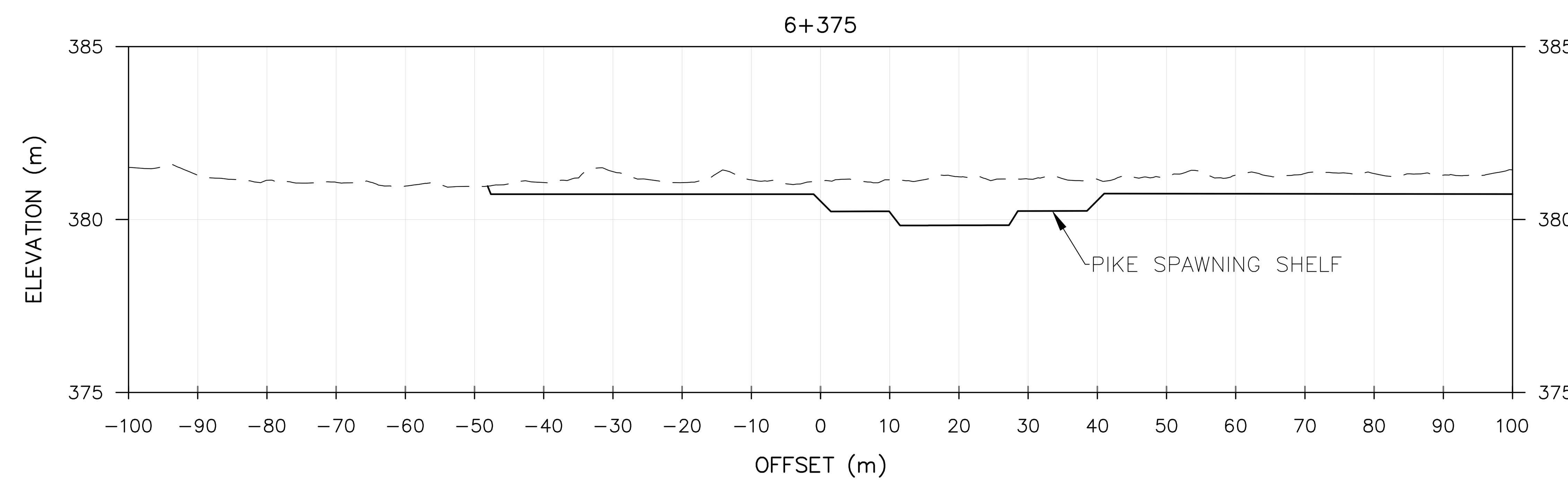












1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND
——— PROPOSED GRADE
— — — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 20 40
HORIZONTAL
0 4 8
VERTICAL

No.	REVISIONS	DATE	INITIAL
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D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
SECTIONS [6+250 - 6+400]

Wood Dwg. No.: 100264-846-DW00-PLN-2034
Client Dwg. No.: 846-C-2034
Scale: 1:600
Drawn By: CWM
Drawing No. WRC2-C-9
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

PLANTING NOTES:

GENERAL PLANTING NOTES:

1. PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONES.
2. THERE ARE TWO PLANTING ZONES WITH EACH THEIR OWN SPECIES PRESCRIPTION; ZONE 1 AND ZONE 2.
3. ZONE 1 IS LOCATED FROM TOP OF BANK TO 4 m.
4. ZONE 2 IS LOCATED BETWEEN 4 m FROM TOP OF BANK AND THE EXISTING FOREST EDGE.
5. PLANTING OF SEEDLINGS AND WHIPS IS TO BE COMPLETED BY HAND, BY EXPERIENCED PROFESSIONALS.
6. THE SCHEDULE OF SPECIES AND STOCK IS TO BE TO FOLLOWED PRECISELY, IF SUBSTITUTIONS ARE REQUIRED IT MUST BE AUTHORIZED BY A REGISTERED FORESTER.
7. PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
8. PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN TREES AND SHRUBS.
9. THE PLANTING SCHEDULES PRESCRIBE A 50% TREE AND 50% SHRUB COVER FOR ZONE 1, AND 75% TREE COVER WITH 25% OPEN SPACES FOR ZONE 2.
10. ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK (1100 TOTAL PLANTINGS)
11. SALVAGED MATERIAL RECOVERED FROM THE MOLLIE RIVER (SEE NL-G-1) TO BE INCORPORATED INTO THE ZONE 1 PLANTINGS, AT THE DIRECTION OF THE CONSTRUCTION SUPERVISOR.

Zone 1: Adjacent to Watercourse (1.1 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Trees (50% cover)				
Black Spruce	Picea mariana	10	100	Seedling Plugs
Balsam Fir	Abies balsamea	10	100	Seedling Plugs
Tamarack	Larix laricina	20	200	Seedling Plugs
Eastern White Cedar	Thuja occidentalis	30	300	Bare Root Seedlings
Trembling Aspen	Populus tremuloides	30	300	Whips
	Total	100	1000	
Shrubs (50% cover)				
Green Alder	Alnus crispa	20	200	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	50	500	12" Live Stakes, Locally Harvested
Red-Osier Dogwood	Cornus stolonifera	30	300	12" Live Stakes, Locally Harvested
	Total	100	1000	

Zone 2: General Floodplain (6.4 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Trees (75% cover)				
Black Spruce	Picea mariana	30	2600	Seedling Plugs
Balsam Fir	Abies balsamea	10	850	Seedling Plugs
White Spruce	Picea glauca	20	1700	Seedling Plugs
Tamarack	Larix laricina	10	850	Seedling Plugs
Jack Pine	Pinus banksiana	30	2600	Seedling Plugs
	Total	100	8600	
25% open space to represent natural openings in the floodplain canopy cover				

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- RIFFLE STONE PLACEMENT
- PIKE SPAWNING SHELF
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING
- ALDER PLANTINGS AT 3 m O.C.

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- EXPOSED TREE STUMPS

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

0 15 30

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
REVEGETATION AND RESTITUTION [0+000 - 0+400]

Wood Dwg. No.: 100264-846-DW00-PLN-2035
Client Dwg. No.: 846-C-2035
Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-R-1

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- RIFFLE STONE PLACEMENT
- PIKE SPAWNING SHELF
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING
- ALDER PLANTINGS AT 3 m O.C.

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- EXPOSED TREE STUMPS

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14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
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RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

0 15 30

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D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
REVEGETATION AND RESTITUTION [0+400 - 0+800]

Wood Dwg. No.: 100264-846-DW00-PLN-2036
Client Dwg. No.: 846-C-2036
Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-R-2

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- LOWFLOW CHANNEL CL CHAINAGE (0+300)
- VALLEY CL CHAINAGE (5+300)
- RIFFLE STONE PLACEMENT
- PIKE SPAWNING SHELF
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING
- ALDER PLANTINGS AT 3 m O.C.

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- EXPOSED TREE STUMPS

LICENSED PROFESSIONAL ENGINEER
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PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

0 15 30

No.	REVISIONS	DATE	INITIAL
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F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
REVEGETATION AND RESTITUTION [0+800 - 1+200]

Wood Dwg. No.: 100264-846-DW00-PLN-2037
Client Dwg. No.: 846-C-2037

Scale: 1:500
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-R-3

1:1 HORIZONTAL
5:1 VERTICAL

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- RIFFLE STONE PLACEMENT
- PIKE SPAWNING SHELF
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING
- ALDER PLANTINGS AT 3 m O.C.

HABITAT FEATURES:

- FALLEN TREE
- STANDING SNAG
- LARGE BOULDER
- EXPOSED TREE STUMPS

LICENSED PROFESSIONAL ENGINEER
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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

0 15 30

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F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
REVEGETATION AND RESTITUTION [1+200 - 1+600]

Wood Dwg. No.: 100264-846-DW00-PLN-2038
Client Dwg. No.: 846-C-2038

Scale: 1:500
Drawn By: CWM
Drawing No. WRC2-R-4
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- 0+300 LOWFLOW CHANNEL CL CHAINAGE
- 5+300 VALLEY CL CHAINAGE
- RIFFLE STONE PLACEMENT
- PIKE SPAWNING SHELF
- AREAS TO MAINTAIN EXISTING GROUND
- LIMIT OF BLENDING
- ALDER PLANTINGS AT 3 m O.C.

HABITAT FEATURES:

- FALLEN TREE
- LARGE BOULDER
- STANDING SNAG
- EXPOSED TREE STUMPS

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14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
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RECEIVED FEB 2, 2018

VERTICAL DATUM:
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SCALES

0 HORIZONTAL 30

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

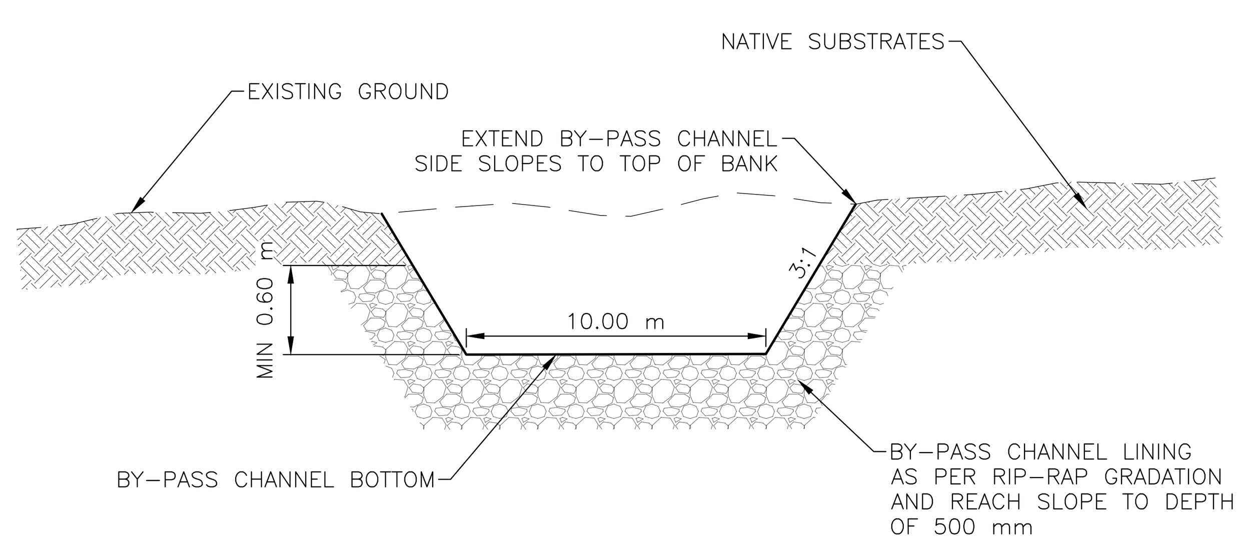
IAMGOLD COTE MINE - WRC2
REVEGETATION AND RESTITUTION [1+600 - 1+860]

Wood Dwg. No.: 100264-846-DW00-PLN-2039
Client Dwg. No.: 846-C-2039

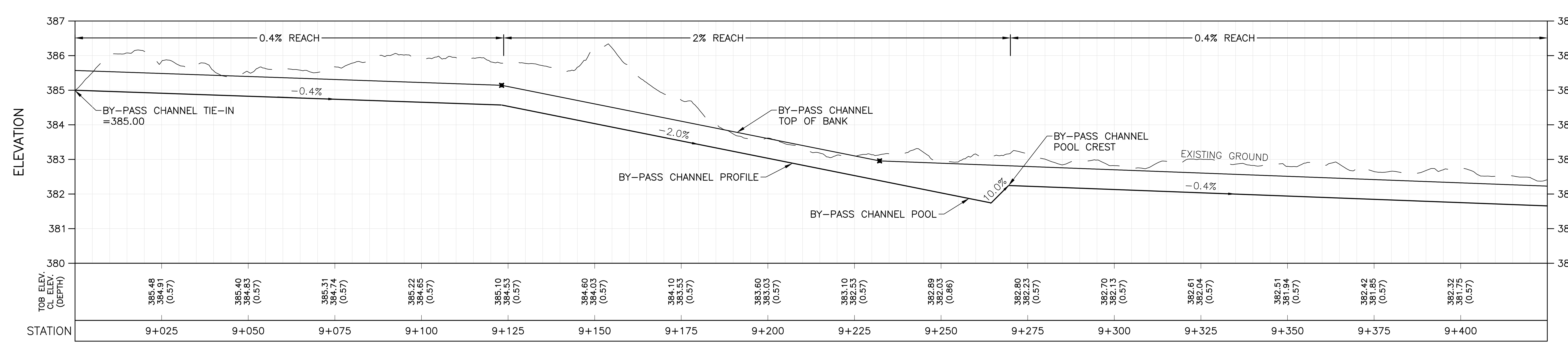
Scale: 1:500
Drawn By: CWM
Drawing No. WRC2-R-5
Date Issued: FEB 14, 2020
Checked By: BDP, JPH

Bypass Rip Rap Gradation – 0.4 % Reaches (Riprap Zone 6A)	
Particle Size (mm)	*% Passing by Weight*
200	100
150	50-100
100	5-50
90	0-40
45	0-8

Bypass Rip Rap Gradation – 2% Reach	
Particle Size (mm)	*% Composition*
300	25
Zone 6A Rip Rap	75



SCALE = 1:750
1:1 HORIZONTAL
10:1 VERTICAL



STATION	TOB ELEV.	CL ELEV.	(DEPTH)
9+025	385.48	384.91	(0.57)
9+050	385.40	384.83	(0.57)
9+075	385.31	384.74	(0.57)
9+100	385.22	384.65	(0.57)
9+125	385.10	384.53	(0.57)
9+150	384.60	384.03	(0.57)
9+175	384.10	383.53	(0.57)
9+200	383.60	383.03	(0.57)
9+225	383.10	382.53	(0.57)
9+250	382.89	382.03	(0.86)
9+275	382.80	382.23	(0.57)
9+300	382.70	382.13	(0.57)
9+325	382.61	382.04	(0.57)
9+350	382.51	381.94	(0.57)
9+375	382.42	381.85	(0.57)
9+400	382.32	381.75	(0.57)

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 15 30
PLAN ONLY

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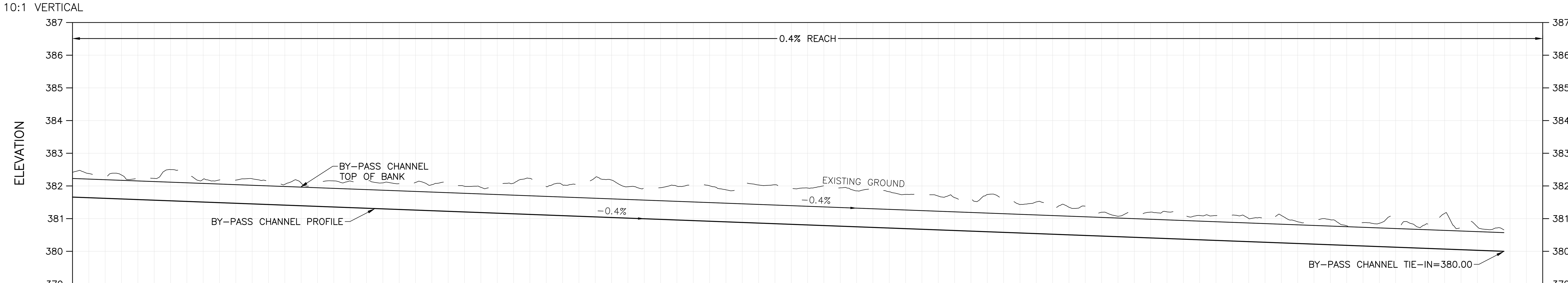
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

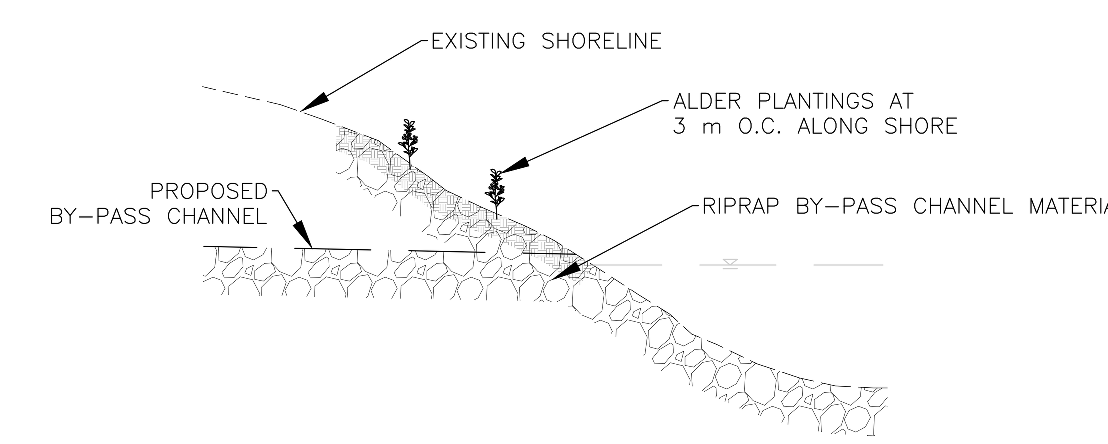
IAMGOLD COTE MINE - WRC2
BY-PASS CHANNEL [9+000 - 9+425]

Wood Dwg. No.: 100264-846-DW00-PLN-2040 | Client Dwg. No.: 846-C-2040
Scale: 1:500 PLAN | Drawn By: CWM | Drawing No. WRC2-B-1
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

SCALE = 1:750
1:1 HORIZONTAL
10:1 VERTICAL



STATION	TOB ELEV.	CL ELEV.	(DEPTH)
9+450	382.13	381.56	(0.57)
9+475	382.04	381.47	(0.57)
9+500	381.94	381.37	(0.57)
9+525	381.85	381.28	(0.57)
9+550	381.76	381.19	(0.57)
9+575	381.66	381.09	(0.57)
9+600	381.57	381.00	(0.57)
9+625	381.47	380.90	(0.57)
9+650	381.38	380.81	(0.57)
9+675	381.28	380.71	(0.57)
9+700	381.19	380.62	(0.57)
9+725	381.09	380.52	(0.57)
9+750	381.00	380.43	(0.57)
9+775	380.90	380.33	(0.57)
9+800	380.81	380.24	(0.57)
9+825	380.71	380.14	(0.57)
9+850	380.62	380.05	(0.57)



BY-PASS CHANNEL-CONFLUENCE STABILIZATION

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD

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LEGEND
- PROPOSED CHANNEL BOTTOM
- PROPOSED TOP OF BANK
- EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
0 15 30
PLAN ONLY

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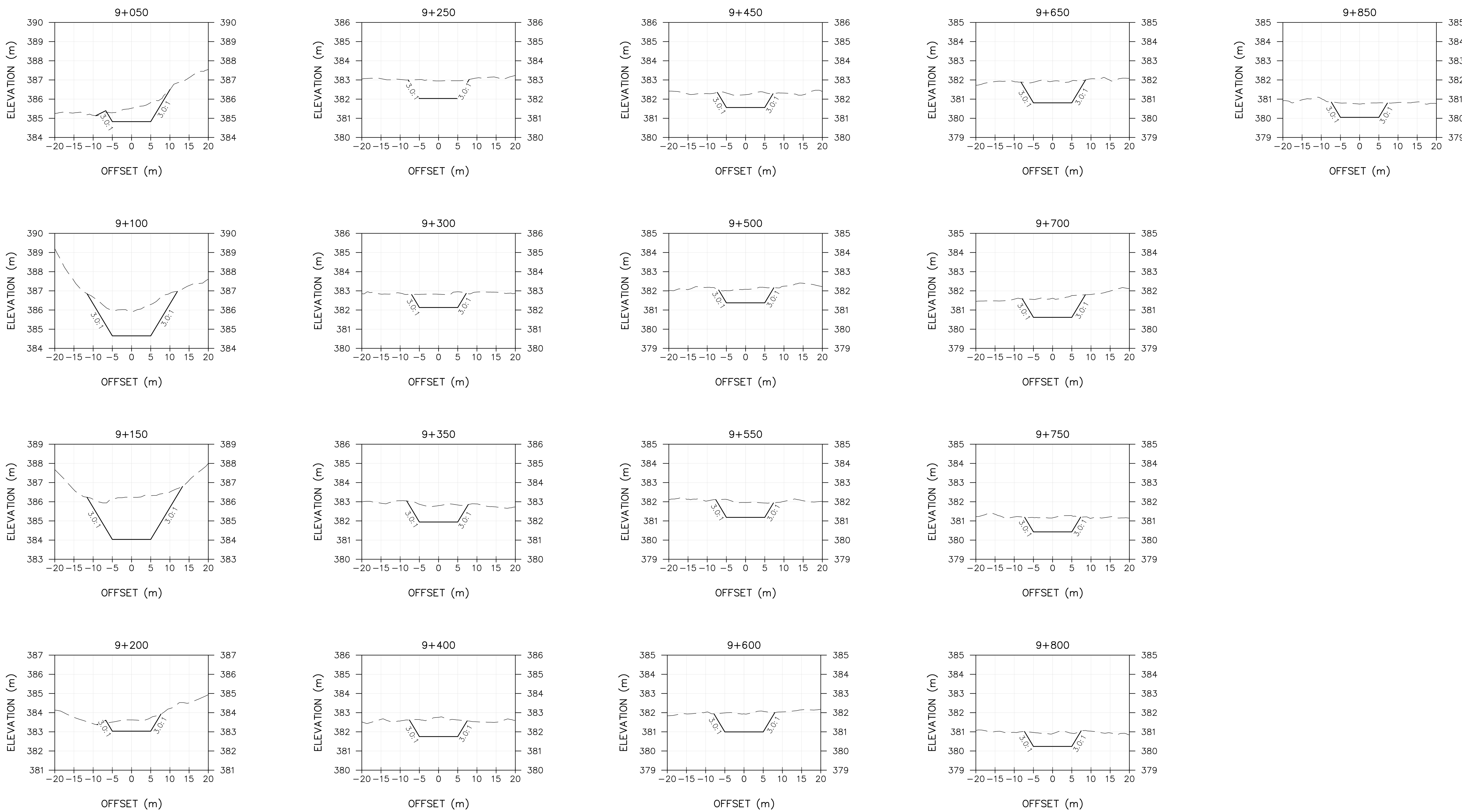
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
BY-PASS CHANNEL [9+425 - END]

Wood Dwg. No.: 100264-846-DW00-PLN-2041
Client Dwg. No.: 846-C-2041
Scale: 1:500 PLAN
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-B-2



NOTE: BY-PASS CHANNEL MATERIALS TO BE PROVIDED BY WOOD

BY-PASS CHANNEL CAPACITY DESIGN AS PER MEMO PROVIDED BY WOOD

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LEGEND

——— PROPOSED BY-PASS CHANNEL

— — — EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER
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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
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VERTICAL DATUM:
NAD83 (CSRS)

SCALES

0 15 30
HORIZONTAL

0 3 6
VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
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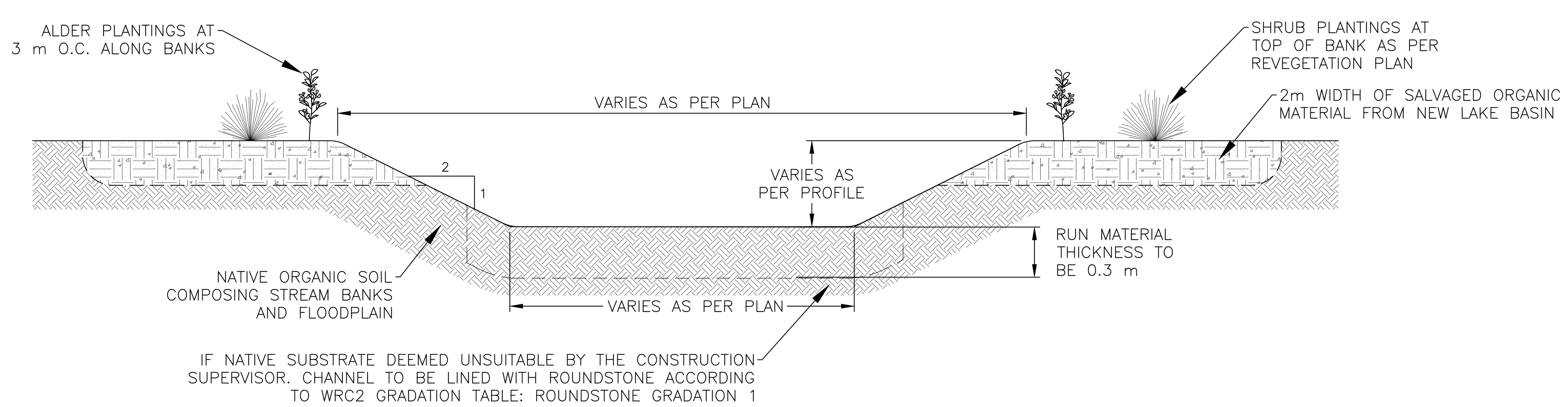
F	Issued for Construction (Updated)	2020-02-14	JPH

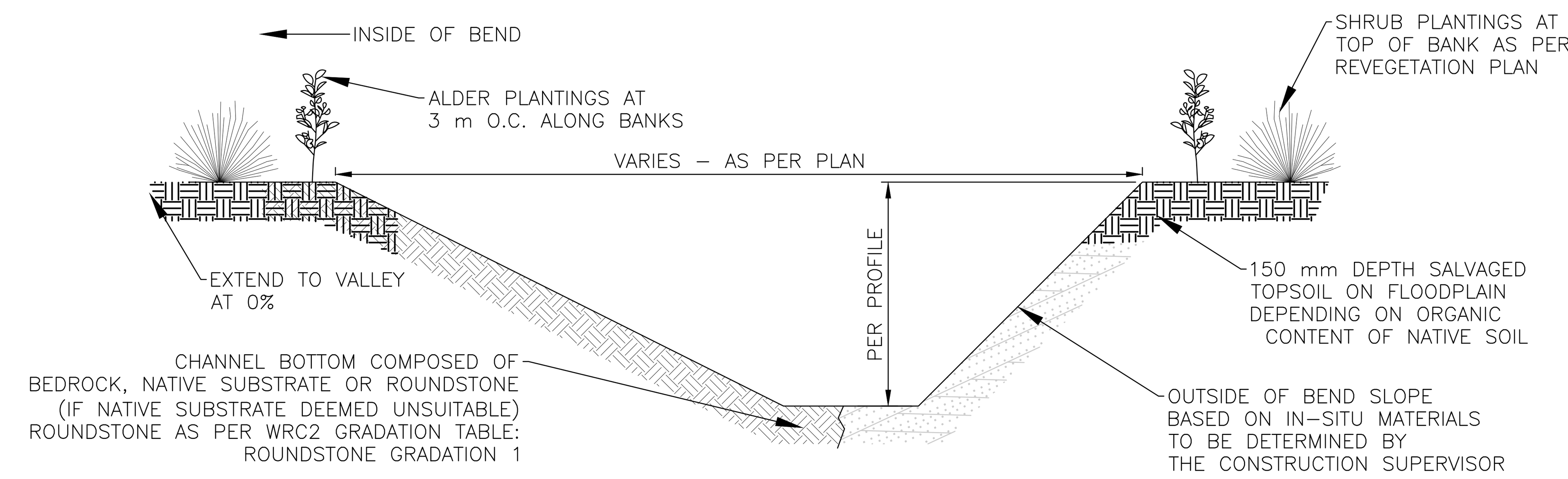
IAMGOLD COTE MINE - WRC2
BY-PASS CHANNEL SECTIONS

Wood Dwg. No.: 100264-846-DW00-PLN-2042
Client Dwg. No.: 846-C-2042

Scale: 1:500
Drawn By: CWM
Drawing No. WRC2-B-3
Date Issued: FEB 14, 2020
Checked By: BDP, JPH



WRC2–LG1,2,3 TYPICAL LOW GRADIENT RUN SECTION (1:25)

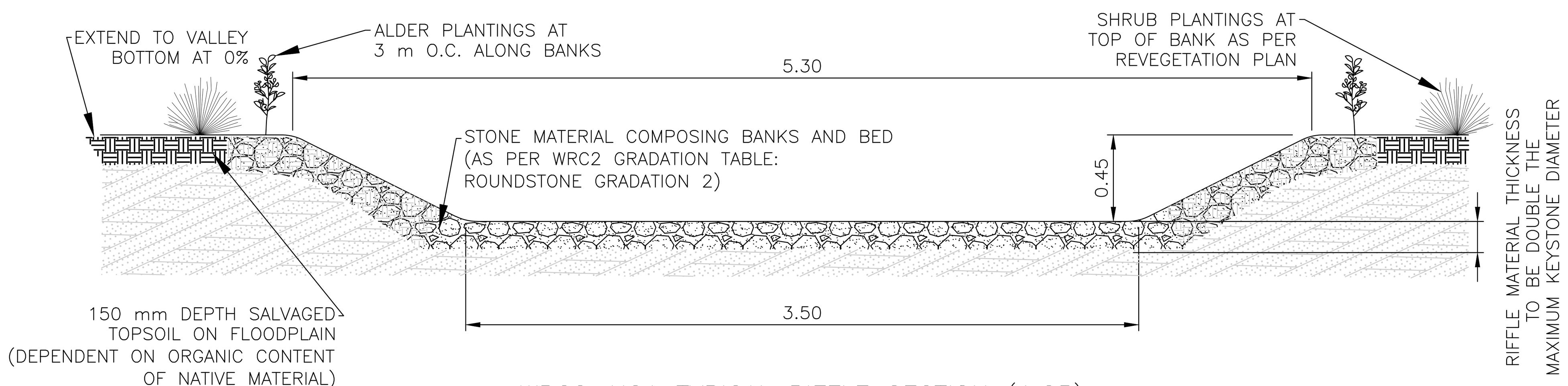


WRC2–LG TYPICAL POOL SECTION (1:20)

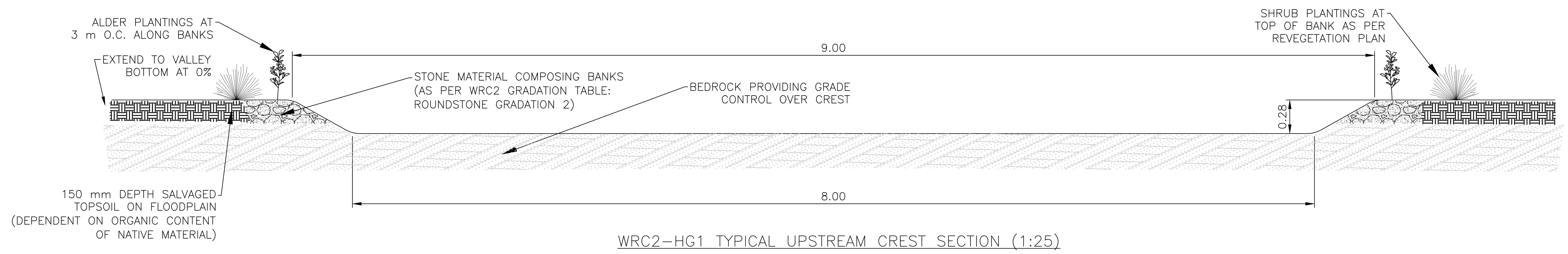
WRC2 GRADATION TABLE

Roundstone Gradation 1	Roundstone Gradation 2	Roundstone Gradation 3
20% - clay	10% - clay[1]	15% - clay[1]
40% - sand	10% - <25 mm ø[2]	15% - <25 mm ø[2]
40% - <25 mm ø[2]	10% - 25 to 100 mm ø	15% - 25 to 50 mm ø
	10% - 100 to 200 mm ø	30% - 50 to 100 mm ø
	30% - 200 to 300 mm ø	25% - 100 to 200 mm ø
	30% - 300 to 500 mm ø	Keystone - 300 to 400 mm ø
	Keystone - 600 to 750 mm ø	

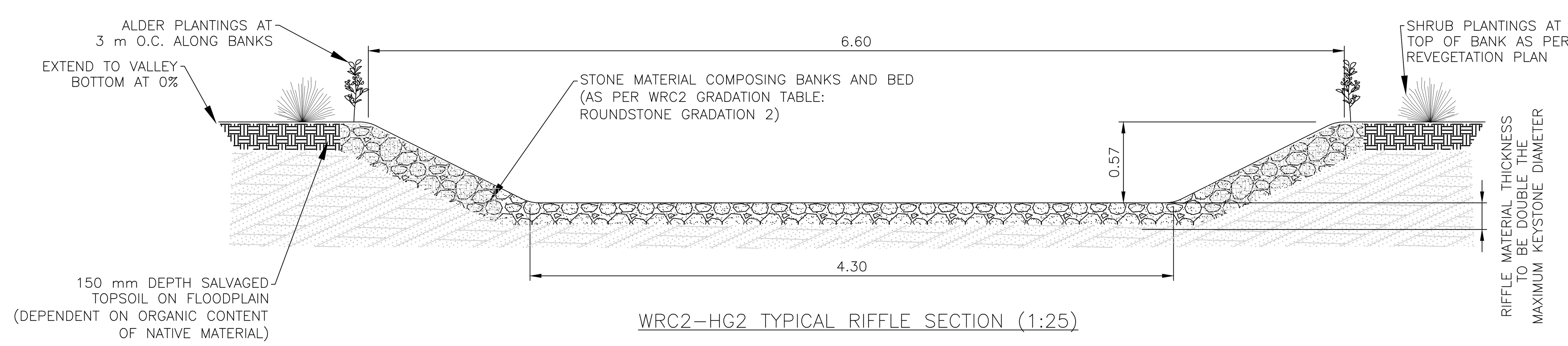
NOTES:
1. Clay or approved equivalent
2. Granular fill material
3. Boulders to be used for feature crests
4. % indicates the percent of the mixture by volume



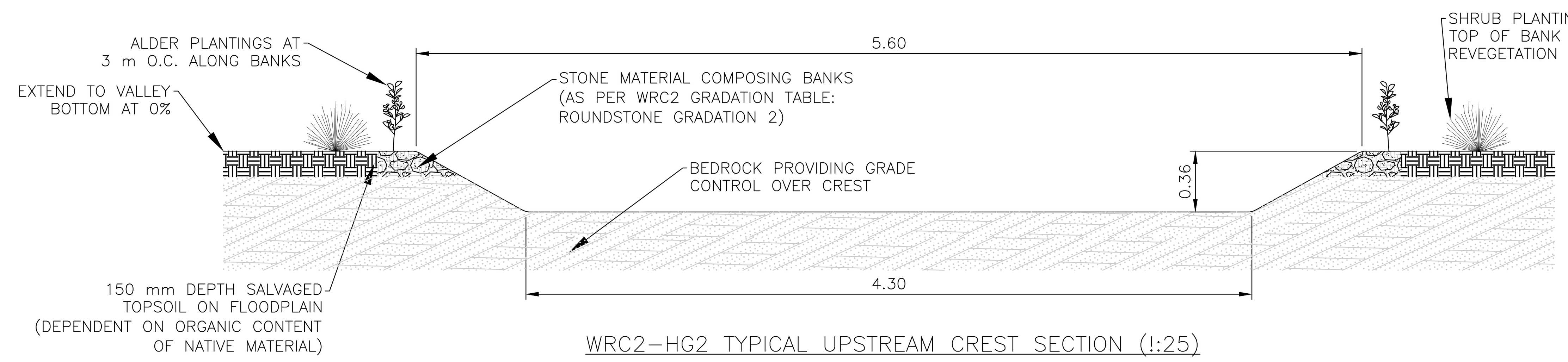
WRC2–HG1 TYPICAL RIFFLE SECTION (1:25)



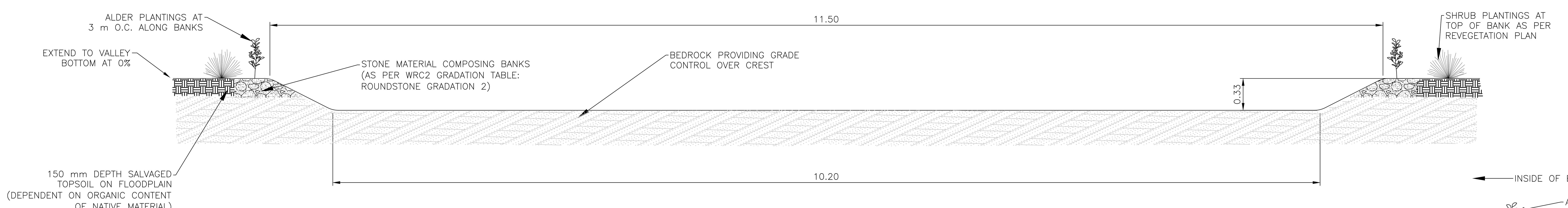
WRC2–HG1 TYPICAL UPSTREAM CREST SECTION (1:25)



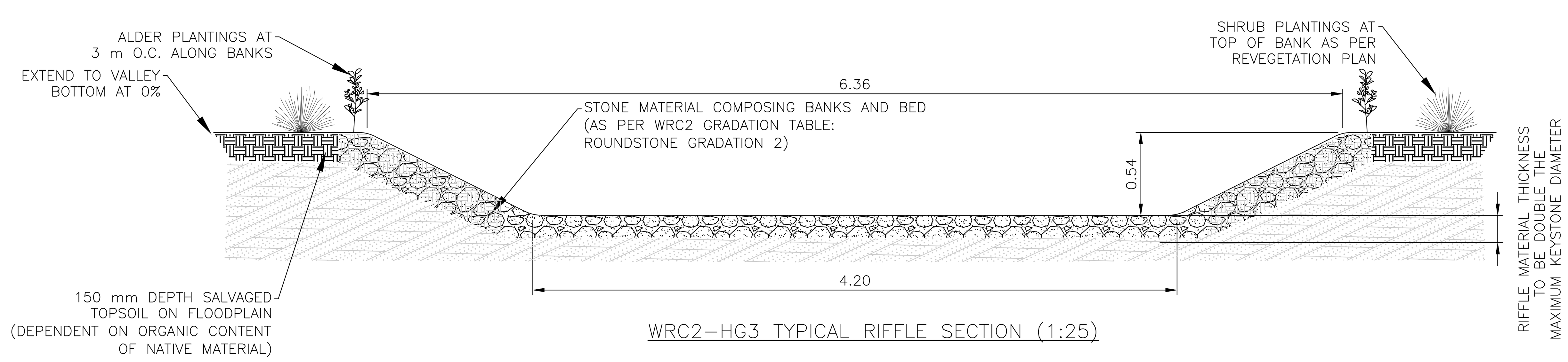
WRC2–HG2 TYPICAL RIFFLE SECTION (1:25)



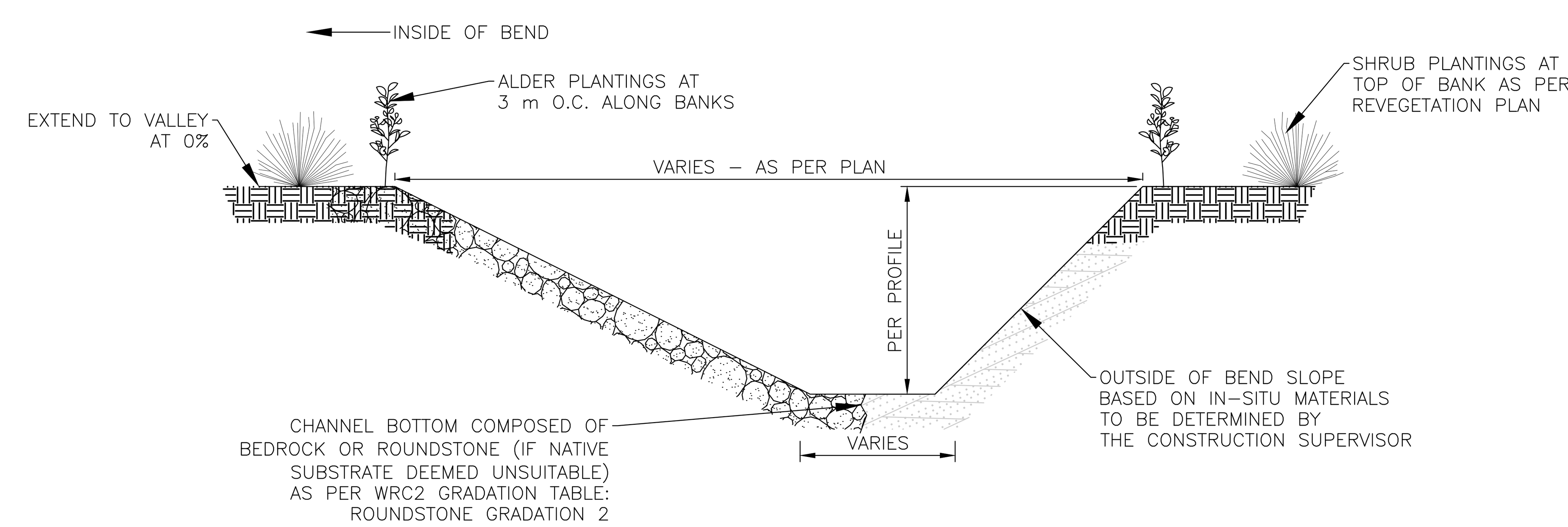
WRC2–HG2 TYPICAL UPSTREAM CREST SECTION (!:25)



WRC2–HG3 TYPICAL UPSTREAM CREST SECTION (1:25)



WRC2–HG3 TYPICAL RIFFLE SECTION (1:25)



WRC2–HG TYPICAL POOL SECTION (1:20)

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LEGEND

LICENSED PROFESSIONAL ENGINEER
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100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
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SCALES

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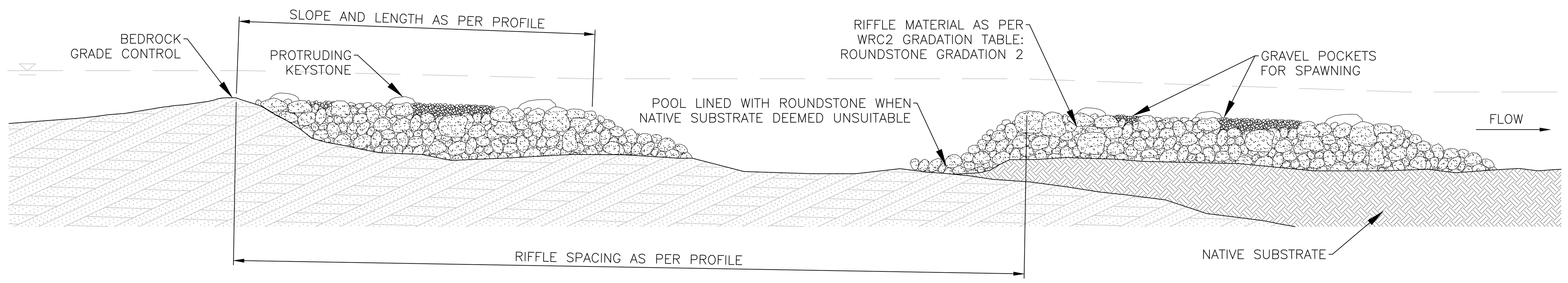
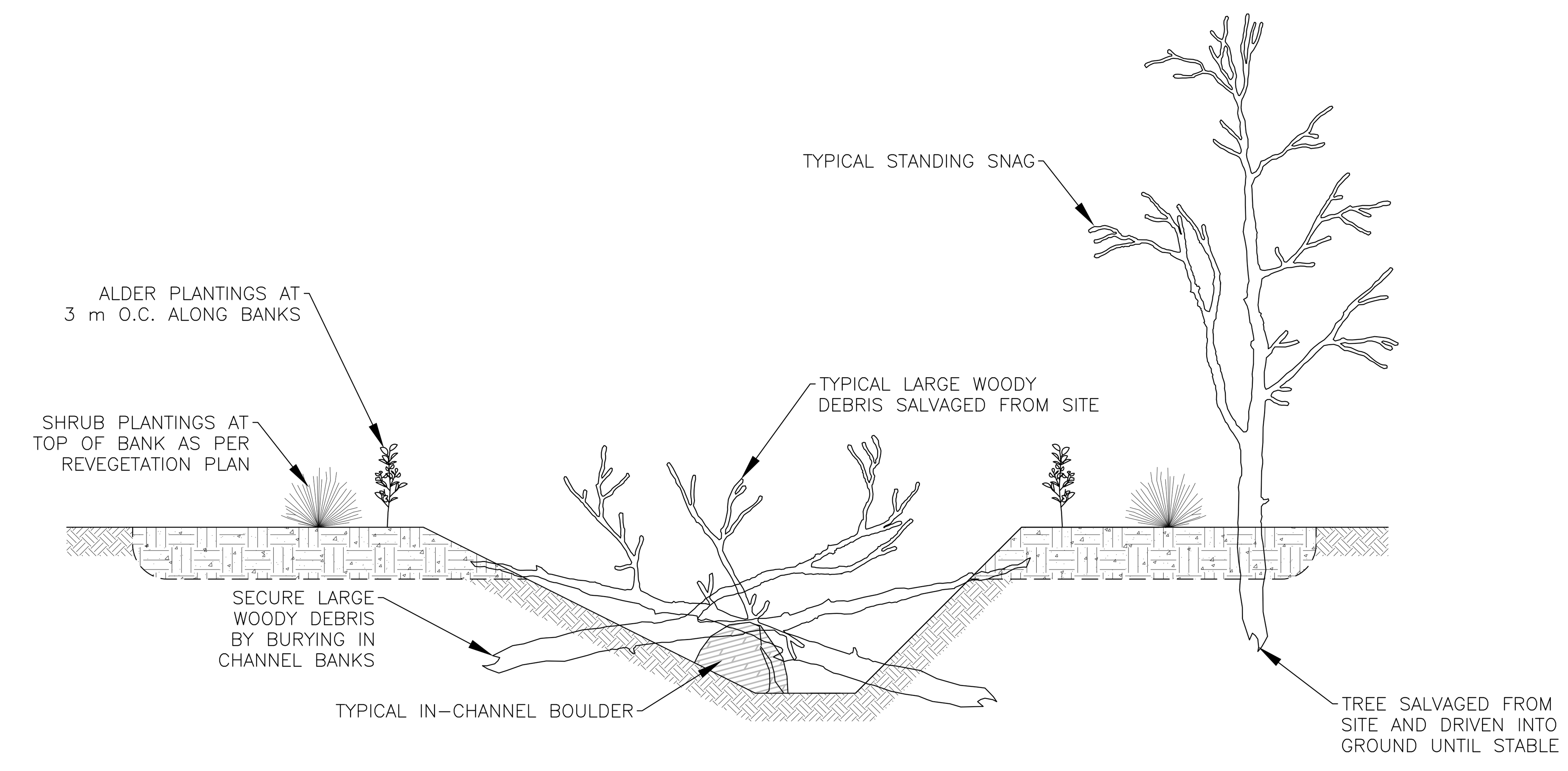
IAMGOLD COTE MINE - WRC2
TYPICAL DETAILS

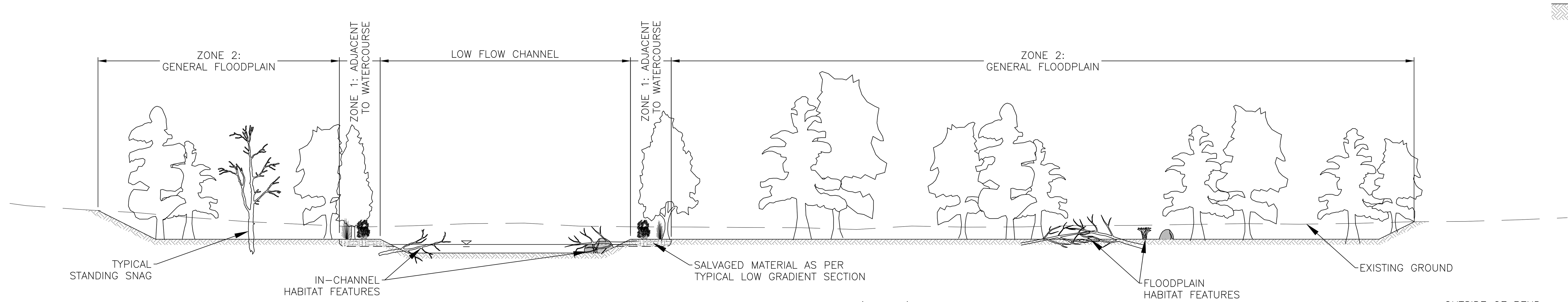
Wood Dwg. No.: 100264-846-DW00-PLN-2043	Client Dwg. No.: 846-C-2043	
Scale: AS SHOWN	Drawn By: CWM	Drawing No. WRC2-T-1
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



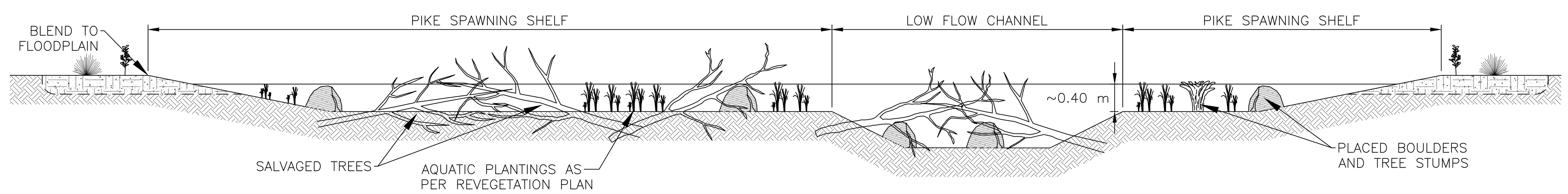
WRC2 TYPICAL HIGH GRADIENT RIFFLE PROFILE (N.T.S.)



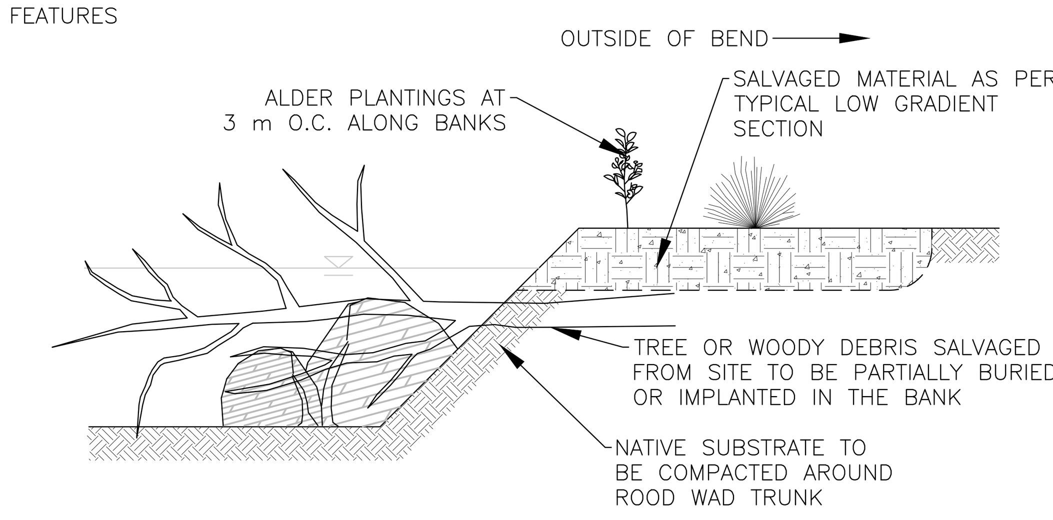
WRC2 TYPICAL HABITAT REVETMENT (N.T.S.)



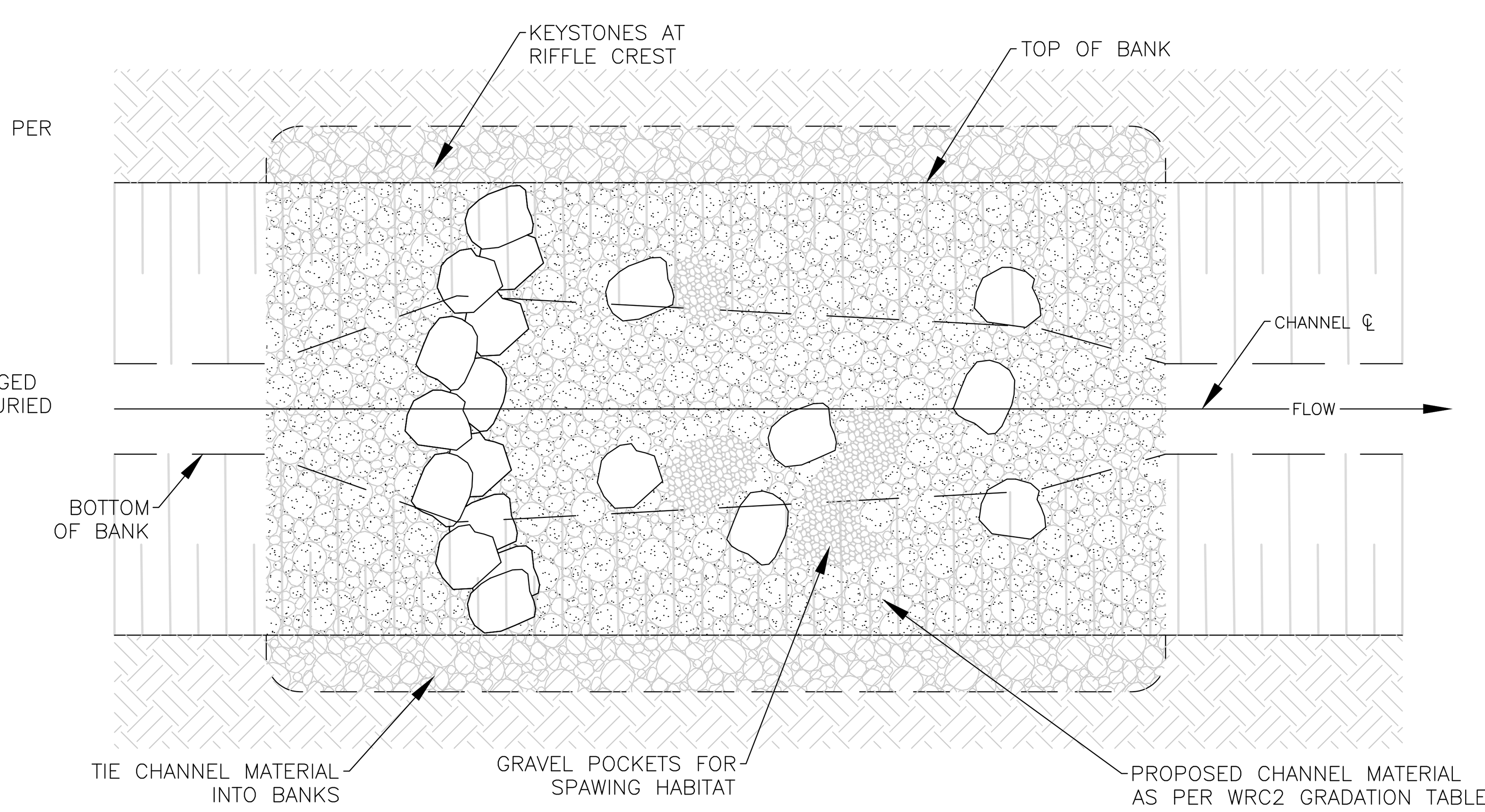
WRC2 VEGETATED VALLEY TYPICAL (1:100)



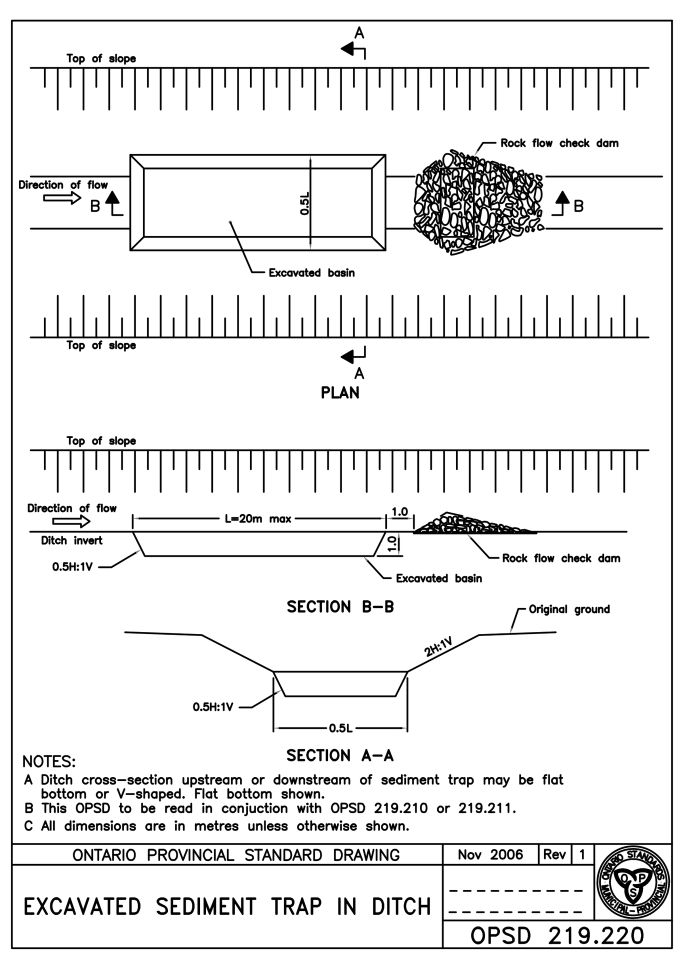
WRC2 PIKE SPAWNING SHELF (1:50)

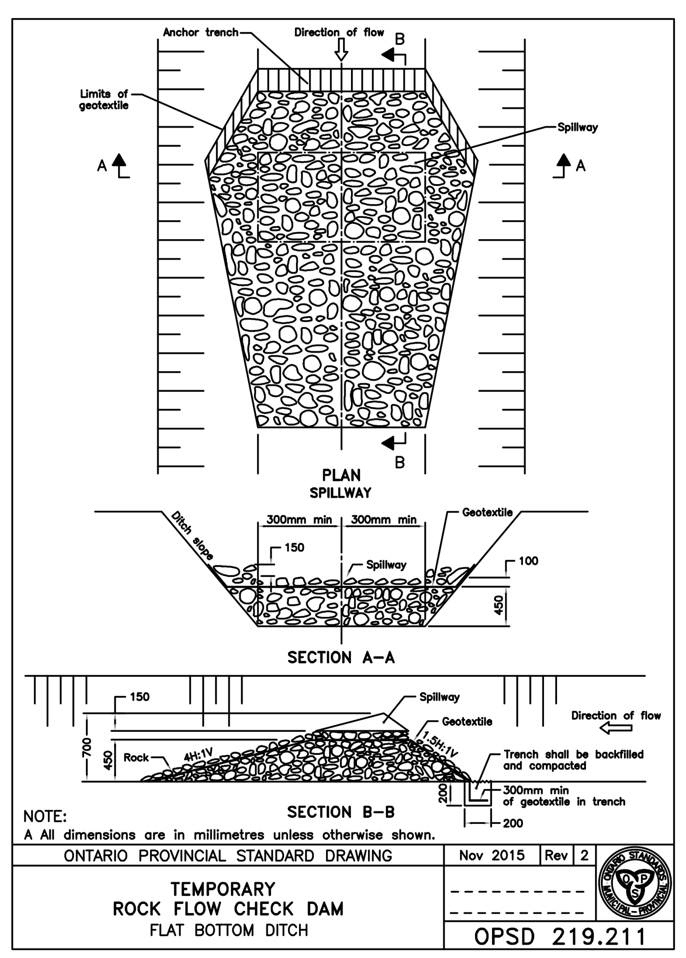


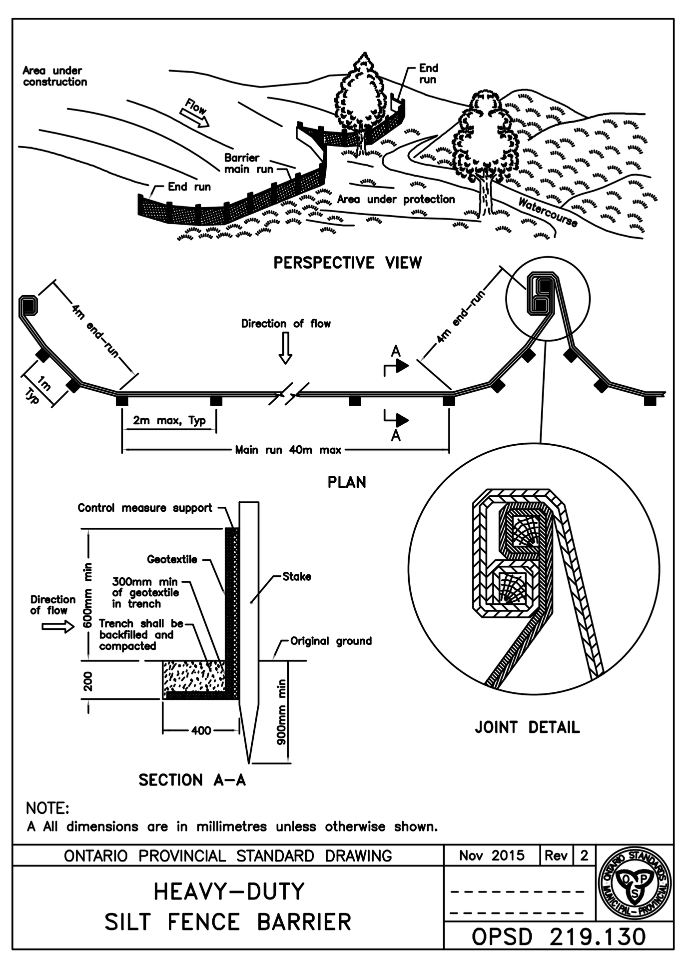
WRC2 TYPICAL FLOW DEFLECTOR (1:25)

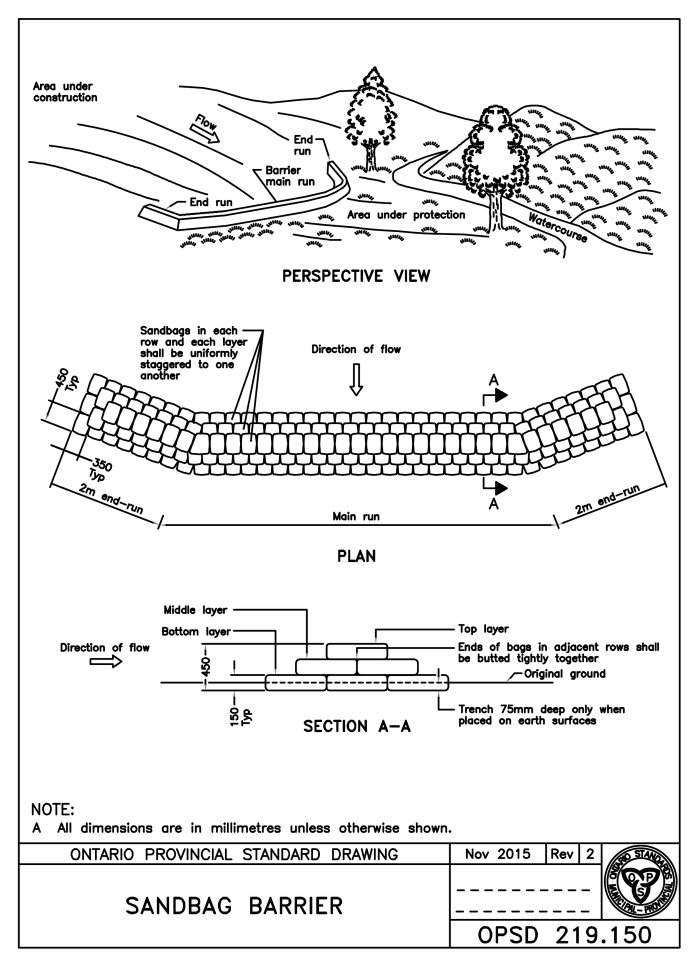


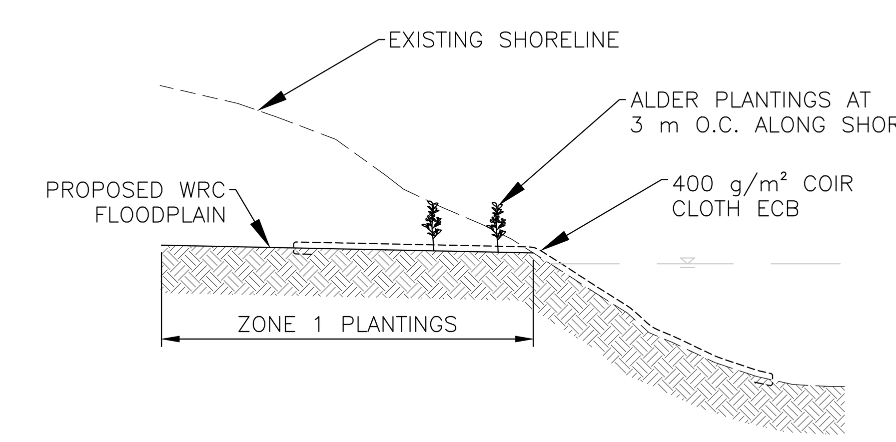
WRC2-HG TYPICAL RIFFLE PLAN (N.T.S)











WRC2-CONFLUENCE STABILIZATION

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LEGEND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523599 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - WRC2
TYPICAL DETAILS

Wood Dwg. No.: 100264-846-DW00-PLN-2044
Client Dwg. No.: 846-C-2044

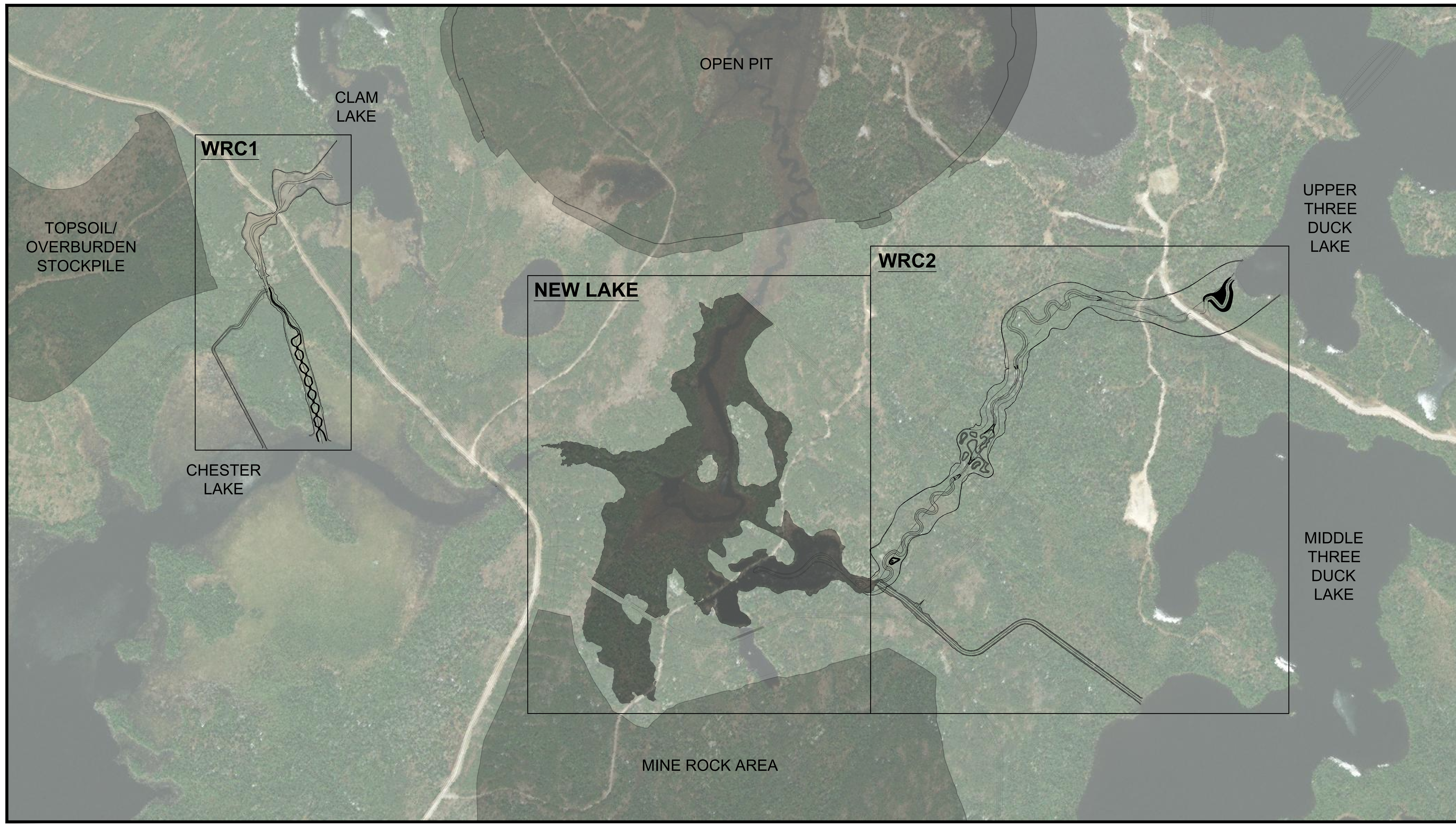
Scale: AS SHOWN
Drawn By: CWM
Date Issued: FEB 14, 2020
Checked By: BDP, JPH
Drawing No. WRC2-T-2

NEW LAKE
DESIGN DRAWINGS

IAMGOLD CÔTÉ MINE

WATERCOURSE REALIGNMENT CHANNEL

NEW LAKE



NO.	DESCRIPTION
G - 1	GRADING PLAN
C - 1	SECTIONS
T - 1	TYPICAL DETAILS

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SCALES	No.	REVISIONS	DATE	INITIAL
0 250 500	C	Issued for DFO Review	2019-02-04	JPH
	D	Revised as per DFO Comments	2019-07-10	JPH
	E	Issued for Construction	2019-08-26	JPH
	F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - NEW LAKE

Wood Dwg. No.: 100264-846-DW00-PLN-2045	Client Dwg. No.: 846-C-2045	
Scale: 1:7500	Drawn By: CWM	Drawing No. NL-KEY
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

NEW LAKE – COMPLIANCE AND OVERSIGHT

THE FOLLOWING NEW LAKE ACTIVITIES ARE SUBJECT TO APPROVAL BY THE ONSITE ENVIRONMENTAL MONITOR:

- STAKING AND PLACEMENT OF HEAVY DUTY SILT FENCE.
- FLAGGING OF LIMITS FOR REMOVAL OF ORGANIC MATERIAL WITHIN LAKE AREA. ORGANIC MATERIAL INCLUDES ALL TREES, SHRUBS AND HERBACEOUS PLANTS. HERBACEOUS PLANTS ARE TO BE REMOVED DURING TOPSOIL SCRAPING. DEPTH OF TOPSOIL SCRAPING TO BE IDENTIFIED ON SITE BY THE ENVIRONMENTAL MONITOR.
- CERTIFICATION OF FINAL EXTENTS OF ORGANIC REMOVALS.
- STAKING OF LIMITS FOR EROSION CONTROL BLANKET PLACEMENT.

THE FOLLOWING NEW LAKE ACTIVITIES ARE SUBJECT TO APPROVAL BY THE ONSITE CONSTRUCTION SUPERVISOR:

- INSTALLATION OF SHORELINE HABITAT FEATURES.

EROSION AND SEDIMENT CONTROL

GENERAL:

QUANTITIES OF MATERIALS FOR REMOVAL, SALVAGE AND DISPOSAL ARE ESTIMATES ONLY. THE CONTRACTOR IS RESPONSIBLE TO REVIEW SITE AND VERIFY QUANTITIES IN SITU.

EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION, TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.

NEW LAKE SHORELINE IS TO BE CONTOURED TO MATCH THE PLANS AND SHORELINE VEGETATION RETAINED TO THE CLOSEST (TO THE SHORE) EXTENT FEASIBLE.

ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE AREAS OF BARE SOIL EXPOSED AT ANY ONE TIME; AND DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.

ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.

STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE-SLOPES SHALL BE 1.5:1.

EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.

IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.

THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

DE-WATERING:

SEDIMENT LADEN WATER SHALL NOT DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG IN THE FLOODPLAIN.

IN THE EVENT OF RAINFALL OR SEEPAGE ENTERING THE WORK SITE, ADDITIONAL DEWATERING (BEYOND THAT RECOMMENDED IN THE PLANS), MAY BE REQUIRED.

DEWATERING INLET PUMP HEAD TO BE COVERED WITH FILTER FABRIC OR CLEAR STONE. THE OUTLET PUMP HEAD IS TO DISCHARGE TO A SEDIMENT BAG OR BASIN. DISCHARGE FROM THE BAG IS TO BE RELEASED TO A VEGETATED LOCATION OR IF A VEGETATED LOCATION IS NOT AVAILABLE, A FLOW DISSIPATING STRUCTURE.

SPILLS CONTROL NOTES:

ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.

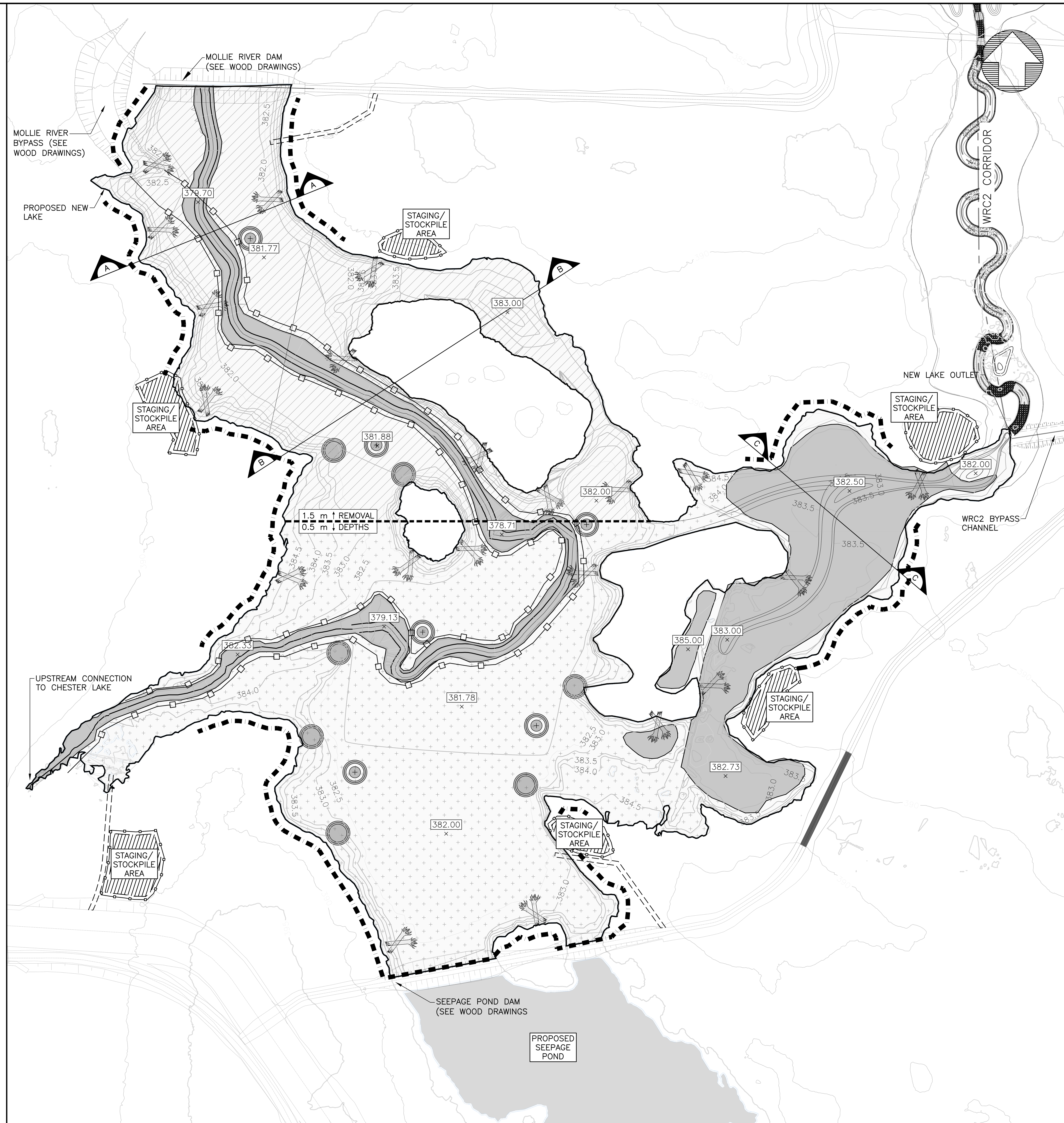
THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.

IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:

- IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
- TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
- THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.



CONSTRUCTION SEQUENCING AND STAGING:

GENERAL STAGING NOTES:

NO NEW LAKE REMOVALS OR GRADING TO BE CONDUCTED UNITL THE MOLLIE RIVER DAM, BYPASS AND HEAVY DUTY SILT FENCE IS INSTALLED.

GRADING IS RESTRICTED TO AREAS WHERE ORGANIC MATERIAL REMOVAL IS REQUIRED. SEE OVERSIGHT SECTION.

ALL GRADING TO OCCUR FROM THE NEW LAKE SHORELINE, WORKING TOWARDS THE ISOLATED SECTION OF THE MOLLIE RIVER. THIS IS TO MINIMIZE TIME WORKING IN CLOSE PROXIMITY TO THE MOLLIE RIVER.

THE MOLLIE RIVER IS TO REMAIN ISOLATED FROM THE MAIN REMOVALS AND GRADING OF NEW LAKE. MINOR REGRADING OF THE MOLLIE RIVER BANKS MAY BE REQUIRED. THIS WORK SHOULD BE COMPLETED IN THE DRY, SUCH THAT NO HEAVY MACHINERY WILL BE WITHIN THE CHANNEL.

ALL AREAS DISTURBED DURING ACCESS TO NEW LAKE ARE TO BE RESTORED TO EXISTING OR BETTER CONDITION FOLLOWING THE COMPLETION OF CONSTRUCTION. DISTURBANCES TO THE SURROUNDING LANDS AND WOODLOTS ARE TO BE MINIMIZED DURING CONSTRUCTION. CONSTRUCTION, INCLUDING ACCESS IS TO BE MAINTAINED TO THE AREAS IDENTIFIED WITHIN THE DRAWINGS.

NEW LAKE GRADING IS TO BE UNDERTAKEN IN TWO (2) PHASES. STAGING AND SEQUENCING FOR EACH PHASE ARE PROVIDED.

PHASE 1: REMOVAL OF ORGANIC MATERIAL AND LAKE GRADING

INSTALL HEAVY DUTY SILT FENCE ON BOTH SIDES OF THE MOLLIE RIVER IN AREAS SHOWN.

6500 m² ORGANIC PEAT MATERIAL TO BE SALVAGED FROM NEW LAKE BASIN FOR USE IN WRC CHANNEL CONSTRUCTION TO BE DIRECTED BY THE CONSTRUCTION SUPERVISOR.

CLEARING AND GRUB NEW LAKE AREA. WORK FROM NEW SHORELINE, INWARDS TOWARDS THE MOLLIE RIVER

COMPLETE ORGANIC REMOVAL AND GRADING OF NEW LAKE BASIN, AS SHOWN.

INSTALL EROSION CONTROL BLANKET (400 g/m² COCONUT FIBRE ECB) ALONG THE NEW LAKE SHORELINE, IN AREAS SHOWN ON PLAN. AREAS ARE APPROXIMATE AND SUBJECT TO APPROVAL OF THE ENVIRONMENTAL MONITOR.

PHASE 2: REMOVAL OF ESC MEASURES PRIOR TO NEW LAKE FILLING

REMOVE SILT FENCE LINING THE MOLLIE RIVER.

DECOMMISSIONING THE MOLLIE RIVER BYPASS CHANNEL.

ALLOW NEW LAKE BASIN TO FILL. MONITOR DAILY FOR ESC CONCERNS.

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LEGEND

- PREVIOUSLY WETTED AREAS (NO GRADING REQUIRED)
- HEAVY DUTY SILT FENCE
- SHORELINE GROWTH MEDIUM AND ECB
- POINT BAR SHOAL
- NEAR SHORE HABITAT
- DEEP WATER SHOAL
- REMOVE SOIL TO 0.5 m DEPTH
- REMOVE SOIL TO 1.5 m DEPTH
- NO SOIL REMOVAL AREAS

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

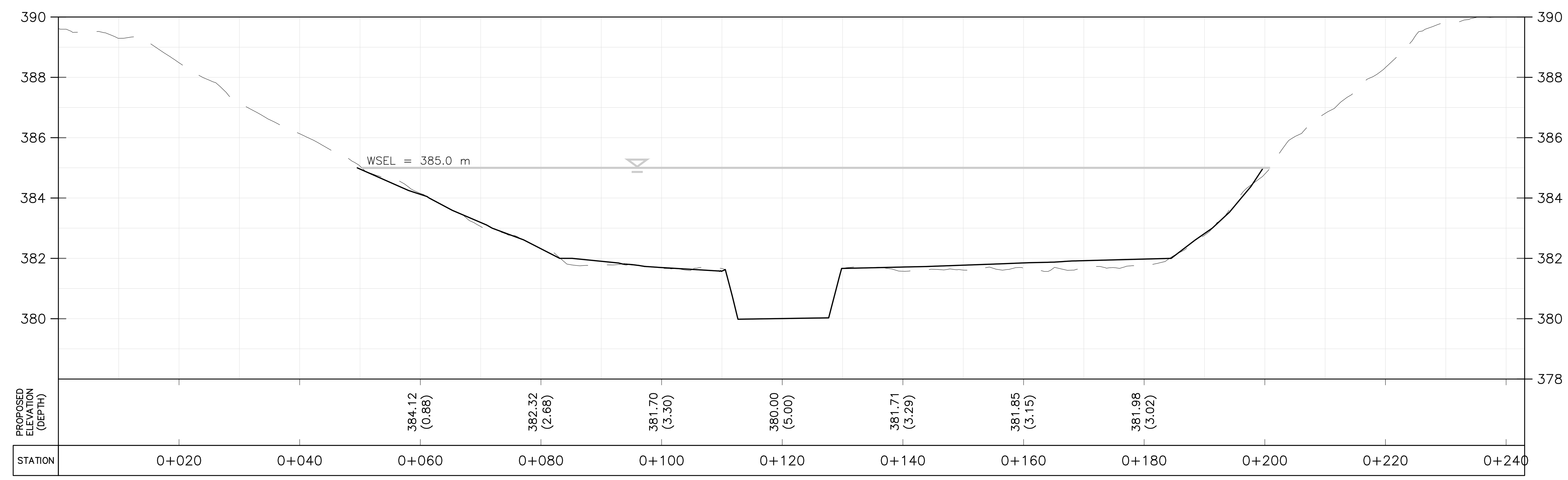
SCALES: 0 – 75 – 150; 1:2000

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

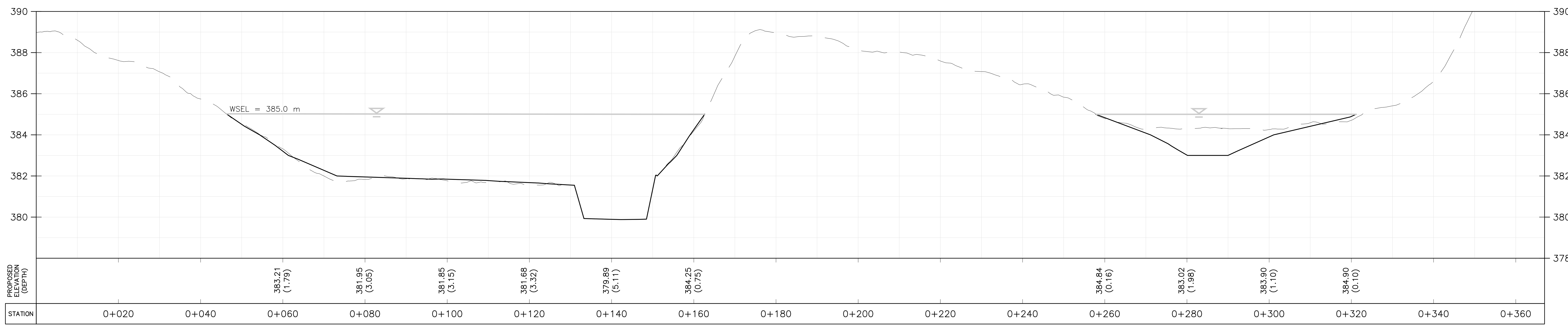
IAMGOLD COTE MINE - NEW LAKE GRADING PLAN

Wood Dwg. No.: 100264-846-DW00-PLN-2046	Client Dwg. No.: 846-C-2046	
Scale: 1:2000	Drawn By: CWM	Drawing No. NL-G-1
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

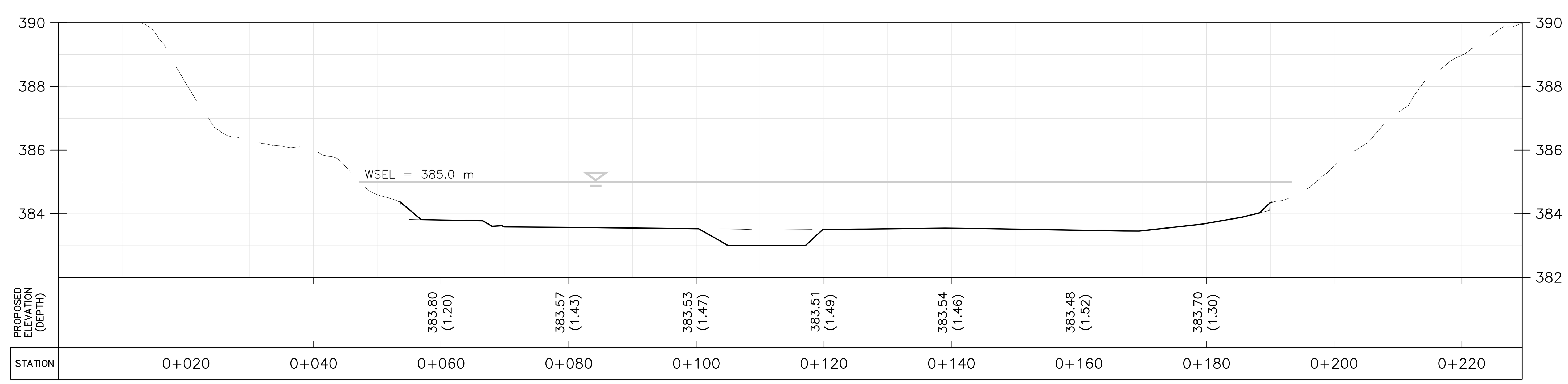
XS – A



XS – B



XS – C



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LEGEND

PROPOSED LAKE BOTTOM

PROPOSED WATER LEVEL

EXISTING GROUND

LICENSED PROFESSIONAL ENGINEER B. D. PLUMB 100523569 14/02/20 PROVINCE OF ONTARIO

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES

0 20 40 HORIZONTAL

0 4 8 VERTICAL

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - NEW LAKE SECTIONS

Wood Dwg. No.: 100264-846-DW00-PLN-2047

Client Dwg. No.: 846-C-2047

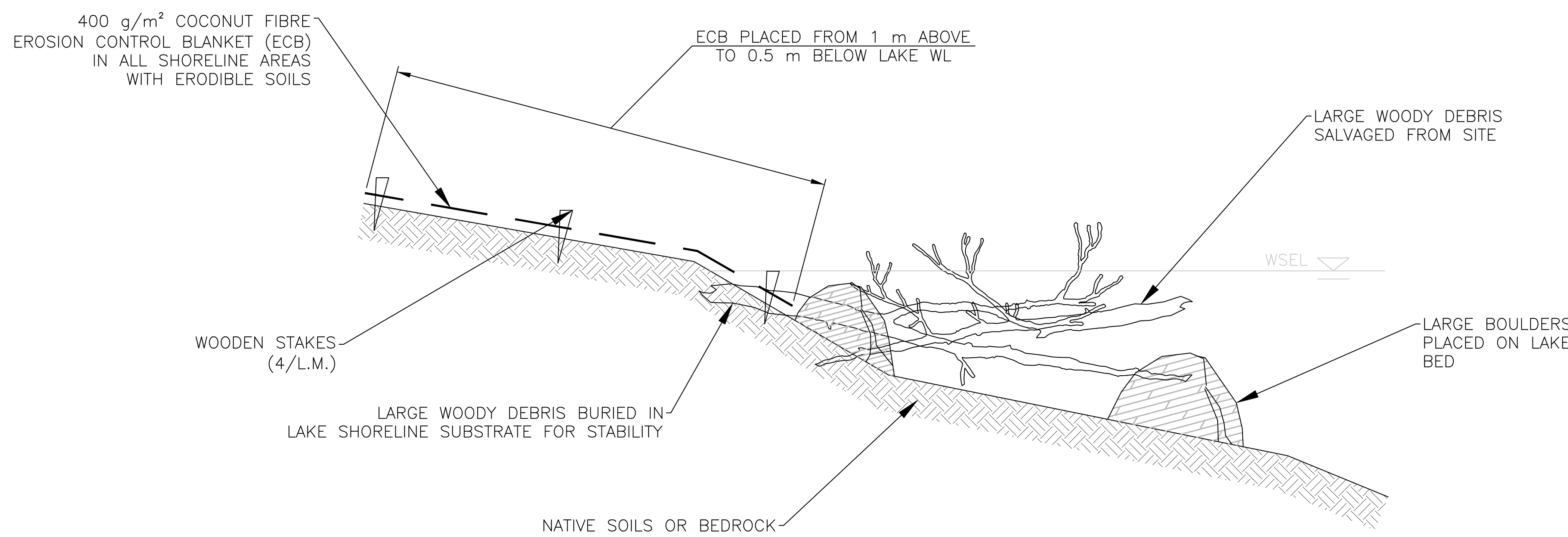
Scale: 1:500

Drawn By: CWM

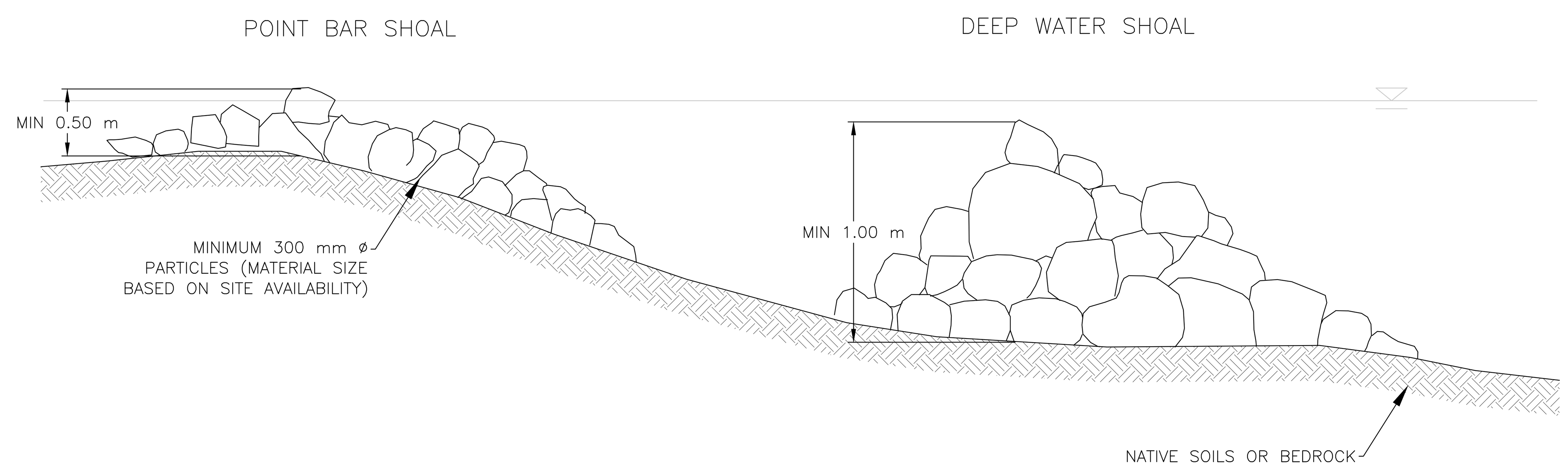
Drawing No. NL-C-1

Date Issued: FEB 14, 2020

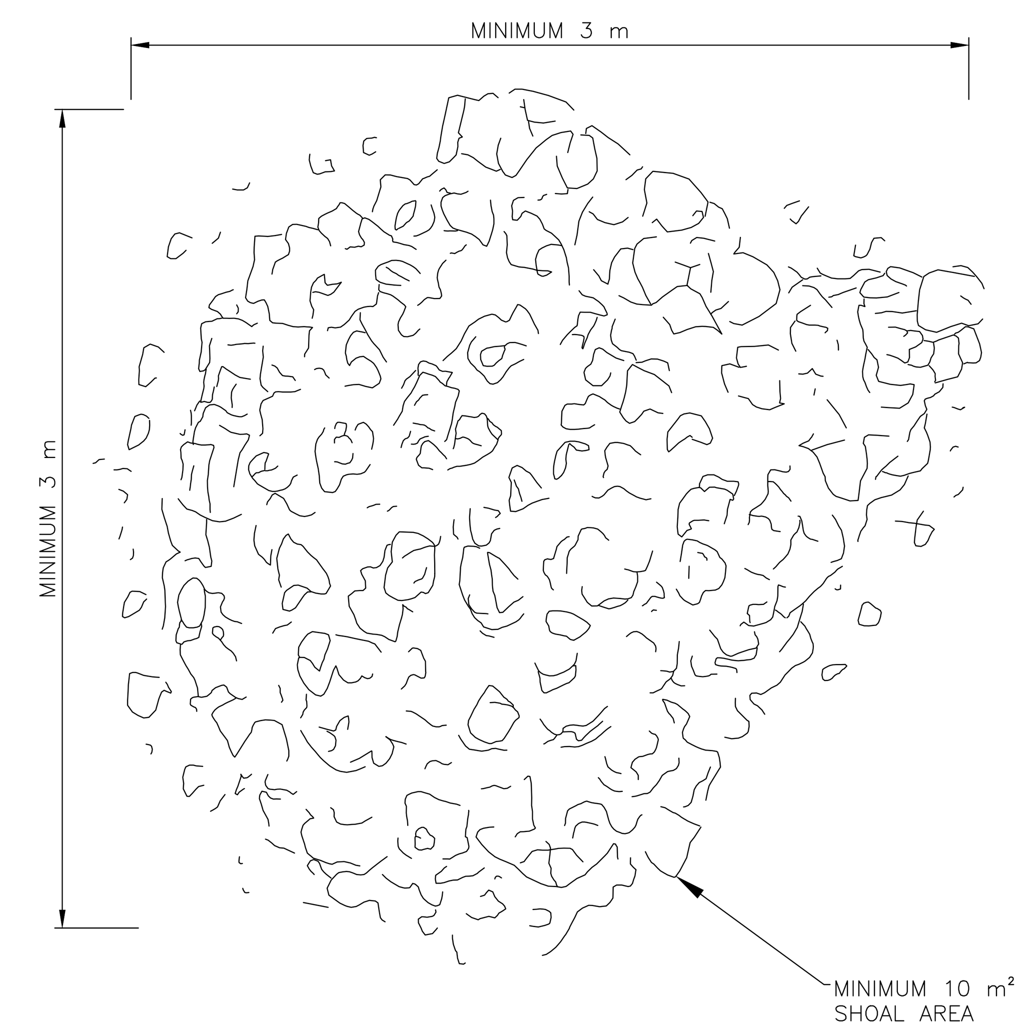
Checked By: BDP, JPH



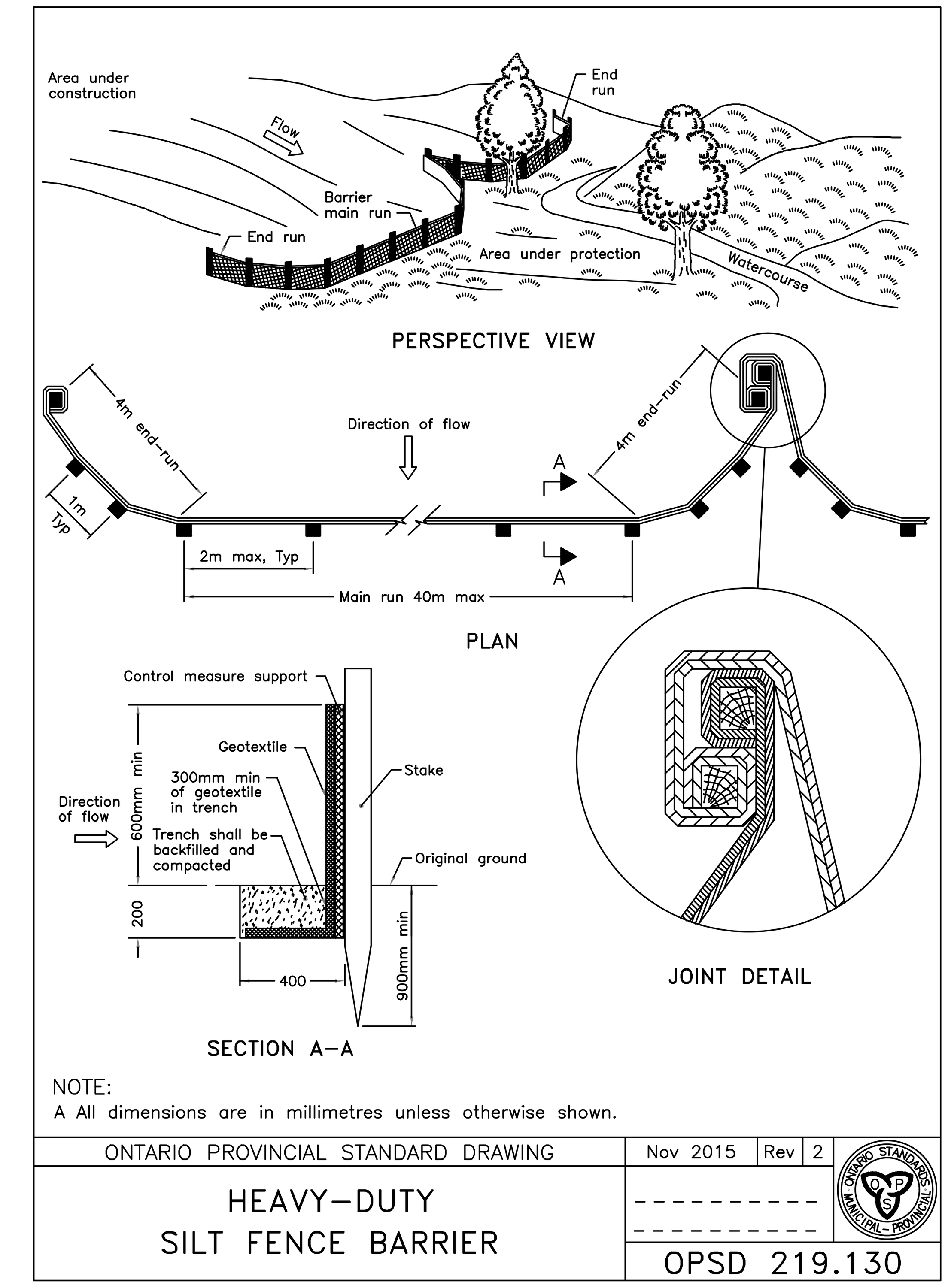
TYPICAL NEAR SHORE HABITAT



TYPICAL POINT BAR SHOAL AND DEEP WATER SHOAL SECTIONS



TYPICAL SHOAL PLAN (POINT BAR OR DEEP WATER)



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LEGEND

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

No.	REVISIONS	DATE	INITIAL
C	Issued for DFO Review	2019-02-04	JPH
D	Revised as per DFO Comments	2019-07-10	JPH
E	Issued for Construction	2019-08-26	JPH
F	Issued for Construction (Updated)	2020-02-14	JPH

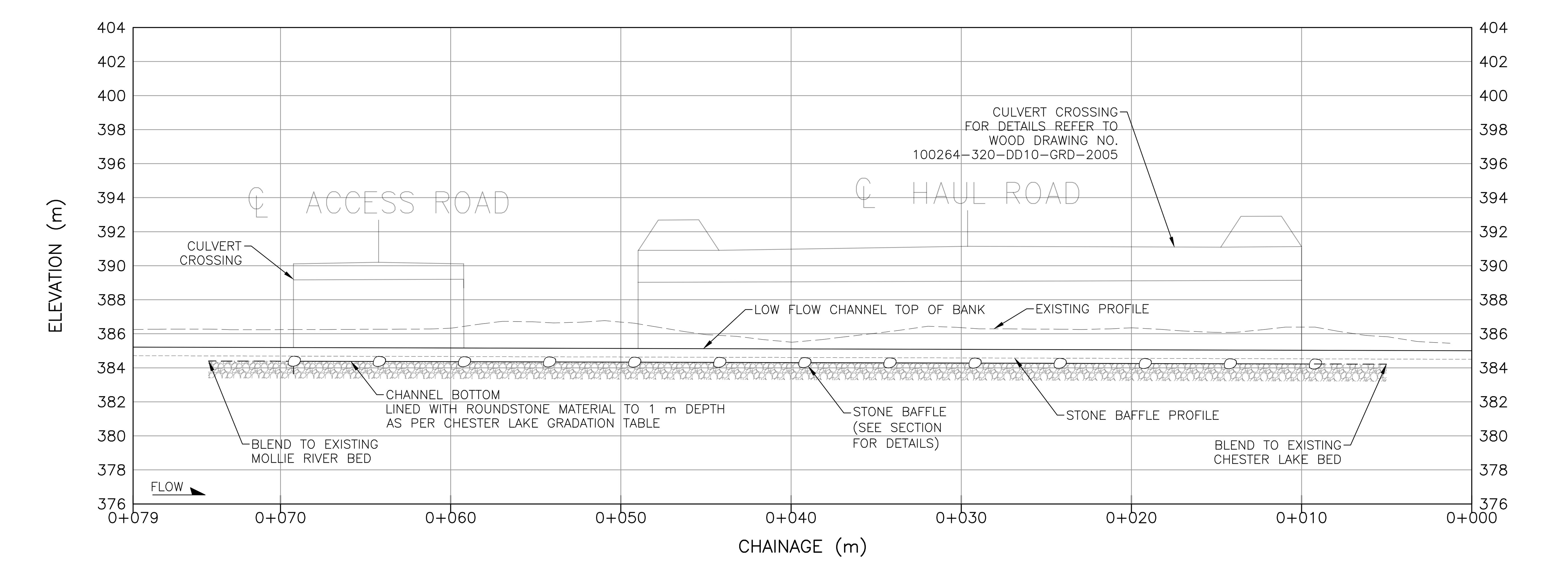
IAMGOLD COTE MINE - NEW LAKE
TYPICAL DETAILS

Wood Dwg. No.: 100264-846-DW00-PLN-2048
Client Dwg. No.: 846-C-2048

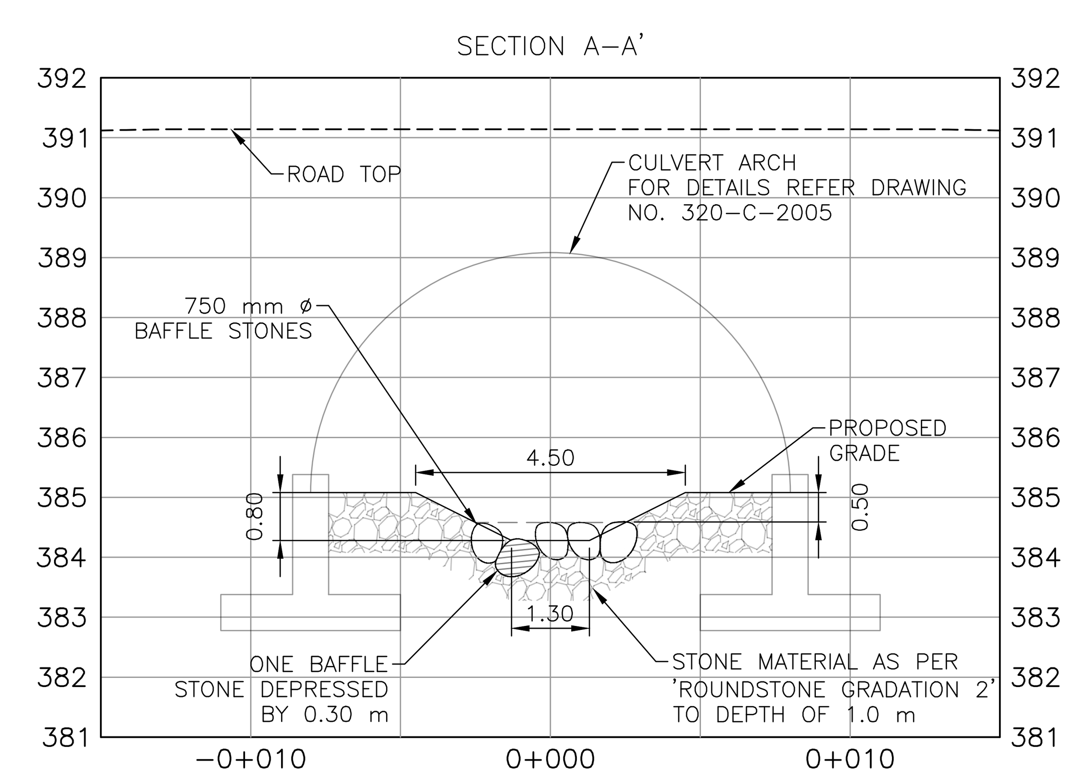
Scale: NOT TO SCALE	Drawn By: CWM	Drawing No. NL-T-1
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

MOLLIE RIVER ROAD CROSSING
DESIGN DRAWINGS

PLAN (1:100)



PROFILE (1:200)



SECTION (1:100)

NOTES:

EROSION AND SEDIMENT CONTROL AND CONSTRUCTION SEQUENCING:
- FOR ESC, SEE DRAWING #'S: 320-C-2005, 320-C-2006, 320-C-2007
- FOR CONSTRUCTION SEQUENCING, SEE DRAWING #: 320-C-2008

CONSTRUCTION NOTES:
- PLACEMENT OF BAFFLE STONES SUBJECT TO SUPERVISION BY QUALIFIED PROFESSIONAL HAVING EXPERIENCE IN NATURAL CHANNEL CONSTRUCTION.
- BLENDING OF ENDS OF CULVERT CHANNEL TO EXISTING LAKE AND CHANNEL BED TO BE DETERMINED IN THE FIELD AND SUPERVISED BY A QUALIFIED PROFESSIONAL.
- ROUNDSTONE MATERIAL TO BE MIXED AND THE GRADATION APPROVED PRIOR TO INSTALLATION IN THE CHANNEL.

CHESTER LAKE GRADATION TABLE

Roundstone Gradation 2
10% - clay[1]
10% - <25 mm ø[2]
10% - 25 to 100 mm ø
10% - 100 to 200 mm ø
30% - 200 to 300 mm ø
30% - 300 to 500 mm ø
Keystone - 600 to 750 mm ø

NOTES:
1. Clay or approved equivalent
2. Granular fill material
3. Boulders to be used for feature crests
4. % indicates the percent of the mixture by volume

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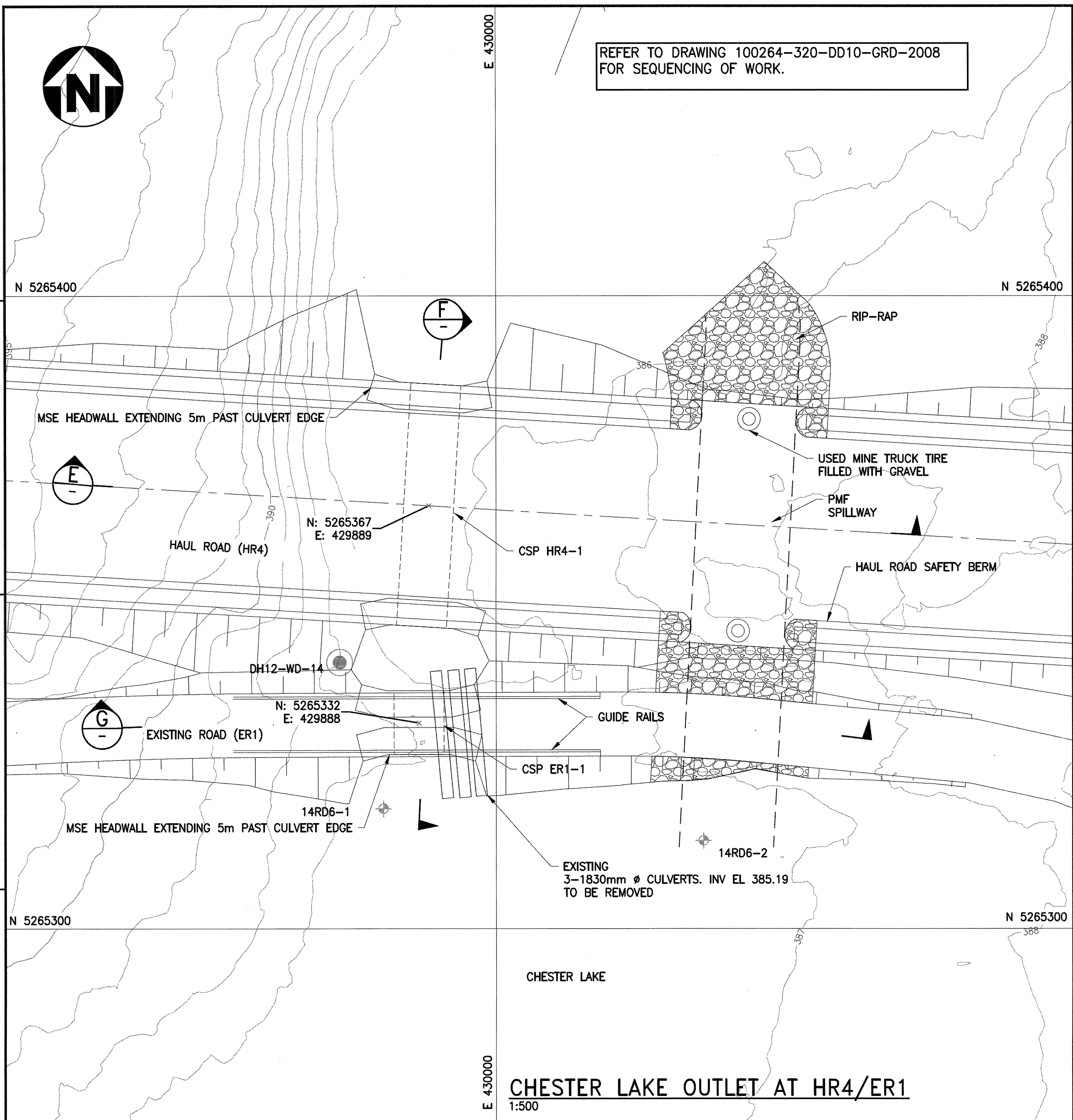
SCALES
0 2 4 6 — 1:100
0 5 10 — 1:200

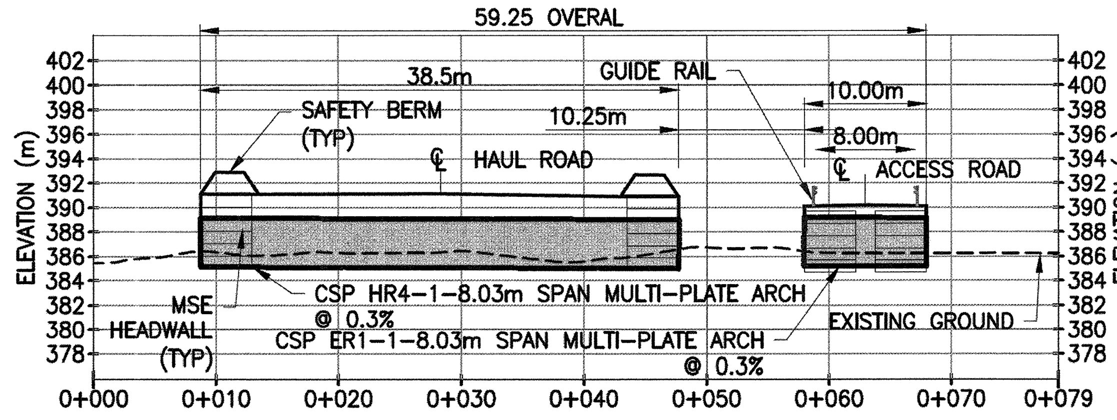
No.	REVISIONS	DATE	INITIAL
01	DRAFT DESIGN FOR REVIEW	2019-07-04	BDP

IAMGOLD COTE MINE - CHESTER LAKE CULVERT CROSSING
CULVERT RIFFLE DESIGN

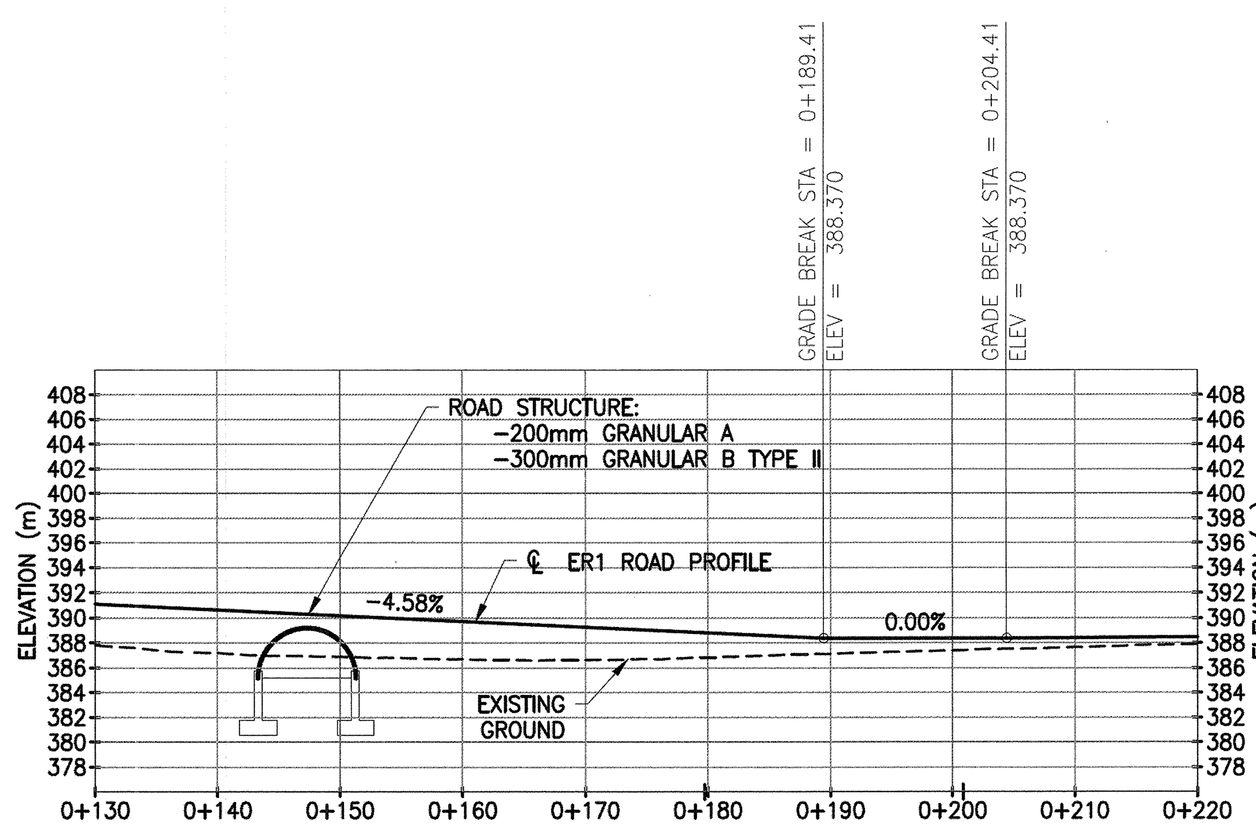
Scale: as shown	Drawn By: CWM	Drawing No. 01
Date Issued: JULY 4, 2019	Checked By: BDP	



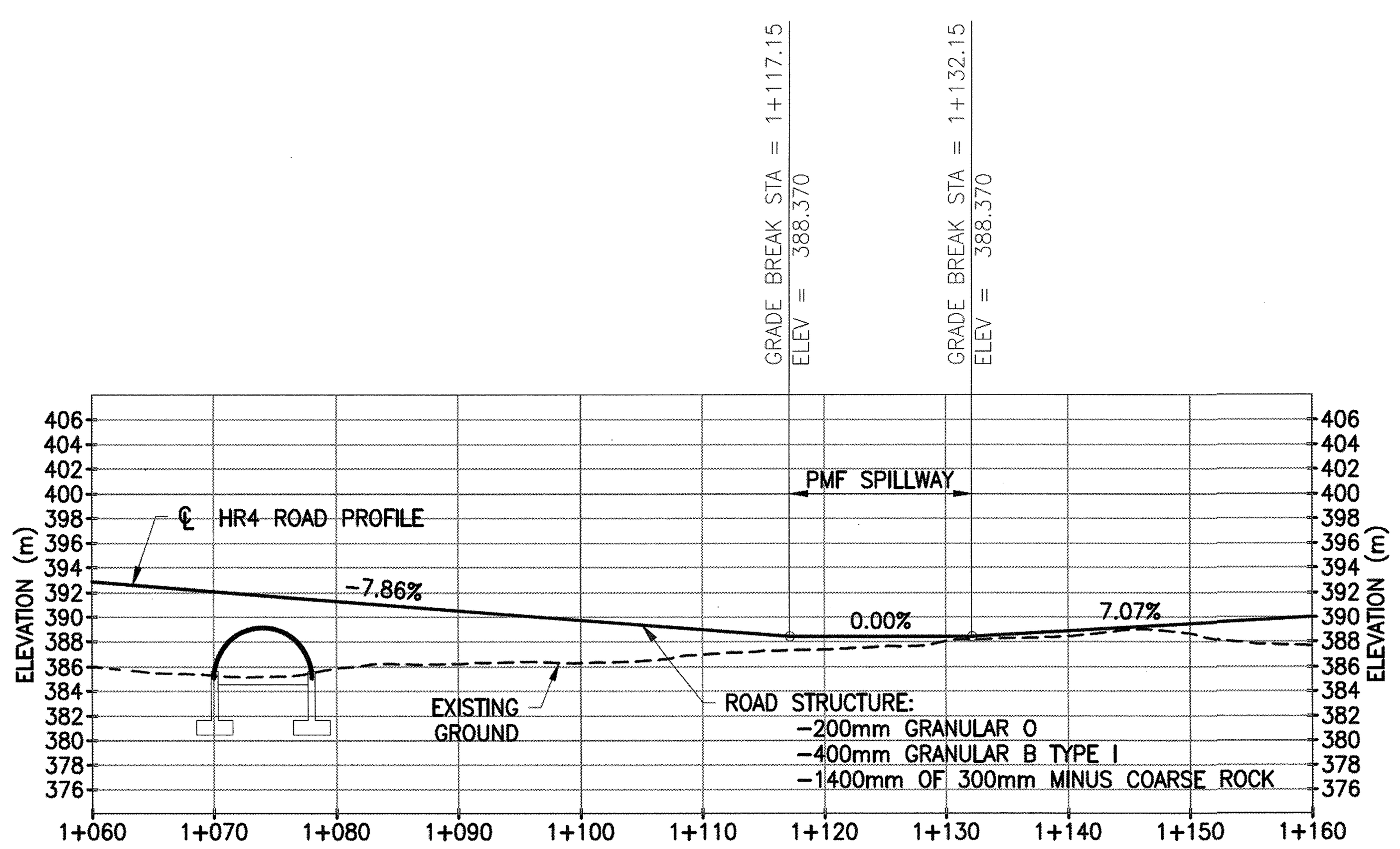
CHESTER LAKE OUTLET AT HR4/ER1
1:500



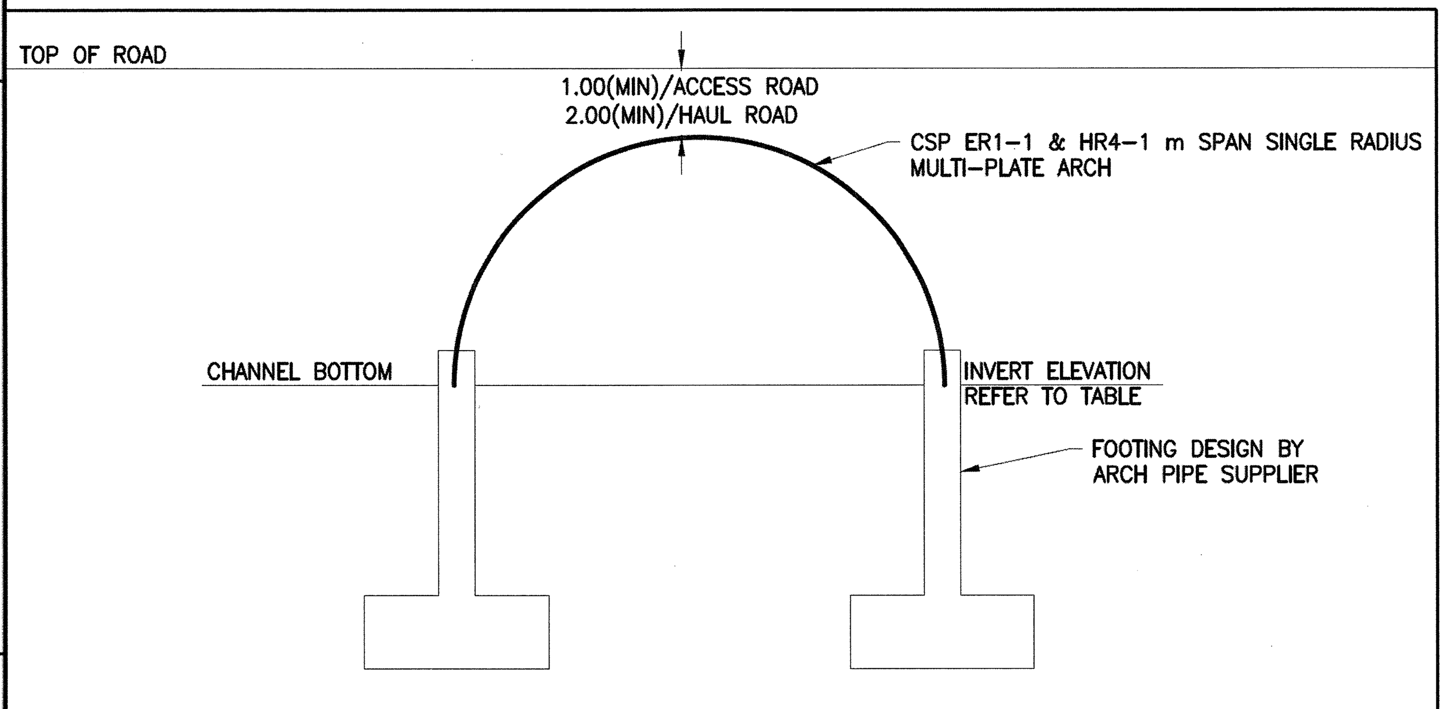
SECTION F
1:500



SECTION G
1:500



SECTION E
1:500



TYPICAL CULVERT SECTION
1:100

CULVERT TABLE

NAME	UPSTREAM INVERT	DOWNSTREAM INVERT	LENGTH	SLOPE
CSP ER1-1	385.19	385.16	10.0 m	0.30%
CSP HR4-1	385.13	385.01	38.5m	0.30%

0m 1 2 3 4 5
1:100

0m 5 10 15 20 25
1:500

SEDIMENTATION CONTROL:

1. ALL WORK TO BE CONDUCTED IN ISOLATION FROM FLOWING WATERS WITH FLOW BY-PASS SYSTEMS AND APPROPRIATE CONTROLS TO PREVENT SEDIMENT FROM ENTERING ANY ACTIVE WATERCOURSE.
2. CONTRACTOR IS REQUIRED TO DEVELOP A SITE-SPECIFIC WATER MANAGEMENT AND EROSION SEDIMENTATION CONTROL (ESC) PLAN FOR APPROVAL BY THE ENVIRONMENTAL COORDINATOR AND AREA CONSTRUCTION MANAGER PRIOR TO COMMENCEMENT OF WORK.
3. EROSION PREVENTION AND SEDIMENT CONTROL MEASURES TO BE DEVELOPED IN ACCORDANCE WITH THE OVERALL PROJECT E&S PLAN. MEASURES TO BE APPROVED PRIOR BY THE ENGINEER PRIOR TO INSTALLATION. WORK SEQUENCE SHALL BE AS FOLLOWS: INSTALL EROSION AND SEDIMENT CONTROL MEASURES, ISOLATE FLOW FROM WORK AREA, CONSTRUCT CULVERT AND INLET/OUTLET TREATMENTS, RESTORE FLOW THROUGH CULVERT, AND REMOVE EROSION AND SEDIMENT CONTROL MEASURES ONCE THE AREA IS STABILIZED.
4. EROSION AND SEDIMENT CONTROL MEASURES WILL BE MAINTAINED THROUGHOUT INSTALLATION.
5. WORK MAY BE CONDUCTED IN WINTERTIME. CONTRACTOR TO ADJUST MEASURES AS REQUIRED. CONTRACTOR MUST WORK WITH THE ENGINEER TO DEVELOP SUITABLE ESC PLAN.
6. INVERTS FOR EXISTING CULVERTS TO BE FIELD VERIFIED PRIOR TO ANY WORK COMMENCING. RESULTS OF FIELD SURVEY TO BE GIVEN TO ENGINEER FOR REVIEW. DESIGN MAY BE ADJUSTED BASED ON FIELD CONDITIONS.

RIP-RAP:

1. RIP-RAP SHALL BE AS PER OPSS.MUNI.1004.
2. GEOTEXTILE SHALL BE NON-WOVEN, CLASS II CONFORMING TO OPSS 1860, WITH AN FOS OF 75 – 150 μm.

GENERAL NOTES:

1. ALL WORK AND MATERIALS SHALL CONFORM TO CURRENT ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND STANDARDS.
2. ALL DIMENSIONS, ELEVATIONS AND COORDINATES ARE IN METERS UNLESS NOTED OTHERWISE.
3. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 'OCCUPATIONAL HEALTH AND SAFETY ACT' AND REGULATIONS FOR CONSTRUCTION PROJECTS.
4. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL CONFIRM THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED PRIOR TO ANY CONSTRUCTION. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER BEFORE PROCEEDING.
6. GUIDE RAIL SHALL BE AS PER OPSD 912.145 C/W ENERGY ATTENUATORS AS PER OPSD 922.180 AT ALL TERMINAL POINTS AND SNOW PLOW MARKERS POSTS,(BOTH ENDS).

CULVERTS:

1. CULVERT DIAMETER AND LENGTHS SHALL BE AS NOTED ON THE DRAWINGS.
2. CULVERT SHALL BE SINGLE RADIUS ARCH, STRUCTURAL PLATE CORRUGATED STEEL PILE,GALVANIZED, 8.03m SPAN BY ATLANTIC INDUSTRIES LIMITED OR APPROVED EQUIVALENT.
3. FOUNDATION AND STRUCTURAL DESIGN BY MANUFACTURER. DESIGN TO INCLUDE STAMPED & SEALED ENGINEERING DRAWINGS, CONSTRUCTION METHODS, BACKFILLING PROCEDURES AND ETC.
4. DESIGN VEHICLE FOR HR4 & HR6 SHALL BE A FULLY LOADED CATERPILLAR 793F HAUL TRUCK OR SIMILAR SIZED TRUCK. LOADING FOR ER1 SHALL BE CL-625-ONT HIGHWAY LOADING.

ABBREVIATIONS:

- m – METER
- TYP – TYPICAL
- EL – ELEVATION
- INV. – INVERT
- MIN – MINIMUM
- C/W – COMPLETE WITH
- H:V – HORIZONTAL : VERTICAL
- D_{50} – MEDIUM VALUE OF PARTICLE SIZE DISTRIBUTION
- CSP – CORRUGATED STEEL PIPE
- OPSD – ONTARIO PROVINCIAL STANDARD DRAWING
- OPSS – ONTARIO PROVINCIAL STANDARD SPEC.
- SPMDD – STANDARD PROCTOR MAXIMUM DRY DENSITY
- HR – HAUL ROAD
- ER – EXISTING ROAD
- N – NORTHING
- E – EASTING
- ℄ – CENTRELINE
- ⌀ – DIAMETER
- μm – MICRO METER

LEGEND:

- 460 EXISTING CONTOUR
- DIRECTION OF FLOW
- 460.00 PROPOSED GROUND ELEVATION
- X:1 (H:V) SLOPE
- RIP-RAP
- CULVERT EMBEDMENT
- COMPACTED GRANULAR 'A' BEDDING
- BOREHOLE
- DRILL HOLE

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP	APP	APP
0	10MAY19	ISSUED FOR CONSTRUCTION	RS	NA	JJ	PH		
B	29APR19	ISSUED FOR REVIEW	RS	NA	JJ	PH		
A	05APR19	ISSUED FOR SQUAD CHECK	RS	NA	JJ	PH		

REFERENCES

REF	NUMBER	TITLE
2	320-DD10-GRD-2004	PLAN & PROFILE-HAUL ROAD HR4
1	320-DD10-GRD-2008	CONSTRUCTION SEQUENCING

STAMP/SEAL
PROFESSIONAL ENGINEER
LICENSED
J. E. J. JACKSON
5/10/19
PROVINCE OF ONTARIO

APPROVED FOR ________
CLIENT PROJECT MGR | DEPARTMENT MGR | PROJECT MGR
PROJECT PHASE: EPCM
PROJECT NO.: 100264
SCALE: AS SHOWN

	BY	DDMMMYY
DES	JJ	15MAR19
DRN	RS	15MAR19
CHK	NA	15MAR19
APP	PH	15MAR19

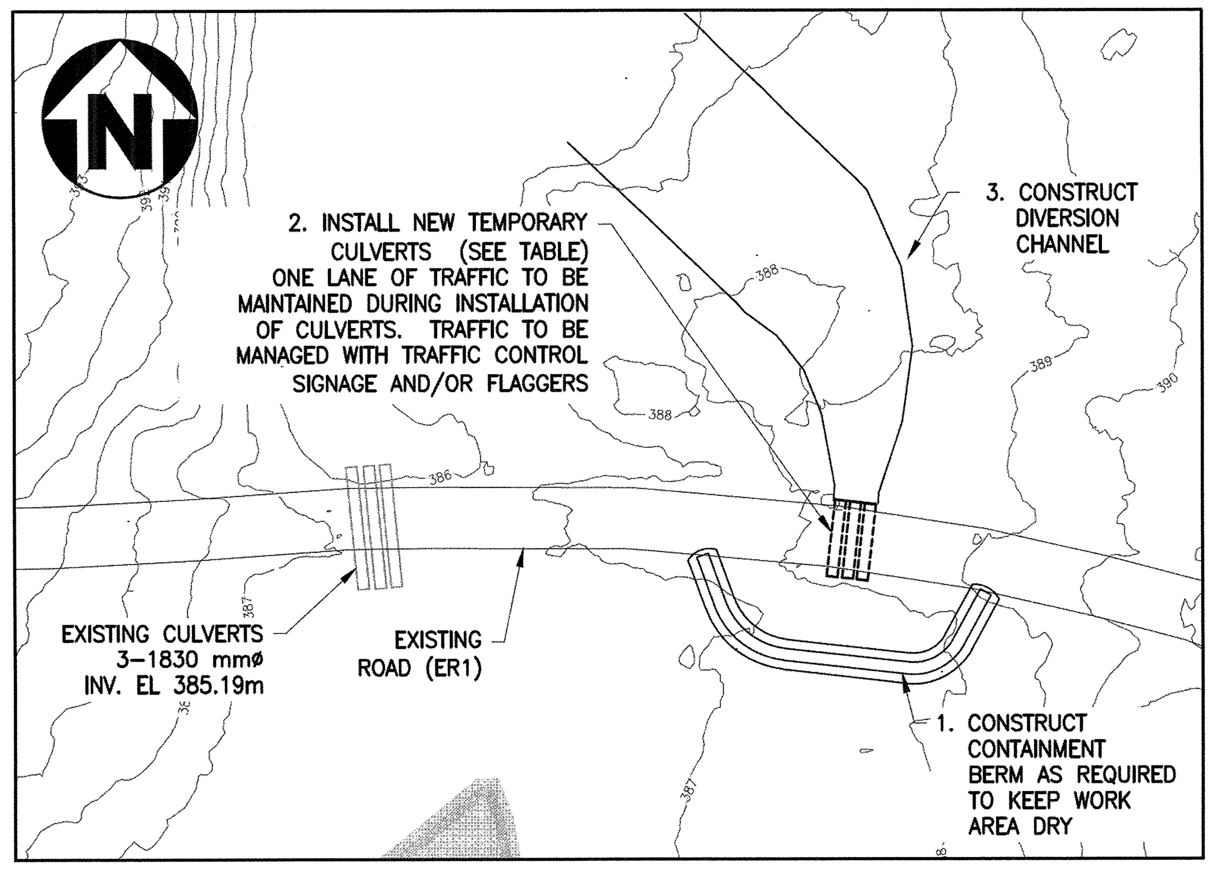
CÔTÉ GOLD

SUBJECT: CIVIL
CHESTER LAKE OUTLET AT HR4/ER1
PLAN & SECTIONS

wood.

AREA: 500
CÔTÉ GOLD PROJECT CACO-A
CLIENT DWG NO.: 320-C-2005 | 0
DRAWING NO.: 100264-320-DD10-GRD-2005 | REV 0

SAVED: 10-May-19 10:27 AM PLOTTED: 10-May-19 10:36 AM USER: SAFARI, REZA



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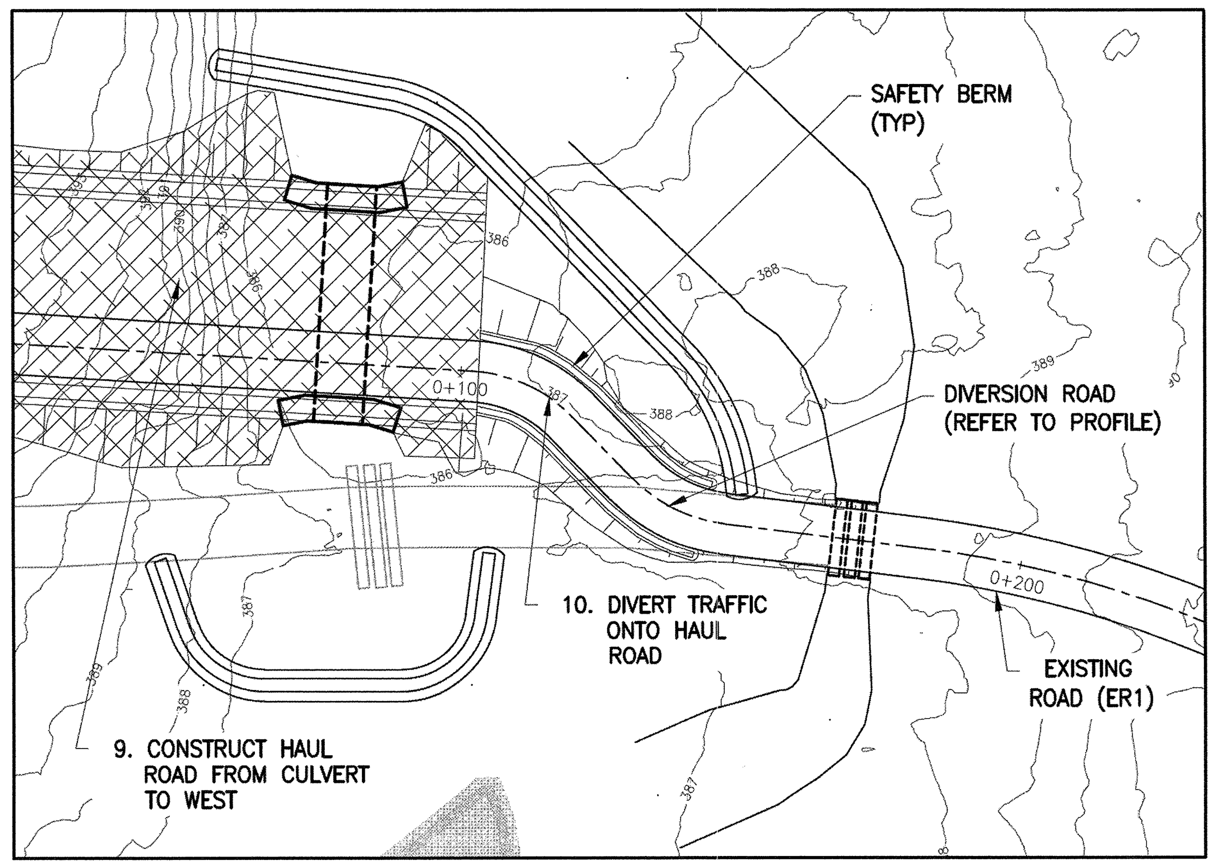

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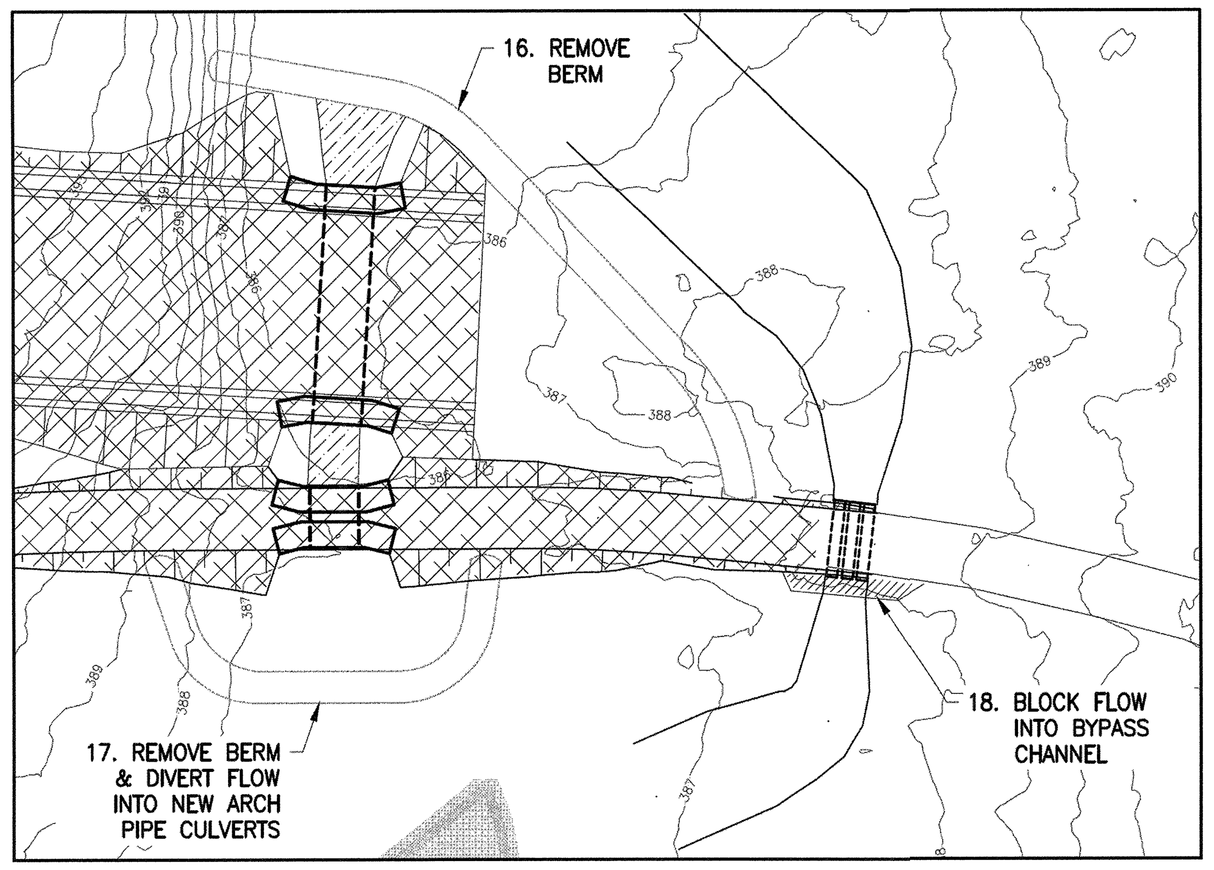

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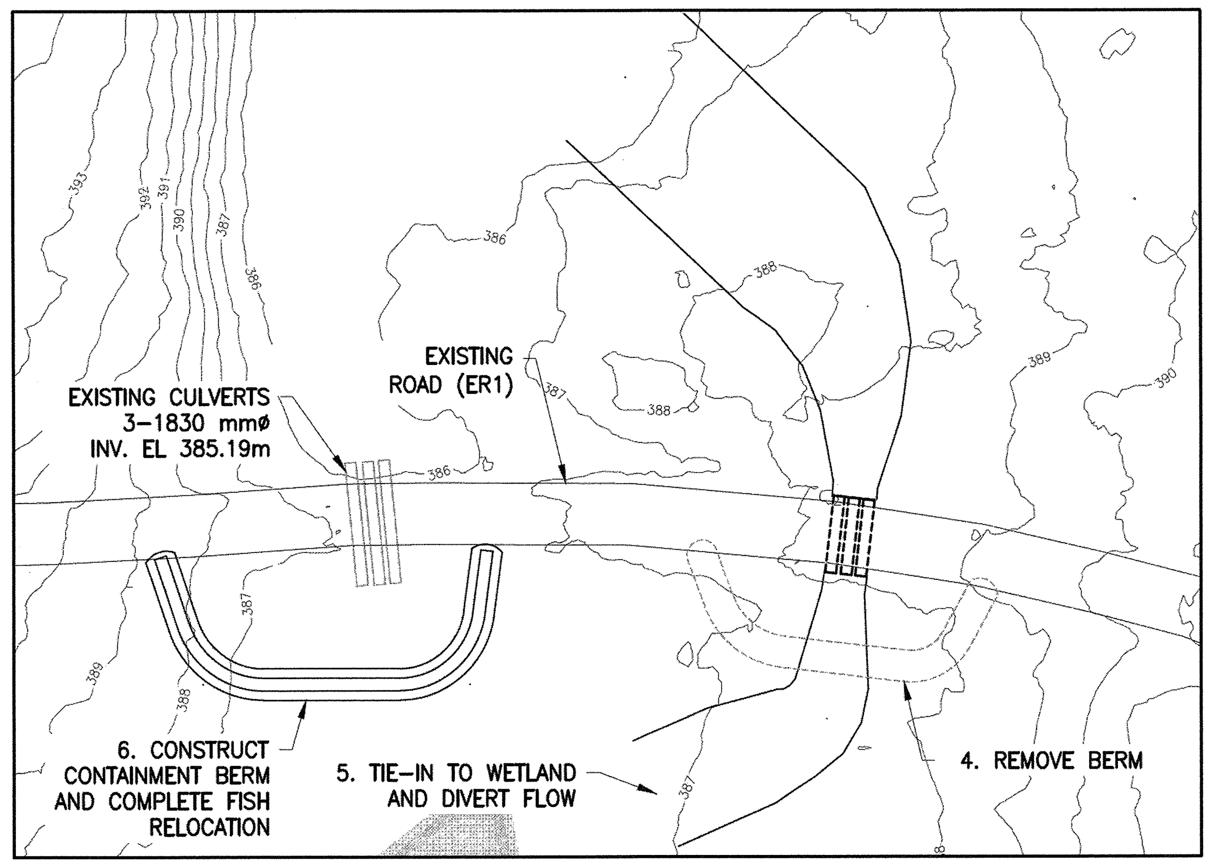

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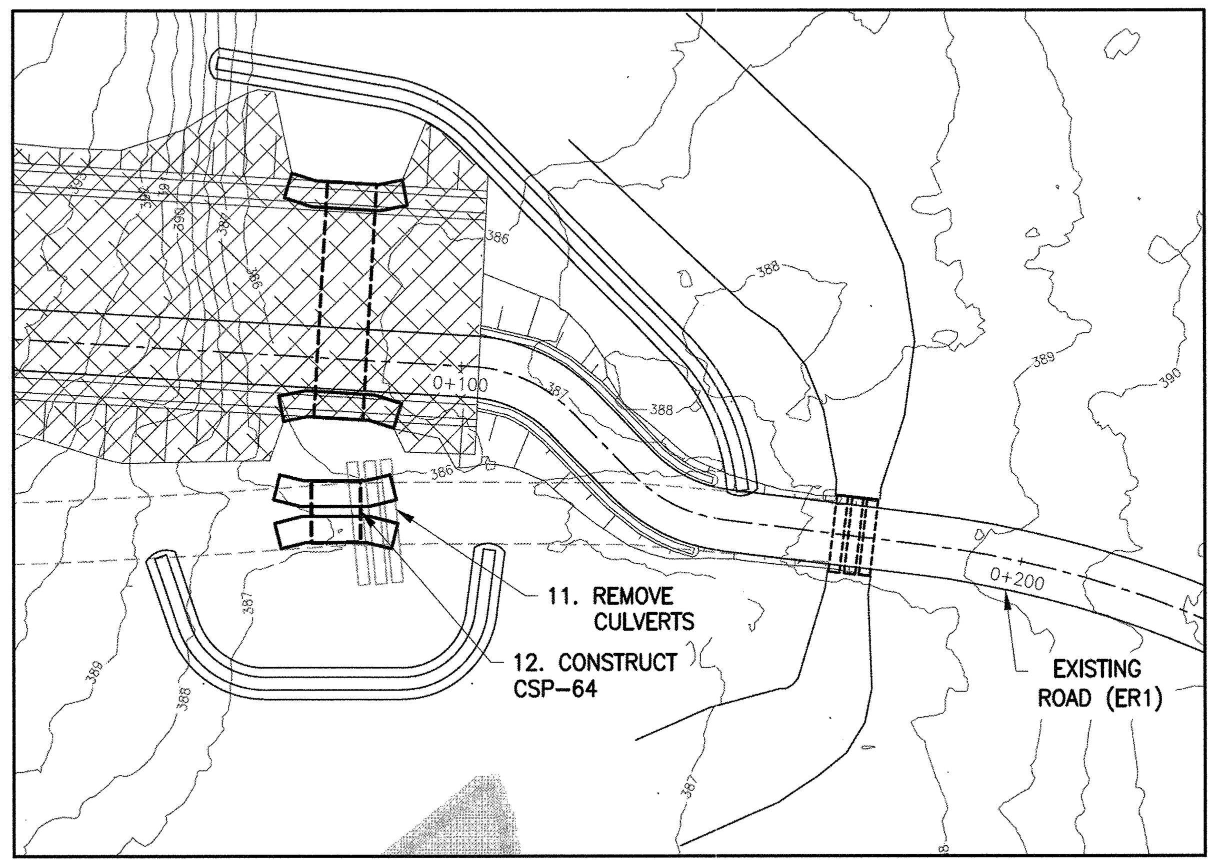

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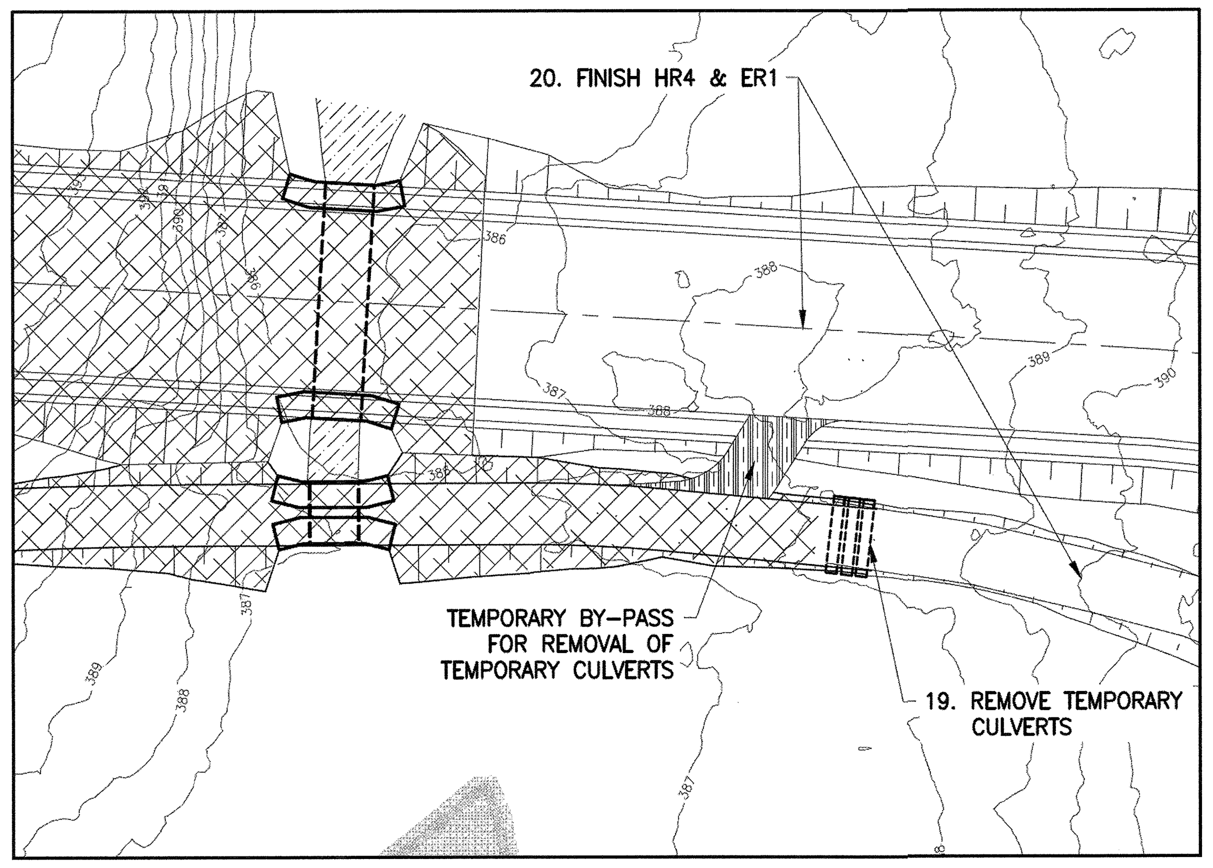

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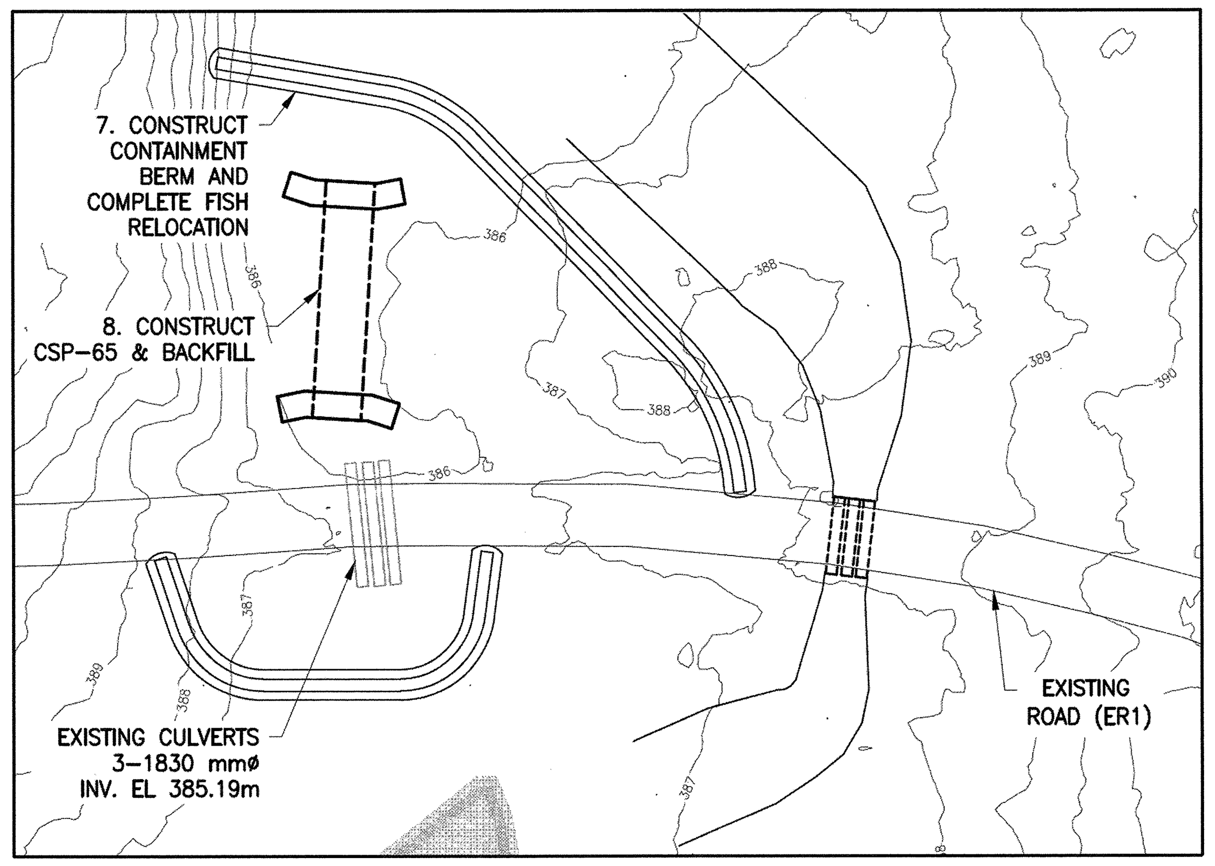

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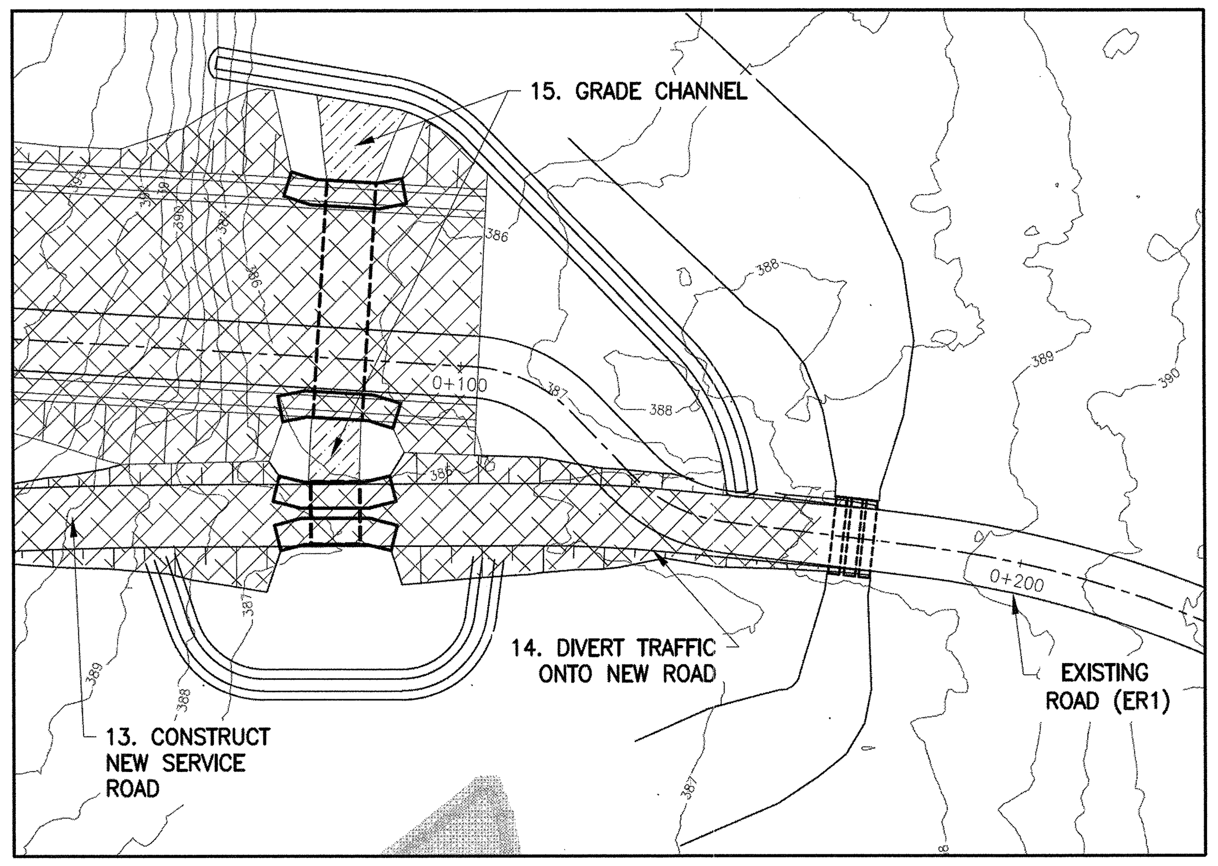

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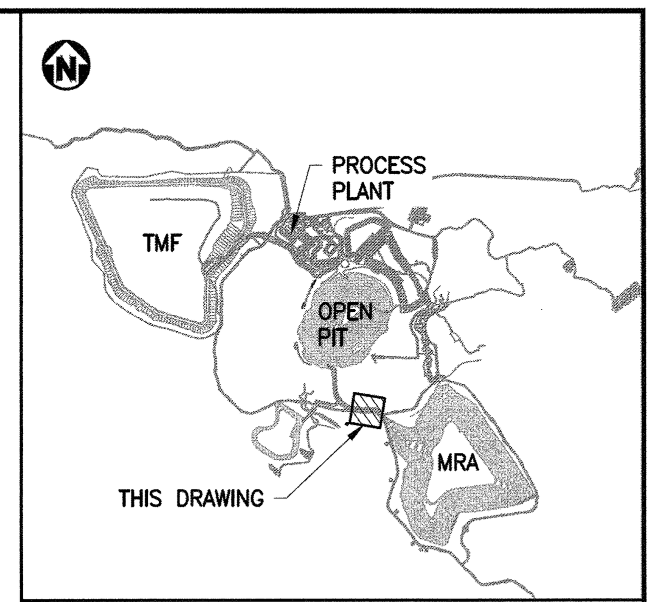


KEY PLAN
NTS

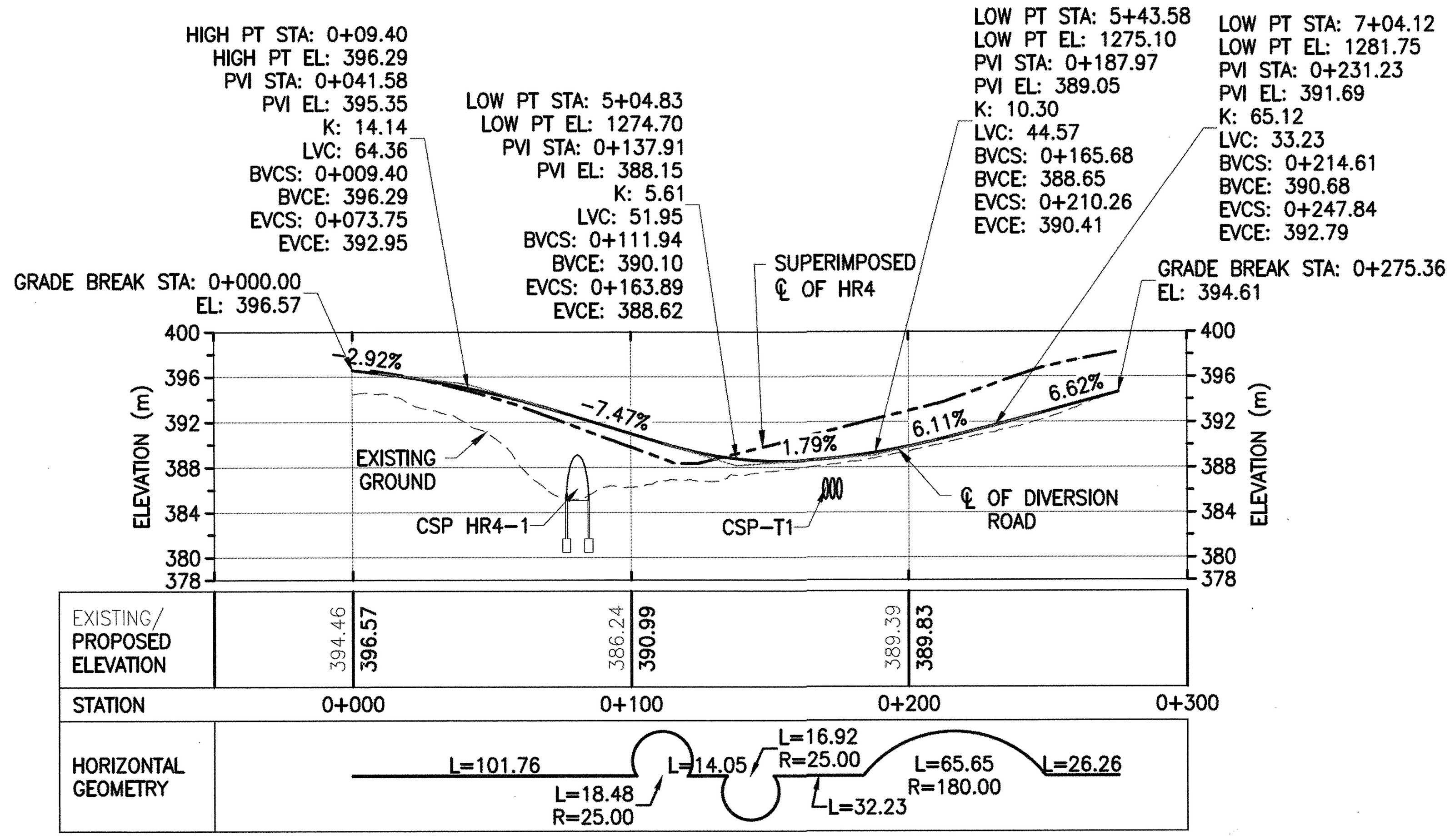
NOTES:

1. FOR KEY PLAN, GENERAL NOTES, ABBREVIATIONS AND LEGEND, REFER TO DRAWING: 100264–500–DD10–GRD–2000.
2. TERRAIN MAPPING PROVIDED BY IAMGOLD CORP. (2016)
3. CONTOUR INTERVAL IS 1m.
4. CONSTRUCTION SEQUENCING SHOWN ON THIS DRAWING IS FOR PLANNING PURPOSES. CONTRACTOR TO PREPARE THEIR OWN CONSTRUCTION SEQUENCING PLAN AND SHALL SUBMIT TO THE ENGINEER FOR REVIEW. WATER FLOW AND FISH PASSAGE TO BE MAINTAINED AT ALL TIMES. TRAFFIC FLOW TO BE MAINTAINED AS WELL.
5. INVERTS FOR EXISTING CULVERTS TO BE FIELD VERIFIED PRIOR TO ANY WORK COMMENCING. RESULTS OF FIELD SURVEY TO BE GIVEN TO ENGINEER FOR REVIEW. DESIGN MAY BE ADJUSTED BASED ON FIELD CONDITIONS.
6. CONTRACTOR IS REQUIRED TO DEVELOP A SITE–SPECIFIC WATER MANAGEMENT AND EROSION SEDIMENTATION CONTROL (ESC) PLAN FOR APPROVAL BY THE ENVIRONMENTAL COORDINATOR AND AREA CONSTRUCTION MANAGER PRIOR TO COMMENCEMENT OF WORK.

TEMPORARY CULVERT

NAME	LENGTH (m)	NUMBER OF PIPES	PIPE SIZE (mm)	SLOPE	UPSTREAM INVERT	DOWNSTREAM INVERT
CSP–T1	12.5	3	1800	0.00%	385.19	385.19

TYPE
CSP GALVANIZED, ROUND, 2.0mm WALL THICKNESS, 125 X 25mm CORRUGATION



DIVERSION ROAD PROFILE
1:2000 H
1:500 V

0m 5 10 15 20 25
1:500

0m 10 20 30 40 50
1:1000

0m 20 40 60 80 100
1:2000

REV	DDMMMYY	REVISION / ISSUE DESCRIPTION	DRN	CHK	APP	APP
0	09MAY19	ISSUED FOR CONSTRUCTION	AR	NA	JJ	PH
B	24APR19	ISSUED FOR REVIEW	AR	NA	JJ	PH
A	18APR19	ISSUED FOR SQUAD CHECK	AR	NA	JJ	

REF	NUMBER	TITLE
2	320-DD10-GRD-2003	HAUL ROAD (HR4) PLAN & PROFILE
1	500-DD10-GRD-2000	SITE ROADS - KEY PLAN

REFERENCES

STAMP/SEAL
LICENSED PROFESSIONAL ENGINEER J. E. J. JACKSON 5/10/19 PROVINCE OF ONTARIO

APPROVED FOR ________
CLIENT PROJECT MGR | DEPARTMENT MGR | PROJECT MGR

PROJECT PHASE: EPCM

PROJECT NO.: 100264

SCALE: AS SHOWN

	BY	DDMMMYY
DES	JJ	15APR19
DRN	AR	15APR19
CHK	NA	15APR19
APP	PH	15APR19

CÔTÉ GOLD

SUBJECT: CIVIL
PLAN & DETAILS
CHESTER LAKE OUTLET AT HR4
CONSTRUCTION SEQUENCING

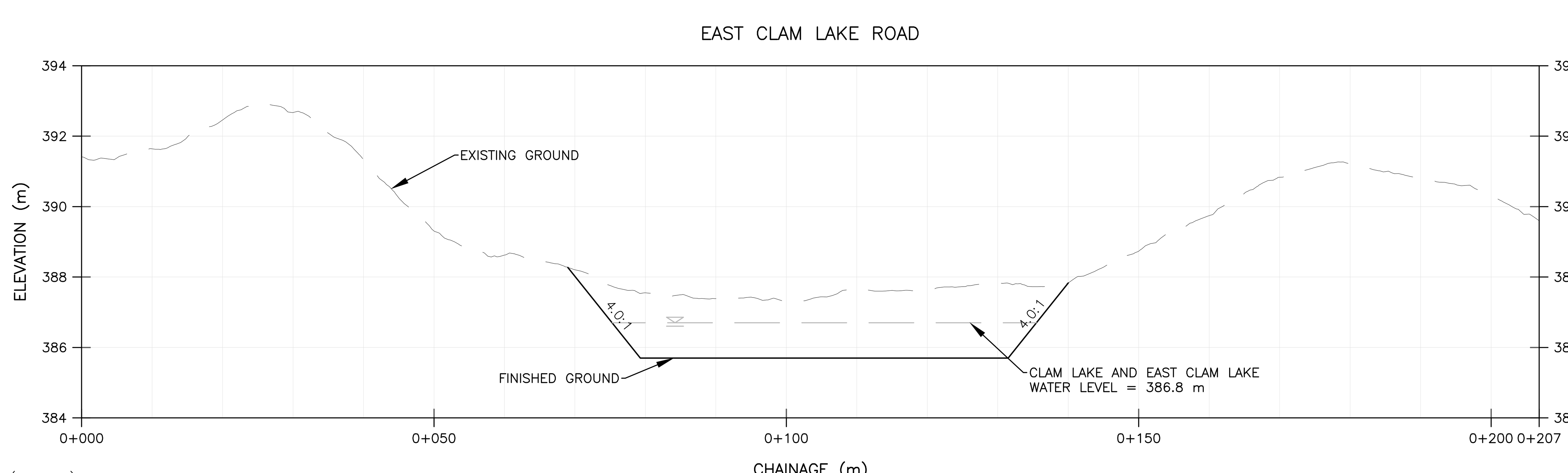
wood.

AREA: 320 — CÔTÉ GOLD PROJECT CACO-A
CLIENT DWG NO.: 320-C-2008 — 0
DRAWING NO.: 100264-320-DD10-GRD-2008 — REV 0

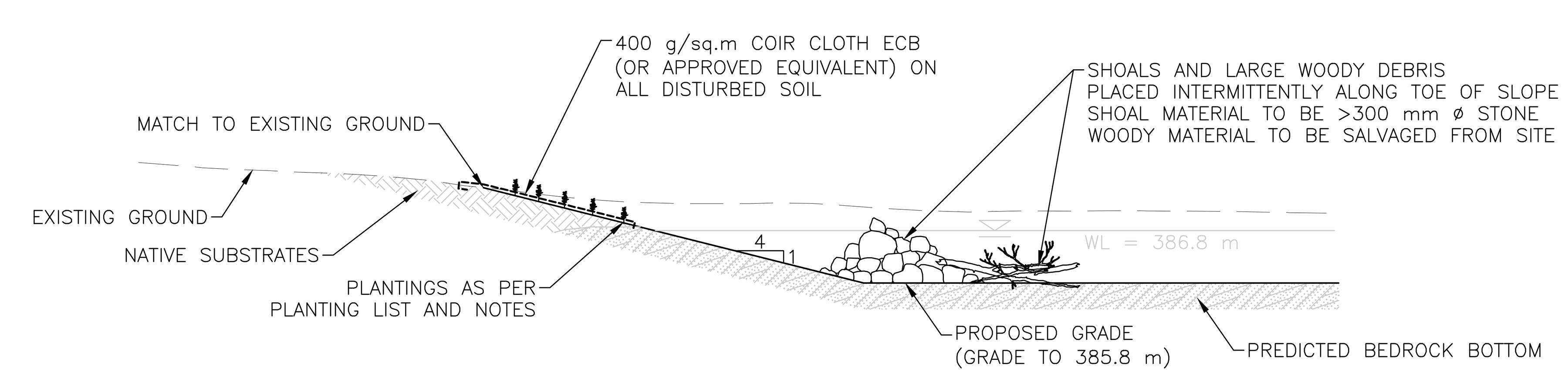
SAVED: 09-May-19 11:33 AM PLOTTED: 09-May-19 11:40 AM USER: RODRIGUEZ, ACHILLES
CAD FILE: P:\CAD\CIV\100264-320-DD10-GRD-2008.DWG

LITTLE CLAM, EAST CLAM AND CLAM LAKE CONNECTION
DESIGN DRAWINGS

PLAN (1:250)



PROFILE (1:500)



TYPICAL DETAIL: LAKE CONNECTION EXCAVATION

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LEGEND

- LAKE CONNECTION AREA
- ESTIMATED GRADING AREA
- PLANTING AREA
- PROPOSED PROFILE
- EXISTING GROUND PROFILE
- WATER LEVEL PROFILE

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES
0 10 20 — 1:250 (PLAN)
0 20 40 — 1:500 (PROFILE)

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-03-17	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
CLAM LAKE CONNECTIONS
EAST CLAM LAKE TO CLAM LAKE PLAN

Scale: as shown	Drawn By: CWM	Drawing No.
Date Issued: Mar 17, 2020	Checked By: BDP, JPH	1

PLAN (1:300)

PROFILE (1:300)

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LEGEND

- WETLAND AREA
- ROUNDSTONE CHANNEL MATERIAL
- LAKE AREA
- PROPOSED PROFILE
- EXISTING GROUND PROFILE
- WATER LEVEL PROFILE

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

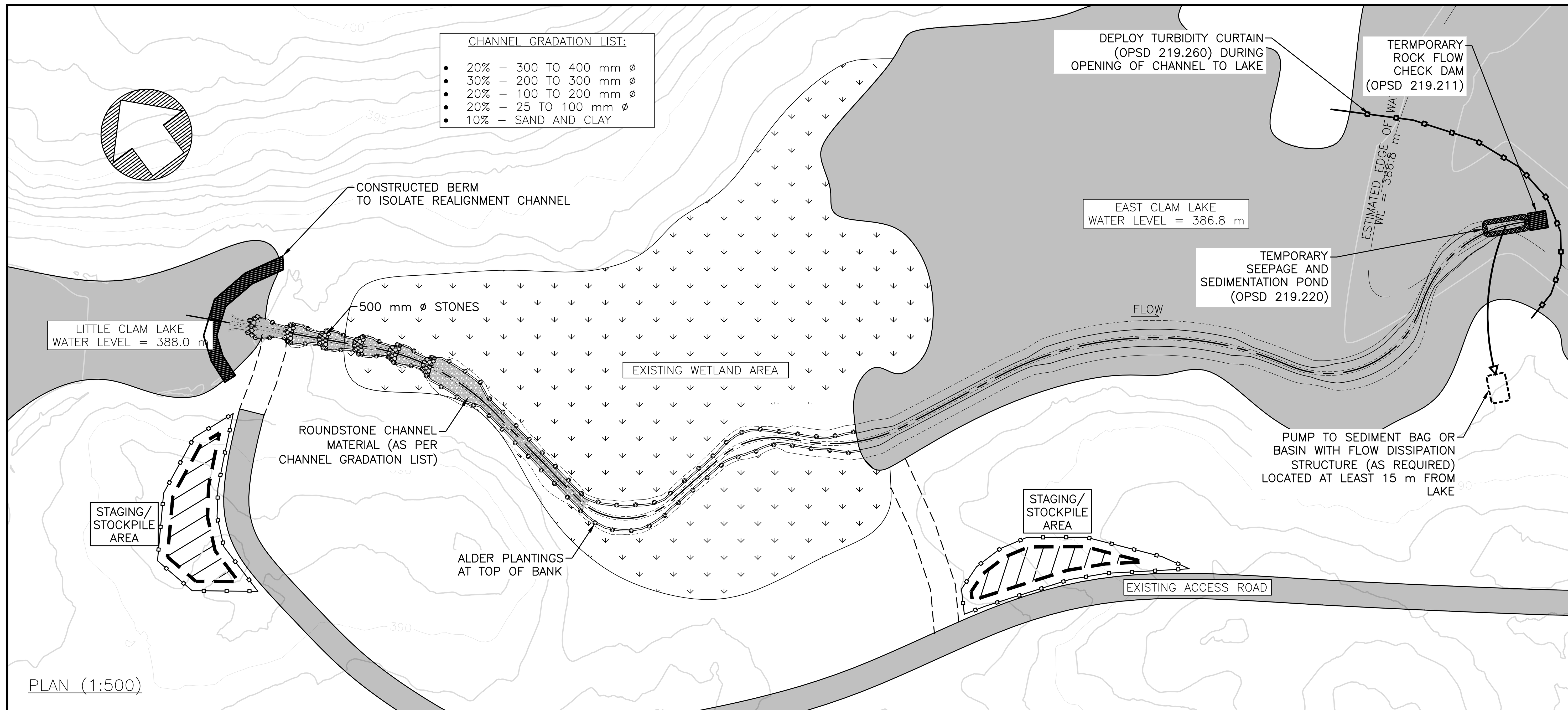
VERTICAL DATUM:
NAD83 (CSRS)

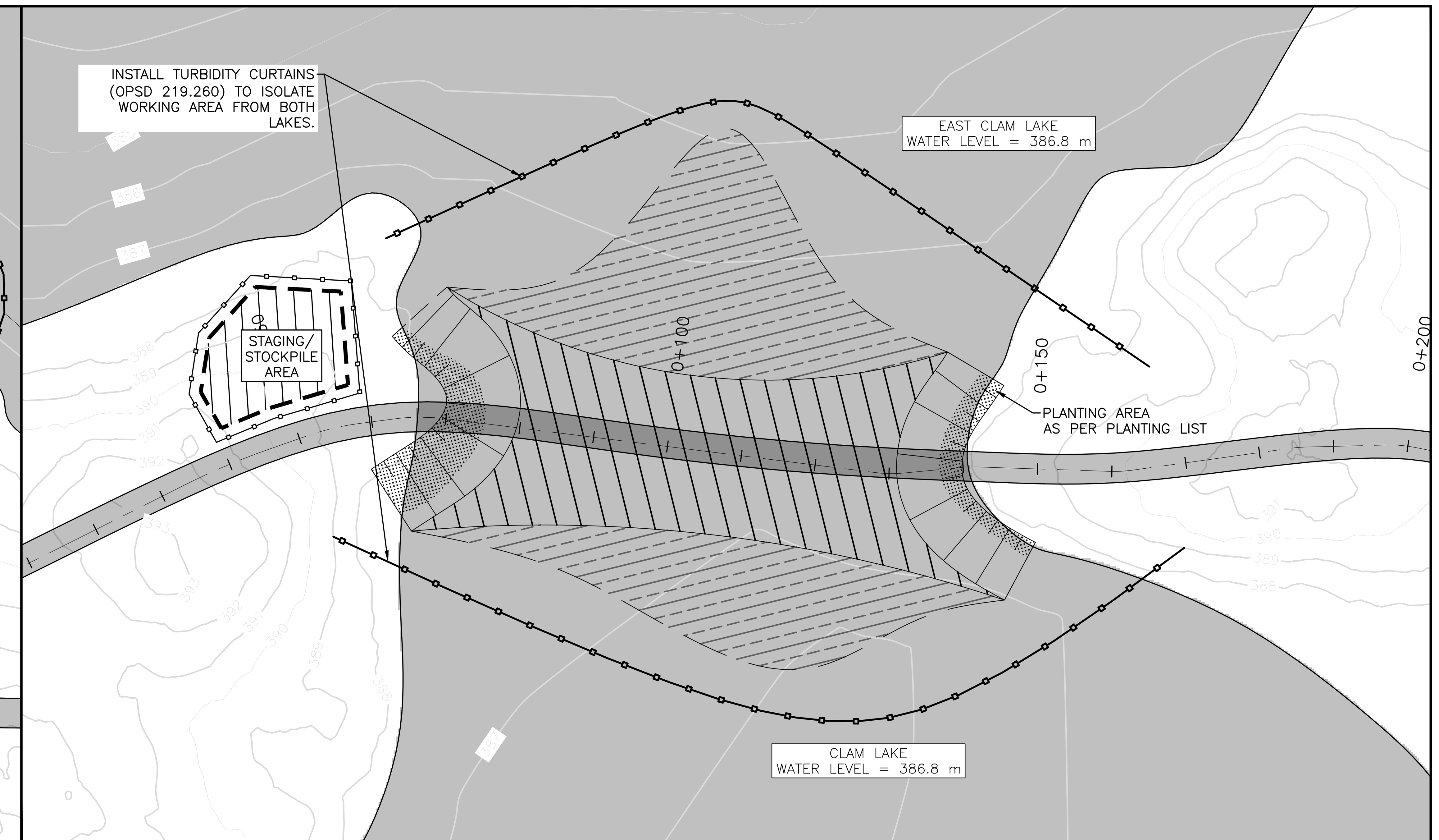
SCALES
HORIZONTAL: 0 10 20
VERTICAL: 0 2 4

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
CLAM LAKE CONNECTIONS
LITTLE CLAM LAKE TO EAST CLAM LAKE - PLAN AND PROFILE

Scale: 1:300	Drawn By: CWM	Drawing No. 2
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	





PLANTING NOTES:

GENERAL PLANTING NOTES:

- PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONE.
- PLANTINGS ARE TO OCCUR IN ALL DISTURBED AREAS AT ELEVATIONS GREATER THAN THE EAST CLAM LAKE WATER LEVEL.
- THE SCHEDULE OF SPECIES AND STOCK IS TO BE TO FOLLOWED PRECISELY, IF SUBSTITUTIONS ARE REQUIRED IT MUST BE AUTHORIZED BY A REGISTERED FORESTER.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN AND SHRUBS.
- ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK ABOVE THE EAST CLAM LAKE WATER LEVEL (76 TOTAL PLANTINGS).
- THE PLANTING PLAN MAY NEED TO BE ADJUSTED DEPENDING ON THE CONDITION OF THE EXISTING WETLAND AREA AT THE TIME OF CONSTRUCTION.

PLANTING LIST (0.4 ha, 1800 stems/ha)

Common Name	Latin Name	Quantity (Little Clam Lake to East Clam Lake)	Quantity (East Clam Lake to Clam Lake)	Stock
Shrubs				
Green Alder	Alnus crispa	19	8	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	57	20	12" Live Stakes, Locally Harvested
Red–Osier Dogwood	Cornus stolonifera	N/A	12	12" Live Stakes, Locally Harvested
	Total	76	40	

STAGING NOTES FOR CONSTRUCTION OF LITTLE CLAM LAKE EXTENSION:

- THE EXACT LIMITS OF EAST CLAM LAKE HAVE NOT BEEN CONFIRMED. THEREFORE THE EXACT POSITION OF THE TIE–IN WILL BE CONFIRMED IN THE FIELD BY A QUALIFIED CONTRACT ADMINISTRATOR.
- CLEAR ACCESS ROUTES FROM ROAD AND ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- CLEAR ACCESS ALONG CHANNEL CENTRELINE FROM LITTLE CLAM LAKE TO EAST CLAM LAKE. UNDERTAKE CLEARING AND GRUB AS PER OPSS 201.
- CONSTRUCT TEMPORARY ROCK FLOW CHECK DAMS AT UPSTREAM AND DOWNSTREAM LIMITS, AS SPECIFIED IN OPSD 219.211. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.
- CONSTRUCT THE TEMPORARY SEEPAGE POND AT THE DOWNSTREAM LIMITS OF THE CHANNEL, AS SPECIFIED IN OPSD 219.220. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.
- INSTALL DEWATERING PUMP AT SEEPAGE POND. SEEPAGE POND IS TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO EAST CLAM LAKE.
- CONSTRUCT THE LOW FLOW CHANNEL WORKING FROM THE DOWNSTREAM LIMITS TO THE UPSTREAM LIMITS.
- ENSURE LOW FLOW CHANNEL AND BANKS ARE STABILIZED.
- DEWATER TEMPORARY SEEPAGE POND. EXCAVATE AND DISPOSE OF ANY EXCESS SEDIMENT WITHIN THE SEEPAGE POND. REMOVE ALL MATERIALS AND EQUIPMENT FROM THE CHANNEL.
- INSTALL TURBIDITY CURTAIN (OPSD 219.260) TO ISOLATE THE CHANNEL FROM EAST CLAM LAKE.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, REMOVE THE DOWNSTREAM TEMPORARY ROCK FLOW CHECK DAMS AND ALL OTHER TEMPORARY MATERIALS.
- DECONSTRUCT THE UPSTREAM TEMPORARY ROCK FLOW CHECK DAM IN INCREMENTAL LIFTS. ALLOW THE UPSTREAM LAKE LEVEL TO STABILIZE PRIOR TO INITIATING EXCAVATING THE NEXT LIFT.
- FOLLOWING THE DECONSTRUCTION OF THE TEMPORARY ROCK FLOW CHECK DAM, REMOVE THE TURBIDITY CURTAIN, AND REMOVE ALL ACCUMULATED SEDIMENT FROM ISOLATED WORKING AREA USING VAC TRUCK (AS REQUIRED). REMOVE ALL MATERIALS AND EQUIPMENT FROM THE CHANNEL.

STAGING NOTES FOR CONSTRUCTION OF CONNECTION BETWEEN EAST CLAM AND CLAM LAKE:

- ALL WORKS ARE TO BE UNDERTAKEN FROM THE EXISTING ROAD.
- ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- INSTALL TURBIDITY CURTAIN (OPSD 219.260) TO ISOLATE WORKING AREA FROM BOTH LAKES.
- EXCAVATE EXISTING ROAD, STARTING AT THE SOUTHEASTERN BANK. COMPLETE GRADING OF LAKE BOTTOM AND SHORELINE FROM ROAD.
- THE FINAL GRADING IS TO MAINTAIN A PERMANENT WET CONNECTION BETWEEN THE EAST CLAM AND CLAM LAKE. THE EXACT LIMITS OF THE GRADING WILL BE CONFIRMED ONSITE AND WILL BE COMPLETED TO THE SATISFACTION OF THE CONSTRUCTION ADMINISTRATOR.
- AS REQUIRED, REMOVE ALL ACCUMULATED SEDIMENT FROM ISOLATED WORKING AREA USING VAC TRUCK.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, REMOVE THE TURBIDITY CURTAIN AND ALL OTHER TEMPORARY MATERIALS.

EROSION AND SEDIMENT CONTROL NOTES:

GENERAL:

- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION, TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
- ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE AREAS OF EXPOSED BARE SOIL AT ANY ONE TIME. THE EXTENT OF DISTURBED AREAS IS BE MINIMIZED WHERE POSSIBLE. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.
- ALL IN–WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
- STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE–SLOPES SHALL BE 1.5:1.
- EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.
- IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK–AROUND–WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

DE–WATERING:

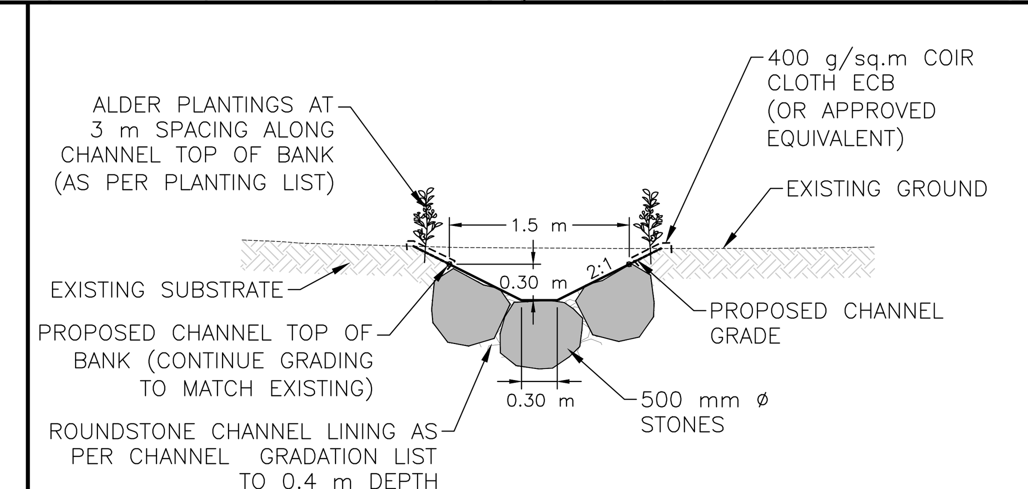
- SEDIMENT LADEN WATER SHALL NOT DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG IN THE FLOODPLAIN.
- IN THE EVENT OF RAINFALL OR SEEPAGE ENTERING THE WORK SITE, ADDITIONAL DEWATERING (BEYOND THAT RECOMMENDED IN THE PLANS), MAY BE REQUIRED.
- DEWATERING INLET PUMP HEAD TO BE COVERED WITH FILTER FABRIC OR CLEAR STONE. THE OUTLET PUMP HEAD IS TO DISCHARGE TO A SEDIMENT BAG OR BASIN. DISCHARGE FROM THE BAG IS TO BE RELEASED TO A VEGETATED LOCATION OR IF A VEGETATED LOCATION IS NOT AVAILABLE, A FLOW DISSIPATING STRUCTURE.

SPILLS CONTROL NOTES:

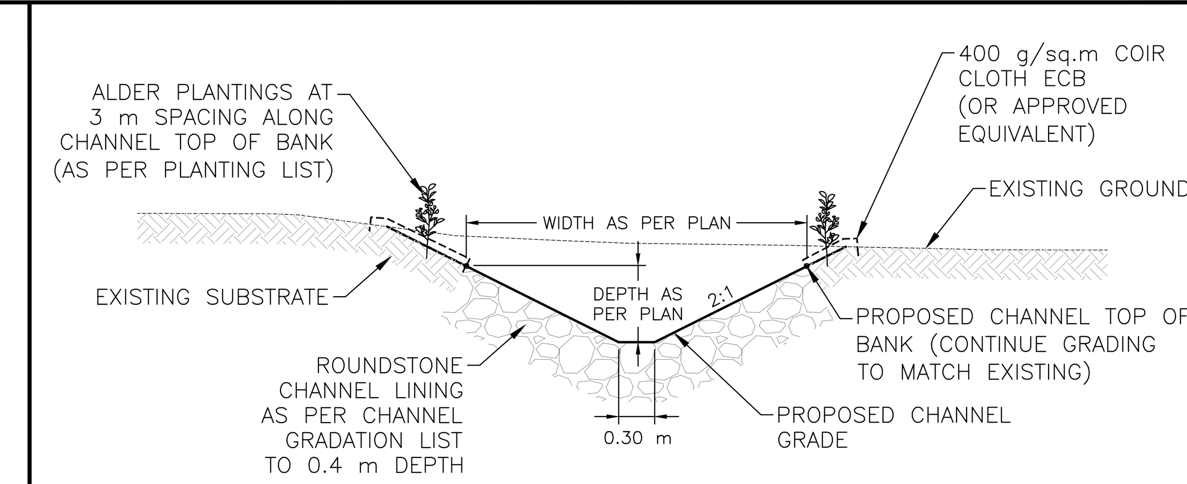
- ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.
- THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.
- IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:
  1. IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY–LAWS, PERMITS, APPROVALS, ETC.
  2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
  3. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

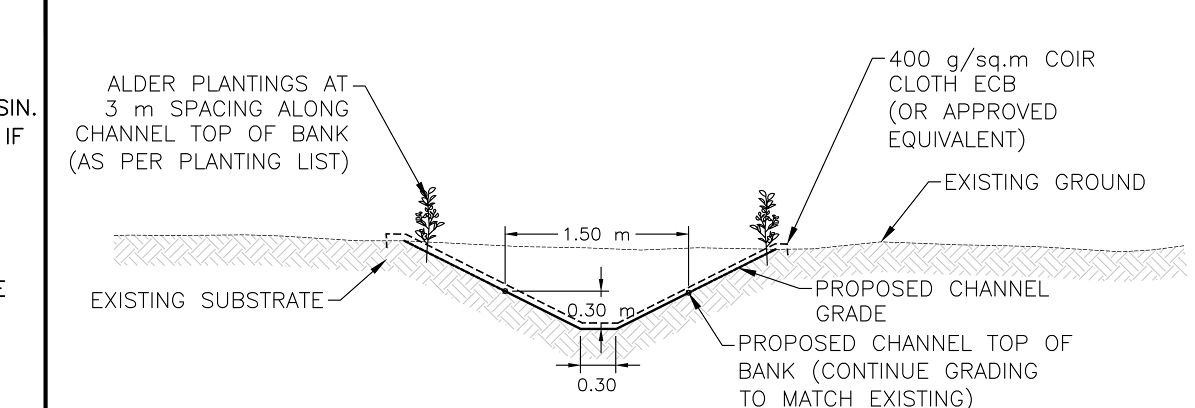
- IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.



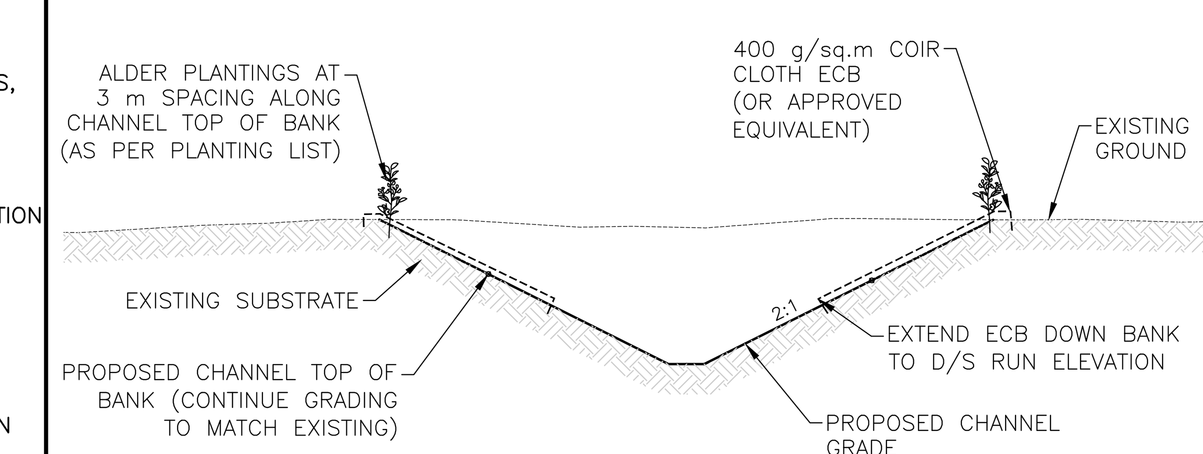
TYPICAL DETAIL: STEP–POOL REACH – CREST SECTION



TYPICAL DETAIL: STEP–POOL REACH – POOL SECTION



TYPICAL DETAIL: RUN–POOL REACH – RUN SECTION



TYPICAL DETAIL: RUN–POOL REACH – POOL SECTION

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LEGEND

- SILT FENCE (OPSD 219.130)
- TURBIDITY CURTAIN (OPSD 219.260)
- STAGING AND STOCKPILE AREA
- ALDER PLANTINGS

NOT FOR CONSTRUCTION

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

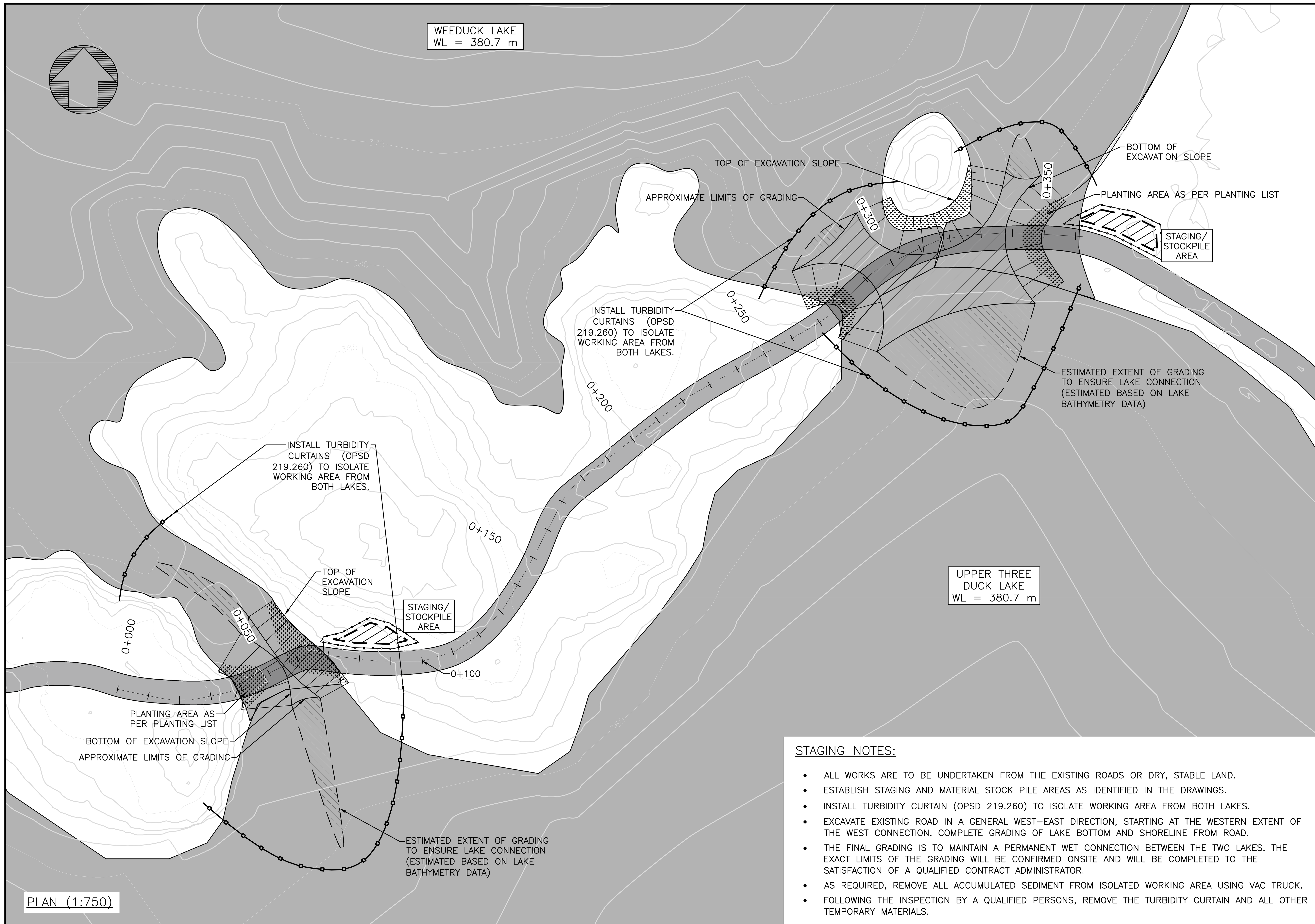
SCALES: HORIZONTAL 0 – 10 – 20; VERTICAL 0 – 2 – 4

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
CLAM LAKE CONNECTIONS
REVEGETATION AND EROSION AND SEDIMENT CONTROL

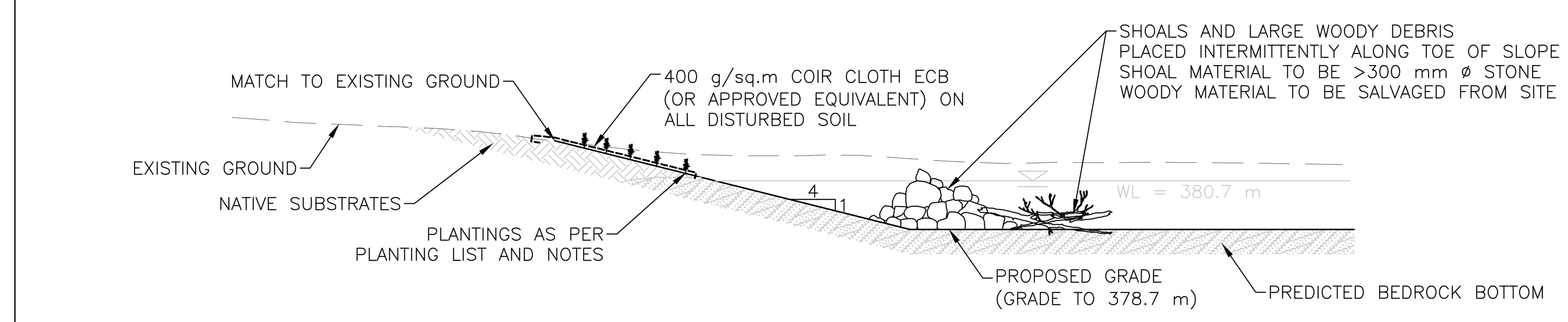
Scale: 1:300 | Drawn By: CWM | Drawing No. 3
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

WEEDUCK LAKE CONNECTION
DESIGN DRAWINGS



STAGING NOTES:

- ALL WORKS ARE TO BE UNDERTAKEN FROM THE EXISTING ROADS OR DRY, STABLE LAND.
- ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- INSTALL TURBIDITY CURTAIN (OPSD 219.260) TO ISOLATE WORKING AREA FROM BOTH LAKES.
- EXCAVATE EXISTING ROAD IN A GENERAL WEST–EAST DIRECTION, STARTING AT THE WESTERN EXTENT OF THE WEST CONNECTION. COMPLETE GRADING OF LAKE BOTTOM AND SHORELINE FROM ROAD.
- THE FINAL GRADING IS TO MAINTAIN A PERMANENT WET CONNECTION BETWEEN THE TWO LAKES. THE EXACT LIMITS OF THE GRADING WILL BE CONFIRMED ONSITE AND WILL BE COMPLETED TO THE SATISFACTION OF A QUALIFIED CONTRACT ADMINISTRATOR.
- AS REQUIRED, REMOVE ALL ACCUMULATED SEDIMENT FROM ISOLATED WORKING AREA USING VAC TRUCK.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, REMOVE THE TURBIDITY CURTAIN AND ALL OTHER TEMPORARY MATERIALS.



TYPICAL DETAIL: LAKE CONNECTION EXCAVATION

PLANTING NOTES:

GENERAL PLANTING NOTES:

- THE SCHEDULE OF SPECIES AND STOCK IS TO BE TO FOLLOWED PRECISELY, IF SUBSTITUTIONS ARE REQUIRED IT MUST BE AUTHORIZED BY A REGISTERED FORESTER.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN SHRUBS.
- EXTENTS OF PLANTING AREA TO BE DETERMINED IN–SITU BASED ON SUBSTRATE MATERIAL, WATER LEVEL, AND OVERBURDEN DEPTH.

PLANTING LIST

Common Name	Latin Name	Percentage	Quantity	Stock
		Shrubs		
Green Alder	Alnus crispa	20	28	Bare root
Speckled Alder	Alnus rugosa	50	70	Bare root
Red–Osier Dogwood	Cornus stolonifera	30	42	Bare root
	Total	100	140	

EROSION AND SEDIMENT CONTROL NOTES:

GENERAL:

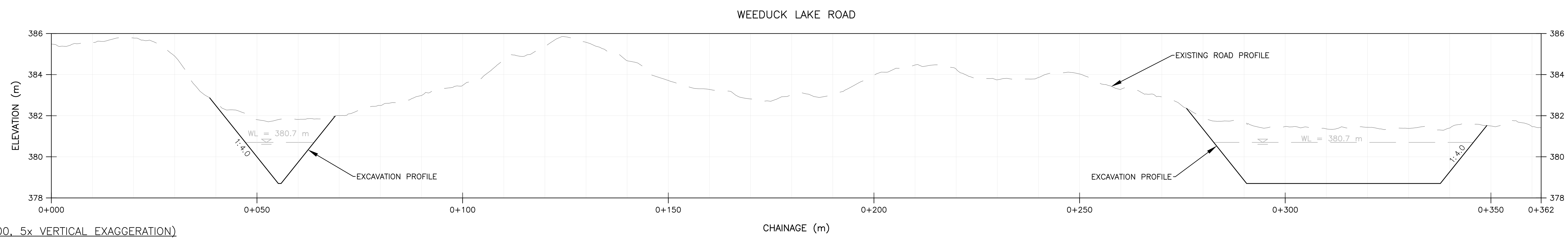
- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION, TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
- ALL IN–WATER AND NEAR WATER WORKS WILL BE CONDUCTED FROM DRY, STABLE LAND.
- STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE–SLOPES SHALL BE 1.5:1.
- EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.
- IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK–AROUND–WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

SPILLS CONTROL NOTES:

- ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.
- THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.
- IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:
  1. IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY–LAWS, PERMITS, APPROVALS, ETC.
  2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
  3. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

- IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.



PROFILE (1:500, 5x VERTICAL EXAGGERATION)

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LEGEND

- LAKE CONNECTION AREA
- ESTIMATED GRADING AREA
- PLANTING AREA
- SILT FENCE (OPSD 219.130)
- TURBIDITY CURTAIN (OPSD 219.260)
- STAGING AND STOCKPILE AREA

NOT FOR CONSTRUCTION

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

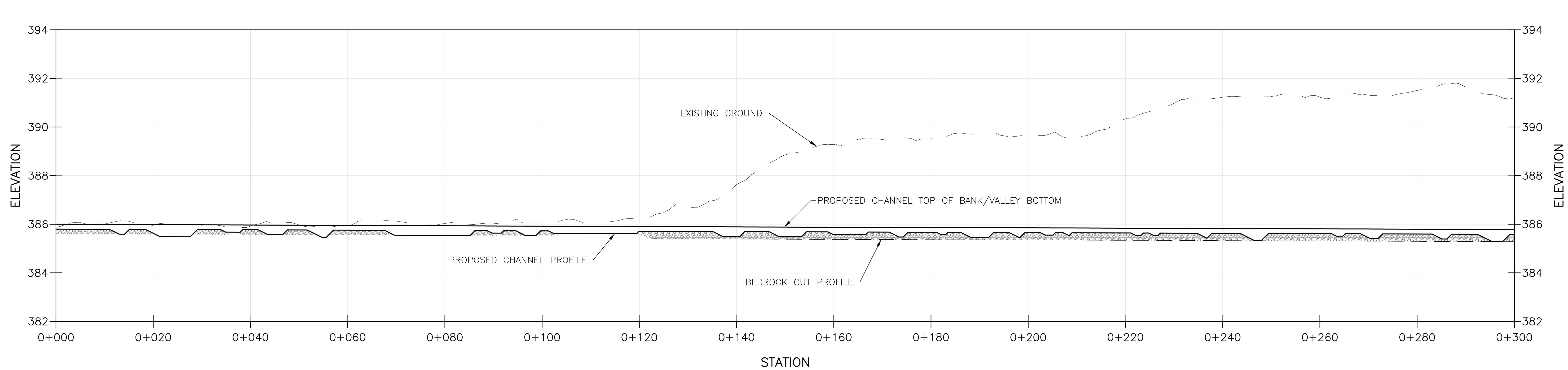
SCALES
0 30 60
1:750 (PLAN)
0 20 40
1:500 (PROFILE)

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-03-17	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
WEEDUCK LAKE CONNECTION

Scale: as shown	Drawn By: CWM	Drawing No. 04
Date Issued: MAR 17, 2020	Checked By: BDP, JPH	

UNNAMED POND OUTLET
DESIGN DRAWINGS



ENGINEERING DESIGN APPLICABLE TO LOW FLOW CHANNEL ONLY. DESIGN APPLIES ONLY TO THE SPECIFIC VALLEY CUT AS SHOWN IN THE DRAWING AND UNDER EXISTING HYDROLOGIC CONDITIONS.

VALLEY CUT DESIGNED BY OTHERS.

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LEGEND

- REVEGETATION AREA
- ROUNDSTONE CHANNEL MATERIAL
- VALLEY STONE MATERIAL
- PROPOSED PROFILE
- EXISTING GROUND PROFILE
- STANDING SNAG
- ALDER PLANTINGS
- FLOODPLAIN BOULDER PLACEMENT
- FLOODPLAIN WOODY DEBRIS PLACEMENT

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD RECEIVED FEB 28, 2019

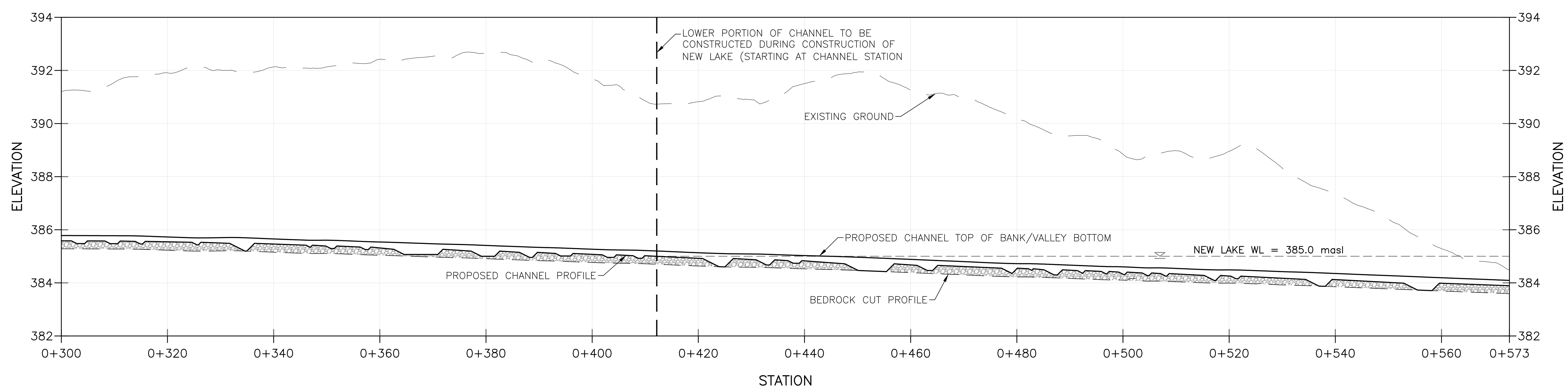
VERTICAL DATUM:
NAD83 (CSRS)

SCALE
AS SHOWN

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Construction	2019-08-28	JPH
C	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
UNNAMED POND CONNECTION CHANNEL
PLAN AND PROFILE (0+000 TO 0+300)

Scale: AS SHOWN	Drawn By: CWM	Drawing No. 5
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



PROFILE (1:500 H, 1:100 V)

ENGINEERING DESIGN APPLICABLE TO LOW FLOW CHANNEL ONLY. DESIGN APPLIES ONLY TO THE SPECIFIC VALLEY CUT AS SHOWN IN THE DRAWING AND UNDER EXISTING HYDROLOGIC CONDITIONS.

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LEGEND

- REVEGETATION AREA
- ROUNDSTONE CHANNEL MATERIAL
- VALLEY STONE MATERIAL
- PROPOSED PROFILE
- EXISTING GROUND PROFILE
- STANDING SNAG
- ALDER PLANTINGS
- FLOODPLAIN BOULDER PLACEMENT
- FLOODPLAIN WOODY DEBRIS PLACEMENT

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PROVINCE OF ONTARIO

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

VERTICAL DATUM:
NAD83 (CSRS)

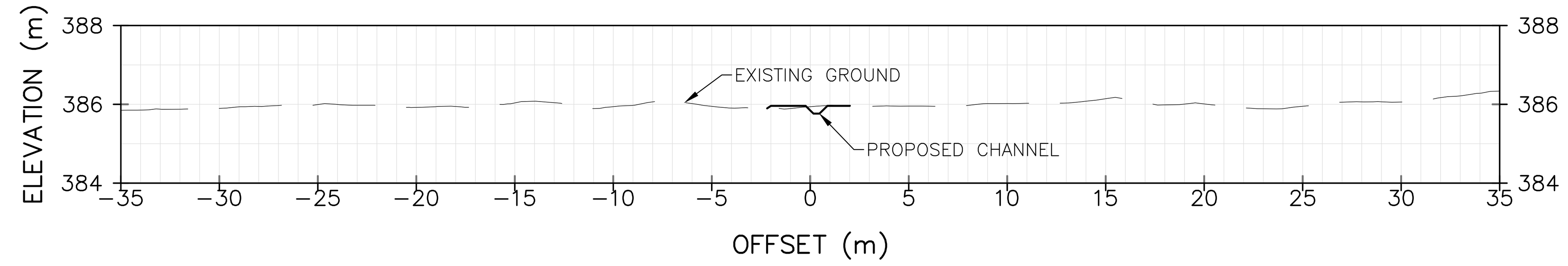
SCALE: AS SHOWN

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Construction	2019-08-28	JPH
C	Issued for Construction (Updated)	2020-02-14	JPH

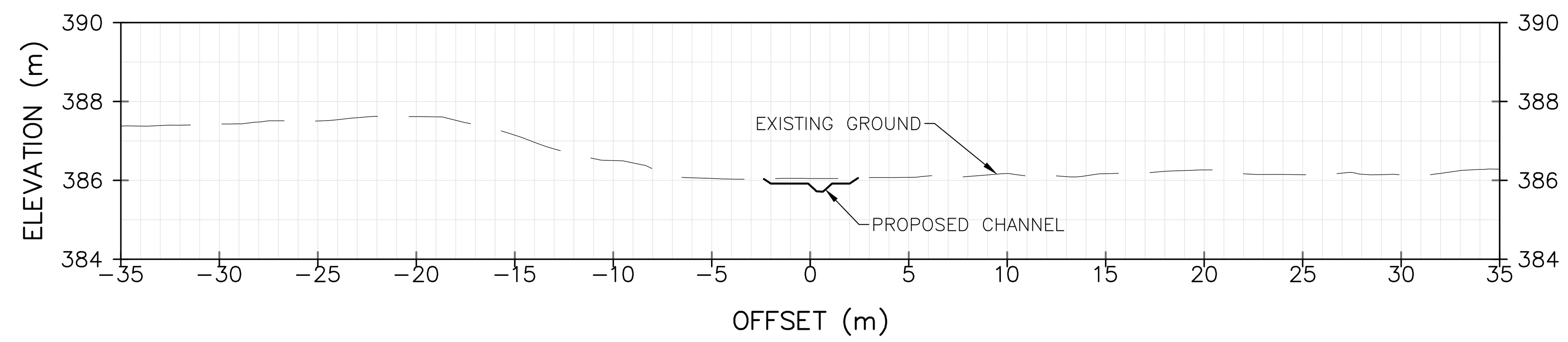
IAMGOLD COTE MINE - HABITAT COMPENSATION
UNNAMED POND CONNECTION CHANNEL
PLAN AND PROFILE (0+300 TO END)

Scale: AS SHOWN	Drawn By: CWM	Drawing No. 6
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

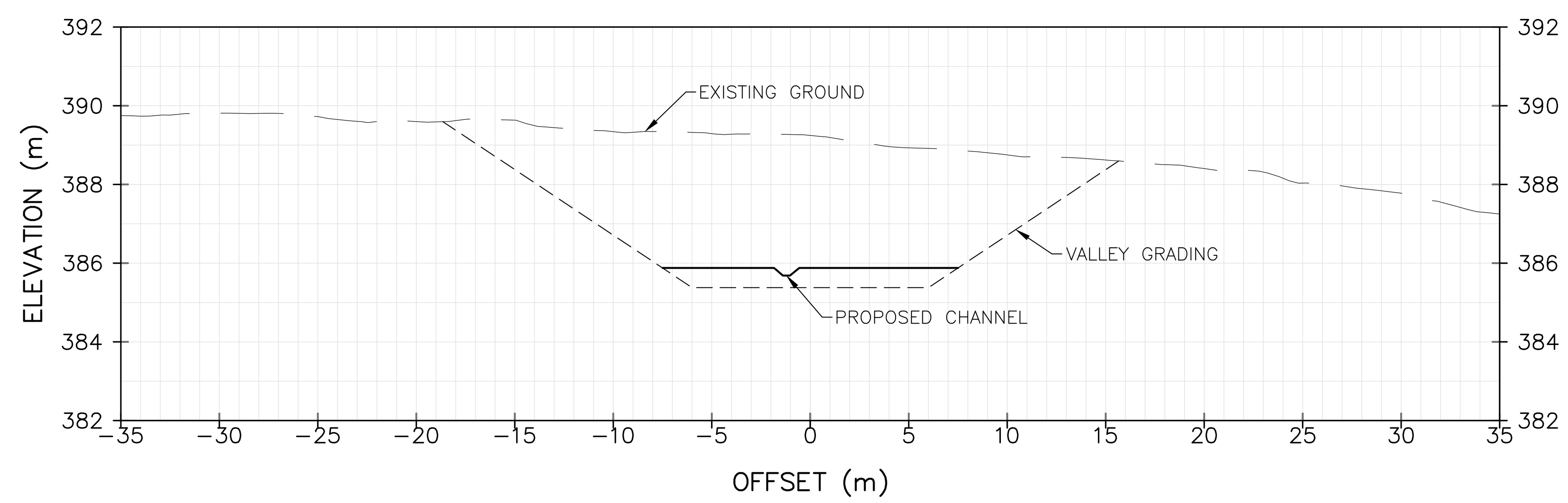
SECTION 5+050



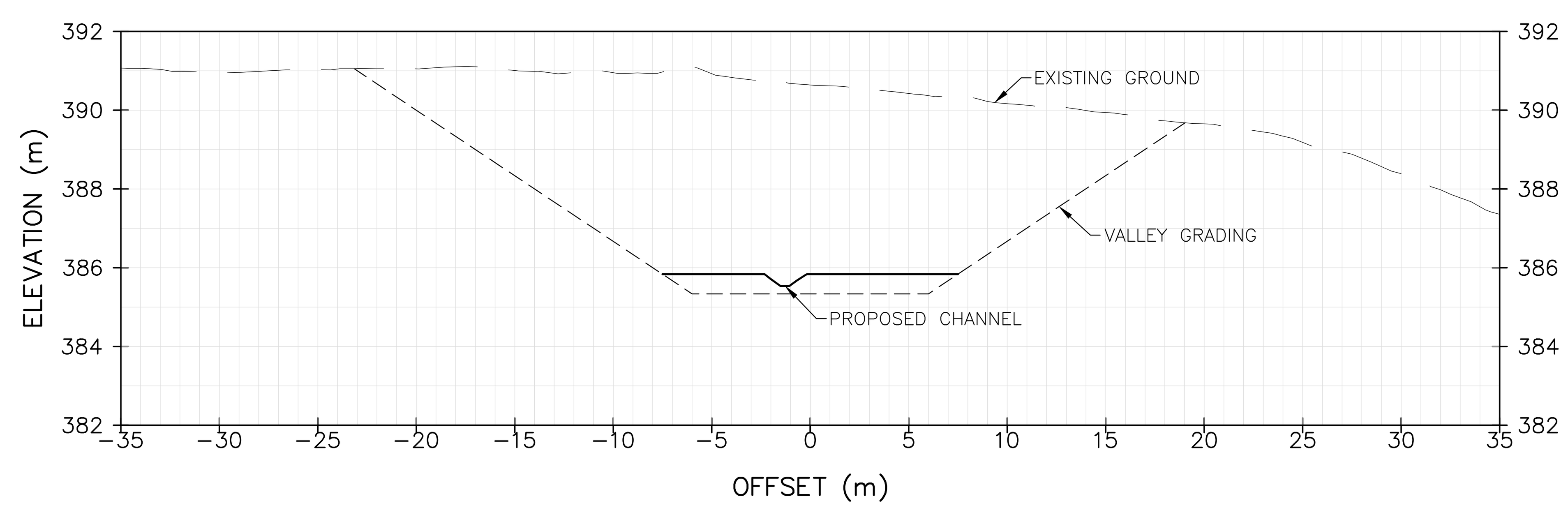
SECTION 5+100



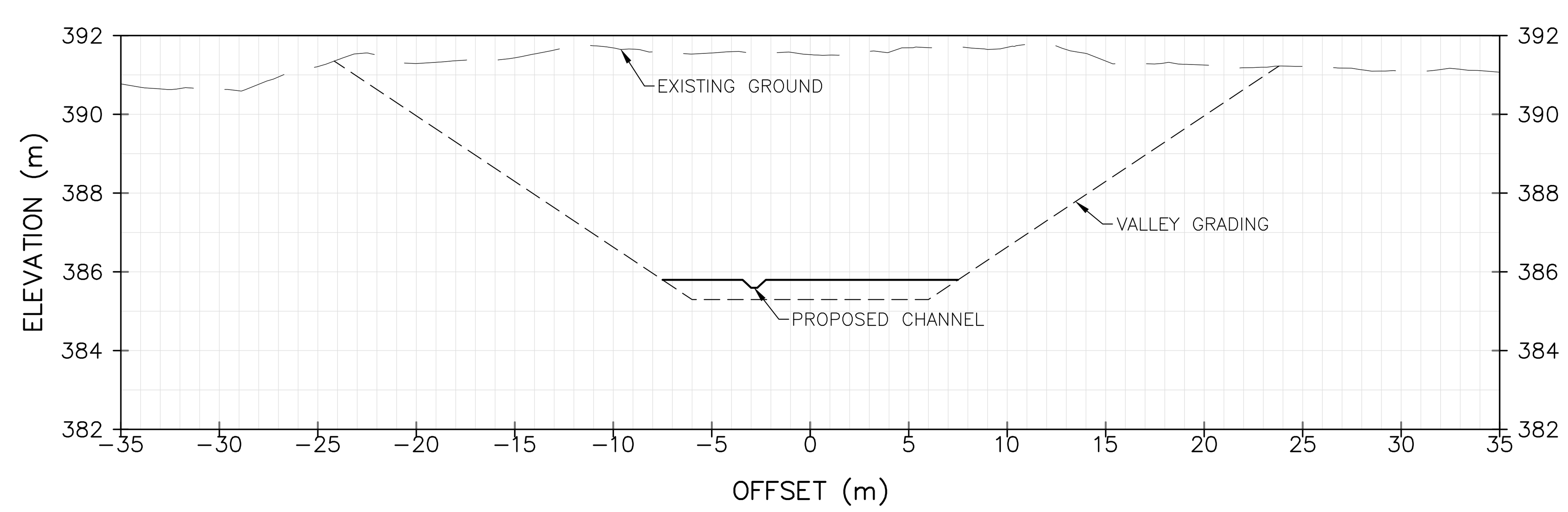
SECTION 5+150



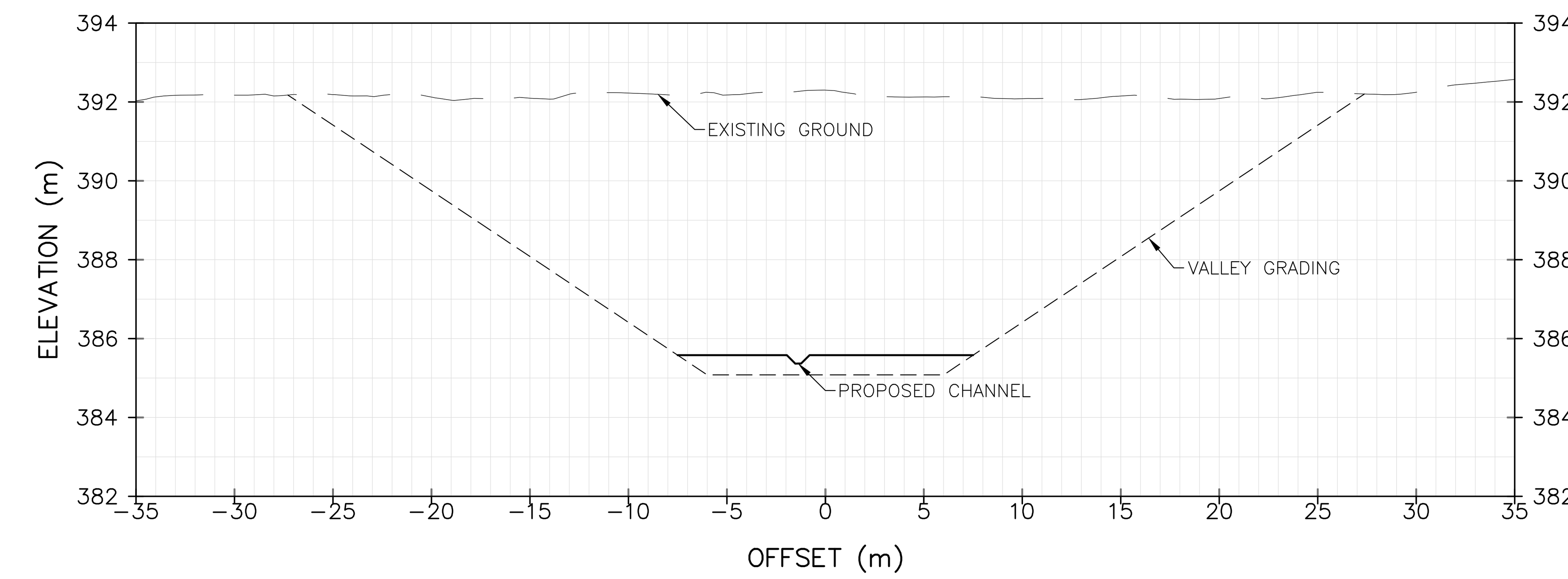
SECTION 5+200



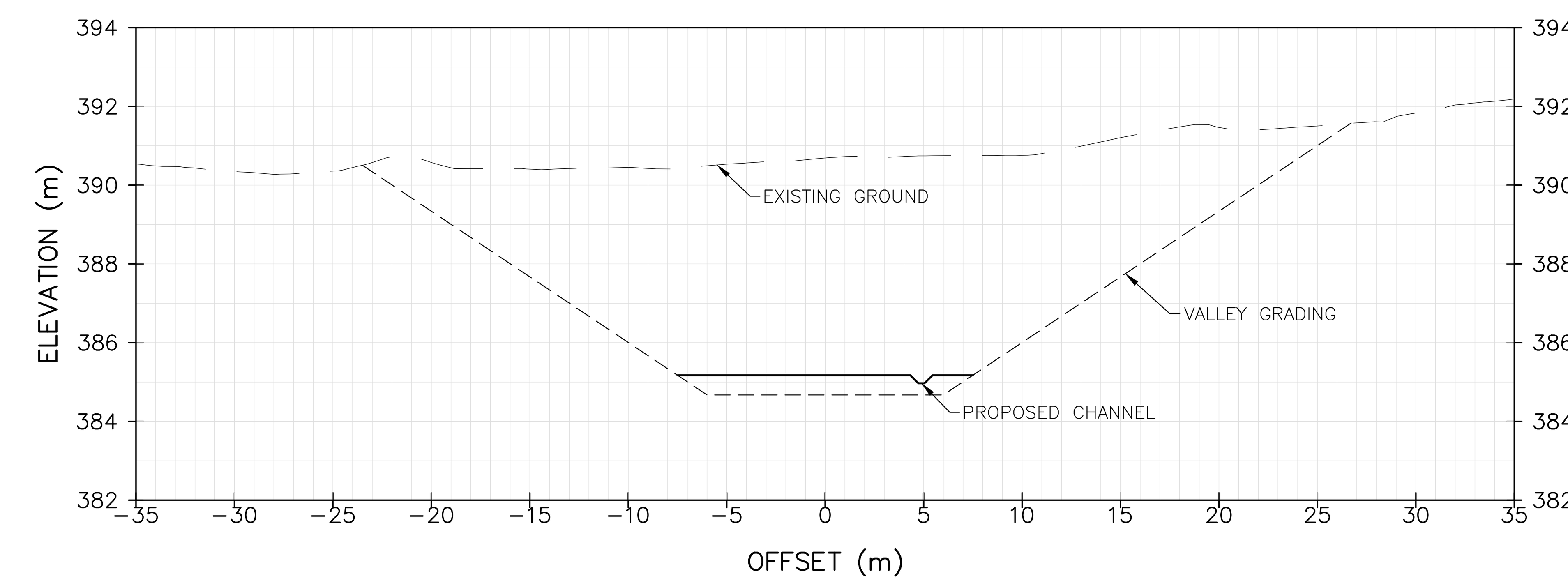
SECTION 5+250



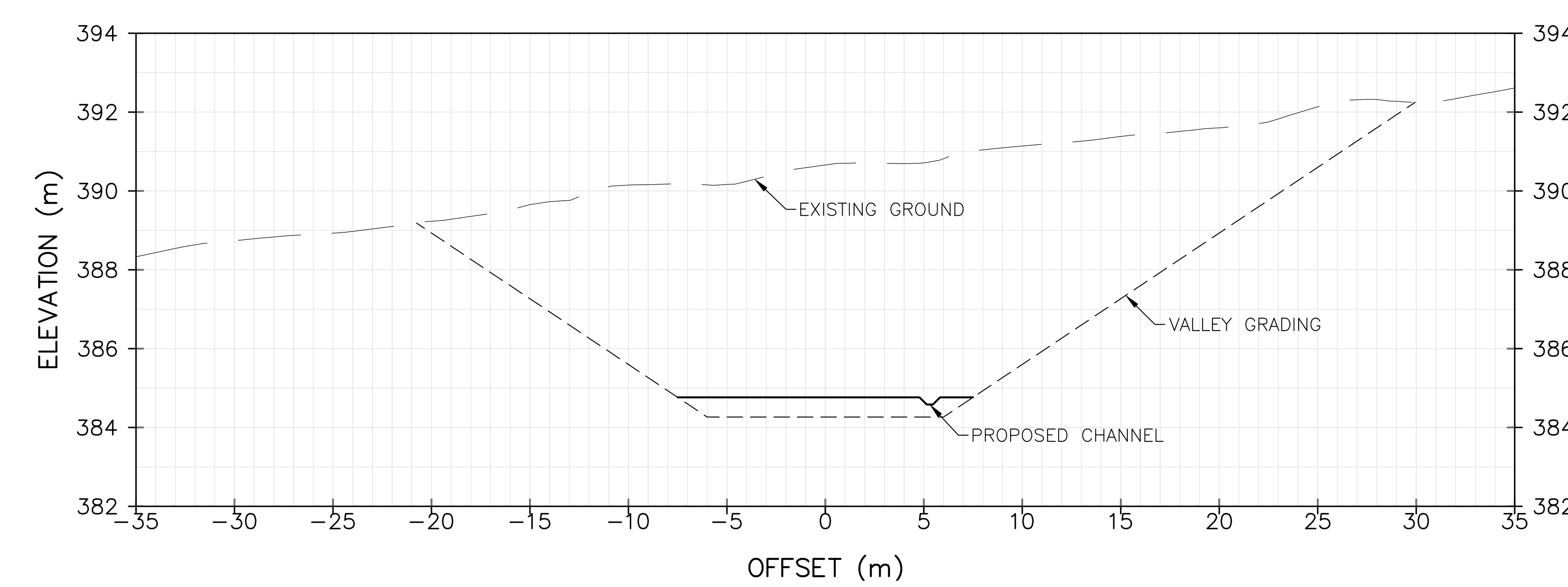
SECTION 5+300



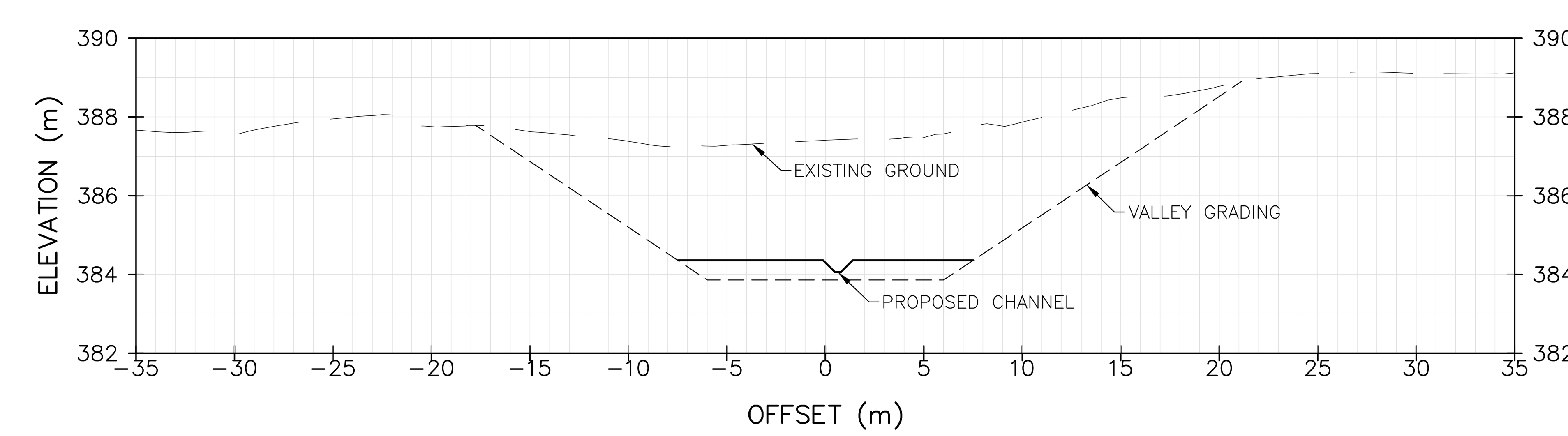
SECTION 5+350



SECTION 5+400



SECTION 5+450



ENGINEERING DESIGN APPLICABLE TO LOW FLOW CHANNEL ONLY. DESIGN APPLIES ONLY TO THE SPECIFIC VALLEY CUT AS SHOWN IN THE DRAWING AND UNDER EXISTING HYDROLOGIC CONDITIONS.

VALLEY CUT DESIGNED BY OTHERS.

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LEGEND

PROPOSED GRADE

EXISTING GROUND PROFILE

PROPOSED VALLEY GRADING PROFILE

LICENSED PROFESSIONAL ENGINEER
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PROVINCE OF ONTARIO

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

VERTICAL DATUM:
NAD83 (CSRS)

SCALE

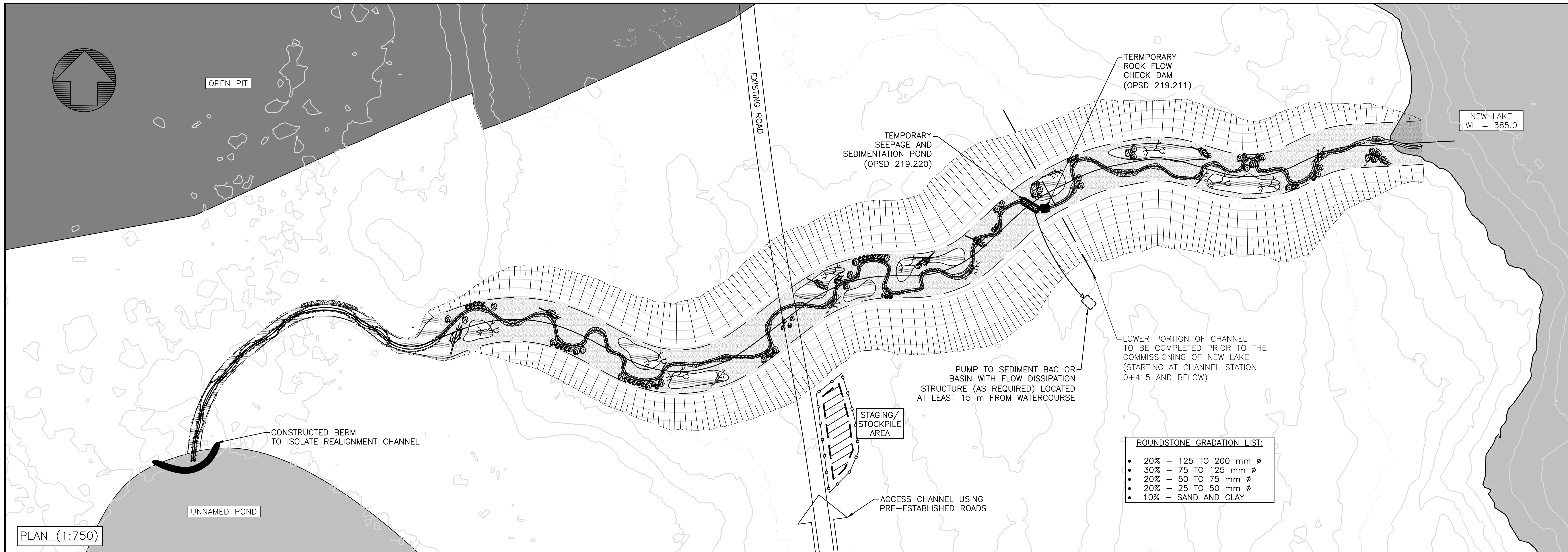
0 5 10 15
HORIZONTAL

0 2.5 5 7.5
VERTICAL

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Construction	2019-08-28	JPH
C	Issued for Construction (Updated)	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
UNNAMED POND CONNECTION CHANNEL
SECTIONS

Scale: 1:250	Drawn By: CWM	Drawing No. 7
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



PLAN (1:750)

STAGING NOTES FOR CONSTRUCTION OF CHANNEL:

- BEDROCK CUT TO BE COMPLETED BEFORE CONSTRUCTION OF LOW FLOW CHANNEL. BEDROCK CUT DESIGNED BY OTHERS.
- THE EXACT LIMITS OF UNNAMED POND AND NEW LAKE HAVE NOT BEEN CONFIRMED. THEREFORE THE EXACT POSITION OF THE TIE-INS WILL BE CONFIRMED IN THE FIELD BY A QUALIFIED CONTRACT ADMINISTRATOR.
- CLEAR ACCESS ROUTES FROM ROAD AND ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- CLEAR ACCESS ALONG CHANNEL CENTRELINE FROM NEW LAKE TO UNNAMED POND. UNDERTAKE CLEARING AND GRUB AS PER OPSS 201.
- DOWNSTREAM PORTION OF LOW FLOW CHANNEL AS INDICATED IN PLAN TO BE COMPLETED PRIOR TO THE COMMISSIONING OF NEW LAKE. THIS AREA CAN BE CONSTRUCTED WITHOUT ESC MEASURES AS LONG AS CONNECTION TO UNNAMED POND IS NOT ESTABLISHED.
- ONCE DOWNSTREAM REACH OF LOW FLOW CHANNEL IS COMPLETED, CONSTRUCT TEMPORARY ROCK FLOW CHECK DAM AT UPSTREAM LIMIT OF COMPLETED WORKS, AS SPECIFIED IN OPSD 219.211. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.
- PRIOR TO CONSTRUCTING THE UPSTREAM PORTION OF THE LOW FLOW CHANNEL, A BERM SHALL BE CONSTRUCTED TO ISOLATE UNNAMED POND.
- CONSTRUCT THE TEMPORARY SEEPAGE POND (OPSD 2019.220) AT THE DOWNSTREAM LIMITS OF THE CHANNEL AND INSTALL DEWATERING PUMP. THE SEEPAGE POND IS TO DEWATER TO THE FLOODPLAIN AND CHANNEL BEFORE FLOWING INTO NEW LAKE.
- CONSTRUCT THE LOW FLOW CHANNEL WORKING FROM THE DOWNSTREAM LIMITS TO THE UPSTREAM LIMITS.
- ENSURE LOW FLOW CHANNEL AND BANKS ARE STABILIZED.
- DEWATER TEMPORARY SEEPAGE POND. EXCAVATE AND DISPOSE OF ANY EXCESS SEDIMENT WITHIN THE SEEPAGE POND. REMOVE ALL MATERIALS AND EQUIPMENT FROM THE CHANNEL.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, REMOVE THE TEMPORARY ROCK FLOW CHECK DAMS AND ALL OTHER TEMPORARY MATERIALS.
- PRIOR TO THE DECONSTRUCTION OF THE UPSTREAM BERM, REMOVE ALL ACCUMULATED SEDIMENT FROM ISOLATED WORKING AREA USING VAC TRUCK (AS REQUIRED). REMOVE ALL MATERIALS AND EQUIPMENT FROM THE CHANNEL.
- DECONSTRUCT THE UPSTREAM TEMPORARY BERM IN INCREMENTAL LIFTS. ALLOW THE UNNAMED POND LAKE LEVEL TO STABILIZE PRIOR TO INITIATING EXCAVATING THE NEXT LIFT.

PLANTING LIST (0.4 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Shrubs				
Green Alder	Alnus crispa	20	46	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	50	114	12" Live Stakes, Locally Harvested
Red-Osier Dogwood	Cornus stolonifera	30	68	12" Live Stakes, Locally Harvested
	Total	100	228	

PLANTING NOTES:

GENERAL PLANTING NOTES:

- PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONE.
- PLANTINGS ARE TO OCCUR IN ALL DISTURBED AREAS WITH SUITABLE GROWTH MEDIUM AT ELEVATIONS GREATER THAN THE NEW LAKE LAKE WATER LEVEL.
- THE SCHEDULE OF SPECIES AND STOCK IS TO BE FOLLOWED PRECISELY, IF SUBSTITUTIONS ARE REQUIRED IT MUST BE AUTHORIZED BY A REGISTERED FORESTER.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN AND SHRUBS.
- ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK UPSTREAM OF THE BEDROCK CUT AREA (81 TOTAL PLANTINGS).

EROSION AND SEDIMENT CONTROL NOTES:

GENERAL:

- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION, TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
- ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE AREAS OF EXPOSED BARE SOIL AT ANY ONE TIME. THE EXTENT OF DISTURBED AREAS IS BE MINIMIZED WHERE POSSIBLE. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.
- ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
- STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE-SLOPES SHALL BE 1.5:1.
- EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.
- IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

DE-WATERING:

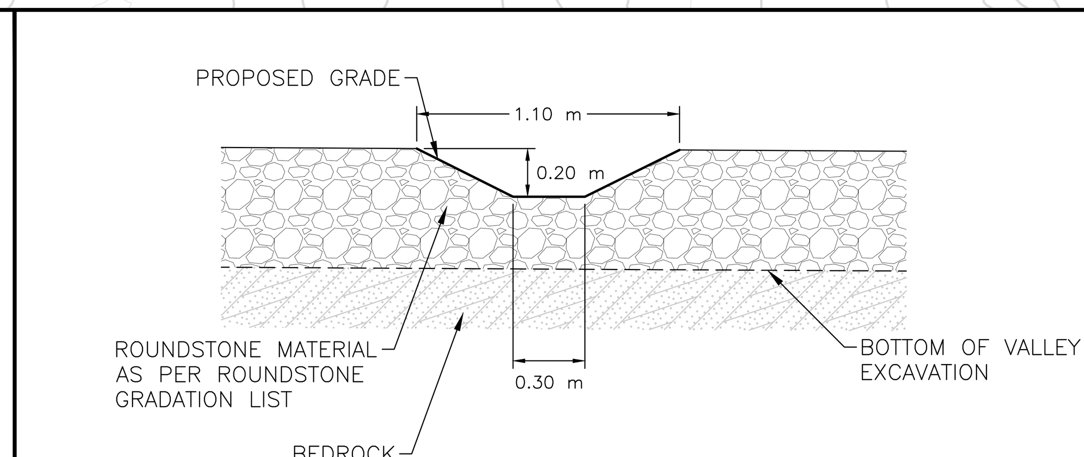
- SEDIMENT LADEN WATER SHALL NOT DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG IN THE FLOODPLAIN.
- IN THE EVENT OF RAINFALL OR SEEPAGE ENTERING THE WORK SITE, ADDITIONAL DEWATERING (BEYOND THAT RECOMMENDED IN THE PLANS), MAY BE REQUIRED.
- DEWATERING INLET PUMP HEAD TO BE COVERED WITH FILTER FABRIC OR CLEAR STONE. THE OUTLET PUMP HEAD IS TO DISCHARGE TO A SEDIMENT BAG OR BASIN. DISCHARGE FROM THE BAG IS TO BE RELEASED TO A VEGETATED LOCATION OR IF A VEGETATED LOCATION IS NOT AVAILABLE, A FLOW DISSIPATING STRUCTURE.

SPILLS CONTROL NOTES:

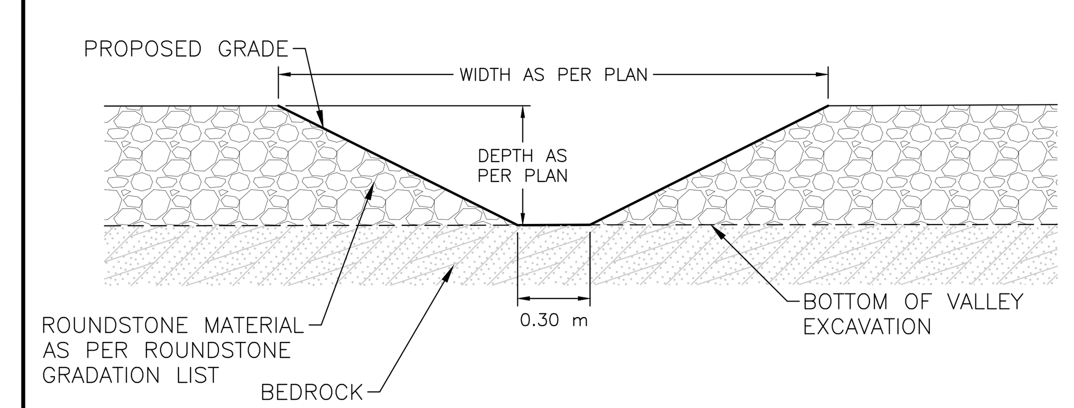
- ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.
- THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.
- IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:
  1. IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
  2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
  3. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

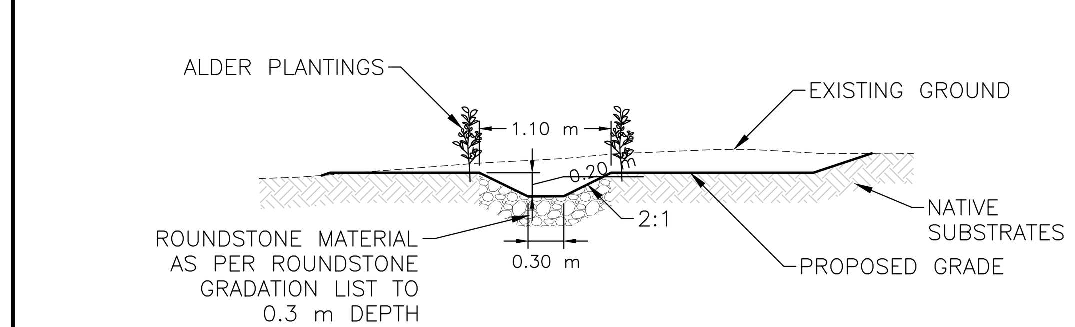
- IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.



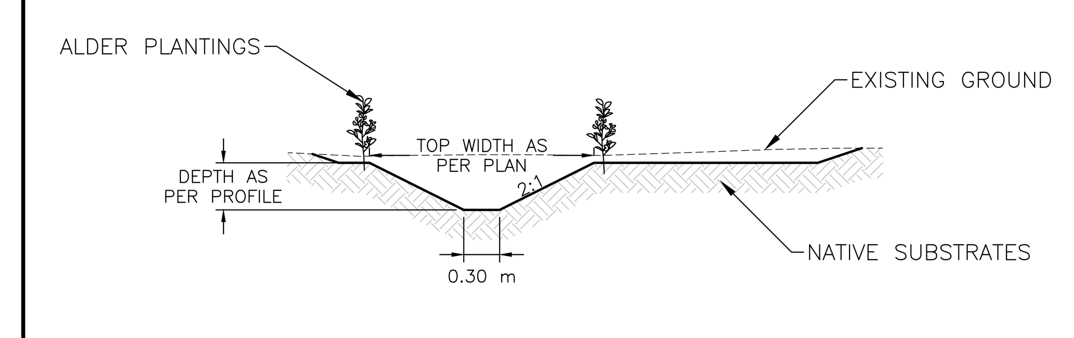
TYPICAL DETAIL: DOWNSTREAM RIFFLE SECTION (1:25)



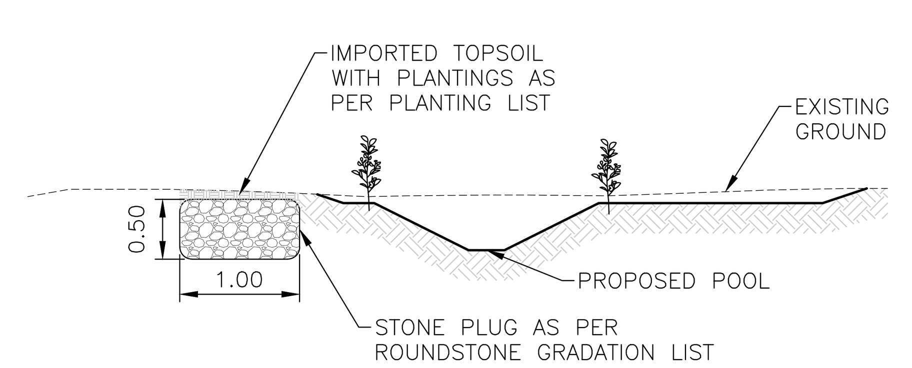
TYPICAL DETAIL: DOWNSTREAM POOL SECTION (1:25)



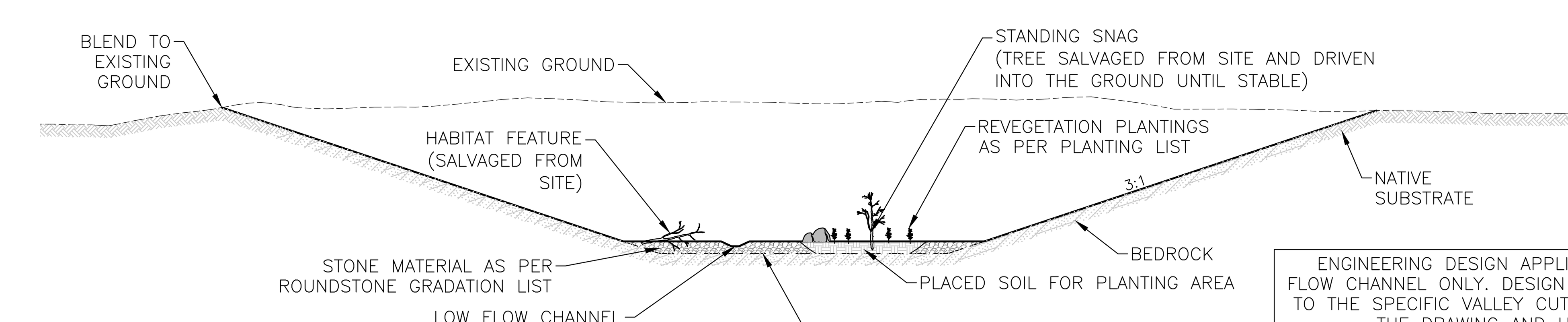
TYPICAL DETAIL: UPSTREAM RIFFLE SECTION (1:50)



TYPICAL DETAIL: UPSTREAM POOL SECTION (1:50)



TYPICAL DETAIL: STONE EROSION PROTECTION (1:50)



TYPICAL DETAIL: BEDROCK CUT VALLEY SECTION (1:200)

ENGINEERING DESIGN APPLICABLE TO LOW FLOW CHANNEL ONLY. DESIGN APPLIES ONLY TO THE SPECIFIC VALLEY CUT AS SHOWN IN THE DRAWING AND UNDER EXISTING HYDROLOGIC CONDITIONS.

VALLEY CUT DESIGNED BY OTHERS.

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LEGEND

- SILT FENCE (OPSD 219.130)
- TURBIDITY CURTAIN (OPSD 219.260)
- STAGING AND STOCKPILE AREA
- ALDER PLANTINGS
- CONSTRUCTED BERM

LICENSED PROFESSIONAL ENGINEER
B. D. PLUMB
100523599
14/02/20
PROVINCE OF ONTARIO

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

VERTICAL DATUM:
NAD83 (CSRS)

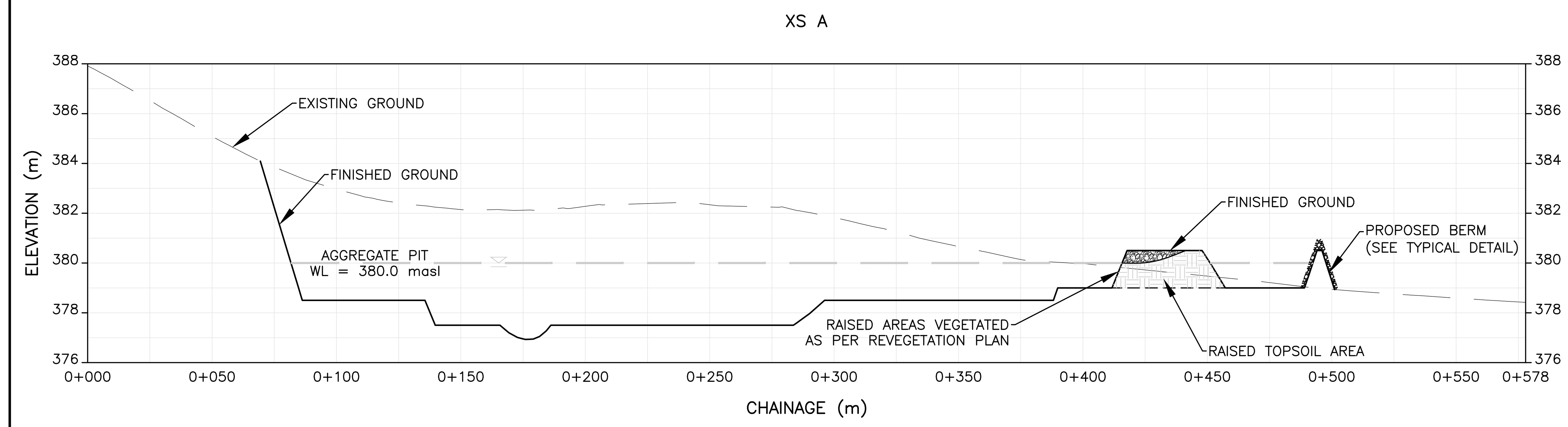
SCALE
0 25 50
1:750

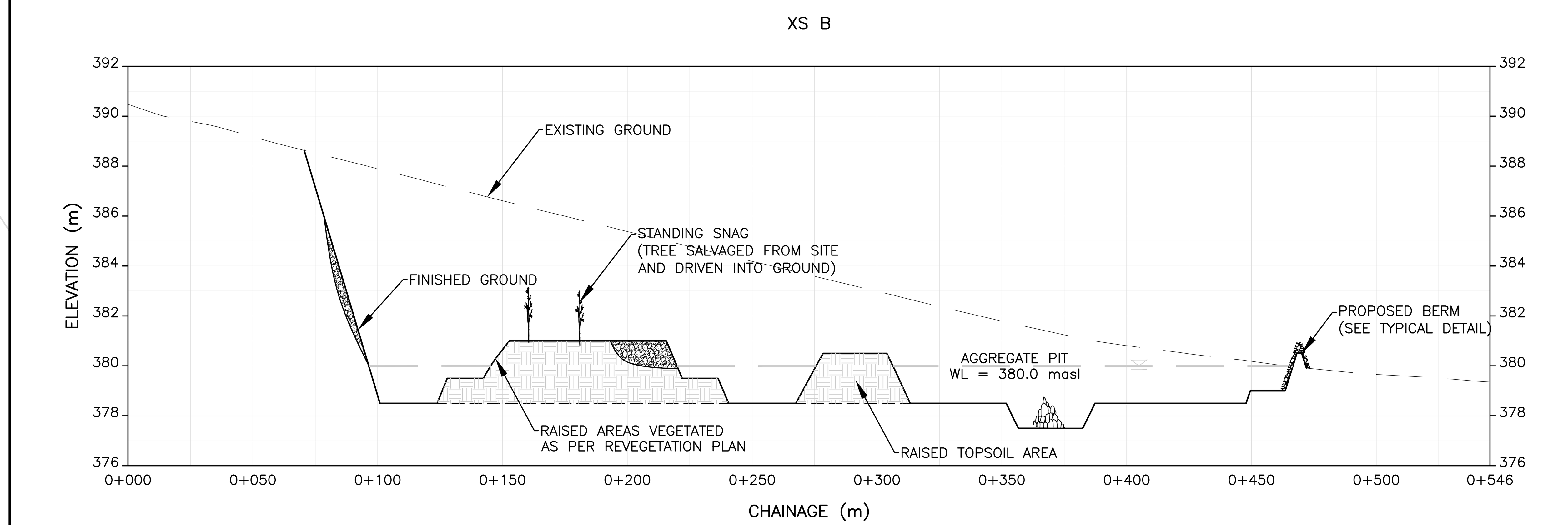
No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Construction	2019-08-28	JPH
C	Issued for Construction (Updated)	2020-02-14	JPH

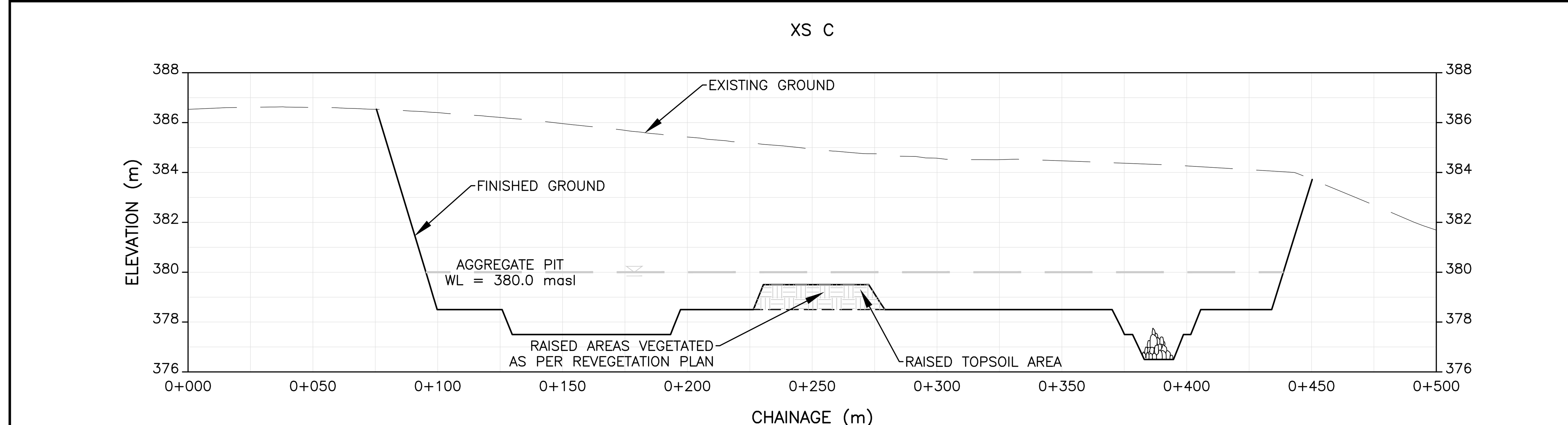
IAMGOLD COTE MINE - HABITAT COMPENSATION
UNNAMED POND CONNECTION CHANNEL
EROSION AND SEDIMENT CONTROL AND REVEGETATION PLAN

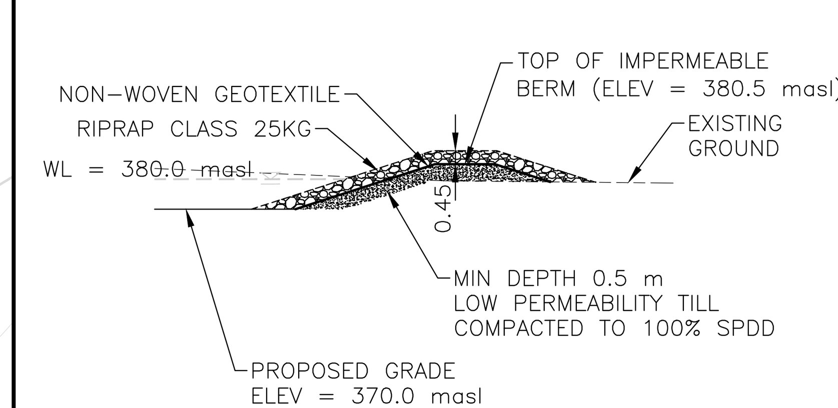
Scale: 1:750	Drawn By: CWM	Drawing No. 8
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

BAGSVERD AGGREGATE PIT
DESIGN DRAWINGS

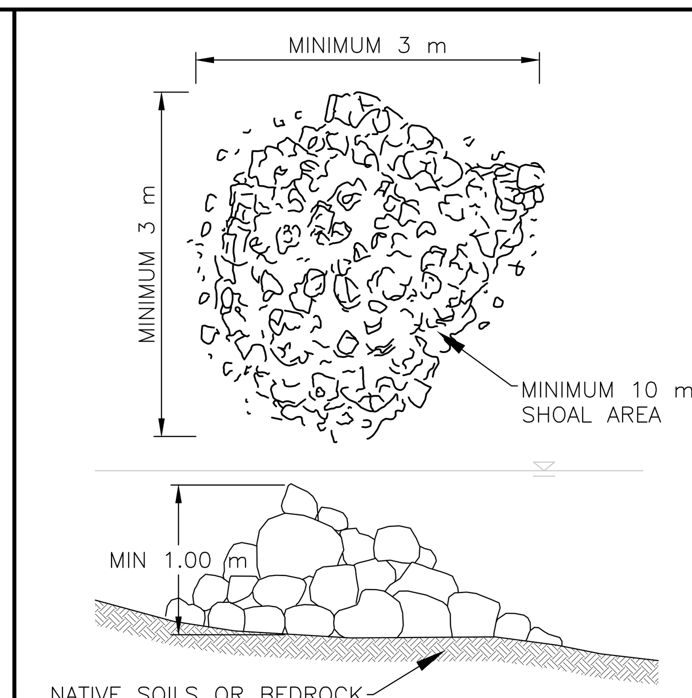




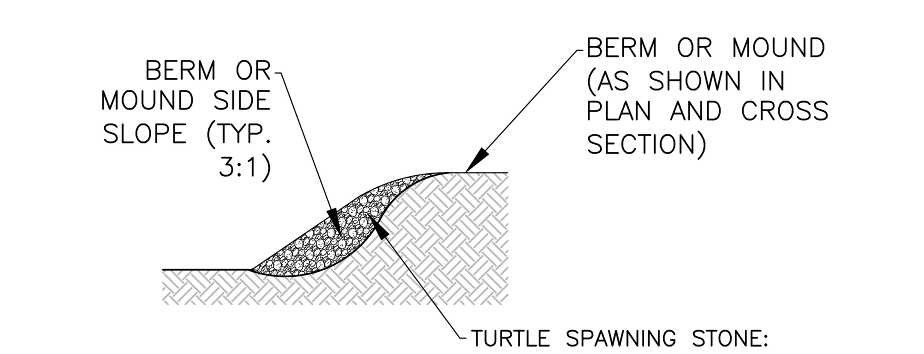




TYPICAL DETAIL: LOW PROFILE BERM



TYPICAL DETAIL: SHOAL



TURTLE SPAWNING STONE:
- 25% (by vol.) 75mm clear stone
- 25% (by vol.) 50mm clear stone
- 25% (by vol.) 25mm clear stone
- 25% (by vol.) sand

PLACE TO A MIN DEPTH OF 0.5 m

TYPICAL DETAIL: TURTLE SPAWNING FEATURE

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- PLANTING ZONE 3
- TURTLE SPAWING AREA
- SHOAL
- STANDING SNAG
- BOULDER PLACEMENT
- ALDER PLANTINGS
- WOODY DEBRIS

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

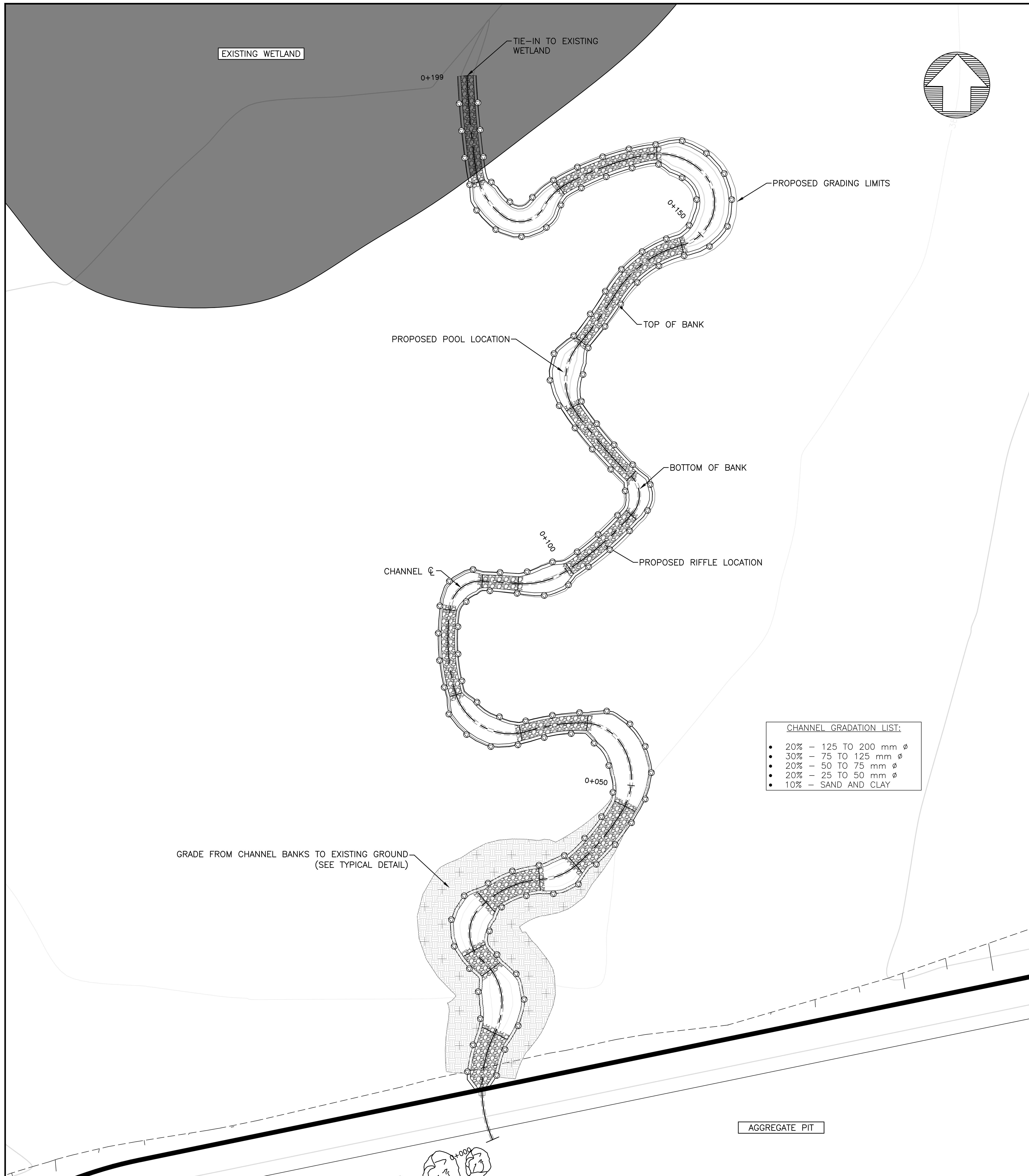
VERTICAL DATUM:
NAD83 (CSRS)

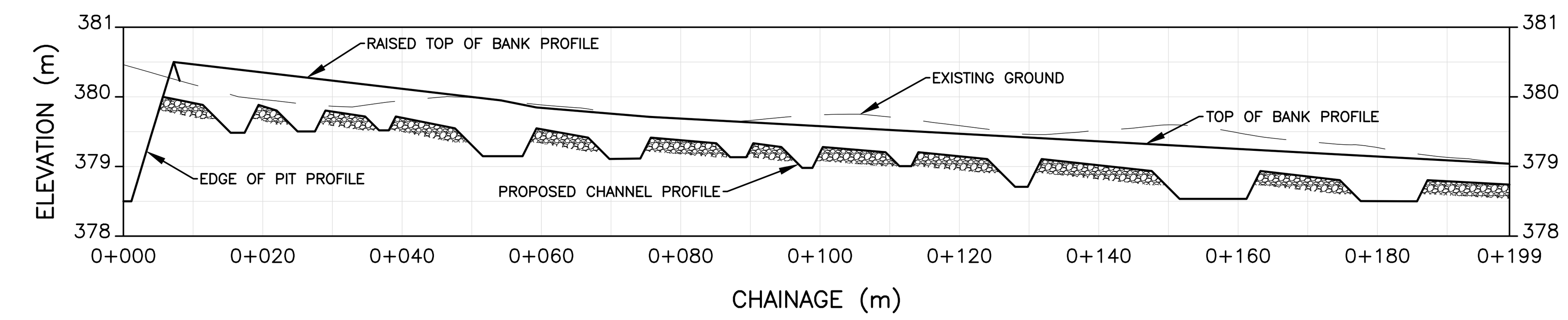
SCALES
HORIZONTAL: 0 50 100
VERTICAL: 0 5 10

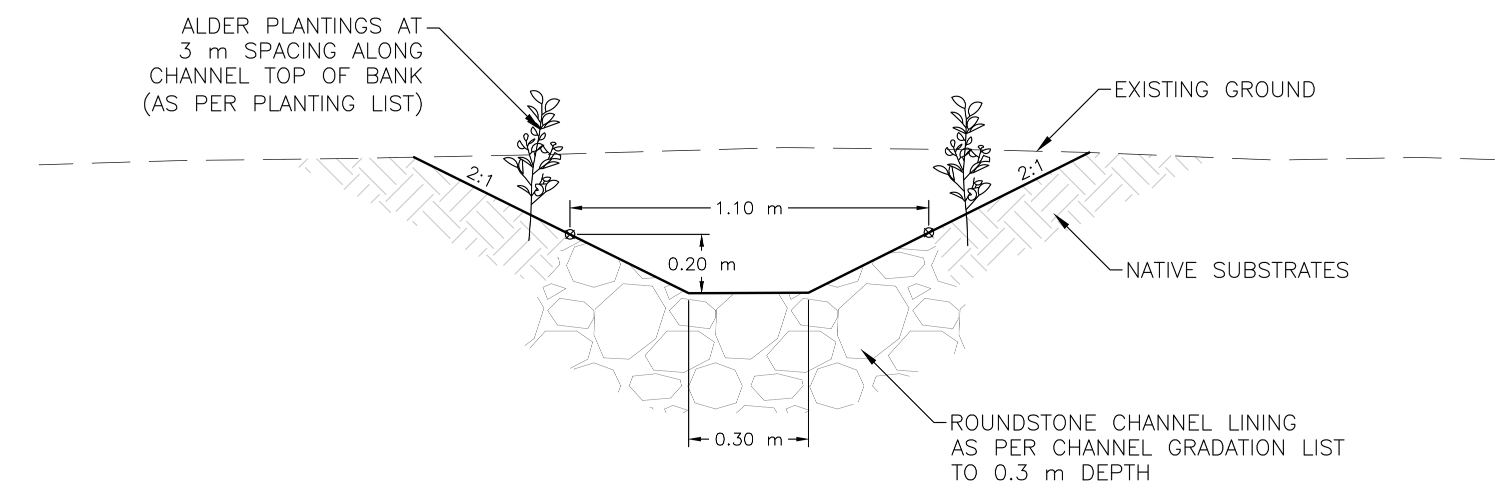
No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
BAGSVERD AGGREGATE PIT
PIT GRADING

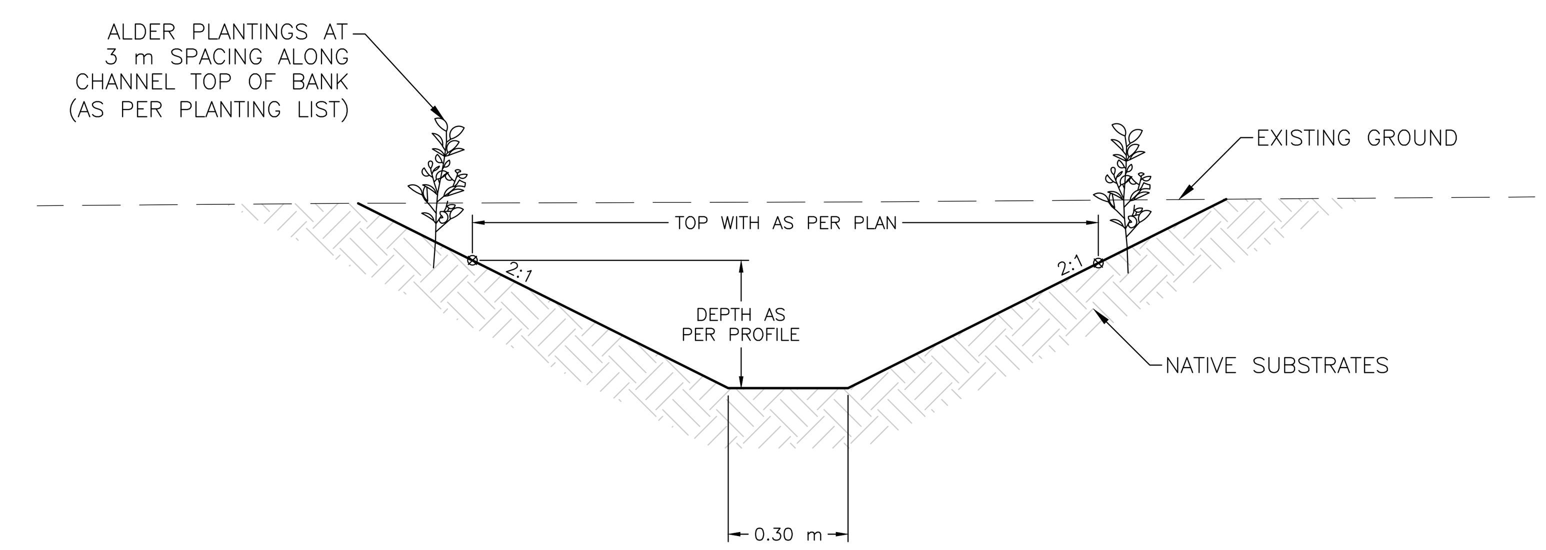
Scale: 1:1500	Drawn By: CWM	Drawing No. 9
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



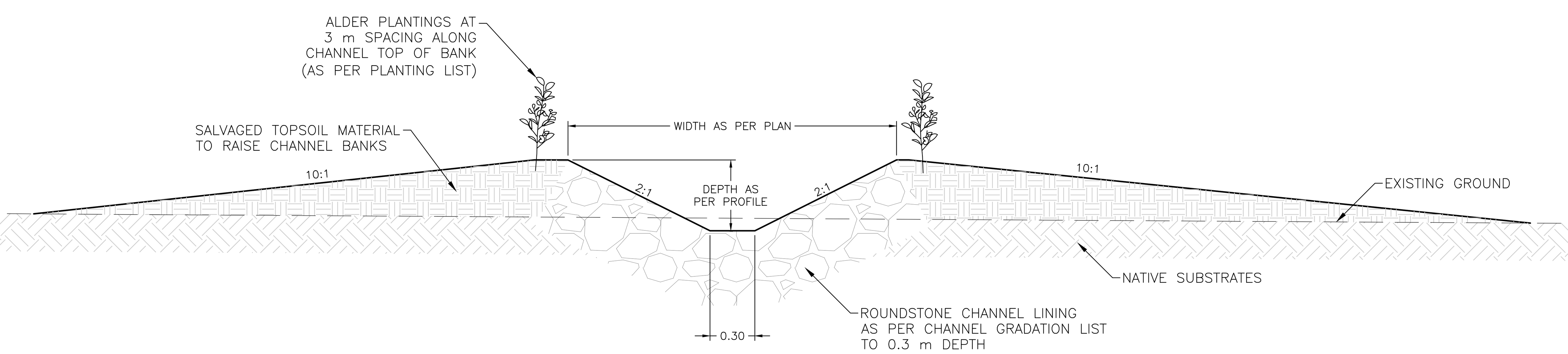




TYPICAL DETAIL: RIFFLE SECTION



TYPICAL DETAIL: POOL SECTION



TYPICAL DETAIL: UPSTREAM CHANNEL SECTION

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LEGEND

- PLANTING ZONE 2
- ALDER PLANTINGS
- PROPOSED PROFILE
- EXISTING PROFILE

NOT FOR CONSTRUCTION

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

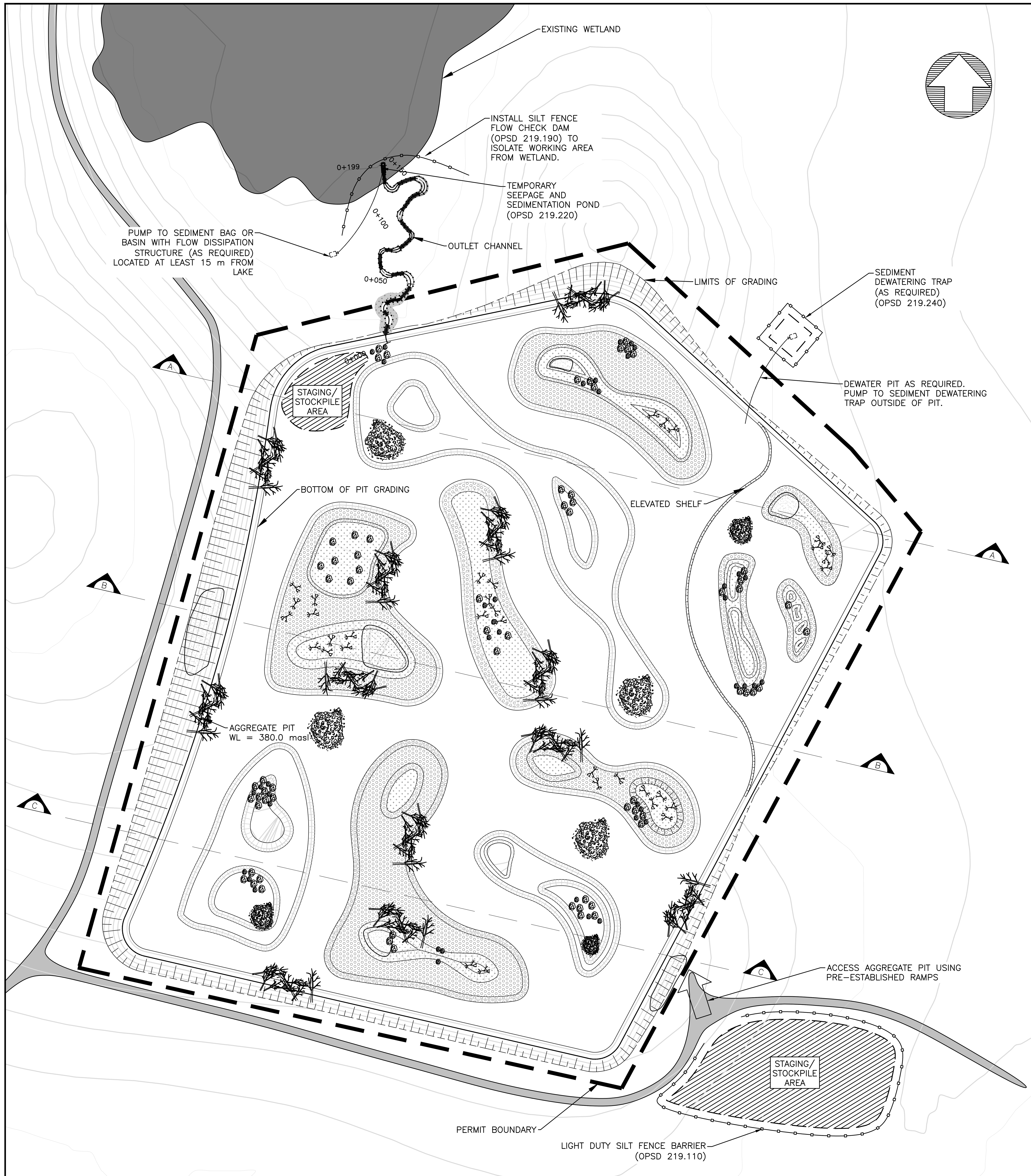
0 50 100
HORIZONTAL

0 5 10
VERTICAL

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
BAGSVERD AGGREGATE PIT
CHANNEL PLAN AND PROFILE

Scale: 1:1500	Drawn By: CWM	Drawing No. 10
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



EROSION AND SEDIMENT CONTROL NOTES:

GENERAL:

- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION, TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
- ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE AREAS OF EXPOSED BARE SOIL AT ANY ONE TIME. THE EXTENT OF DISTURBED AREAS IS BE MINIMIZED WHERE POSSIBLE. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.
- ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
- STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE-SLOPES SHALL BE 1.5:1.
- EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.
- IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

DE-WATERING:

- DEWATERING IS NOT ANTICIPATED, AS THE PIT IS EXPECTED TO BE DRY DURING CONSTRUCTION. PROVISIONS FOR DEWATERING ARE TO BE AVAILABLE ONSITE AT ALL TIMES SHOULD CONDITIONS CHANGE.
- SEDIMENT LADEN WATER SHALL NOT DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG OR SEDIMENT TRAP IN THE FLOODPLAIN.
- IN THE EVENT OF RAINFALL OR SEEPAGE ENTERING THE WORK SITE, ADDITIONAL DEWATERING (BEYOND THAT RECOMMENDED IN THE PLANS), MAY BE REQUIRED.

SPILLS CONTROL NOTES:

- ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.
- THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.
- IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:
  1. IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
  2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
  3. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

- IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.

STAGING NOTES FOR CONSTRUCTION OF CHANNEL:

- THE CHANNEL IS TO BE CONSTRUCTED BEFORE THE HABITAT ENHANCEMENTS TO THE PIT.
- THE EXACT LIMITS OF THE WETLAND HAVE NOT BEEN CONFIRMED. THEREFORE THE EXACT POSITION OF THE TIE-IN WILL BE CONFIRMED IN THE FIELD BY A QUALIFIED CONTRACT ADMINISTRATOR.
- ACCESS TO THE CHANNEL WILL BE THROUGH THE AGGREGATE PIT.
- CLEAR ACCESS ALONG CHANNEL CENTRELINE FROM AGGREGATE PIT TO WETLAND. UNDERTAKE CLEARING AND GRUB AS PER OPSS 201. ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- INSTALL SILT FENCE FLOW CHECK DAM (OPSD 219.190) AND TEMPORARY SEEPAGE POND AT THE DOWNSTREAM LIMITS OF THE CHANNEL. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.
- INSTALL DEWATERING PUMP AT SEEPAGE POND. SEEPAGE POND IS TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO WETLAND (AS REQUIRED).
- CONSTRUCT THE LOW FLOW CHANNEL WORKING FROM THE DOWNSTREAM LIMITS TO THE UPSTREAM LIMITS.
- ENSURE LOW FLOW CHANNEL AND BANKS ARE STABILIZED.

STAGING NOTES FOR CONSTRUCTION OF AGGREGATE PIT:

- CONSTRUCT SEDIMENT TRAP (OPSD 219.240) BEYOND EXCAVATION LIMITS FOR DEWATERING OF THE AGGREGATE PIT. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS. INSTALL DEWATERING PUMP AT SEDIMENT TRAP TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO WETLAND (AS REQUIRED).
- COMPLETE GRADING OF AGGREGATE PIT, WORKING IN A GENERAL NORTH TO SOUTH DIRECTION.
- COMPLETE PLANTING AS SPECIFIED IN THESE DRAWINGS.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, COMPLETELY DEWATER TEMPORARY SEEPAGE POND AND SEDIMENT TRAP. EXCAVATE AND DISPOSE OF ANY EXCESS SEDIMENT WITHIN THE SEEPAGE POND. REMOVE ALL MATERIALS.

Planting List for Zone 1: Emergent Vegetation (2.34 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Broad-Leaved Arrowhead	Sagittaria latifolia	25	1161	Seedling Plugs
Pickeral Weed	Pontederia cordata	25	1611	Seedling Plugs
Softstem Bulrush	Scirpus validus	25	1611	Seedling Plugs
Common Cattail	Typha latifolia	25	1611	Seedling Plugs
	Total	100	4644	

Planting List for Zone 2: Shoreline Plantings (1.09 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
		Shrubs		
Green Alder	Alnus crispa	20	392	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	50	981	12" Live Stakes, Locally Harvested
Red-Osier Dogwood	Cornus stolonifera	30	589	12" Live Stakes, Locally Harvested
	Total	100	1962	

Planting List for Zone 3: Upland Areas (0.14 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
		Trees (75% cover)		
Black Spruce	Picea mariana	30	77	Seedling Plugs
Balsam Fir	Abies balsamea	10	26	Seedling Plugs
White Spruce	Picea glauca	20	51	Seedling Plugs
Tamarack	Larix laricina	10	25	Seedling Plugs
Jack Pine	Pinus banksiana	30	76	Seedling Plugs
	Total	100	255	
		25% open space to represent natural openings in the canopy cover		

PLANTING NOTES:

GENERAL PLANTING NOTES:

- PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONE.
- THERE ARE THREE PLANTING ZONES WITH EACH THEIR OWN SPECIES PRESCRIPTION; ZONES 1, 2 AND 3.
- PLANTINGS ARE TO OCCUR IN ALL PRESCRIBED AREAS, AS WELL AS DISTURBED AREAS ON THE POND EDGES THAT CONTAIN A SUITABLE SUBSTRATE.
- THE PLANTING PLAN IS SUBJECT TO CHANGE UNDER THE DIRECTION OF THE CONTRACT ADMINISTRATOR BASED ON WATER LEVEL WITHIN THE RESTORED PIT FEATURE.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN AND SHRUBS.
- ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK IN THE AREAS INDICATED (129 TOTAL PLANTINGS).
- THE PLANTING PLAN MAY NEED TO BE ADJUSTED DEPENDING ON THE CONDITION OF THE EXISTING WETLAND AREA AT THE TIME OF CONSTRUCTION.
- THE PLACEMENT ON THE DRAWINGS OF HABITAT FEATURES (IE. FALLEN TREES, BOULDERS, STANDING SNAGS, AND SHOALS) IS A GUIDELINE AND REPRESENTS A MINIMUM CONDITION. THE PLACEMENT AND QUANTITY OF THESE FEATURES IS MEANT TO BE AN ORGANIC PROCESS, AND ADDING THESE FEATURES TO THE RESTORED PIT FEATURE SPORADICALLY IS SEEN AS A BENEFIT.

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LEGEND

- SILT FENCE (OPSD 219.130)
- TURBIDITY CURTAIN (OPSD 219.260)
- STAGING AND STOCKPILE AREA
- PLANTING ZONE 1
- PLANTING ZONE 2
- PLANTING ZONE 3

SURFACE DATA:
CONTOUR DATA FROM IAMGOLD
RECEIVED FEB 28, 2019

VERTICAL DATUM:
NAD83 (CSRS)

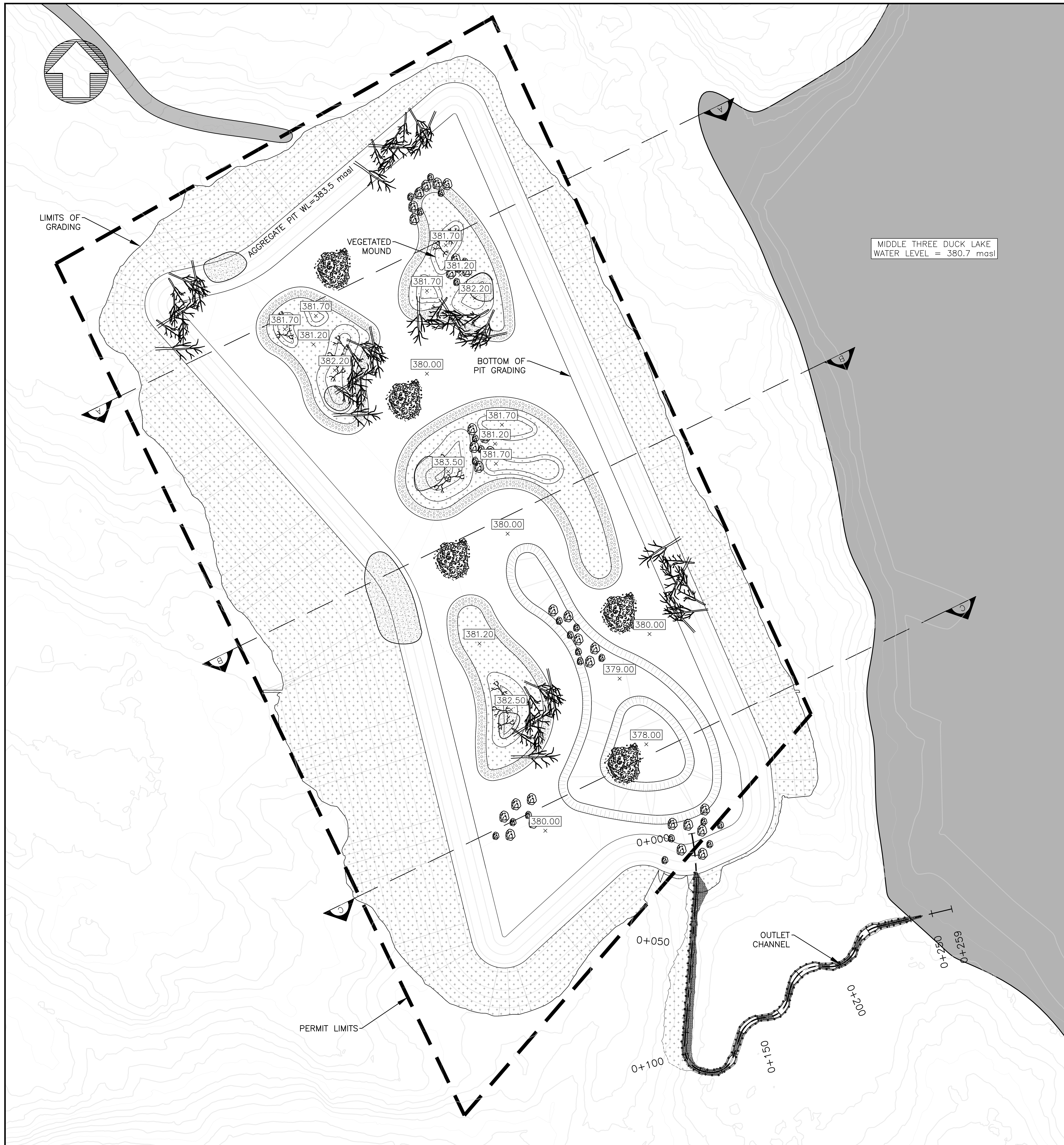
SCALES
HORIZONTAL: 0 50 100
VERTICAL: 0 5 10

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

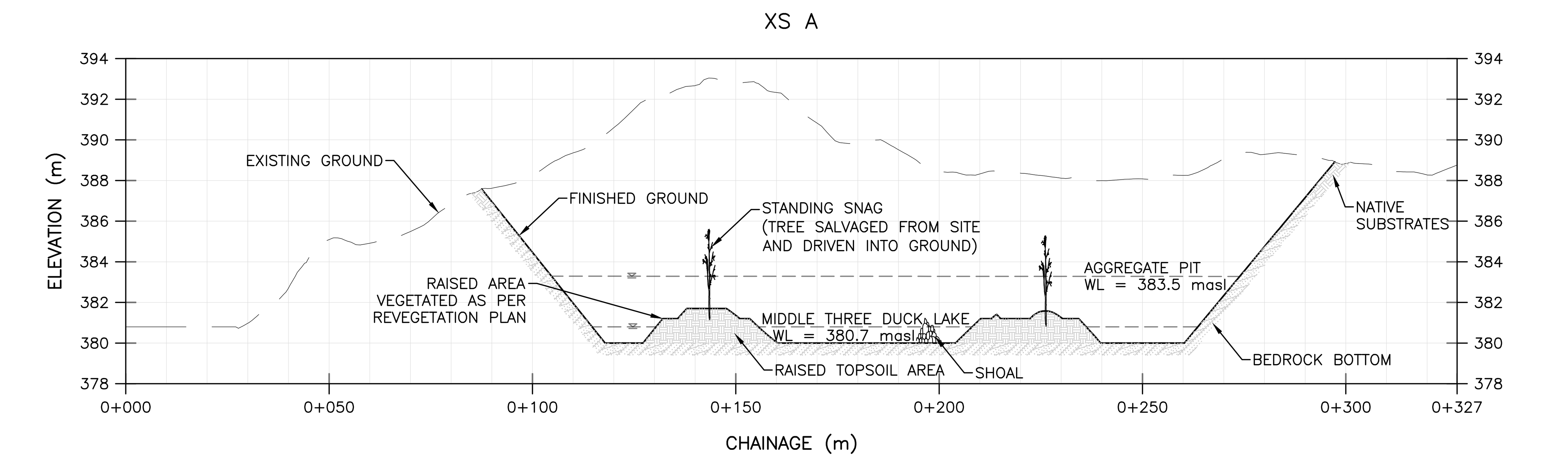
IAMGOLD COTE MINE - HABITAT COMPENSATION
BAGSVERD AGGREGATE PIT
EROSION AND SEDIMENT CONTROL AND REVEGETATION PLAN

Scale: 1:1500 | Drawn By: CWM | Drawing No. 11
Date Issued: FEB 14, 2020 | Checked By: BDP, JPH

AGGREGATE PIT #3
DESIGN DRAWINGS



XS A



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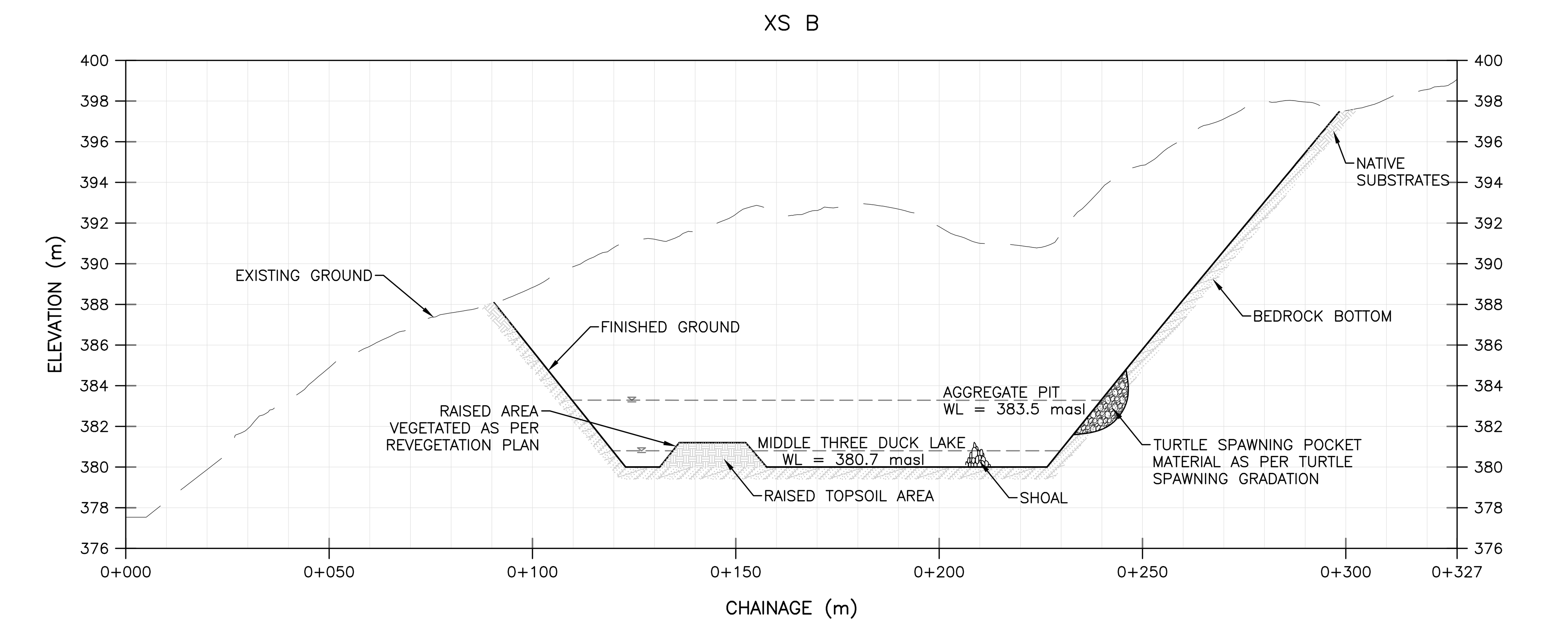
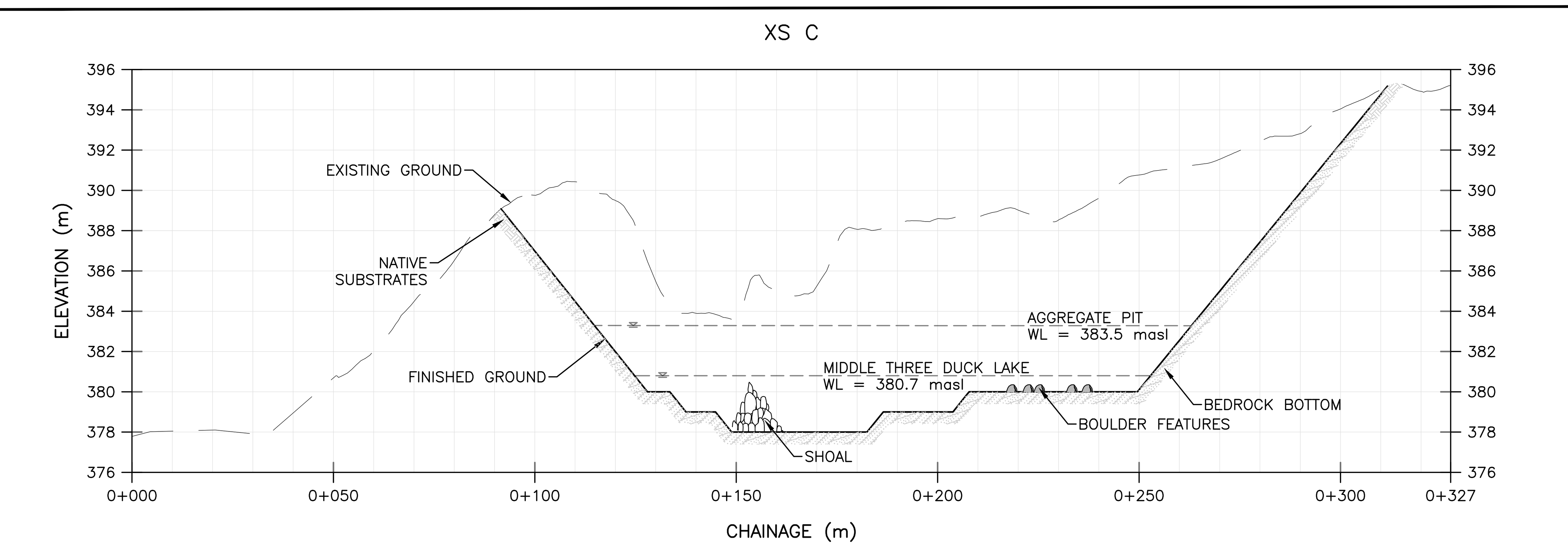
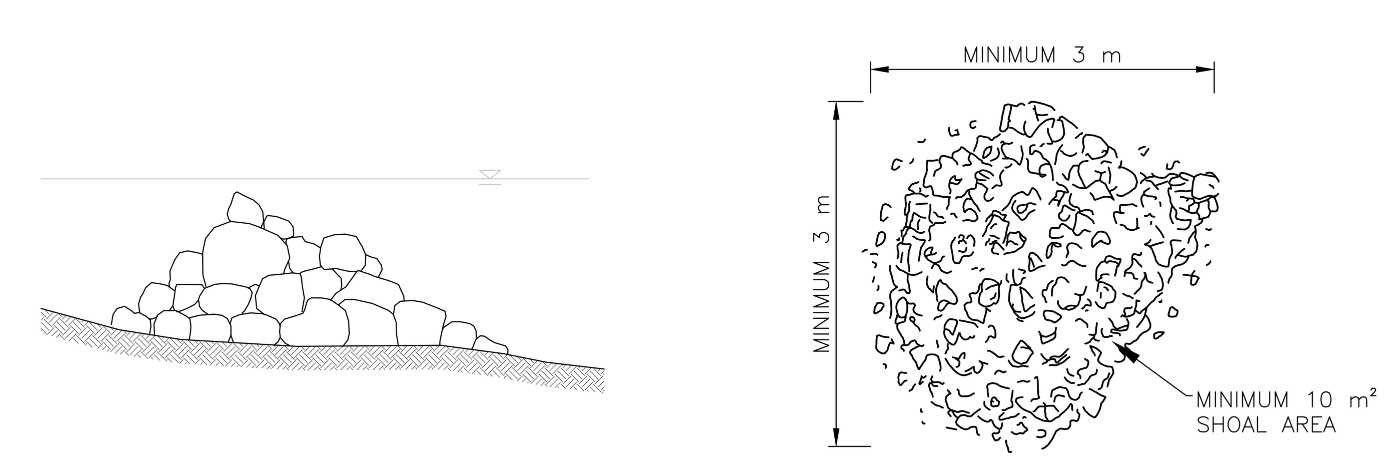
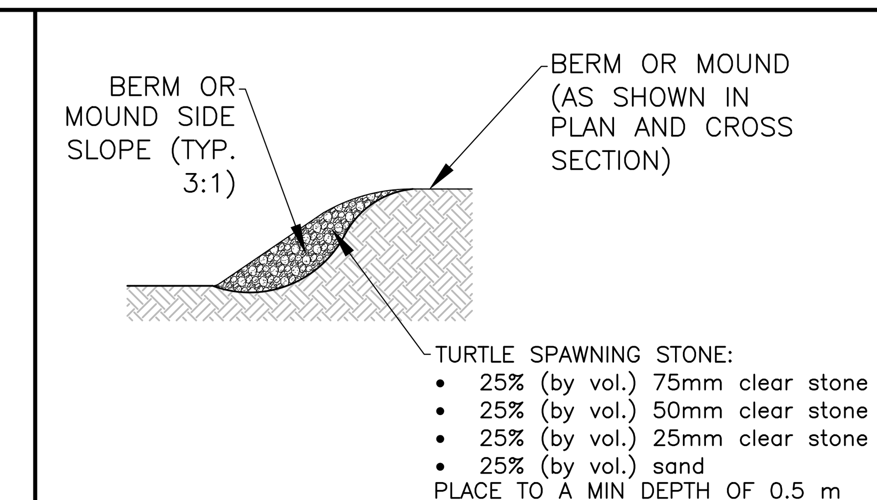


XS C





TYPICAL DETAIL: SHOAL



TYPICAL DETAIL: TURTLE SPAWNING FEATURE

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LEGEND

- PLANTING ZONE 1
- PLANTING ZONE 2
- PLANTING ZONE 3
- TURTLE SPAWING AREA
- SHOAL
- STANDING SNAG
- BOULDER PLACEMENT
- ALDER PLANTINGS
- WOODY DEBRIS

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

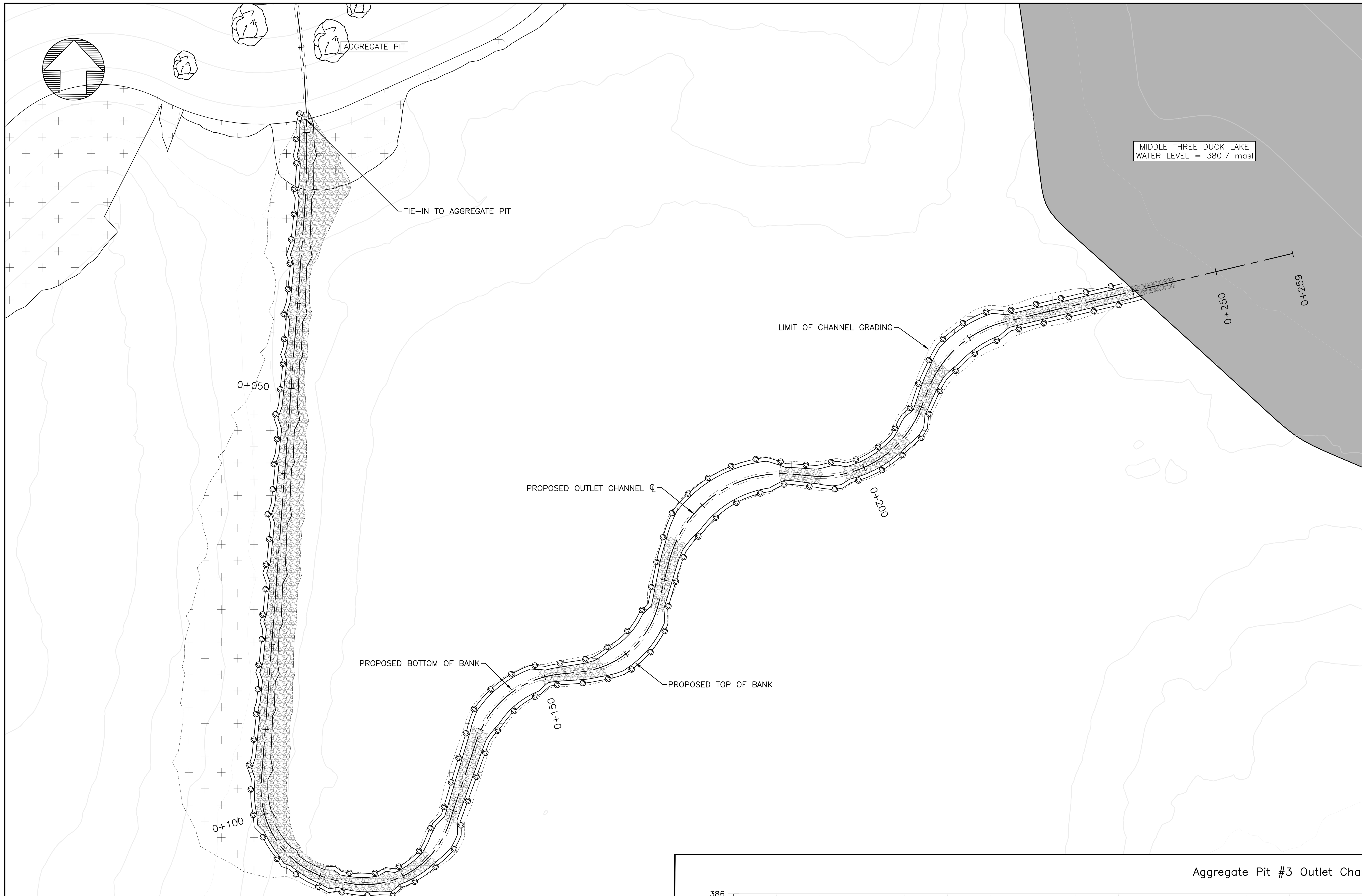
VERTICAL DATUM: NAD83 (CSRS)

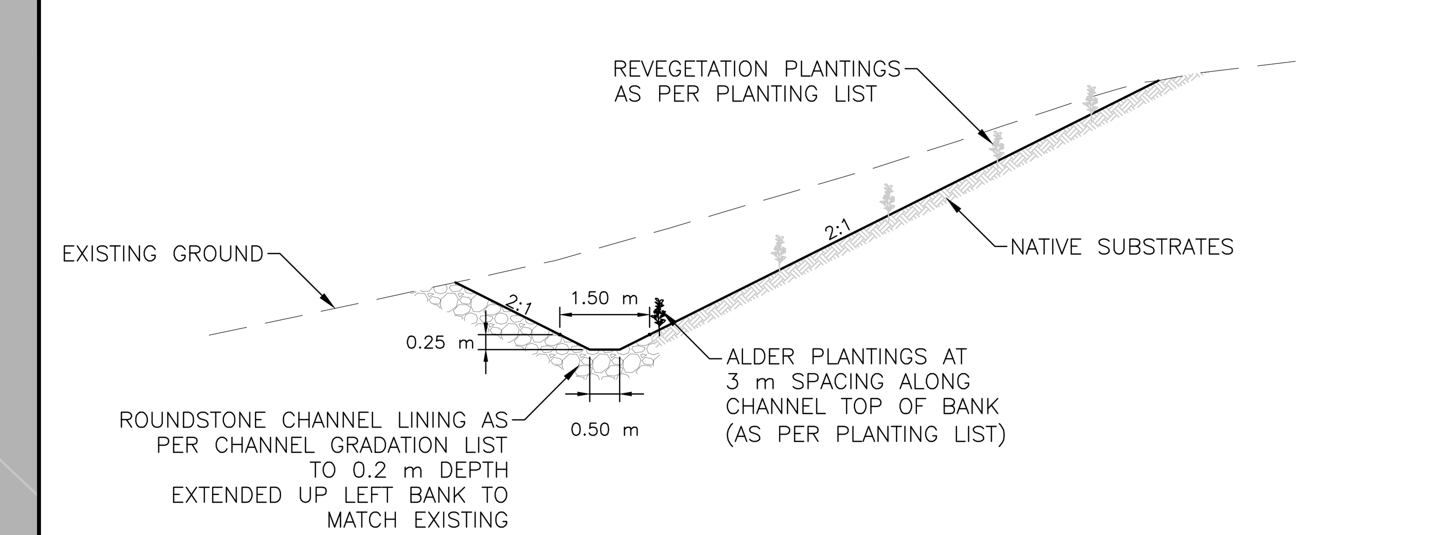
SCALES
HORIZONTAL: 0 25 50 75
VERTICAL: 0 5 10 15

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

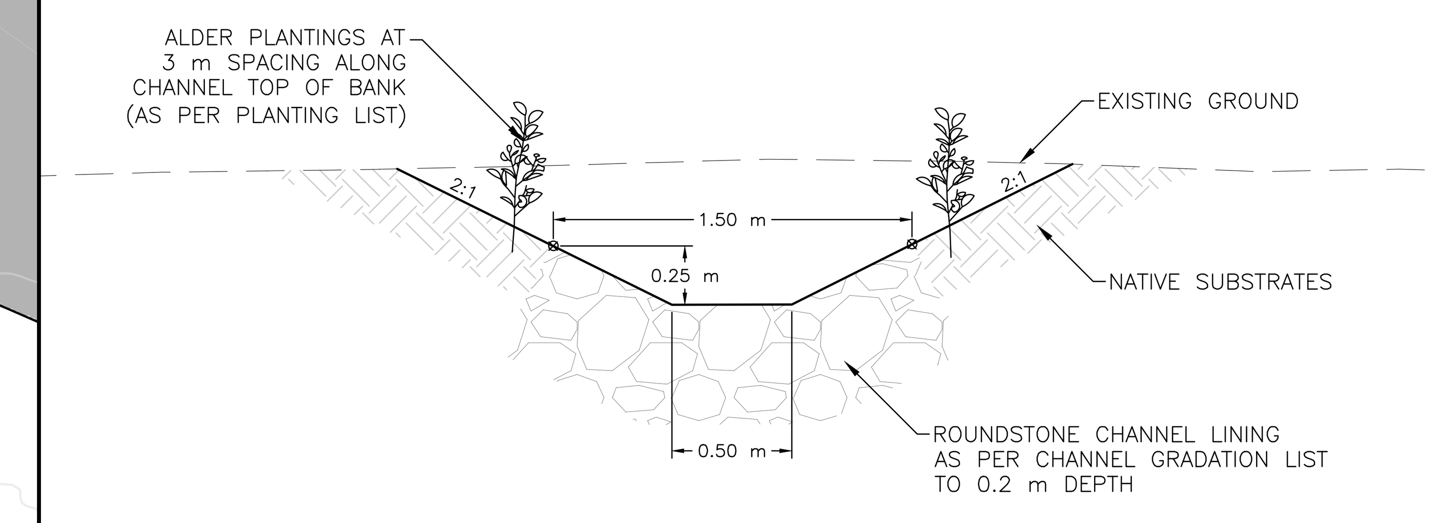
IAMGOLD COTE MINE - HABITAT COMPENSATION
AGGREGATE PIT #3
PIT GRADING

Scale: 1:1000	Drawn By: CWM	Drawing No. 12
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

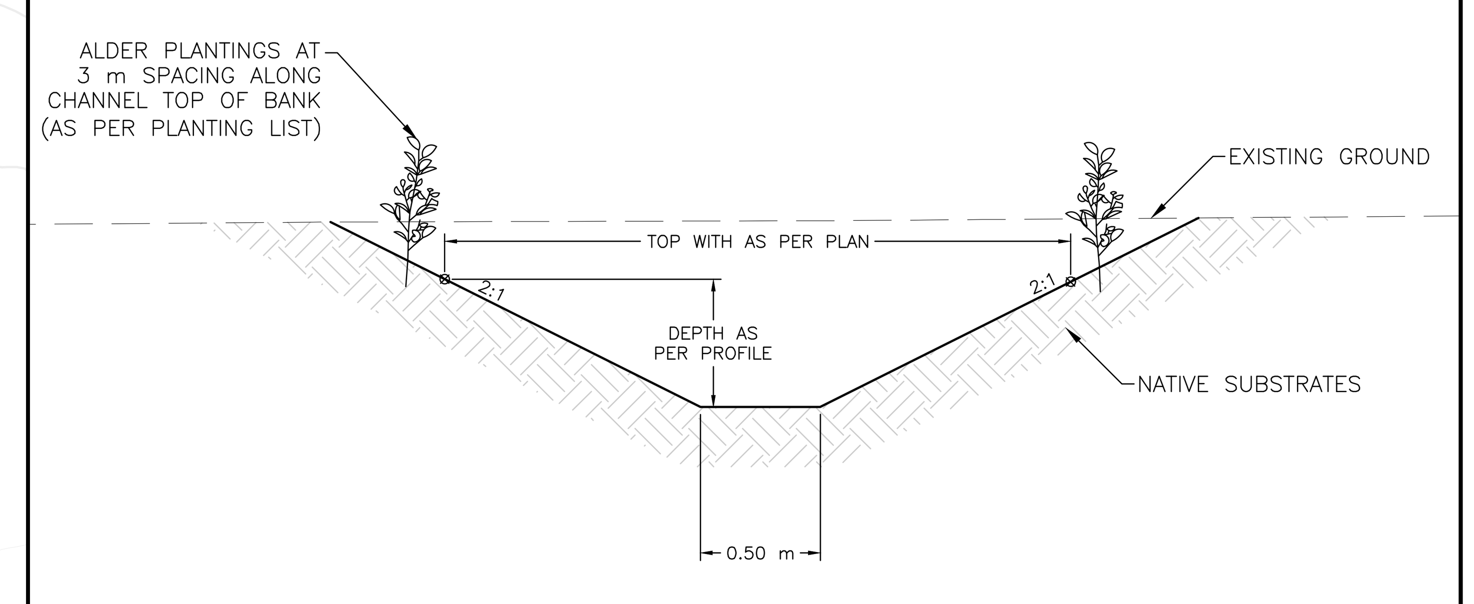




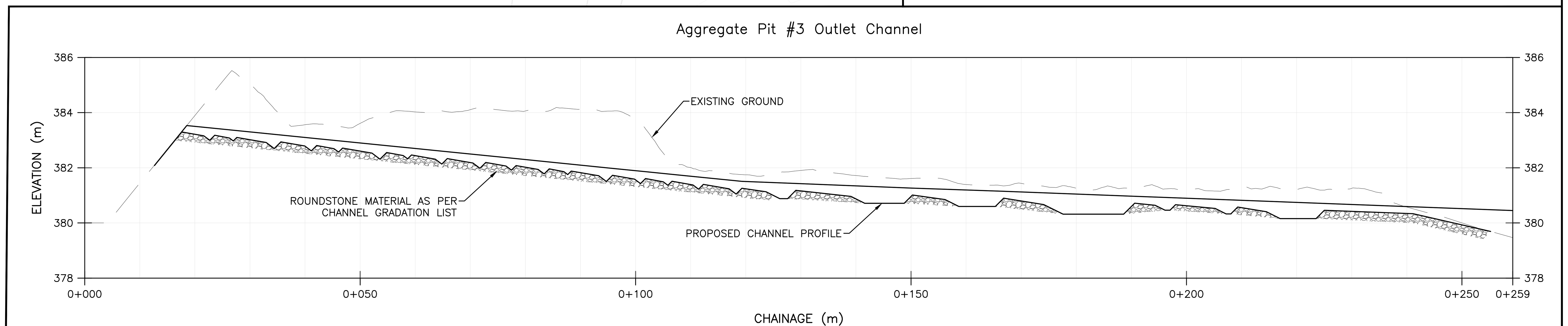
TYPICAL DETAIL: UPSTREAM CHANNEL SECTION



TYPICAL DETAIL: RIFFLE SECTION



TYPICAL DETAIL: POOL SECTION



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LEGEND

- PLANTING ZONE 2
- ALDER PLANTINGS
- PROPOSED PROFILE
- EXISTING PROFILE

NOT FOR CONSTRUCTION

SURFACE DATA:
LIDAR FROM IAMGOLD
RECEIVED FEB 2, 2018

VERTICAL DATUM:
NAD83 (CSRS)

SCALES

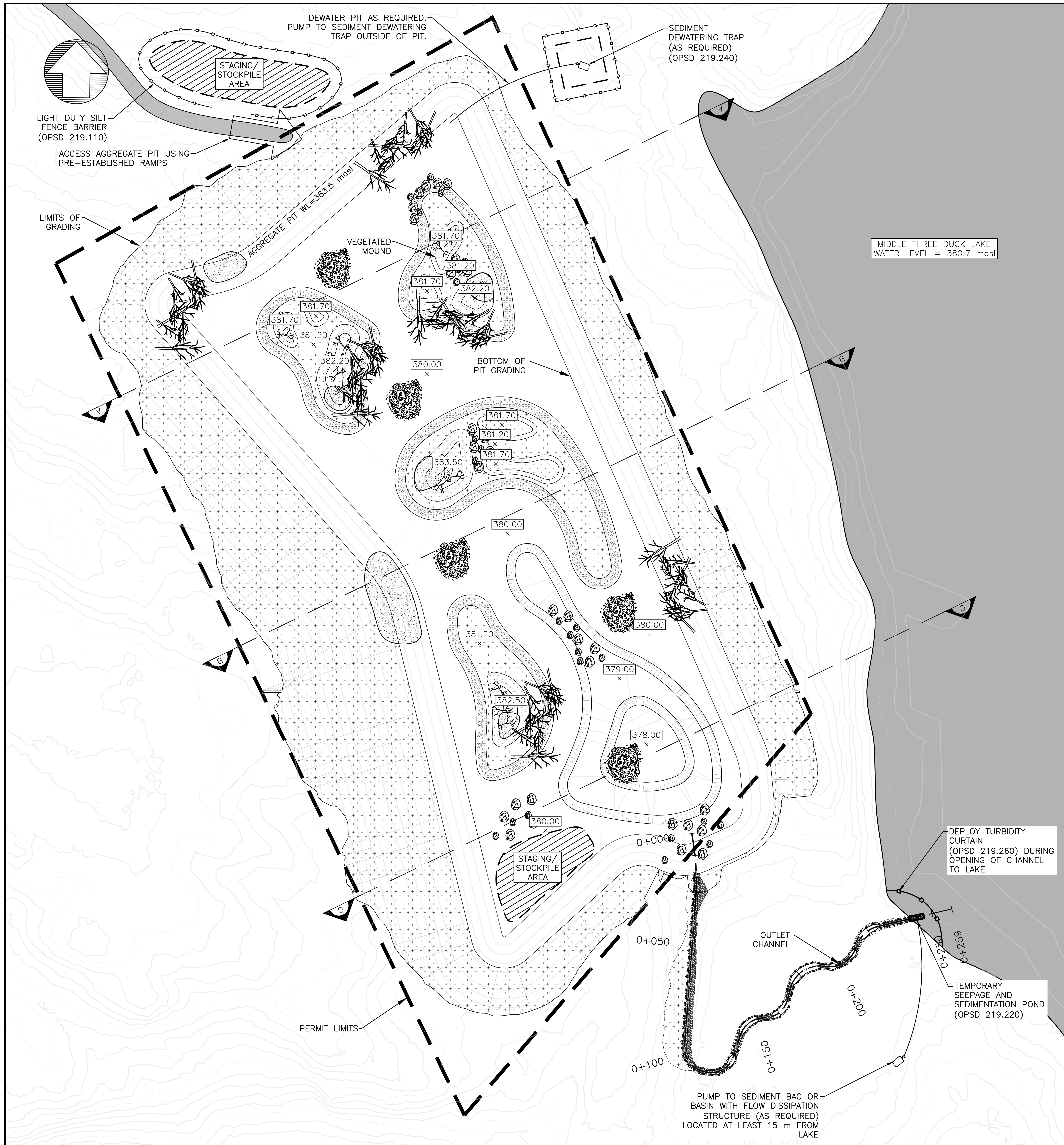
HORIZONTAL: 0 25 50 75

VERTICAL: 0 5 10 15

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
AGGREGATE PIT #3
OUTLET CHANNEL PLAN AND PROFILE

Scale: 1:1000	Drawn By: CWM	Drawing No. 13
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	



EROSION AND SEDIMENT CONTROL NOTES:

GENERAL:

- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING CONSTRUCTION TO PREVENT SEDIMENT FROM ENTERING THE WATERCOURSE. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
- ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE AREAS OF EXPOSED BARE SOIL AT ANY ONE TIME. THE EXTENT OF DISTURBED AREAS IS BE MINIMIZED WHERE POSSIBLE. EXISTING GROUND COVER SHALL BE RETAINED WHEREVER FEASIBLE, FOR AS LONG AS POSSIBLE.
- ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
- STOCKPILED MATERIAL SHOULD BE ISOLATED FROM THE WATERCOURSE AND LAKE, CONTAINED TO THE RECOMMENDED STAGING/STOCKPILE LOCATIONS SURROUNDED WITH SEDIMENT CONTROLS. ALL TOPSOIL STOCKPILE MATERIALS SHALL BE LOCATED A MINIMUM OF 5M AWAY FROM THE TOP OF BANK. THE MAXIMUM SIDE-SLOPES SHALL BE 1.5:1.
- EROSION AND SEDIMENT CONTROLS TO REMAIN IN PLACE UNTIL THE WORKING AREA HAS BEEN STABILIZED TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR.
- IN ADDITION TO THE DETAILS LISTED ON THIS PLAN, THE CONTRACTOR RECOGNIZES THE IMPORTANCE OF WATER AND SEDIMENT HANDLING. THE CONTRACTOR AGREES TO FOLLOW BEST MANAGEMENT PRACTICES AND ADHERE TO APPLICABLE ENVIRONMENTAL LEGISLATION GOVERNING WORK-AROUND-WATER AND PREVENTION OF EROSION AND SEDIMENT DISCHARGE.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS.

DE-WATERING:

- DEWATERING IS NOT ANTICIPATED, AS THE PIT IS EXPECTED TO BE DRY DURING CONSTRUCTION. PROVISIONS FOR DEWATERING ARE TO BE AVAILABLE ONSITE AT ALL TIMES SHOULD CONDITIONS CHANGE.
- SEDIMENT LADEN WATER SHALL NOT DISCHARGE DIRECTLY TO ANY WATERBODY. DEWATERING SHOULD BE UNDERTAKEN UTILIZING A FILTER BAG OR SEDIMENT TRAP IN THE FLOODPLAIN.
- IN THE EVENT OF RAINFALL OR SEEPAGE ENTERING THE WORK SITE, ADDITIONAL DEWATERING (BEYOND THAT RECOMMENDED IN THE PLANS), MAY BE REQUIRED.

SPILLS CONTROL NOTES:

- ALL MAINTENANCE ACTIVITIES PROCEDURES TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO THE WATER. VEHICULAR REFUELING AND MAINTENANCE TO BE CONDUCTED A MINIMUM OF 30M FROM THE WATER.
- THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT. A SPILL KIT SHALL BE KEPT ON SITE.
- IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT TO THE ENVIRONMENT, THE CONTRACTOR SHALL:
  1. IMMEDIATELY REPORT SPILL TO THE OWNER AND THE APPROPRIATE GOVERNMENT AUTHORITY IN ACCORDANCE WITH ALL LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
  2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE TO MITIGATE AGAINST ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
  3. THE CONTRACTOR SHALL RESTORE THE AFFECTED AREA TO ORIGINAL CONDITION OR BETTER, TO THE SATISFACTION OF THE ENVIRONMENTAL MONITOR AND APPLICABLE AUTHORITIES.

CONTINGENCY FOR STORM EVENT:

- IN THE EVENT OF AN UNANTICIPATED LARGE STORM EVENT, THE CONTRACTOR SHALL STABILIZE ALL EXPOSED SOILS AND VISUALLY CONFIRM THAT ALL EROSION AND SEDIMENT CONTROL MEASURES ARE FULLY FUNCTIONING. THE CONTRACTOR SHALL REMOVE ALL MACHINERY AND HAZARDOUS MATERIAL FROM THE ACTIVE WATERCOURSE OR VALLEY.

STAGING NOTES FOR CONSTRUCTION OF CHANNEL:

- THE CHANNEL IS TO BE CONSTRUCTED BEFORE THE HABITAT ENHANCEMENTS TO THE PIT.
- THE EXACT LIMITS OF MIDDLE THREE DUCK LAKE HAVE NOT BEEN CONFIRMED. THEREFORE THE EXACT POSITION OF THE TIE-IN WILL BE CONFIRMED IN THE FIELD BY A QUALIFIED CONTRACT ADMINISTRATOR.
- ACCESS TO THE CHANNEL WILL BE THROUGH THE AGGREGATE PIT.
- CLEAR ACCESS ALONG CHANNEL CENTRELINE FROM AGGREGATE PIT TO MIDDLE THREE DUCK LAKE. UNDERTAKE CLEARING AND GRUB AS PER OPSS 201. ESTABLISH STAGING AND MATERIAL STOCK PILE AREAS AS IDENTIFIED IN THE DRAWINGS.
- INSTALL SILT FENCE FLOW CHECK DAM (OPSD 219.190) AND TEMPORARY SEEPAGE POND AT THE DOWNSTREAM LIMITS OF THE CHANNEL. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS.
- INSTALL DEWATERING PUMP AT SEEPAGE POND. SEEPAGE POND IS TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO MIDDLE THREE DUCK LAKE (AS REQUIRED).
- CONSTRUCT THE LOW FLOW CHANNEL WORKING FROM THE DOWNSTREAM LIMITS TO THE UPSTREAM LIMITS.
- ENSURE LOW FLOW CHANNEL AND BANKS ARE STABILIZED.

STAGING NOTES FOR CONSTRUCTION OF AGGREGATE PIT:

- CONSTRUCT SEDIMENT TRAP (OPSD 219.240) BEYOND EXCAVATION LIMITS FOR DEWATERING OF THE AGGREGATE PIT. THE DIMENSIONS MAY VARY AS PER PLAN AND SITE CONDITIONS. INSTALL DEWATERING PUMP AT SEDIMENT TRAP TO DEWATER TO THE FLOODPLAIN AND FLOW OVERLAND TO MIDDLE THREE DUCK LAKE (AS REQUIRED).
- COMPLETE GRADING OF AGGREGATE PIT, WORKING IN A GENERAL SOUTH TO NORTH DIRECTION.
- COMPLETE PLANTING AS SPECIFIED IN THESE DRAWINGS.
- FOLLOWING THE INSPECTION BY A QUALIFIED PERSONS, COMPLETELY DEWATER TEMPORARY SEEPAGE POND AND SEDIMENT TRAP. EXCAVATE AND DISPOSE OF ANY EXCESS SEDIMENT WITHIN THE SEEPAGE POND. REMOVE ALL MATERIALS.

Planting List for Zone 1: Emergent Vegetation (0.06 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Broad-Leaved Arrowhead	Sagittaria latifolia	25	101	Seedling Plugs
Pickeral Weed	Pontederia cordata	25	101	Seedling Plugs
Softstem Bulrush	Scirpus validus	25	101	Seedling Plugs
Common Cattail	Typha latifolia	25	102	Seedling Plugs
	Total	100	105	

Planting List for Zone 2: Shoreline Plantings (0.55 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Shrubs				
Green Alder	Alnus crispa	20	198	12" Live Stakes, Locally Harvested
Speckled Alder	Alnus rugosa	50	496	12" Live Stakes, Locally Harvested
Red-Osier Dogwood	Cornus stolonifera	30	297	12" Live Stakes, Locally Harvested
	Total	100	991	

Planting List for Zone 3: Upland Areas (0.26 ha, 1800 stems/ha)

Common Name	Latin Name	Percentage	Quantity	Stock
Trees (75% cover)				
Black Spruce	Picea mariana	30	143	Seedling Plugs
Balsam Fir	Abies balsamea	10	48	Seedling Plugs
White Spruce	Picea glauca	20	95	Seedling Plugs
Tamarack	Larix laricina	10	47	Seedling Plugs
Jack Pine	Pinus banksiana	30	142	Seedling Plugs
	Total	100	475	
25% open space to represent natural openings in the canopy cover				

PLANTING NOTES:

GENERAL PLANTING NOTES:

- PLANTING IS TO FOLLOW THE FINAL CONSTRUCTION PHASE, ONCE HEAVY MACHINERY HAS BEEN REMOVED FROM THE PLANTING ZONE.
- THERE ARE THREE PLANTING ZONES WITH EACH THEIR OWN SPECIES PRESCRIPTION; ZONES 1, 2 AND 3.
- PLANTINGS ARE TO OCCUR IN ALL PRESCRIBED AREAS, AS WELL AS DISTURBED AREAS ON THE POND EDGES THAT CONTAIN A SUITABLE SUBSTRATE.
- THE PLANTING PLAN IS SUBJECT TO CHANGE UNDER THE DIRECTION OF THE CONTRACT ADMINISTRATOR BASED ON WATER LEVEL WITHIN THE RESTORED PIT FEATURE.
- PLANTING IS TO OCCUR BETWEEN MAY 1 AND OCTOBER 15.
- PLANTING DENSITY IS PRESCRIBED AS 1800 STEMS/HA WITH AN AVERAGE SPACING OF 2.5 m BETWEEN AND SHRUBS.
- ALDER PLANTINGS OF BARE ROOT FORM TO BE SPACED AT 3 m ALONG TOP OF LOW FLOW CHANNEL BANK IN THE AREAS INDICATED (119 TOTAL PLANTINGS).
- THE PLACEMENT ON THE DRAWINGS OF HABITAT FEATURES (IE. FALLEN TREES, BOULDERS, STANDING SNAGS, AND SHOALS) IS A GUIDELINE AND REPRESENTS A MINIMUM CONDITION. THE PLACEMENT AND QUANTITY OF THESE FEATURES IS MEANT TO BE AN ORGANIC PROCESS, AND ADDING THESE FEATURES TO THE RESTORED PIT FEATURE SPORADICALLY IS SEEN AS A BENEFIT.

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LEGEND

- SILT FENCE (OPSD 219.130)
- TURBIDITY CURTAIN (OPSD 219.260)
- STAGING AND STOCKPILE AREA
- PLANTING ZONE 1
- PLANTING ZONE 2
- PLANTING ZONE 3

NOT FOR CONSTRUCTION

SURFACE DATA: LIDAR FROM IAMGOLD RECEIVED FEB 2, 2018

VERTICAL DATUM: NAD83 (CSRS)

SCALES
HORIZONTAL: 0 25 50 75
VERTICAL: 0 5 10 15

No.	REVISIONS	DATE	INITIAL
A	Issued for Review	2019-07-10	JPH
B	Issued for Review	2020-02-14	JPH

IAMGOLD COTE MINE - HABITAT COMPENSATION
AGGREGATE PIT #3
EROSION AND SEDIMENT CONTROL AND REVEGETATION PLAN

Scale: 1:1000	Drawn By: CWM	Drawing No. 14
Date Issued: FEB 14, 2020	Checked By: BDP, JPH	

APPENDIX D

CONSULTATION SUMMARY

1.0 CÔTÉ GOLD PROJECT CONSULTATION SUMMARY

1.1 Introduction

IAMGOLD's approach to consultation focuses on building and preserving relationships with affected communities and interested stakeholders. Consultation with communities and stakeholders began in the spring of 2013, informed the Federal and Provincial (EA)s, and has continued since Federal and Provincial EA approval[1]. This application support document provides a summary of consultation and engagement during key phases of the Project, namely:

- During preparation of the Federal Amended Environmental Impact Statement (EIS) and Final EA Report;
- Following submission of the Amended EIS / Final EA Report; and
- During preparation of the Environmental Effects Review (EER) Report and permit applications.

Detailed information about consultation and engagement activities can be found in Chapter 4 and Appendix D of the Amended EIS / Final EA Report (AMEC 2015) and in Chapter 3 of the EER (IAMGOLD 2018). IAMGOLD has continued to keep Indigenous communities and stakeholders engaged following Federal and Provincial Project approvals.

Detailed records of consultation and engagement undertaken with Indigenous groups, stakeholders and government agencies are located on the Project website (www.iamgold.com/cotegold-environmental-assessments and www.iamgold.com/cotegold-permitting-applications), including:

- Summary of Consultation to Support the Côté Gold Project Closure Plan (Wood 2018);
- Environmental Effects Review Report, Appendix A: Consultation Records (IAMGOLD 2018); and
- Amended EIS / Final EA Report (AMEC 2015).

Information about consultation specific to this application is detailed in Section 1.5.1.

1.2 Goals of Consultation

IAMGOLD's objective for consultation related to the Project activities to date, including permitting, has been to engage Indigenous groups, government agencies and interested stakeholders to:

[1] While the approval was received by IAMGOLD in January, the approval was dated December 2016.

- Develop and maintain relationships with stakeholders, Indigenous groups and government agencies;
- Understand Indigenous interests and treaty rights in the area that have the potential to be affected by the Project;
- Establish positive working relationships with stakeholders, Indigenous groups and government agencies;
- Share information and gather feedback on Project documents including but not limited to: Project Description, Terms of Reference, EA reports, EER report, and permit applications;
- Provide status updates on exploration and mining-related activities;
- Ensure stakeholders have an appropriate opportunity to understand the proposed Project and identify potential environmental effects by reviewing and gathering feedback on:
  - Results of baseline studies and/or other studies
  - Alternatives and evaluation methods
  - Final selection of criteria indicators
  - Results of the selection of the preferred alternatives
  - Potential environmental effects and mitigation measures
  - Proposed monitoring and management plans
  - Decommissioning / Closure Plan.
- Demonstrate and discuss how comments heard previously were addressed through Project designs or management practices to reduce or avoid the effects;
- Provide an explanation of why the proposed Project cannot be modified to reduce or avoid the effects, where such changes cannot reasonably be made, or are not justified;
- Discuss appropriate ways residual effects could be managed;
- Document and respond to any issues or concerns raised; and
- Meet all regulatory requirements for Indigenous and stakeholder consultation, to the extent possible.

1.3 Identification of Stakeholders and Indigenous Groups

Stakeholders, Indigenous groups (First Nation and Métis) and government agencies who were anticipated to have an interest in the Project were identified during early consultation efforts. The list has evolved over time. Table D-1 provides an overview of how each of these groups are categorized.

Table D-1: Stakeholders and Indigenous Groups

Type	Example
Stakeholders	• Local businesses / business organizations • Community organizations • Non-governmental organizations • Environmental non-governmental organizations • Local educational / service institutes
Indigenous Groups	• Indigenous communities • Indigenous leadership • Tribal Councils
Government Agencies	• Municipal governments and representatives • Provincial (Ontario) governments and representatives • Federal government and representatives

The Federal and Provincial conditions of EA approval for the Côté Gold Project each included a list of Indigenous communities to be considered where relevant for the purpose of fulfilling specific conditions. The Provincial list included all Indigenous communities and/or groups that IAMGOLD communicated with during the EA, specifically:

- Aundeck Omni Kaning First Nation;
- Beaverhouse First Nation;
- Brunswick House First Nation;
- Chapleau Ojibwe First Nation;
- Conseil de la Première Nation Abitibiwinni;
- Flying Post First Nation (represented by Wabun Tribal Council);
- Matachewan First Nation;
- Mattagami First Nation (represented by Wabun Tribal Council);
- Missanabie Cree First Nation;
- M'Chigeeng First Nation;
- Serpent River First Nation;
- Taykwa Tagamou Nation;

- Wahgoshig First Nation; and
- Métis Nation of Ontario – Region 3 (which represents Northern Lights and Temiskaming Métis Councils).

The Federal list includes:

- Mattagami First Nation;
- Flying Post First Nation;
- Brunswick House First Nation; and
- Métis represented by the Métis Nation of Ontario Region 3 Consultation Committee.

1.4 Status of Agreements with Indigenous Communities

An Impact Benefit Agreement (IBA) was signed on April 30, 2019 with Mattagami First Nation and Flying Post First Nation. The details of the negotiations and IBA are confidential, as per the agreement of all parties involved. Prior to reaching an agreement on the IBA, a Process and Funding Agreement was established in 2018 between IAMGOLD, Mattagami First Nation and Flying Post First Nation to support the communities' involvement through the review of the EER and required regulatory permit applications to advance the Project.

IAMGOLD, Mattagami First Nation and Flying Post First Nation have established and agreed upon consultation processes and timeframes for each permit type required to develop the Project. Regular (bi-weekly) meetings between IAMGOLD and representatives of the two communities to review various aspects of the Project including draft permit applications continue to occur, with Wabun Tribal Council participating since January 2019. A separate SharePoint page has been developed for the purpose of sharing and facilitating access to all draft and final permit applications with Mattagami First Nation, Flying Post First Nation and Wabun Tribal Council. The agreed upon timeline for reviewing LRIA applications is 10 business days.

An updated Memorandum of Understanding was negotiated with the Métis Nation of Ontario and was signed on November 20, 2019. In a meeting with the Métis Nation of Ontario Regional Consultation Committee in August 2019, the Métis Nation of Ontario requested that IAMGOLD post all permit applications submitted to Federal or Provincial ministries to the SharePoint site set up by IAMGOLD for this purpose.

1.5 Information Sharing and Engagement Activities

1.5.1 Consultation Related to this Application

In addition to consultation that occurred throughout the EA and EER processes, consultation on for the purpose of gathering input into this application included community open houses in Mattagami First Nation (May 2019) and Gogama (August 2019) to provide a Project update and review the Project's proposed Fisheries Offsetting Plan and a meeting with the Métis Nation of Ontario Region 3 Consultation Committee (August 2019). The open house in Gogama and meeting with Métis Nation of Ontario were held in conjunction with Environment and Climate Change Canada (ECCC) and Fisheries and Oceans Canada (DFO).

Open houses and meetings presented information relevant to this application and provided opportunities for feedback. IAMGOLD developed a plain language overview of the proposed Offsetting Plan which was shared with the communities prior to the consultation Gogama and Métis Nation of Ontario sessions. This plain language was made available at the sessions, in both French and English, and was posted on the Government of Canada website.

IAMGOLD hosted a Project site tour for Fisheries and Oceans Canada and Environment and Climate Change Canada on August 28, 2019 focused on the Open Pit area, Côté Lake, Clam Creek, Mollie River, proposed realignment channels and the Tailings Management Area. The Chief of Mattagami First Nation also participated in this tour.

A meeting was also held with Brunswick House First Nation in September 2019 to discuss the Fisheries Offsetting Plan.

Information about consultation sessions was included in the IAMGOLD *Let's Talk* Project newsletter (September 2019). Consultation materials, including presentations, meeting notes and plain language document are presented in Appendix D-1.

Appendix D-2 contains letters of support for the Fisheries Offsetting Plan from Mattagami First Nation, Flying Post First Nation and Brunswick House First Nation.

A summary of Indigenous consultation and engagement activities specific to this application is presented in Table D-2. A more fulsome record of engagement is included in Appendix D-3. It is important to note that the records appended to this application are focused on consultation and engagement that occurred during the development of the application, the application considered all relevant feedback received since IAMGOLD began engagement about the Project in 2012.

Table D-2: Summary of Indigenous Consultation and Engagement Specific to this Application

Date	Event Summary
April 16, 2019	The draft Fisheries Act Authorization Application, the Offsetting Plan and the Assessment of Alternatives was shared with Mattagami First Nation, Flying Post First Nation, Métis Nation of Ontario and Brunswick House First Nation.
May 5, 2019	IAMGOLD inquired by email about meeting dates to fulfill the requirement for consultation on the Fisheries Act Authorization application with Flying Post First Nation and Mattagami First Nation. Wabun Tribal Council spoke with the Chief of Flying Post First Nation who instructed that the community would not require community consultation on this application.
May 9, 2019	IAMGOLD received a letter of support for the Fisheries Act Authorization, Offsetting Plan and Assessment of Alternatives from Flying Post First Nation.
May 21, 2019	IAMGOLD and the Chief of Flying Post First Nation met with the Major Projects Management Office to discuss outstanding permitting applications with Fisheries and Oceans Canada, Transportation Canada and Environment and Climate Change Canada.
May 29, 2019	IAMGOLD hosted a Project open house in Mattagami First Nation. The session included a general Project update and presentation of the Fisheries Offset Plan. There were 23 participants.
June 3, 2019	Mattagami First Nation confirmed they shared the transmittal summary for the Fisheries Act Authorization for the Fisheries Offsetting Plan and Assessment of Alternatives to all members via their Facebook "Mattagami Engagement Group".
June 6, 2019	IAMGOLD provided Mattagami First Nation with the Project update presentation and the presentation on the Offsetting Plan.
June 30, 2019	IAMGOLD received confirmation from Flying Post First Nation and Mattagami First Nation that they do not require further community open house presentation on the fisheries Offsetting Plan and Assessment of Alternatives.
July 5, 2019	IAMGOLD contacted Mattagami First Nation and Flying Post First Nation to inform them that a new folder had been created on the SharePoint site titled "Presentations" to house the Project update and Fisheries Offsetting Plan presentations.
July 10, 2019	Mattagami First Nation confirmed sharing the Project update presentation from the community open house on 2019-05-29 to all members through a post on the Mattagami Engagement Group Facebook page.
July 17, 2019	Flying Post First Nation provided a letter of support for the Environmental the Fisheries Act Offsetting Plan and Assessment of Alternatives for Mine Waste Disposal.
July 24, 2019	Mattagami First Nation provided a letter of support for the Fisheries Act Authorization, Fish Habitat Offsetting Plan and Alternatives Assessment.
July 31, 2019	IAMGOLD emailed the Métis Nation of Ontario to determine a meeting date to discuss permit applications. Métis Nation of Ontario suggested a meeting date of 2019-08-29. IAMGOLD accepted the tentative meeting date.

Date	Event Summary
August 21, 2019	IAMGOLD delivered the Notice for an Open House regarding the Proposed amendments to the Metal and Diamond Mining Effluent Regulations for the Project to the Gogama post office for distribution to all local residents.
August 27, 2019	ECCC hosted an open house in Gogama to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Approximately 11 people attended the event.
August 28, 2019	IAMGOLD hosted a Project site tour for Fisheries and Oceans Canada and Environment and Climate Change Canada focused on the Open Pit area, Côté Lake, Clam Creek, Mollie River, proposed realignment channels and the Tailings Management Area. The Chief of Mattagami First Nation also participated in the tour.
August 29, 2019	ECCC hosted a meeting with the Métis Nation of Ontario to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Following the federal consultation portion of the meeting, IAMGOLD provided an update on permitting for the Project and discussed the Lakes and Rivers Improvement Act application for the Tailings Management Facility Starter Dam.
September 24, 2019	IAMGOLD met with Chief and Council and a representative of the Lands and Resources Department from Brunswick House First Nation to discuss the Project.
September 27, 2019	On 2019-09-28, IAMGOLD acknowledged receipt of the comments submitted by the Métis Nation of Ontario to Environment and Climate Change Canada on the Project's Assessment of Alternatives for Mine Waste Disposal and Fish Habitat Compensation Plan.
October 28, 2019	IAMGOLD and the Chief of Mattagami First Nation met with Brunswick House First Nation to discuss the Project location, the record of contact between the Project and the community as well as IAMGOLD's request for a letter of support for the Fisheries Act Authorization application. Brunswick House First Nation provided a letter of support for the application.
December 9, 2019	IAMGOLD provided responses to comments regarding the Assessment of Alternatives and Fish Habitat Compensation Plan. The comments were provided by the Métis Nation of Ontario to ECCC on 2019-09-27 and were provided to IAMGOLD on 2019-09-28. On 2019-10-29 ECCC confirmed receipt of the responses and indicated they would be working with Fisheries and Oceans Canada to review them and provide additional context if needed. ECCC also confirmed receipt of the

Date	Event Summary
	updated Assessment of Alternatives and informed that it had been forwarded for review.
January 27, 2020	The Métis Nation of Ontario informed ECCC that they will be submitting responses to IAMGOLD's comments on their review of the Fish Habitat Compensation Plan and the Assessment of Alternatives.
February 4, 2020	IAMGOLD notified Mattagami First Nation, Flying Post First Nation, Brunswick House First Nation and Métis Nation of Ontario that the final application for the Assessment of Alternatives for Storage of Mine Waste was submitted to ECCC. The draft of this application was previously shared on 2019-04-16. IAMGOLD provided a summary of the application purpose and contents as well as a link to the SharePoint site where the application could be viewed.

A summary of public consultation and engagement activities specific to this application is presented in Table D-3.

Table D-3: Summary of Public Consultation and Engagement Specific to this Application

Date	Event Summary
August 27, 2019	ECCC hosted an open house in Gogama to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Approximately 11 people attended the event.

IAMGOLD and its consultants engaged with ECCC and Fisheries and Oceans Canada throughout the development of this application. A record of engagement with government agencies specific to this application is presented in Appendix D-3.

1.5.2 Consultation during the Preparation of the EA

During the EA preparation, IAMGOLD published a total of six newsletters. The *Let's Talk: the Côté Gold Project Community Newsletter (Let's Talk)* provided Project status updates, information about the EA process, details of upcoming community and consultation events and outlined how IAMGOLD responds to community concerns and how it operates in the local area. The newsletters, three in 2013 and three in 2014, shared information about the EA process, baseline studies and effects prediction processes, as well as highlighted public consultation events.

Fact sheets (five in total), written in plain language, were available at open houses and consultation events, posted to the project website and distributed to those who signed onto the Project mailing list. These fact sheets focused on:

- Environmental Assessment Process (May 2013);
- Career and Employment (August 2013);
- Baseline Studies (August 2013);
- Frequently Asked Questions (September 2013); and
- Environmental Assessment Findings (June 2014).

IAMGOLD has taken an iterative and flexible approach to consultation with interested and potentially affected Indigenous communities. Pre-EA meetings, presentations and interviews held between May 2012 and January 2014, therefore, met general consultation goals for the Project, rather than restrictively meeting the goals of consultation for this specific time period.

At various milestones, IAMGOLD conducted open houses for the general public and Indigenous communities. Prior to January 2014, IAMGOLD held a total of 12 open houses; in addition, during the preparation of the EIS / Draft EA Report (January 2014 to September 30, 2014), IAMGOLD held six open houses. Approximately 580 participants attended these events. Table D-4 Project EA Open Houses summarizes this activity.

Table D-4: Project EA Open Houses

Date	Location	Number of Attendees
November 8, 2012	Gogama	73
February 13, 2013	Flying Post First Nation, Nipigon	33
February 20, 2013	Mattagami First Nation	39
February 26, 2013	Timmins	64
February 27, 2014	Gogama	56
February 28, 2014	Sudbury	50
April 25, 2013	Mattagami First Nation	9
May 21, 2013	Sudbury	15

Date	Location	Number of Attendees
May 22, 2013	Gogama	26
May 22, 2013	Mattagami First Nation	20
May 23, 2013	Timmins	43
May 28, 2013	Flying Post First Nation, Nipigon	23
Nov. 13, 2013	Gogama	16
June 18, 2014	Flying Post First Nation, Nipigon	25
June 23, 2014	Timmins	18
June 24, 2014	Sudbury	14
June 25, 2014	Gogama	17
June 26, 2014	Mattagami First Nation	30
August 29, 2014	Brunswick House First Nation	9

At these open houses, information was presented on poster board displays and in formal presentations. Presentations given at the open houses were posted to the Project website to offer those who were unable to attend an opportunity to view the information provided. From November 2012 to February 2013, the presentation and discussion focused on the project overview, the approvals process and baseline study findings; as more information became available, the agenda expanded to include proposed mitigation measures for human environment disciplines in May 2013.

IAMGOLD made all documents associated with the EA process (e.g., Draft Project Description, Draft Terms of Reference, EIS / Draft EA Report) available for public review and comment. The Amended EIS / Final EA Report considered all feedback received from Indigenous groups, stakeholders and government agencies.

1.5.3 Consultation Following Submission of the Amended EIS / Final EA Report

After the EA documents were finalized and submitted, IAMGOLD continued to keep stakeholders informed about the project through two newsletters published between February 2015 and August 2015. These *Let's Talk* newsletters informed stakeholders about report and submission updates and community employment and education partnerships, such as a seven-week program for Mattagami First Nation students, a youth summer employment experience and the Mattagami Fish Hatchery.

In 2015, four open houses were held, as was a site tour. Open houses were held on February 4 in Gogama, March 10 in Timmins, March 11 in Sudbury and April 7 in Brunswick House First Nation. At these events, IAMGOLD provided a project update, a summary of key comments and copies of newsletters and fact sheets. Stakeholders attending included Provincial staff, Ontario Provincial Polices and a cottagers' association representative. On June 30, 2015, IAMGOLD hosted a site tour for eight representatives from the Métis Nation of Ontario.

Federal Project approval was granted in April 2016 and Provincial approval in January 2017. Throughout 2016 and 2017, engagement activities included phone calls, emails, letters and meetings, including confidential Impact Benefit Agreement negotiations.

1.5.4 Consultation During Preparation of the EER Report and Permit Applications

Following the receipt of the EA approvals, IAMGOLD proposed to optimize the Project and prepare an EER Report. IAMGOLD sought to consult Indigenous groups, interested stakeholders and government agencies to inform the EER preparation. Planning for consultation was initiated in 2017 and public open houses were held in February and June 2018. The February open houses, held in Gogama, Timmins and Sudbury, focused on:

- Project updates and news;
- Project optimizations;
- EA approvals;
- Mine closure;
- Project timeline; and
- EER process.

Open houses were held in Mattagami First Nation and Flying Post First Nation in May 2018. These were followed by open houses in Gogama, Timmins and Sudbury in June. This round of open houses presented information and opportunities for attendees to provide input on the following:

- Improvements to the Project design following the EA process;
- How the mine will be shut down at the end of mining operations and what the land may look like after mining ends;
- Archaeological studies and findings, including a display with artifacts from the Project area;
- Results of the EER;
- Transmission line environmental assessment process;

- Alternatives considered to address mine waste; and
- Changes to fish habitat and plans for creation of new fish habitat.

Community open houses were also held in Flying Post First Nation in September 2018 and in Mattagami First Nation in November 2018 to support community input into the development of the Closure Plan for the Project. Open houses related to the Fisheries Act Authorization, including the proposed Offsetting Plan and Assessment of Alternatives were held in Mattagami First Nation (May 2019) and in Gogama (August 2019).

Meetings were held with the Métis Nation of Ontario Region 3 Consultation Committee in April 2018 and August 2019 and addressed topics covered during 2018 and 2019 community open houses.

A summary of key consultation events is listed in Table D-5.

Table D-5: Summary of Project Open Houses During the Preparation of the EER Report / Permit Applications

Event Type	Location	Date(s)	Number of Participants*
Project Open Houses	Mattagami First Nation	May 28, 2018 November 8, 2019 May 29, 2019	31 17 23
	Flying Post First Nation	May 30, 2018 September 26, 2018	28 27
	Gogama	February 14, 2018 June 13, 2018 August 27, 2019	31 39 11
	Timmins	February 13, 2018 June 14, 2018	64 36
	Sudbury	February 15, 2018 June 15, 2018	52 34
Meetings	Métis Nation of Ontario	April 19, 2018 August 29, 2019	6 7
	Mattagami First Nation and Flying Post First Nation	23 Consultation and Permitting Update Meetings since January 2018	NA

Note: Does not include IAMGOLD representatives or Project team participants.

On April 17, 2018 at the Greater Sudbury Chamber of Commerce's President's Luncheon, IAMGOLD provided a project update. The 140 attendees included media, government officials and members of the local business community. In addition to the events listed above, several meetings regarding permitting requirements occurred with Provincial government agencies occurred, as well as information and negotiations meetings with Indigenous communities.

Let's Talk editions issued in February and May 2018 discussed Project specifics and addressed concerns such as effects on water levels and quality in lakes and streams, fish habitat, tailings management, air quality and land and resource use. The 2018 newsletters also explained the key optimizations of the Project and included a layout comparison and table highlighting key changes. Newsletters issued in 2019 provided updates on the status of the Project, including current site activities, information about the Closure Plan approval, community engagement and permitting updates.

At consultations in May and June, IAMGOLD distributed copies of the February and May 2018 editions of *Let's Talk*, as well as a one-page handout highlighting the changes in the Project layout and an updated Project Fact Sheet, which answered frequently asked questions such as those pertaining to changes, how gold mines work, mine closure, IAMGOLD's Zero Harm framework and where to find information on procurement and business opportunities. IAMGOLD also uploaded these resources to the Project website (www.iamgold.com/cotegold-community-engagement).

IAMGOLD has also established a SharePoint site to share specific permit applications (Permits to Take Water and Environmental Compliance Approvals) with all Indigenous groups noted by the Province in the Provincial Conditions of Approval for the Project. Each time an application is posted to the site, an email is sent containing a link to the SharePoint page and a brief summary (PDF) of the application description is provided as well as contact information for IAMGOLD.

1.5.5 Summary of Comments Relevant to this Application

Comments relevant to this application from government agencies, Indigenous groups and the general public to date focused on:

- Erosion and sedimentation controls;
- Monitoring of the Realignment channel;
- New Lake and Realignment channel as fish habitat;
- Potential for flooding;
- Realignment Channel and New Lake closure;

- Potential for realignment channel to alter the culvert performance at Highway 144;
- Baseline data;
- Fish passage in infrastructure;
- Revegetation plans that address biota;
- Consultation on offsetting measures;
- Offsetting options, designs and implementation;
- Monitoring;
- Waterbodies affected;
- Isolation of Weeduck Lake;
- Success of offsetting and contingency measures; and,
- Fish salvaging operations.

Comments specific to the Fish Habitat Offsetting Measures that were heard during the Project EA consultation phase are documented in the Amended EIS / Final EA Report, Appendix Z (AMEC 2015). Comments received to date that are relevant to this application are summarized in Table D-6. See Appendix D-4 for a complete record of comments, including IAMGOLD's responses, related to fish habitat offsetting received from Indigenous groups, government agencies and stakeholders between 2012 and November 2018. Appendix D-5 contains a complete record of comments, including IAMGOLD's responses, related to fish habitat offsetting received from Indigenous groups, government agencies and stakeholders from November 2018 to February 2020.

Métis Nation of Ontario is the only Indigenous group that submitted written comments on the draft application. Their comments and IAMGOLD's response are located within Appendix D-5.

IAMGOLD is not aware of any outstanding issues or concerns of Mattagami First Nation, Flying Post First Nation, or Brunswick House First Nation related to this application. IAMGOLD has addressed the technical comments provided by the Métis Nation of Ontario related to this application and they continue to engage with them as they do with all the communities noted above.

Table D-6: Summary of Comments Related to Fisheries

Comment / Concern	Response / How has the comment been addressed?
Indigenous	
• What will happen to the fish in Côté Lake and what kind of fish are currently there?	• IAMGOLD will relocate fish to nearby lakes. Côté Lake will be drained in stages; fish will be captured and then transferred. Monitoring will occur to ensure the population survives. IAMGOLD may share fish with nearby communities, pending discussions with the communities. The fish include Whitefish, White Sucker, Northern Pike, Pickerel and Perch.
• Concerns about disruption of fishing, hunting and other traditional uses.	• Hunting and fishing will not be permitted within the Project boundary by employees or members of the public; however, access around the site will remain open.
• Concerns about blasting and effects on fish.	• The effects of blasting are expected to be minimal. IAMGOLD has committed to conducting acoustic surveys to confirm noise and vibration levels relative to predictions in fish habitat adjacent to the open pit. IAMGOLD will restrict blasting charge sizes in parts of the open pit in proximity to New Lake during the fish spawning window.
• Concern about methylmercury levels.	• The potential for naturally occurring mercury to methylate and be flushed out will be mitigated by removing organic soils prior to flooding any terrestrial area.
• Concern about water levels in Mesomikenda Lake and other related / or water bodies.	• Permit To Take Water (PTTW) will be required; details will ensure fish within the lake are not affected.
• Concern about methyl mercury in fish tissue.	• Fish tissue monitoring will be conducted in: Chester Lake, New Lake (post-construction), Upper Three Ducks Lake, the south arm of Bagsverd Lake, Clam Lake, Moore Lake, Unnamed Lake 5 and Unnamed Lake 6.
• Concerns regarding current fisheries offsets and compensation plans.	• IAMGOLD is currently working with DFO on the in-kind habitat creation measures proposed to offset any serious harm to fish.
• Expressed interest in participation in fish and water quality monitoring.	• IAMGOLD is committed to support employment for local community members (First Nation, Métis communities and Gogama), including opportunities to support environmental monitoring activities.
• Concerns with TMF downstream impacts, including cyanide and ammonia.	• Cyanide will be destroyed and tailings do not have the potential to generate acid. TMF is designed to minimize seepage. IAMGOLD has modelled receiving water quality and any water discharge to the environment will meet strict discharge and receiving water standards.
• Request to keep New Lake after Closure.	• IAMGOLD will investigate options to maintain New Lake post closure.

Comment / Concern	Response / How has the comment been addressed?
• Concerns regarding water flow monitoring.	• The hydrological and hydrogeological monitoring network will rely on the existing locations as well as the proposed monitoring program to assess spatial extent of predicted effects. Annually the results of this monitoring will be assessed in consideration of ongoing operational activities and additional stations may be incorporated into the program depending upon the results of the ongoing monitoring.
• Concern for Côté Lake's fish population loss due to relocation.	• Relocation will occur at ideal timing windows to minimize fish and egg stranding during the watercourse realignments. It is not possible to predict the mortality rate. The location where fish may be relocated is where an established population is already in place.
• Concern regarding offsetting plan success.	• Mitigation measures will be conducted and a monitoring plan will be in place to ensure offsetting plan is performing as designed. In the event that the monitoring demonstrates the habitat is not functioning as intended, IAMGOLD is committed to ensuring mitigation measures will be taken, and the habitat will be repaired/ adjusted/ augmented to function properly.
• Comment on how the fish salvage will be conducted.	• Planning will take place to allow for strategic transfer and relocation of fish and dewatering. The fish will be captured through non-lethal techniques such as electrofishing, hoop nets, seining, and minnow traps.
• What happens to the fish that die?	• This depends on what is stated in the permits. They may be buried or disposed of in some other way, but the goal is to not have any dead fish at all if possible. Fish loss is usually young fish or small-bodied fish. There is the possibility that fish may be shared with the community, subject to timing and temperature that may prohibit such sharing.
• Concern regarding Indigenous involvement with the fish salvage work.	• IAMGOLD has committed to involve Mattagami First Nation and Flying Post First Nation in the fish salvage work.
• Technical comments from MNO on draft application.	• See Appendix D-5.
Stakeholders	
• What will access look like for hunting and fishing through all phases of the Project?	• Hunting and fishing will not be permitted within the Project boundary by employees or members of the public.
• What will happen to the fish in Côté Lake?	• IAMGOLD will relocate fish to nearby lakes. Côté Lake will be drained in stages, fish will be captured and then transferred.
• Concerns regarding using an ecosystem approach to moving the fish from Côté Lake.	• The location where fish may be relocated is where an established population is already in place.

Comment / Concern	Response / How has the comment been addressed?
• Concerns with open pit flooding upon closure to fish habitat and water quality.	• IAMGOLD is committing to carry out the water quality monitoring program during all phases of the Project, including post-closure and as required under the *Ontario Mining Act.*
• Concerns with potential seepage from the Tailings Management Facility (TMF) into the ground water and accidental spill into water bodies.	• Any water discharge to the environment will meet strict discharge and receiving water standards.
• Concern about water levels in Mesomikenda Lake.	• Prior to being able to take water from Mesomikenda Lake, a Permit to Take Water (PTTW) will be required where further details will be established to ensure fish communities or populations within the lake are not affected.
• Concerns with long term non-lethal effects of toxins.	• Potential chronic sub-lethal effects were considered. Monitoring will be conducted according to federally regulated Environmental Effects Monitoring.
• Concern about habitat compensation plans for *Fisheries Act* Authorization.	• IAMGOLD is currently working with DFO to outline the analysis of how the in-kind habitat creation measures proposed will offset any serious harm to fish.
• Concern with impacts of Project activities on benthic invertebrates.	• The Aquatic Effects Technology Evaluation Program (AETE) was used to assess and recommend Project monitoring tools and benthic monitoring will be conducted downstream and at reference locations
• Concern regarding monitoring and surveys during Project phases and as part of fisheries compensation and especially for closure.	• IAMGOLD is committed to carry out the water quality monitoring program during all phases of the Project, including post-closure and as required under the *Ontario Mining Act.* IAMGOLD is currently working with DFO to outline the analysis of how the in-kind habitat creation measures proposed will offset any serious harm to fish. These offsetting measures will include monitoring and assessment requirements.
• Concern if Aboriginal fishing and resources and water quality have been adequately considered.	• IAMGOLD prepared a standalone report to address how Aboriginal and / or Treaty Rights were considered to ensure Aboriginal communities understand how the Project will impact their use and rights. There are no additional effects anticipated as a result of proposed mitigation measures on current use of lands and resources for traditional purposes.
• Concern about water bodies and / or water crossing being affected by TMF.	• The current Project has a smaller tailings footprint than originally planned and is designed as closed loop system; no TMF discharge is anticipated.
• Concern about methyl mercury and soil disruption.	• The potential for naturally occurring mercury to methylate or to be flushed out will be mitigated by removing organic soils prior to flooding any area.

Comment / Concern	Response / How has the comment been addressed?
• Concern about methyl mercury and fish consumption.	• Fish tissue monitoring will be conducted in: Chester Lake, New Lake (post-construction), Upper Three Ducks Lake, the south arm of Bagsverd Lake, Clam Lake, Moore Lake, Unnamed Lake 5 and Unnamed Lake 6.
• Concern about exposure and controlled access for hunting and fishing resources through all phases of the Project.	• Hunting and fishing will not be permitted within the Project boundary by employees or members of the public; however, access around the site will remain open. Controlled access with be permitted to areas for reasons of health and safety, the duration they can remain in those areas will be managed (24-hour limit).
• Concerns regarding fish tissue analysis samples of metals and/or other baseline fish sampling, time of year and calculation methods.	• All sampling methods and calculations have been reported, reviewed and approved in the Technical Support Documents for the Federal EA. Full baseline results including methods, dates and locations are described.
• Concerns regarding the baseline conditions and whether they may change after various Project phases and affect monitoring programs.	• IAMGOLD has already documented numerous monitoring programs within the EA that would be consistent with the definition and goals of a follow-up program.
• Concerns about aquatic biology and wildlife habitat such as those for turtles, beavers and fish.	• Ecological changes linked to where Federal authorizations must be pursued to affected water bodies including wildlife and wildlife habitat were addressed in the Federal EA. Any habitat offsets including those for wetland will be examined as deemed necessary / applicable.
• Concerns with waste rock, water quality, effects on fish habitat.	• The geochemical characterization study completed during the EA showed a small percentage of potentially acid generating (PAG) rock is well distributed throughout the volume of the waste rock, which is composed predominantly of high neutralization potential (NP) non-PAG rock. The waste rock with its high overall NP and correspondingly high neutralization potential ratio (NPR) values will be non-acid generating. Relocation of this rock from the pit to the waste dump will not alter these proportions. No additional mitigations are required.
• Concerns with lithology during construction phase, including added effects from explosives and sedimentation.	• The other phases are based on predictive water quality modeling of the ultimate production scenario. Based on the detailed results of the latter phases, the construction phase was evaluated qualitatively. Blast rocks are not of concern and best management plans will be implemented for explosives and sedimentation.
• Concerns to water quality due to accidents and malfunctions.	• Tailings pipes will be regularly monitored for leaks and sensors will monitor flow rates and have automatic shutdown.

Comment / Concern	Response / How has the comment been addressed?
• Concerns on cyanide management and other toxins.	• IAMGOLD has developed a closed-loop process water use plan to maximize recycling of water on-site and minimize the amount of freshwater required for operations, as well as minimizing the amount of water pumped to the TMF. Furthermore, the vast majority of cyanide will be destroyed prior to the discharge to the TMF.
• Concern about water levels in Mesomikenda Lake and other related / or water bodies.	• PTTW will be required, details will ensure fish within the lake are not affected. Project will not interfere with current seasonal hydroelectric use. Evaporation rates were considered in the hydrogeological modelling, 1:25 year climate scenario and process water withdrawn for production.
• Concern for Côté Lake's fish population loss due to relocation.	• Relocation will occur at ideal timing windows to minimize fish and egg stranding during the watercourse realignments. It is not possible to predict the mortality rate. The location where fish may be relocated is where an established population is already in place.
• Concern regarding blasting in the open pit may affect fish habitat and spawning in the adjacent lakes.	• It is anticipated the area affected for spawning will be minimal when taking the entire area of the lake into consideration and the habitat present. Since the effects of blasting are expected to be minimal. IAMGOLD has committed to conducting acoustic surveys to confirm noise and vibration levels relative to predictions in fish habitat adjacent to the open pit. IAMGOLD will restrict blasting charge sizes in parts of the open pit in proximity to New Lake during the fish spawning window.
• Concerns regarding toxic metals and human risk due to consumption.	• IAMGOLD will remove organic rich overburden soil and does not expect a significant increase in methyl mercury production post-flooding. Therefore, it does not expect significant changes in mercury body burdens in the fish populations present in the lakes affected by the Project.
• Concerns regarding the scoping of the hydrogeological modelling for use in future effects calculations and mitigation of risks.	• Hydrological monitoring is ongoing at the Côté Gold Project Site to refine the rating curves developed. Comments to baseline studies in the Federal EA were addressed as part of the planning process.
• Concerns regarding truck transportation routes.	• Potential effects (dust, runoff, spills) were considered for the prediction of effects in the EA.
• Technical comments from DFO on the Fish Habitat Offsetting Plan.	• See Appendix D5.

1.6 Ongoing and Future Project Consultation

IAMGOLD will continue to respond to any questions or concerns raised by Indigenous groups or other stakeholders, including government agencies, regarding the Project and plans and programs related to specific Federal and Provincial conditions of Project approval. The Impact Benefit Agreement outlines the relationship between IAMGOLD and Mattagami First Nation and Flying Post First Nation related to permit applications and plans and programs related to specific federal and provincial conditions of Project approval. Where practicable, IAMGOLD will provide draft permit applications and supporting materials in advance of their submission to government agencies. A timeframe for consultation has been established and agreed upon for each permit type required to develop the Project. IAMGOLD meets regularly (bi-weekly) with an established Environmental Committee that includes two appointed members of each community along with support from Wabun Tribal Council to review various aspects of the Project including draft permit applications.

APPENDIX D-1
CONSULTATION MATERIALS, PRESENTATIONS, MEETING NOTES, AND PLAIN LANGUAGE DOCUMENTS

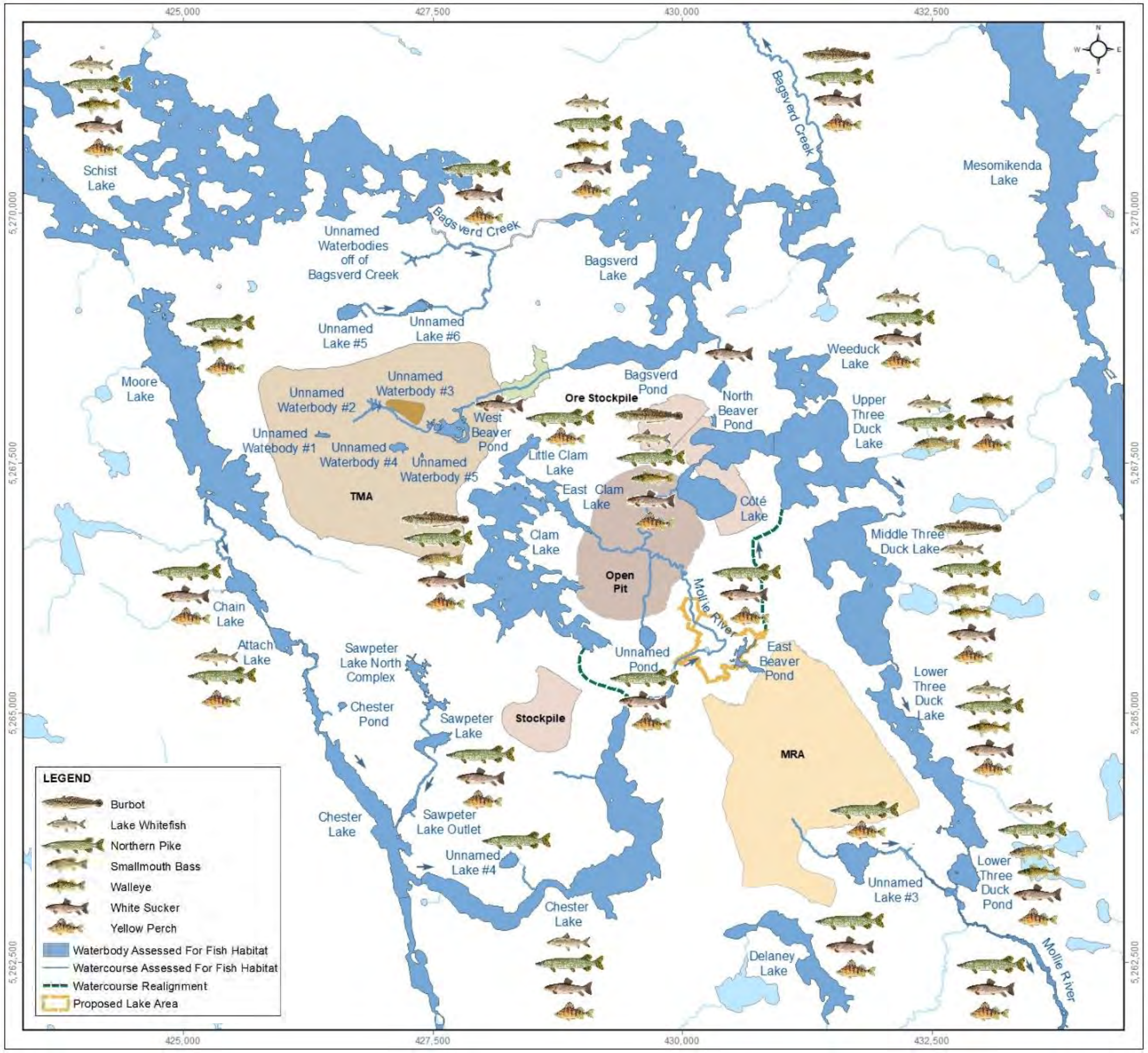
The Côté Gold Project: Offsetting Plan

Presentation Outline

- Baseline Conditions
- Overview of Major Waterbodies within the Site Footprint
- What is an Offsetting Plan? Why do we need it?
- Summary of Lost Fish Habitat
- Proposed Offsetting Habitat
- Mitigation Measures
- Reduction of Lag Times
- Summary

Baseline Conditions

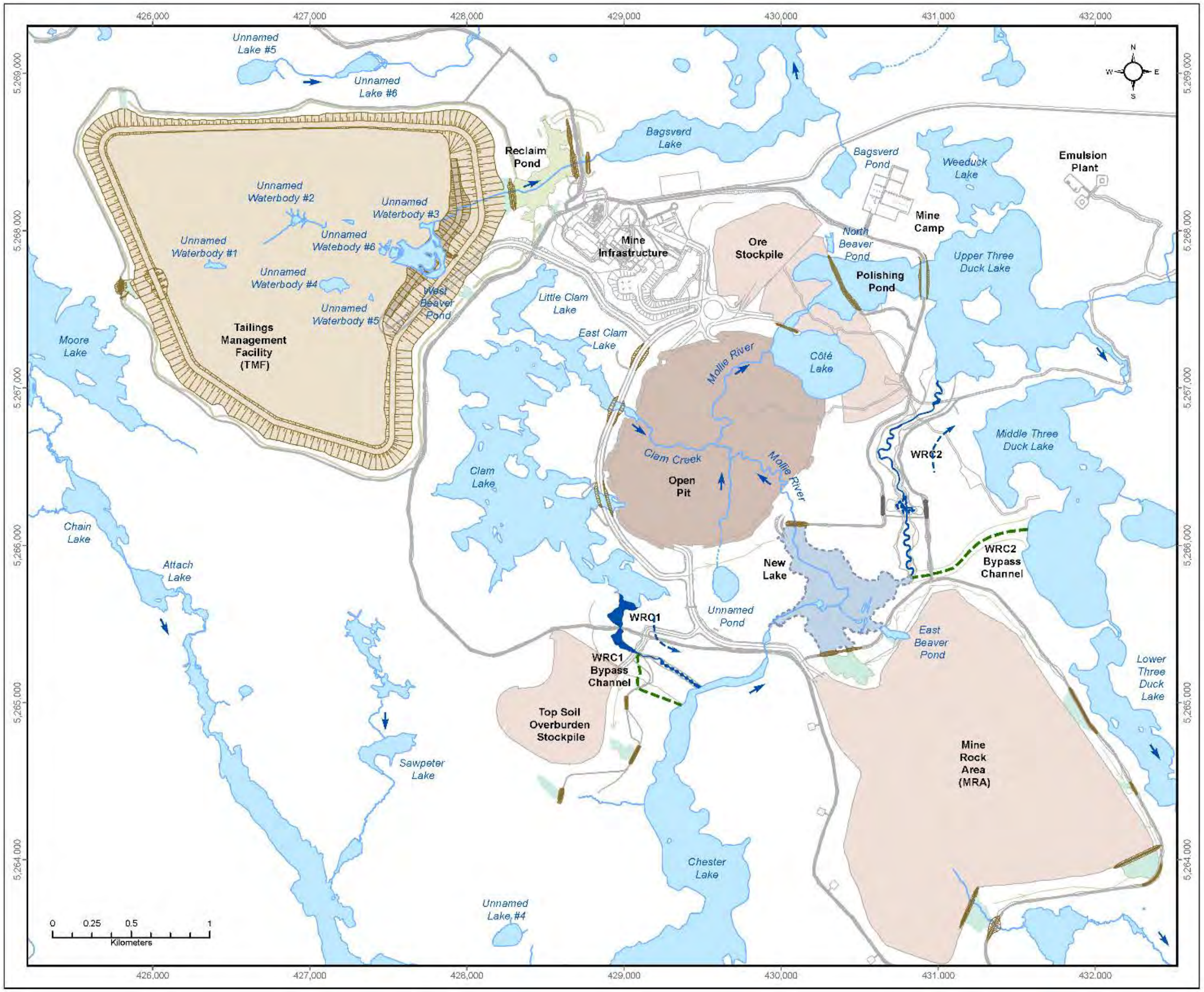
- **Study area is shallow warm lakes connected by meandering streams**
- **Habitat dominated by aquatic vegetation with sandy and silty substrate, some boulders, riffle and cobble habitat uncommon**
- **Fish Populations**
  - Dominated by northern pike and yellow perch
  - Walleye, smallmouth bass, lake whitefish and white sucker also common
  - 15 small-bodied species
  - No endangered, threatened or special concern fish species



Major Waterbodies within the Site Footprint

CÔTÉ GOLD

- Côté Lake
- Upper Three Duck Lake
- Mollie River
- Clam Lake and Clam Creek
- Several small unnamed waterbodies (less than 2 m in depth)



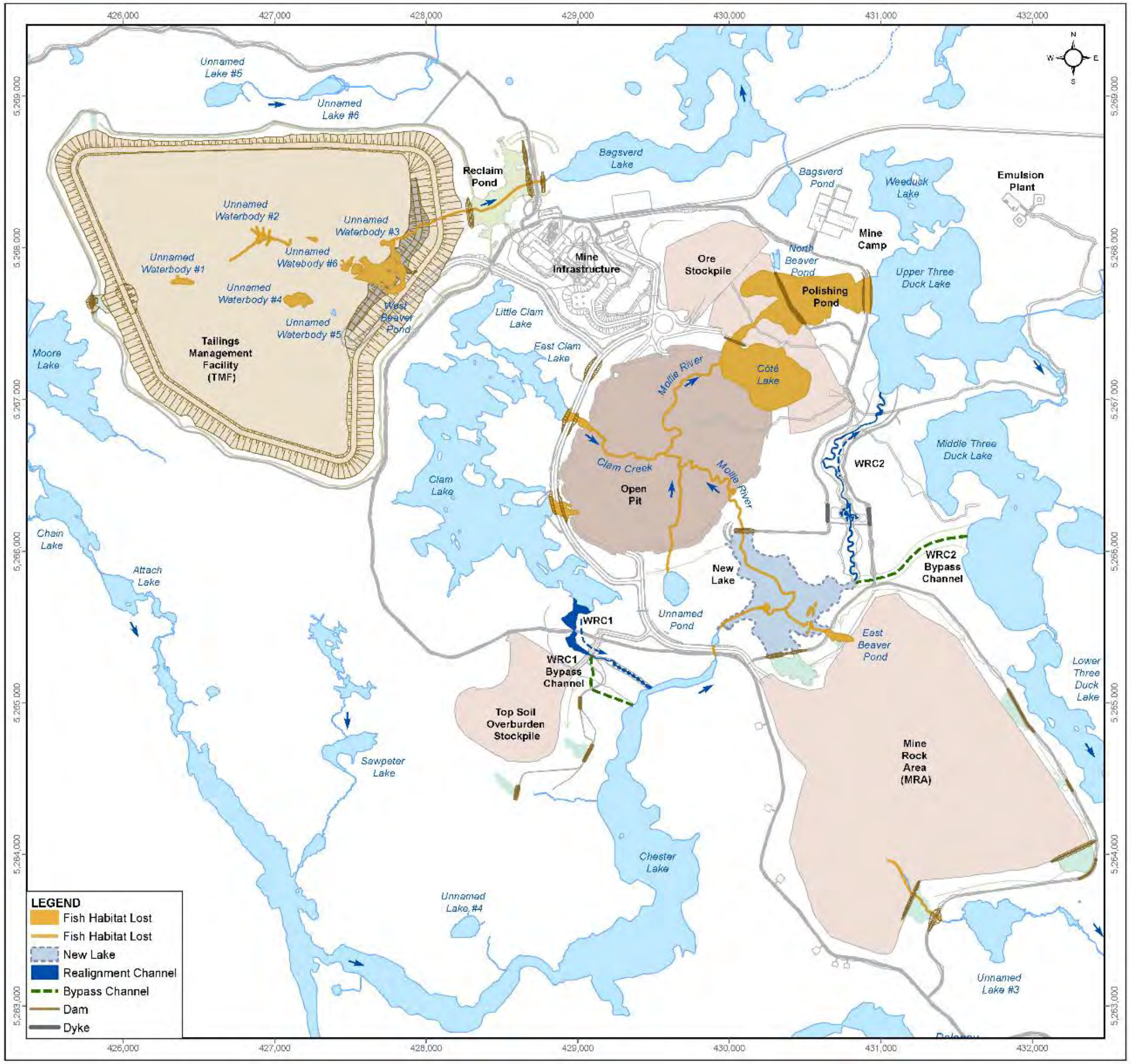
What is an Offsetting Plan?

- Fish habitat losses for the Project are categorized under two sections of the *Fisheries Act*: Section 35(2) and Section 36 (3)
- In order for IAMGOLD to develop the Project, they must develop a plan to offset the harm to fish though an Offsetting Plan
- The plan is required for the submission of a *Fisheries Act* Authorization through Fisheries and Oceans and for a Schedule 2 Amendment of the Metal and Diamond Mine Effluent Regulations from Environment and Climate Change Canada
- This Offsetting Plan addresses the habitat losses under both sections of the *Fisheries Act* in a single comprehensive plan that will ensure no net loss of fish habitat and produce sustainable productive fish habitat and communities associated with the Project

Summary of Lost Fish Habitat

CÔTÉ GOLD

- **Open Pit**
  - Côté Lake
  - Upper Three Duck Lake
  - Mollie River
  - Clam Creek
  - Clam Lake
- **Tailings Management Facility**
  - small unnamed waterbodies
- **Mine Rock Area**
  - East Beaver Pond
  - Unnamed tributary



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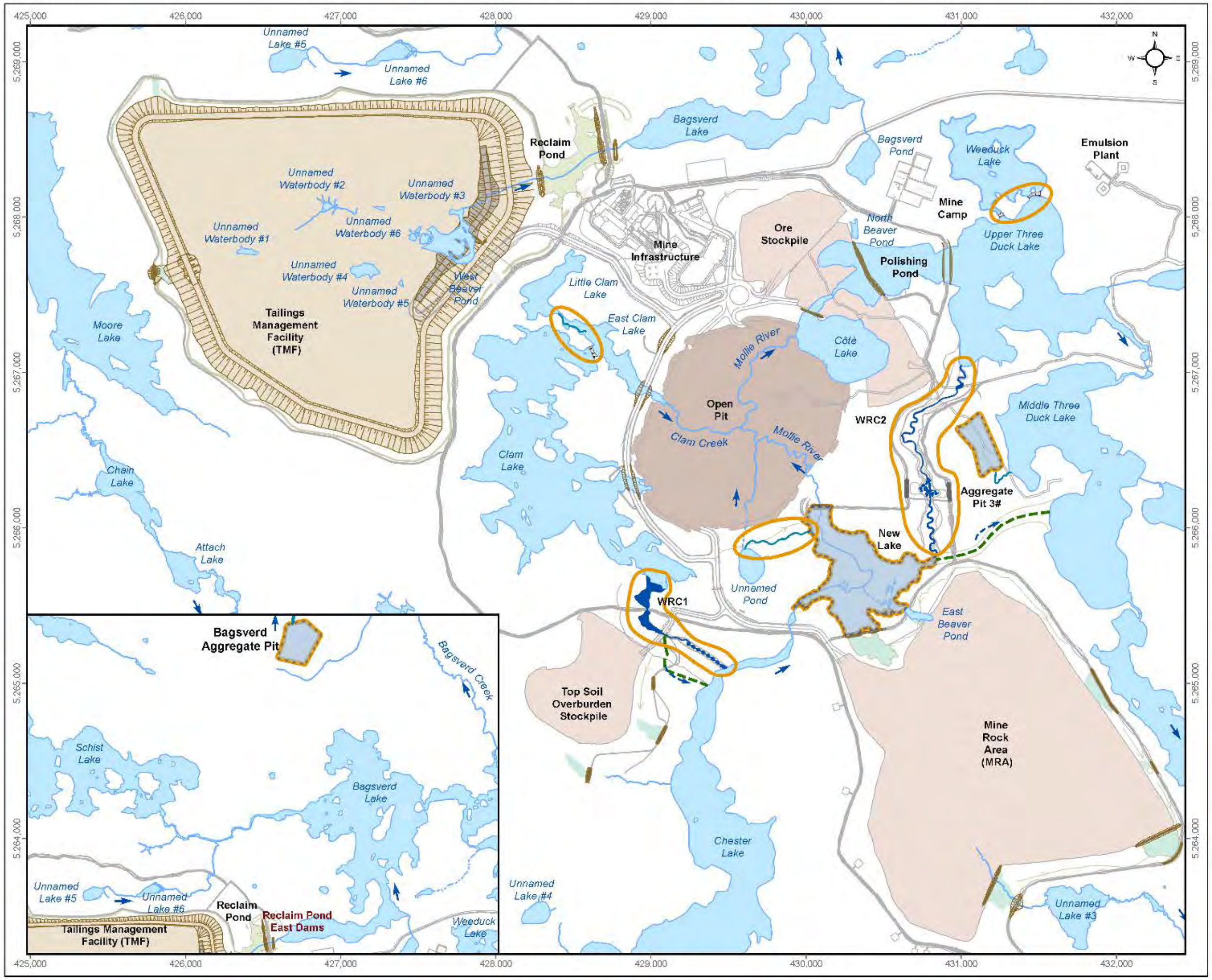
Proposed Offsetting Habitat

CÔTÉ GOLD

- **Designed Habitat**
  - Mollie River (WRC2)
  - New Lake
  - Clam Creek (WRC1)
  - Unnamed Pond Outlet
  - Little Clam/ East Clam Lake
  - Weeduck Lake
  - Aggregate Pits
    - Bagsverd
    - Pit #3



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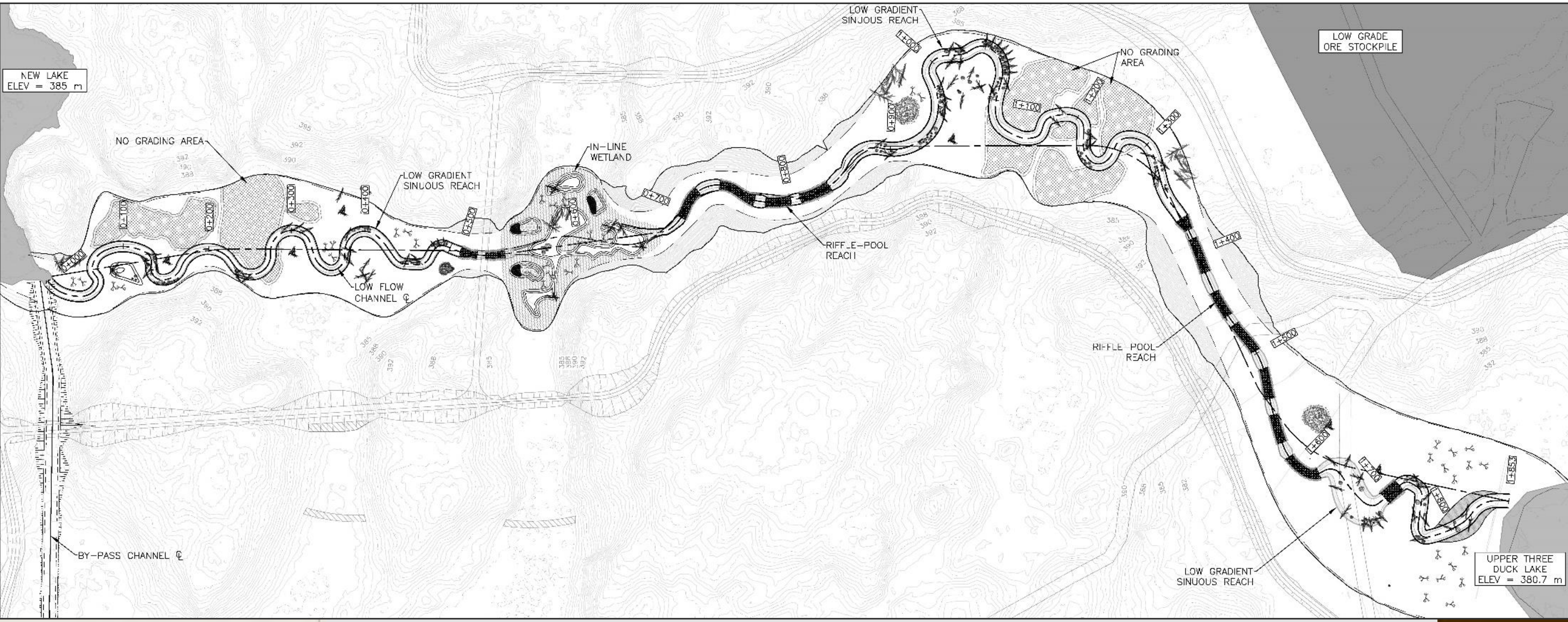
Mollie River Realignment (WRC2)

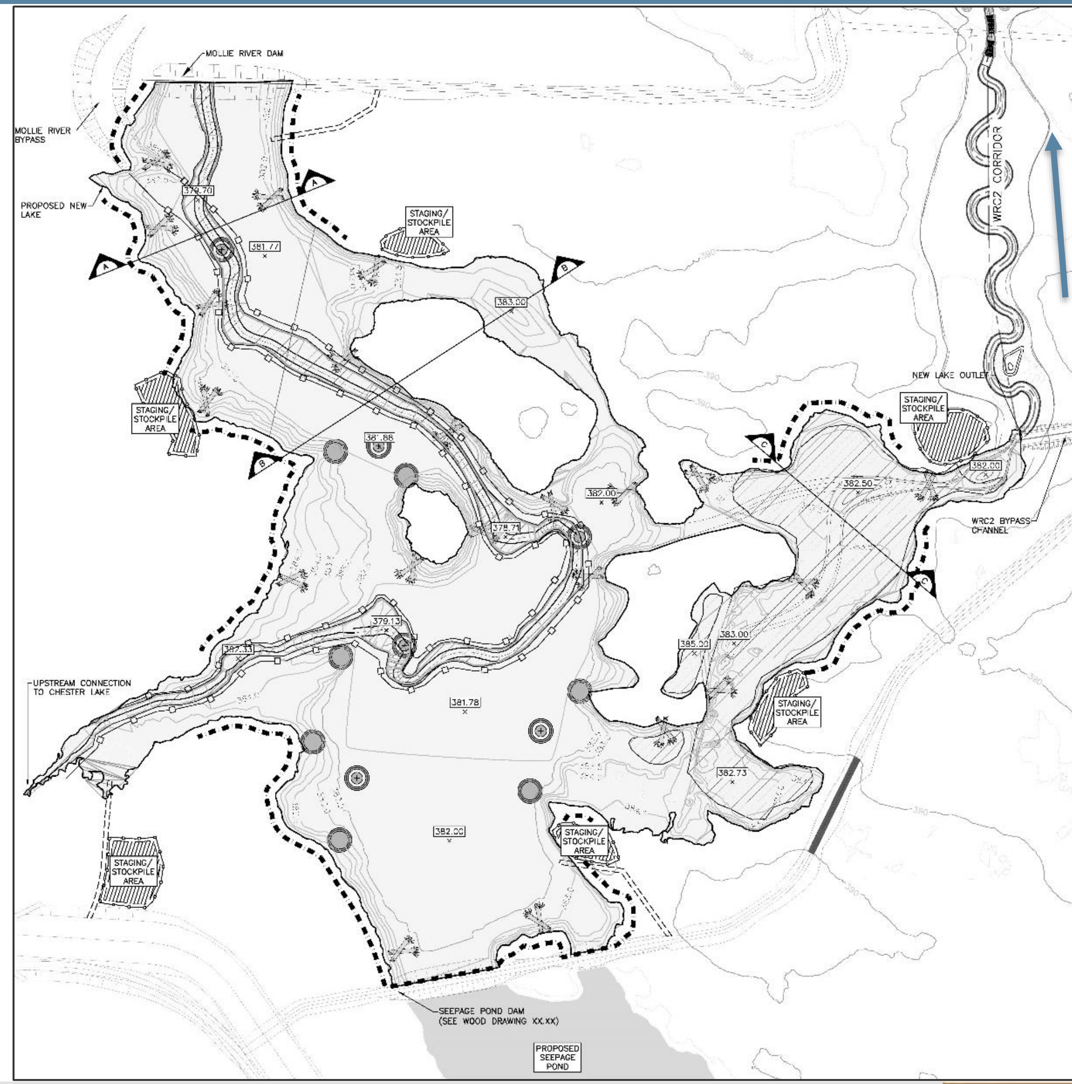
- **Habitat features will include**
  - Spawning habitat for northern pike, yellow perch, and walleye
  - Cover for all fish species
  - Complex habitat (riffle, run, pool) to support a variety of fish species



New Lake

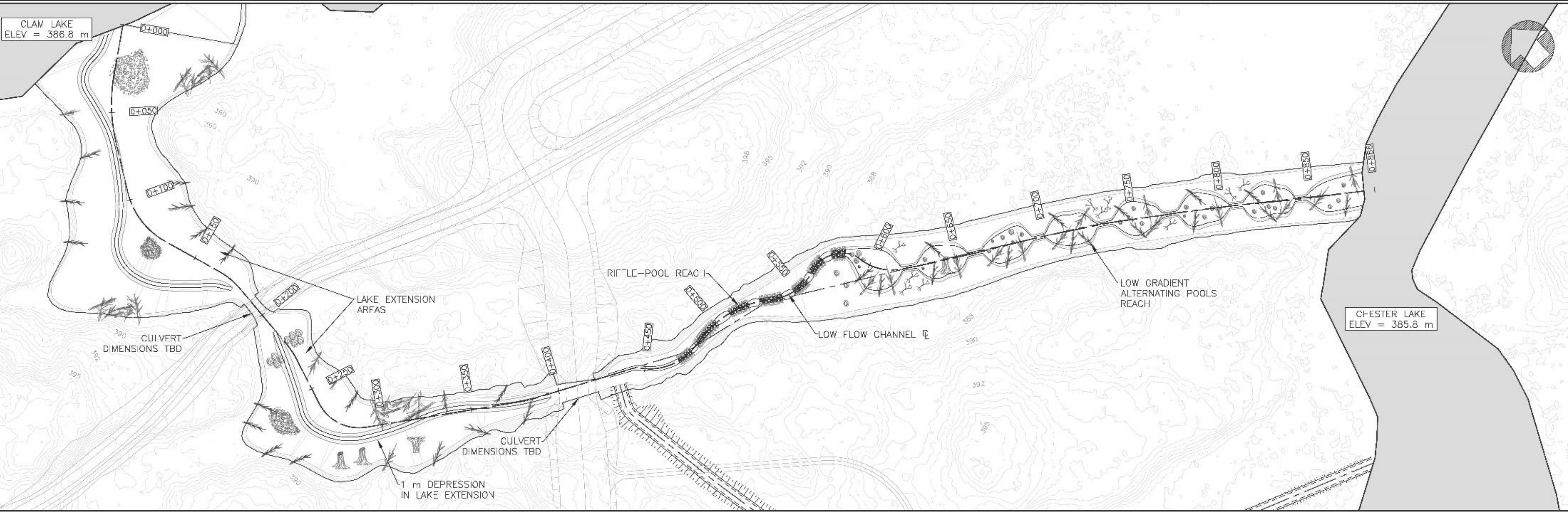
CÔTÉ GOLD

- **Habitat features will include**
  - Spawning habitat for northern pike and yellow perch
  - Point bar shoals for smallmouth bass spawning
  - Near shore habitat to provide cover for fish community
  - Deep water shoals
  - Islands for habitat complexity



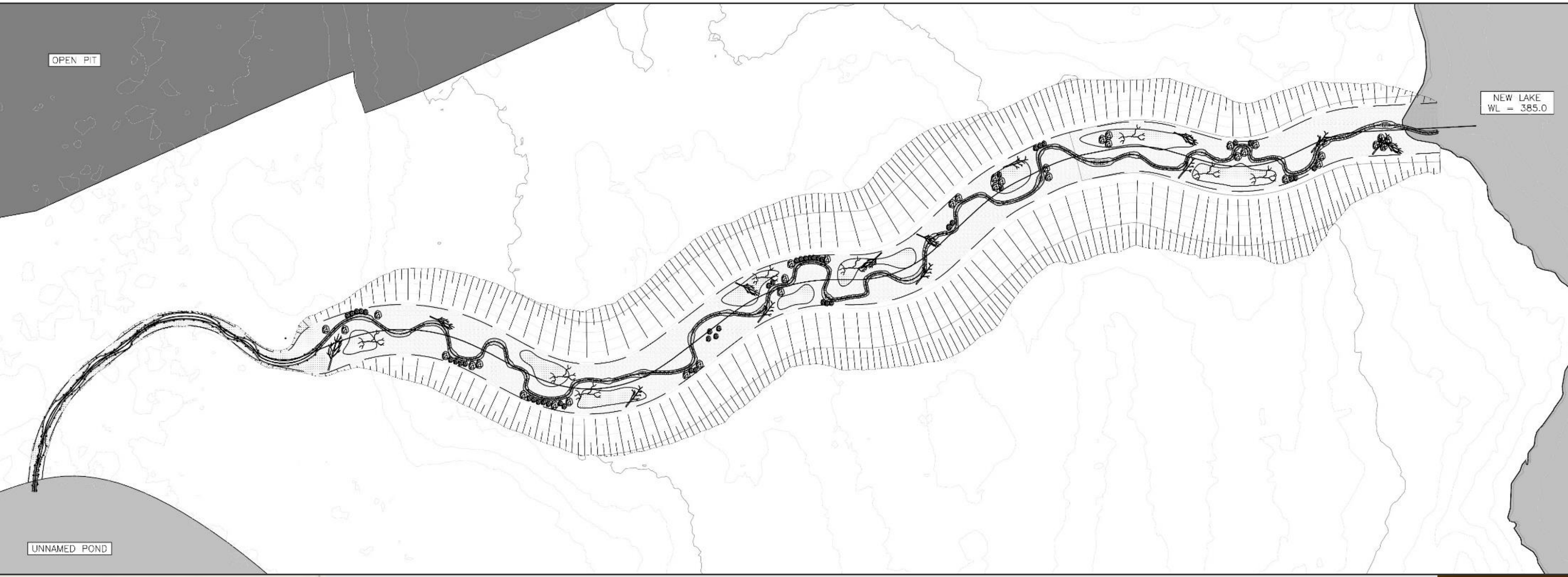
Clam Creek Realignment (WRC1)

- **Habitat features will include**
  - Spawning habitat within lake area for northern pike, yellow perch, and smallmouth bass
  - Spawning habitat within the stream for northern pike and yellow perch
  - Cover for all fish species and life stages



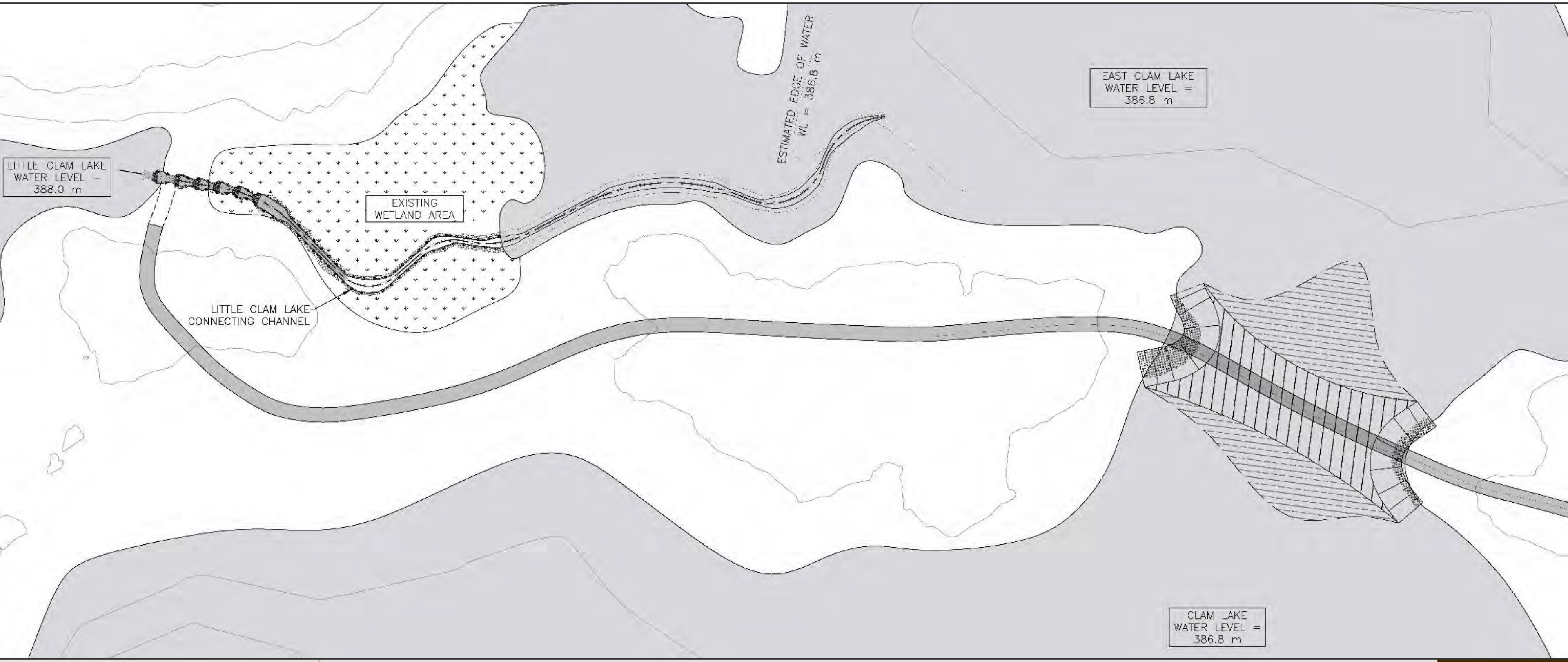
Unnamed Pond Outlet

- Tributary will maintain connection to the watershed
- Habitat will target small-bodied fish species



Connection of Little Clam, East Clam and Clam Lake

- **Access to a variety of habitat and better overwintering habitat**
- **Habitat features will include**
  - Spawning for northern pike, yellow perch, smallmouth bass



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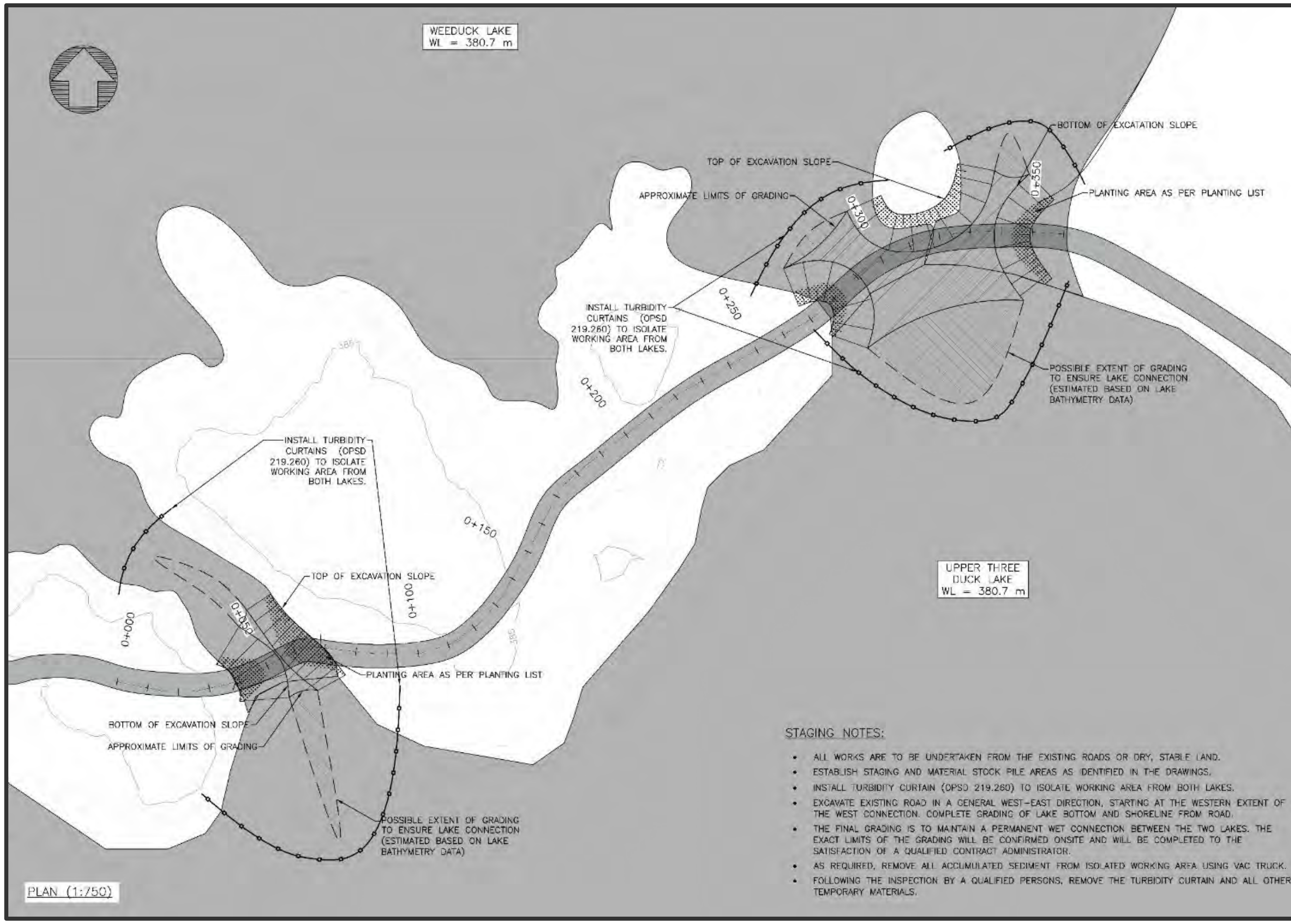
Connection of Weeduck Lake to Upper Three Duck Lake

CÔTÉ GOLD

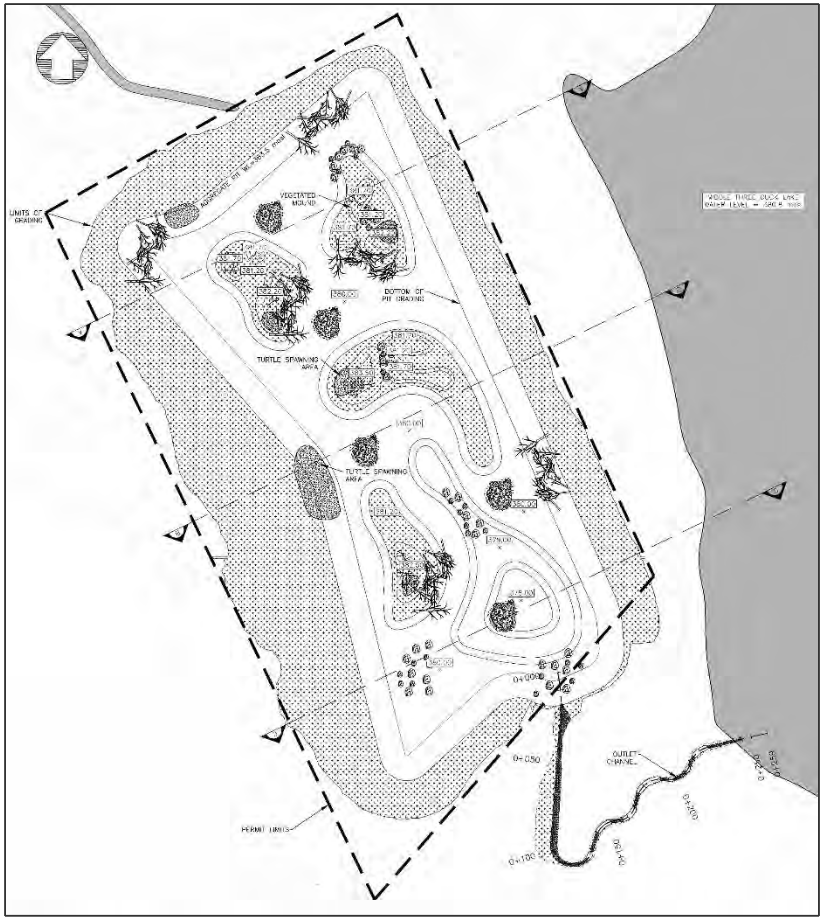
- **Allow the fish community access to a variety of habitat and better overwintering habitat**
- **Restore lake connection to historic configuration**

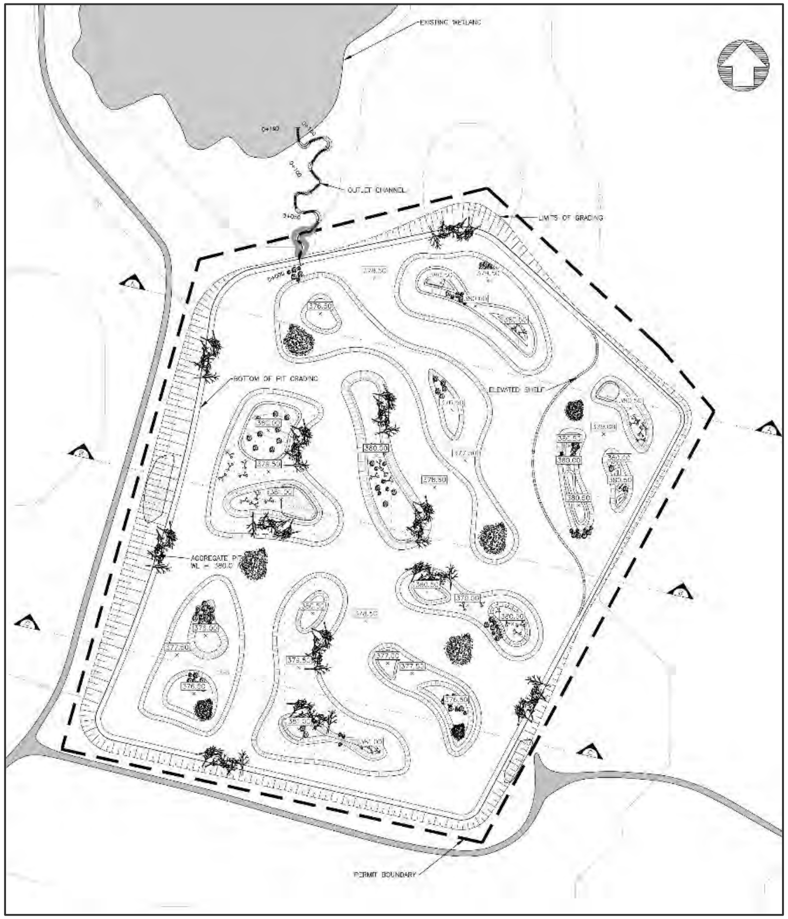


Aggregate Pit Remediation

CÔTÉ GOLD

- **Complex habitat to promote both small- and large-bodied fish community**





Mitigation Measures

- **Construction Sequencing**
- **Fish Salvage / Relocation**
- **Construction Best Management Practices**
  - Location of activities
  - Erosion and sediment control
  - Bank stabilization
  - Prevention of fish trapped in intake structures
  - Maintenance of machinery
  - Containment and spill management
  - Development of response plans
- **Monitoring**

Measures to Reduce Lag Times

- Incorporation of physical habitat features
- Planting of floodplains and shorelines to stabilize soils and promote spawning substrate
- Transplanting aquatic invertebrates to expedite the establishment of the aquatic food web
- Strategic transfer of fish
  - Small-bodied fish prior to large-bodied fish










Summary

- **The Offsetting Plan offers a net gain relative to losses**
- **Offsetting habitat will be sustainable, functional and maintain watersheds**
- **Measures will be incorporated to minimize lag times and improve connectivity within the watershed**
- **Submission – draft submitted in April for review**
  - Draft submitted to Mattagami First Nation, Flying Post First Nation, Wabun Tribal Council, Fisheries and Oceans, Environment and Climate Change Canada
  - Comments are welcome and will be responded to in the final submission

Mattagami First Nation – Community Meeting Report DRAFT
Côté Gold Project Update and Review of Fisheries Act Authorization
May 29, 2019
Mattagami Community Centre

IAMGOLD hosted a community information session/open house on May 29, 2019 at the Mattagami First Nation Community Centre from 4:30pm – 6:30pm. The purpose of this session was to provide a general Project update and an overview of the Fisheries Offsetting Plan.

Participants:

First Nation Partners
Stephanie Labelle, Wabun Tribal Council
Jason Batise, Wabun Tribal Council
Tim Harvey, Mattagami First Nation

IAMGOLD
Steven Bowles, IAMGOLD
Steve Woolfenden, IAMGOLD
David Brown, IAMGOLD
Jerry Finisie, IAMGOLD
Christian Naponse, IAMGOLD
Krista Maydew, Wood
Kim Connors, Minnow Environmental

Approximately 23 Mattagami First Nation (MFN) Community Members attended.

Agenda

4:30 - 5:00pm Dinner and Introductions

- The session began with an opening prayer by a community elder and an introduction from Tim Harvey – Lands and Resources Coordinator for Mattagami First Nation.

5:00 - 6:30pm Presentations from IAMGOLD and Minnow Environmental

- IAMGOLD provided a Project Update which included information on the Impact Benefit Agreement, the Project Construction deferral, activities on site, permitting update and ongoing communications and consultation. Following the general Project Update, Minnow Environmental provided a presentation on the Fisheries Offsetting plan which included information on fish habitat loss, new lake design, watercourse realignments, aggregate pit habitat design and lake connections design.

Questions / Comments from MFN Community Members

Q. When are you hiring?
A. During construction hiring will be done by the contractors. IAMGOLD will begin recruiting for Operations during the construction phase of the Project.

Q. Is everyone still on board for this/the investors?
A. Yes, at this time Sumitomo and IAMGOLD are supportive of the Project.

Q. What is the success rate for the fisheries offsetting plan?
A. Mitigation measures are monitored to determine that measures are working. If they are found not to be working properly, IAMGOLD is responsible for ensuring this is corrected.

Q. What do you do with the fish that die?
A. This depends on what is stated in the permits. They may be buried or disposed of in some other way, but the goal is to not have any dead fish at all if possible. Fish loss is usually young fish or small-bodied fish. There is the possibility that fish may be shared with the community. IAMGOLD is open to providing fish but there are critical considerations around timing and temperature that may prohibit such sharing.

Q. How do you make the lakes drain where you want them to and all the other water that is supposed to be moved around?
A. All of this is determined by the natural elevation of the area when the design is created.

Q. What is the flow of the Mollie River? If it is flowing south doesn't that affect the community? Specifically, I have concerns about a breached tailings dam.
A. Water from the Tailings Management Facility will be captured in a closed loop system to allow this water to be reused in the mill.

Q. How many dams will there actually be in the whole area?
A. There will be 13 dams in total.

Q. Will the dams and waste rock pile be monitored often?
A. Yes, monitoring will be in place for the entire duration of the Project, including post-Closure in perpetuity and the engineer of record would be required to perform inspections.

Q. How do you determine how many fish are in the lakes and rivers and what kinds?
A. We have 2013 population estimates for walleye and white sucker. We anticipate a large number of fish to be moved. Fish loss is usually to young fish or small-bodied fish (i.e., shiners)

Q. How are the fish salvaged?
A. Planning will take place to allow for strategic transfer of fish and dewatering. The fish will be captured through electrofishing, hoop nets, seining, and minnow traps. To minimize mortality, gill nets may not be used.

Additional comments

- IAMGOLD has committed that Mattagami First Nation will have opportunities to be involved in the fish capture and relocation.
- Regarding the current hatchery and opportunities that may be presented as a result of the fisheries offsetting plan the community expressed an interest in helping supply walleye if the fish salvage caught walleye during the spawning period and working with whomever is responsible for doing the fish salvage work
- Minnow has experience working with First Nation communities to train staff to hire for fisheries work which could include first aid training, WHMIS, electrofishing training and working safely around water training.
- Community member expressed that it is important for ample notice of work to be provided so that interested individuals have enough time to prepare, such as organizing daycare as this is one of the largest barriers to employment in the community.
- Regarding the fish capture, there is a commitment to involve Mattagami and Flying Post in the fish salvage work
- IAMGOLD is committed to supporting and hosting a water ceremony at Côté Lake when the arrangements can be made by Mattagami First Nation

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Offsetting Plan Summary for the Côté Gold Project

Overview

The Côté Gold Project (the Project) is a proposed open pit gold mine that is located approximately 20 km southwest of Gogama and 130 km southwest of Timmins. The Project is a joint venture between IAMGOLD and Sumitomo Metal Mining Co.

As part of the development of the Côté Gold Project, several water features will be fully or partially overprinted. The removal or alteration of lakes, rivers and other smaller waterbodies will result in a loss of fish habitat and potential harm to fish within these areas. The avoidance and mitigation of loss of fish habitat and potential harm to the fishery is an important part of the design and engineering of the Project, but as noted above, the Project is anticipated to permanently alter or destroy some existing fish habitat. Therefore, a *Fisheries Act* Authorization (FAA) under Section 35 of the *Fisheries Act* is required. Some of the existing waterbodies (ponds and small streams) will be overprinted by mine waste storage facilities (Tailings Management Area and Mine Rock Area). In order to place these storage facilities in areas with fish, an approval under Section 36 of the *Fisheries Act*, called a Schedule 2 Amendment is required. To obtain a FAA and Schedule 2 Amendment, IAMGOLD has developed a habitat "offsetting plan". This plan is designed to counterbalance unavoidable serious harm to fish (and loss of fish habitat) and, where possible, improve the productivity of the existing fishery. The Offsetting Plan addresses habitat losses under both Section 35 (FAA) and Section 36 (Schedule 2) of the *Fisheries Act* in a single comprehensive plan. The proposed Offsetting Plan has been developed to comply with the policies of Fisheries and Oceans Canada (DFO) to ensure sustainable productive capacity of the fish communities and habitats associated with the Project. This will be accomplished in several ways:

1. implementing a fish salvage and relocation program to reduce the number of fish harmed
2. scheduling offsetting activities to limit the length of time and spatial area of fish habitat being affected
3. developing new fish habitat in the same areas (watershed) as it is being lost (an "in-kind" approach to offsetting). Habitat that is destroyed or permanently altered will be replaced by similar or improved quality of the same type of habitat, with allowances for time for the new habitat to be fully functional. IAMGOLD proposes to create a New Lake and channel realignment plans
4. identifying additional out-of-kind offsetting to contribute to research to improve methods for environmental effect monitoring programs which monitor the aquatic environment and support the environmental management of mine effluents within Canada.

How is fish habitat loss calculated and compensated for?

The predicted loss of fish habitat associated with the Project was assessed relative to the planned habitat to be created (and altered) through the Offsetting Plan considering the net change in productive fish capacity. Habitat units were used as a substitute for fish productivity which is very difficult to effectively measure. Habitat units were considered for lakes and streams separately for five representative resident species (northern pike, yellow perch, walleye, lake whitefish, smallmouth bass) and considered their use of the habitat during their four key life history stages (i.e., spawning and incubation, juvenile rearing, adult foraging, and overwintering for all life stages). Fish habitat was also evaluated for those areas lost under Schedule 2 where only small-bodied forage fish (minnows) were present. The results of this assessment were totaled for each species for both habitat types before and after mine development.

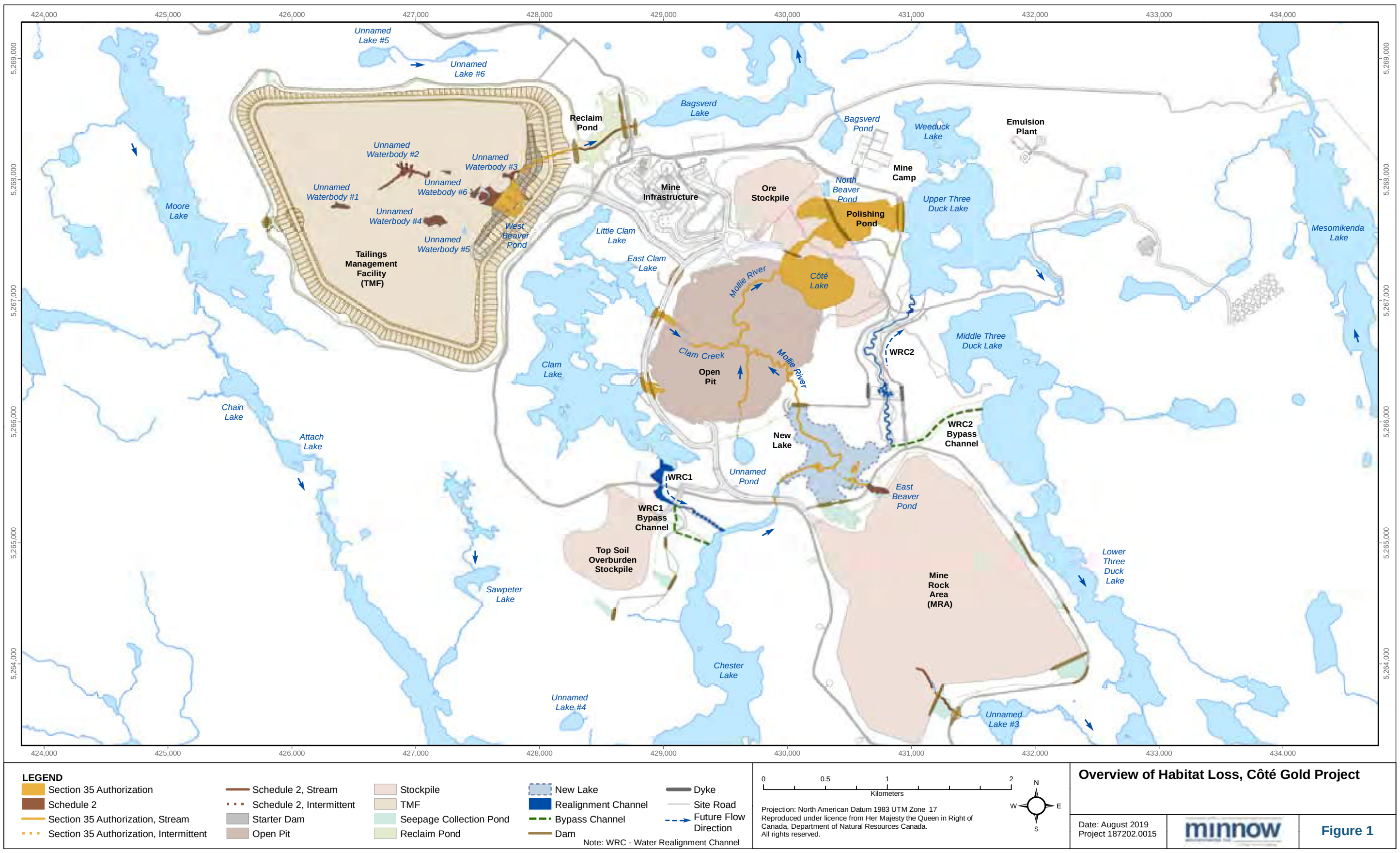
Which areas will be lost?

The Open Pit and Mine Rock Area will partially or fully overprint:

- Côté Lake
- Mollie River
- two small portions of Clam Lake
- several small tributaries and ponds within the Mollie River watershed.

Construction of the Tailings Management Facility will result in the loss of several small unnamed waterbodies, West Beaver Pond, and their associated tributaries.

Figure 1 provides an overview of fish habitat loss.



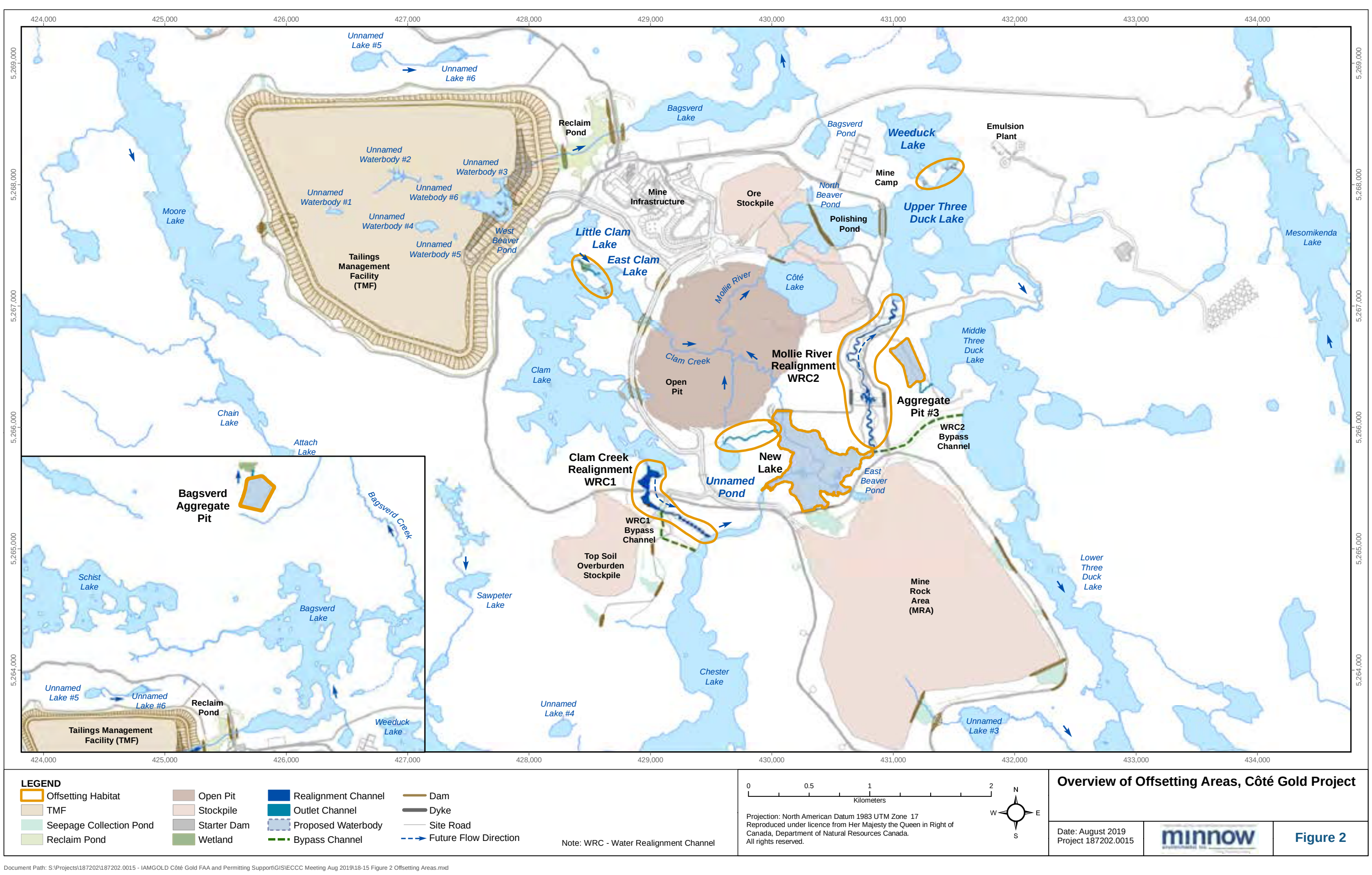
Document Path: S:\Projects\187202\187202.0015 - IAMGOLD Côté Gold FAA and Permitting Support\GIS\ECCC Meeting Aug 2019\18-15 Figure 1 Habitat Loss Overview.mxd

How will these losses be compensated?

To compensate for these habitat losses:

- streams will be constructed to maintain flow out of Clam Lake and in the Mollie River system
- flow from Clam Lake will be directed south to Chester Lake
- a New Lake will be created over portions of the Mollie River and East Beaver Pond (downstream of Chester Lake). The outlet of the New Lake will flow north to the southwest corner of Upper Three Duck Lake around the Open Pit
- Unnamed Pond outlet will be relocated to flow to the New Lake (to maintain its connection to the watershed
- existing connections between Little Clam and East Clam to Clam Lake and will be improved to allow fish greater access to habitats
- Weeduck Lake will be connected to Upper Three Duck Lake because it is currently cut off and fish cannot move from Weeduck to other habitats in the watershed
- two aggregate pits will be developed into fish habitat to support small-bodied fish communities
- IAMGOLD has also committed to providing in-kind compensation to further eDNA sampling of Environmental Effects Monitoring. However, this makes up a very small part of the offsetting plan which is mostly focused on creating habitat in the local area.

Figure 2 shows the offsetting areas proposed in the Offsetting Plan.



What will happen to these offsets at Closure?

Following operations and pit filling (expected to take approximately 30 years) most of the watercourse realignments will be left as wetland habitat and the watersheds will be returned to their original configuration. The Open Pit will be developed into a lake and the polishing pond will be restored (the low grade ore stockpile and the polishing pond dam will be removed) to the arm of Upper Three Duck. The New Lake will remain, as requested by First Nations during consultation on the approved mine Closure Plan.

Summary and Benefits

The assessment suggests that the proposed Offsetting Plan will result in a net gain in fish habitat with, more offsets being provided through lake habitat compared to stream habitat. While the stream offsets are less, the offsetting stream habitat is expected to be of high quality combining a diversity of habitat (riffles, deep pools, runs) and with a variety of structures for both cover and spawning. It is expected that this habitat will be suitable for a variety of species and promote connections within the watershed and access to a variety of habitats (both stream and lake). In addition, restoring East Clam Lake and Weeduck Lake to their original configuration by removing access roads that are no longer required, the fish populations within these lakes will have access to a variety of habitat and better overwintering conditions in larger lakes (e.g., Clam Lake and Upper Three Duck Lake).

The Offsetting Plan meets the goals of providing new habitat that maintains the flow connections of the watersheds, includes natural channel design to maximize the habitat productivity, and promotes connections within the watershed and between habitats. The Plan has committed to a number of mitigation measures including:

- consideration of fish habitat in construction sequencing
- fish salvages/relocations, construction best management practices
- methods to reduce the time required for the habitat to be fully functional (lag times). These include the construction of physical habitat features and the effective transplanting of various ecosystem components (e.g., plants and invertebrates) to stimulate the establishment of the aquatic ecosystem in the newly constructed habitat

Based on this assessment, the proposed Offsetting Plan, will result in an increase in fish productivity over the existing conditions.

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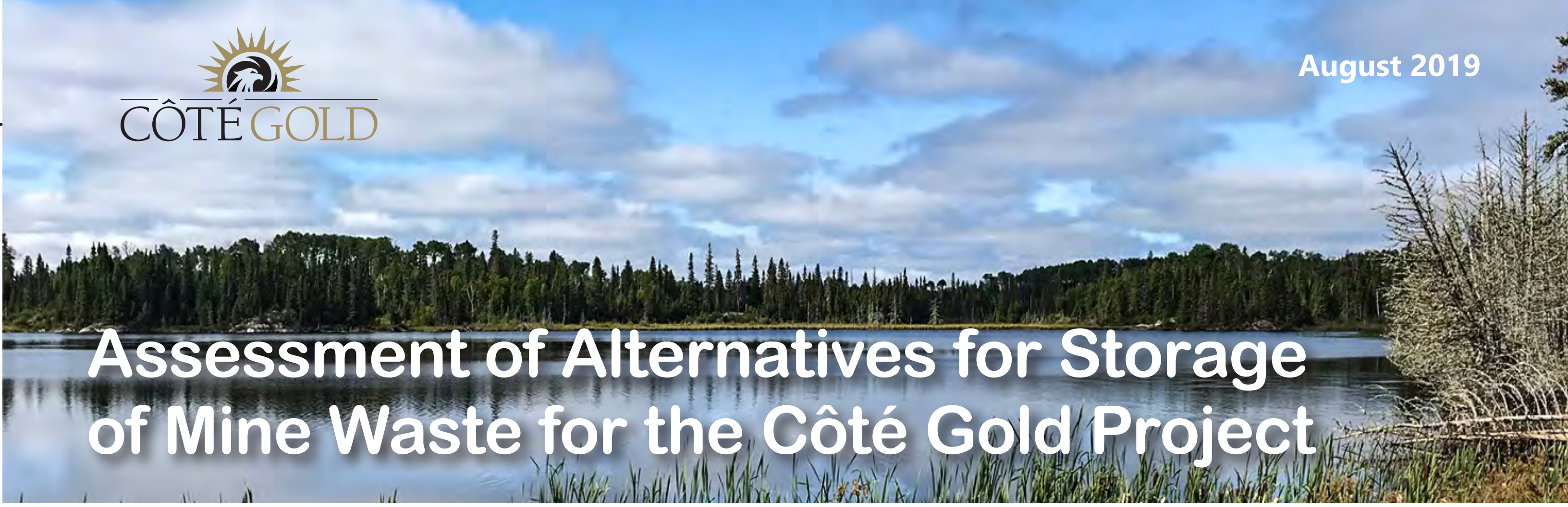


August 2019

Assessment of Alternatives for Storage of Mine Waste for the Côté Gold Project

Overview

IAMGOLD prepared an Amended Environmental Impact Statement / Final Environmental Assessment Report and completed federal and provincial environmental assessment processes. Through these processes and ongoing Project design, it was identified that two Project components; a tailings management facility with a reclaim pond, and a mine rock area, will overprint waters frequented by fish and therefore will require listing on Schedule 2 of the Metal and Diamond Mining Effluent Regulations (MDMER) in order for the Project to proceed.

Environment and Climate Change Canada oversees the process that must be undertaken when a proponent is considering using a natural water body as a tailings impoundment area. The Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Guidelines), are available at: https://www.canada.ca/en/environment-climate-change/services/managing-pollution/publications/guidelines-alternatives-mine-waste-disposal.html

The Côté Gold Project (the Project) is a proposed open pit gold mine that is located approximately 20 km southwest of Gogama and 130 km southwest of Timmins. The Project is a joint venture between IAMGOLD and Sumitomo Metal Mining Co.

As part of the Schedule 2 listing process, IAMGOLD is required to prepare an assessment of alternatives for mine waste disposal, a fish habitat compensation plan and to participate in consultation of possible amendments to the MDMER. This document summarizes the Assessment of Alternatives for Storage of Mine Waste.

The Assessment of Alternatives for Storage of Mine Waste objectively and rigorously assesses all feasible options for both tailings and mine (waste) rock management for the Project. The assessment is designed to find the most appropriate option for tailings and mine rock disposal from environmental, technical and socio-economic perspectives.

The assessment of alternatives follows a set process laid out in the guidelines set out by Environment and Climate Change Canada. For both tailings and mine rock, IAMGOLD undertook a seven step process:

Step 1. Identify potential alternatives. This involved determining which alternatives (locations and methods of storage) could be used for the storage of tailings and mine rock.

Step 2. Pre-screening assessment. This step screened out any alternatives which have a fatal flaw, ensuring at least one option does not overprint natural waters frequented by fish.

Step 3. Alternative characterization. This step involves describing the alternatives from environmental, technical, socio-economic and project economics perspectives.

Step 4. Multiple-accounts ledger. Step 4 is the beginning of a multiple accounts analysis, a decision making tool used by Environment and Climate Change Canada. The step included setting up evaluation criteria and measurement criteria (sub-accounts and indicators respectively).

Step 5. Value-based decision process. During this step each sub-account and indicator was weighted in importance, and assigned a value (scoring, weighting and quantitative analysis).

Step 6. Sensitivity analysis. A sensitivity analysis was conducted, recognizing not all stakeholders will not place the same importance on each impact.

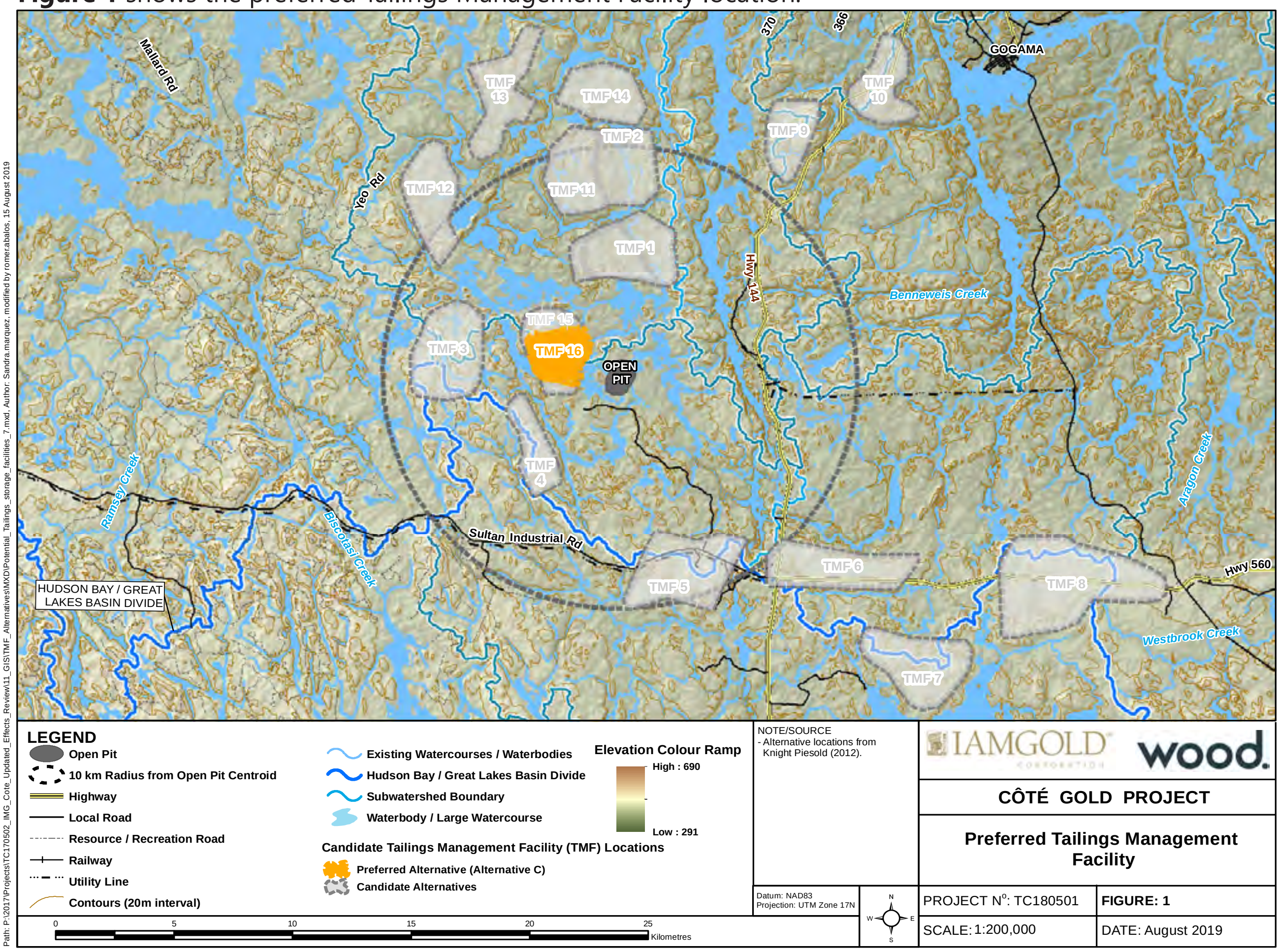
Step 7. Document results. To improve readability of this report, the assessments for tailings and mine rock were structured into six sections that reflect the above steps.

Summary of Tailings Assessment

Eighteen possible candidate alternatives were considered for potential deposition of tailings. The candidates included different locations for tailings management, as well different methods of tailings deposition such as dewatering or partially dewatering the tailings to change the type of impoundment structure.

The pre-screening assessment found four tailings management facility candidates were considered suitable for further consideration in the multiple accounts analysis. The four alternatives were brought forward to the multiple accounts analysis using each of the tailings storage methods and various locations near the Project site. The analysis found that the preferred alternative (from environmental, technical, socio-economics and Project economic perspectives) is to use thickened tailings, deposited northwest of the open pit (Figure 1).

Figure 1 shows the preferred Tailings Management Facility location.

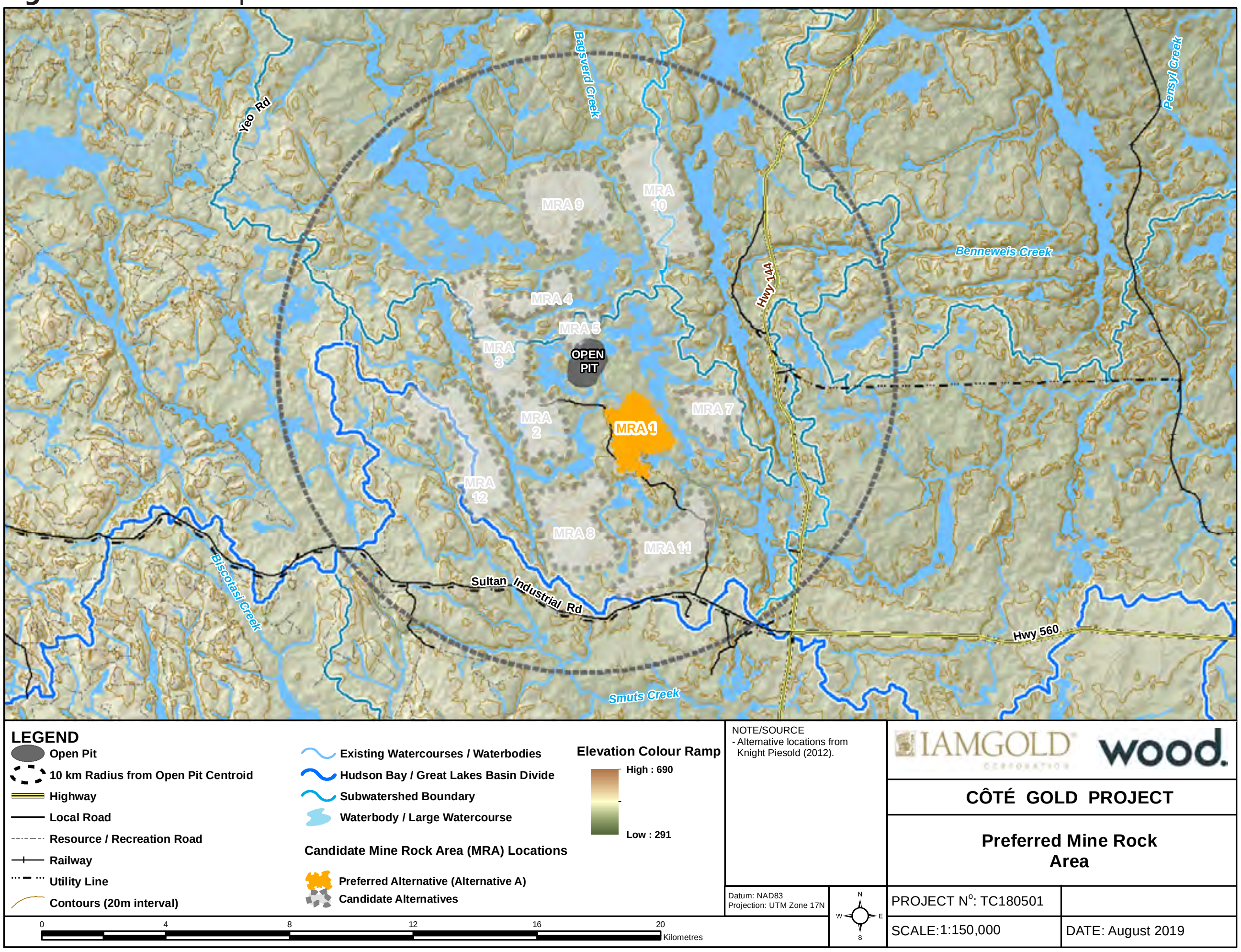


The sensitivity analysis found that the results do not materially change based on different weighting approaches. The preferred alternative will overprint a pond created by beaver activity, several smaller ponds, and a headwater tributary to Bagsverd Lake, which will require listing to Schedule 2 of the MDMER.

Summary of Mine Rock Assessment

Three storage methods and twelve mine rock storage locations were considered in the mine rock pre-screening analysis. Of these methods, one (surface stockpile) was carried forward to the multiple accounts analysis with five mine rock storage locations considered acceptable for further consideration in the multiple accounts analysis. Four alternatives were brought forward to the multiple accounts analysis using various combinations of the five potential mine rock storage locations. The analysis found the preferred alternative (from environmental, technical and Project economic perspectives) to be a single stockpile to the southeast of the Open Pit (Figure 2).

Figure 2 shows the preferred location for the Mine Rock Area.



The sensitivity analysis found that the results of the analysis do not materially change based on different weighting approaches. This alternative will overprint a small pond and a minor headwater tributary, which will require listing to Schedule 2 of the MDMER.

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Côté Gold Project

August 2019

Côté Gold Project Update

- **Côté Gold Construction Deferral**
- **Activities at the Côté Gold Site**
- **Permitting Update**
- **Ongoing Communication and Consultation**

Côté Construction Deferral

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Construction Deferral Decision:

"…to wait for improved, and sustainable, market conditions in order to proceed with construction… and to continue to advance engineering and permitting work at Côté…"

- **What does this mean?**
  - Continuing engagement efforts
  - Delaying start to construction of the Côté Gold Project
  - Continuing with permitting applications and engineering

Activities at the Côté Gold Site

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- **Early works program**
  - **Tree clearing (Spring 2019)**
    - Processed and burned slash piles
    - Merchantable timber sent to EACOM mills
  - **Drilling program**
    - Geotechnical and hydrogeological field studies for the detailed design of the Tailings Management Facility
  - **Geology program**
    - Further study to define the ore body

Tree Clearing – Open pit area – first load of timber being loaded and hauled off-site

Drilling Program for geotechnical Investigation – split spoon sampling

Activities at the Côté Gold Site

- **Activities planned for remainder of 2019**
  - Continued exploration drilling
  - Upgrades / replacement of exploration camp at Mesomikenda
  - Surface and groundwater monitoring
  - Site security monitoring

Tailings Management Facility starter dam access

Permitting Update: Submitted and Approved

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- **Submitted in 2019**
  - Aggregate Permits – Category 9 and 12 (January)
  - Permit to Take Water – Construction Dewatering (February); Realignment Channel Construction (July); Potable water (August)
  - Lakes and Rivers Improvement Act – Tailings Management Facility Starter Dams (March)
  - Environmental Compliance Approval – Air and Noise (March)
  - Environmental Compliance Approval – Water Management during Construction (May)
  - *Fisheries Act* Authorization / Fish Habitat Offsetting
  - Metal and Diamond Mining Effluent Regulations – Schedule 2 Amendment

- **Approved to date**
  - Environmental Effects Review (Federal and Provincial condition / decision statements updated)
  - Closure Plan
  - Forestry Resource License for Phase 1 Clearing
  - Transmission Line Environmental Study Report

Permitting Update: Upcoming Applications

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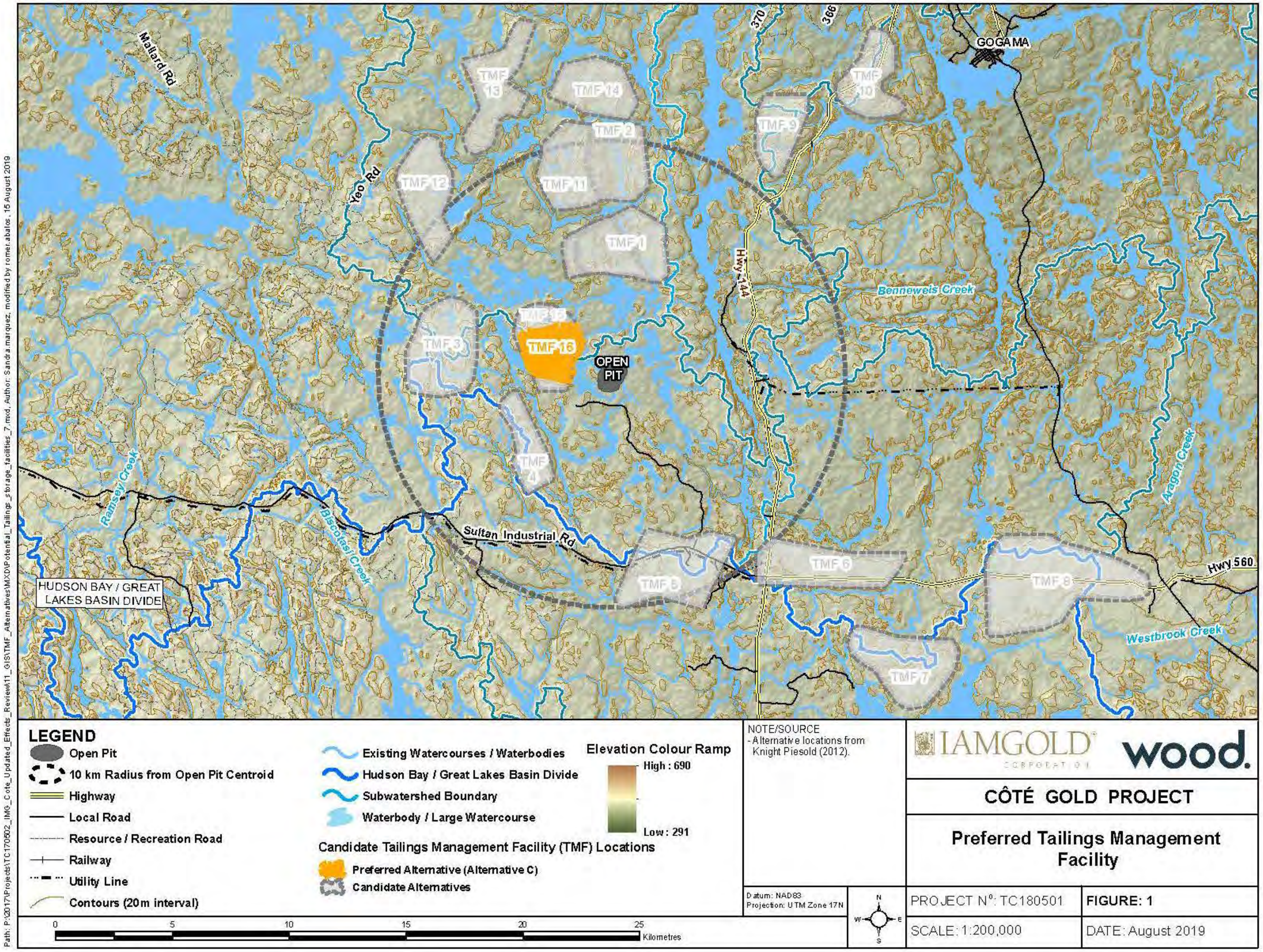
- **Future Permit Application Submissions**
  - Permit to Take Water – Open Pit Dewatering
  - Environmental Compliance Approvals – Industrial Sewage Works, Domestic Sewage Treatment
  - Lakes and Rivers Improvement Act – Access Road Hauling, Mollie River Realignment, Fish Habitat Offsets
  - Forestry Resource License for Construction Clearing

Assessment of Alternatives for Storage of Mine Waste

Assessment of Alternatives: Overview

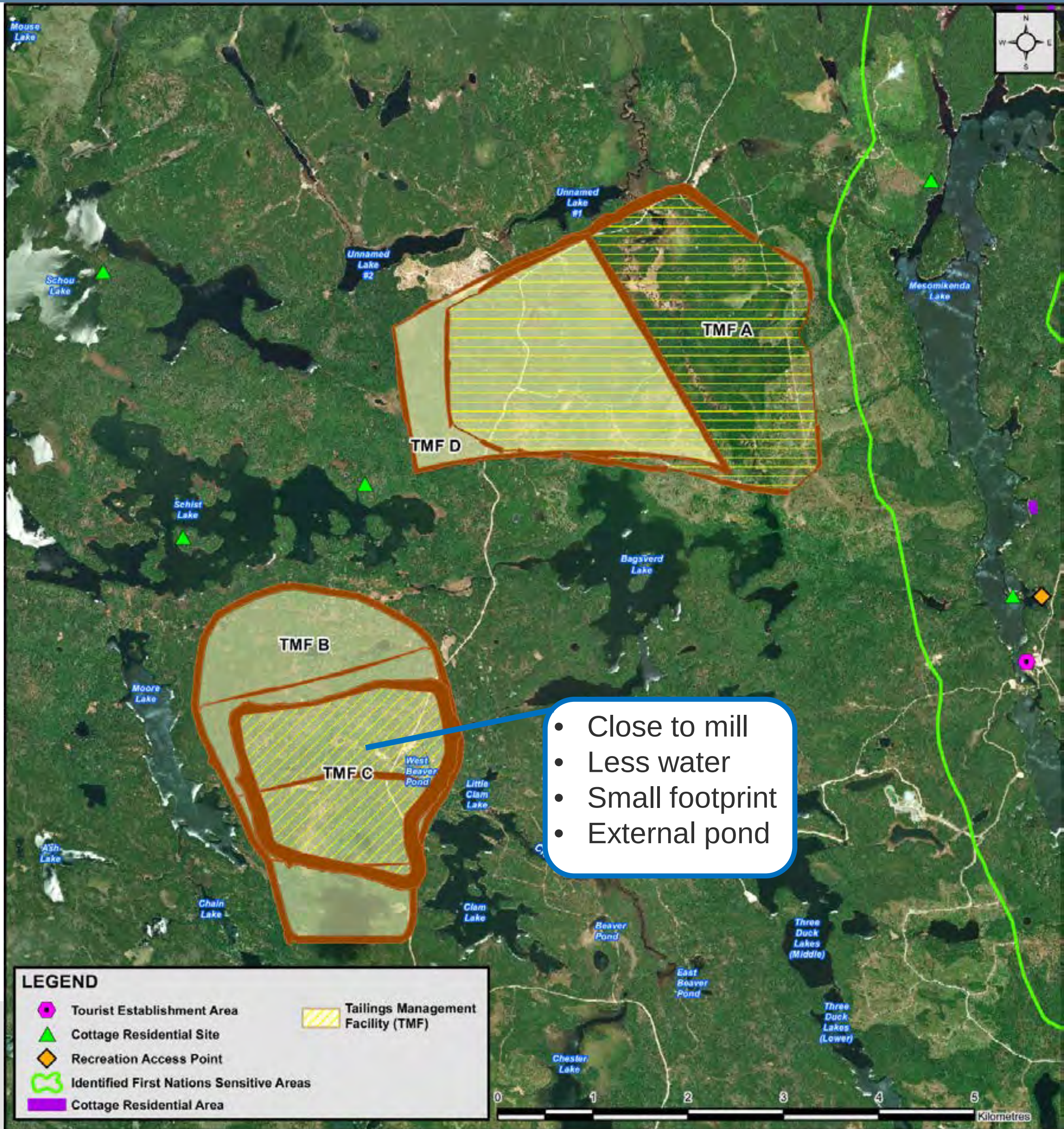
- **Two facilities require a MDMER Schedule 2 listing:**
  - Tailings Management Area
  - Mine Rock Area
- **Originally prepared as part of Environmental Assessment**
- **Assessment updated due to the optimized site layout**
- **Consultation on the revised layout and alternative location in 2018 in tandem with EER consultation**
- **Assessment of Alternatives prepared in accordance with ECCC's guidance material**

Assessment of Alternatives: Tailings

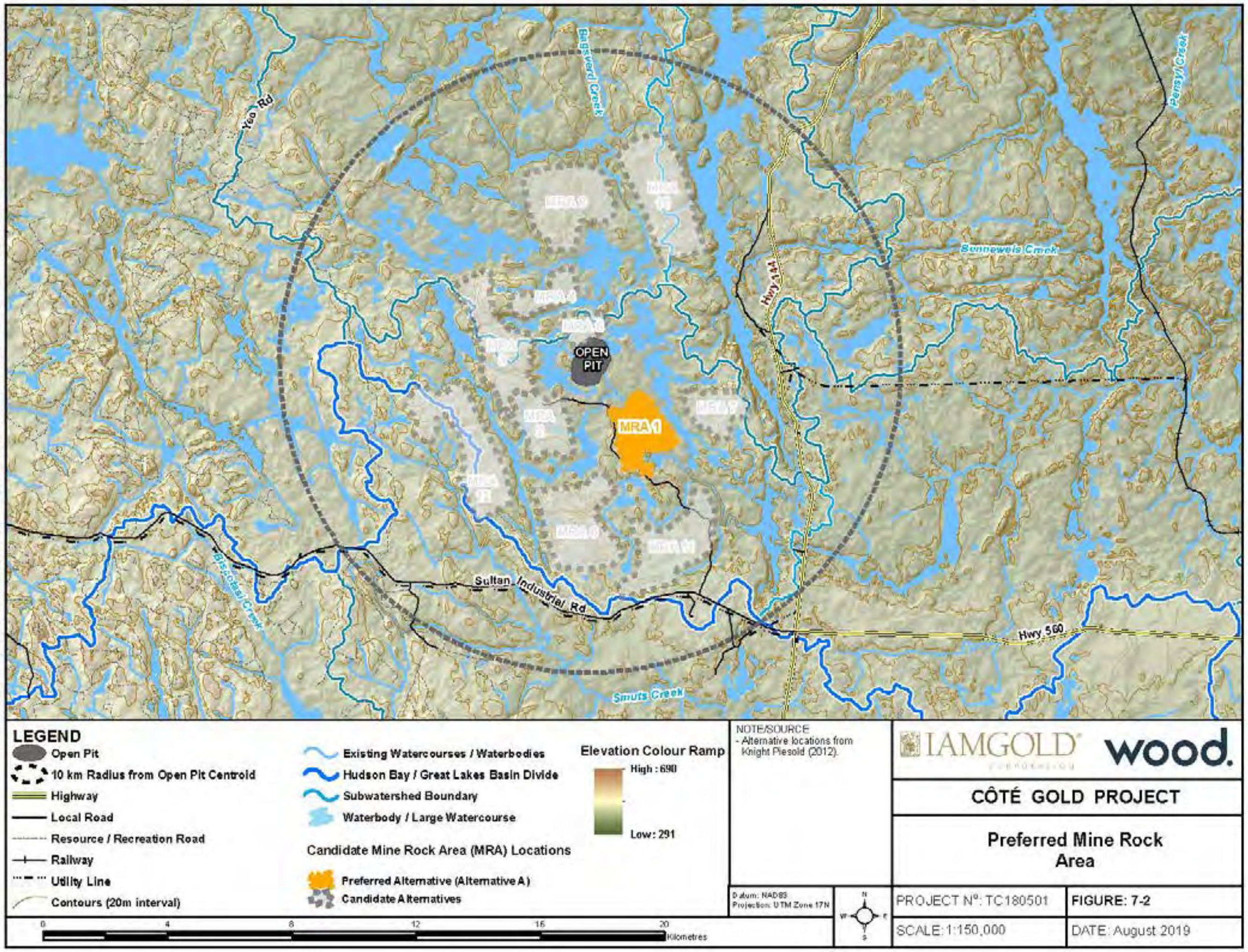


Assessment of Alternatives: Tailings

- **4 locations**
- **Utilized ECCC's methodology**
- **Assessment considered:**
  - Environmental
  - Social
  - Technical
  - Cost
- **Developed a ledger of effects (sub-accounts) and indicators to measure effects, applied weights**

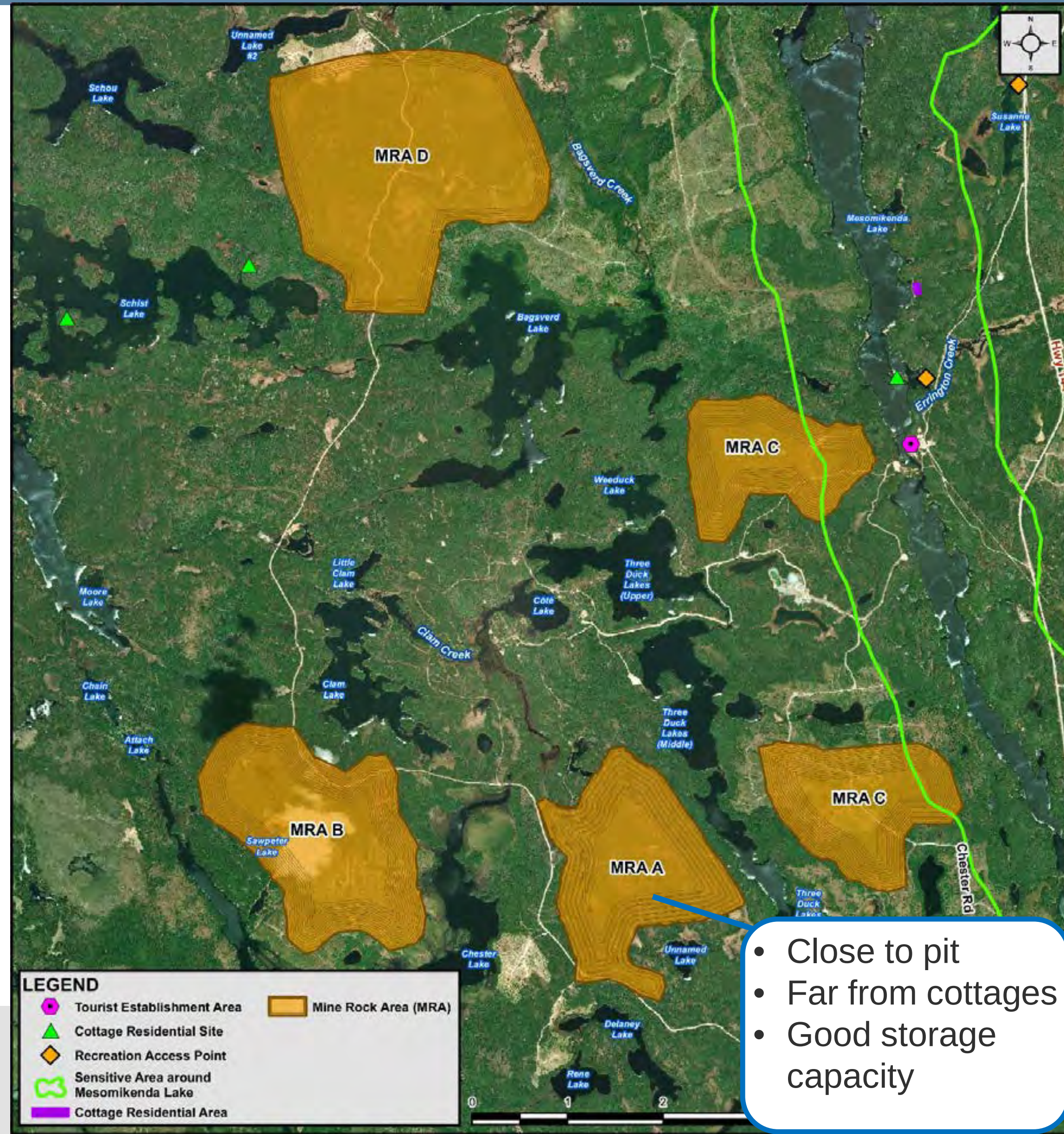


Assessment of Alternatives: Mine Rock



Assessment of Alternatives: Mine Rock

- **5 locations**
- **4 alternatives**
- **Assessment considered:**
  - Environmental
  - Social
  - Technical
  - Cost
- **Developed a ledger of effects (sub-accounts) and indicators to measure effects, applied weights**



- Close to pit
- Far from cottages
- Good storage capacity

Offsetting Plan

Offsetting Plan Presentation Outline

- Baseline Conditions
- Overview of Major Waterbodies within the Site Footprint
- What is an Offsetting Plan? Why do we need it?
- Summary of Lost Fish Habitat
- Proposed Offsetting Habitat
- Mitigation Measures
- Reduction of Lag Times
- Summary

Baseline Conditions

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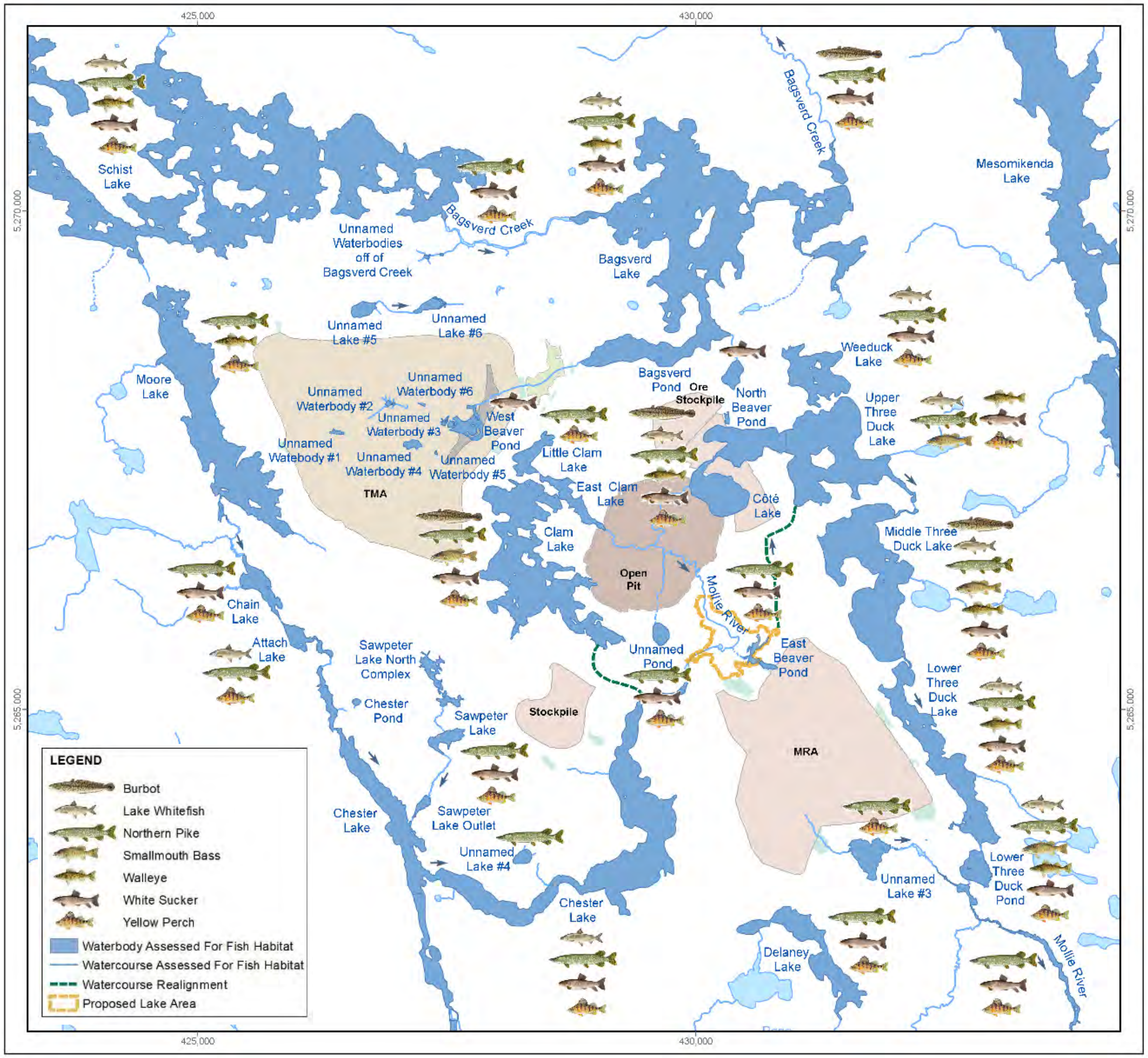
- **Study area is shallow warm lakes connected by meandering streams**
- **Habitat dominated by aquatic vegetation with sandy and silty substrate, some boulders, riffle and cobble habitat uncommon**
- **Fish Populations**
  - Dominated by northern pike and yellow perch
  - Walleye, smallmouth bass, lake whitefish and white sucker also common
  - 15 small-bodied species
  - No endangered, threatened or special concern fish species



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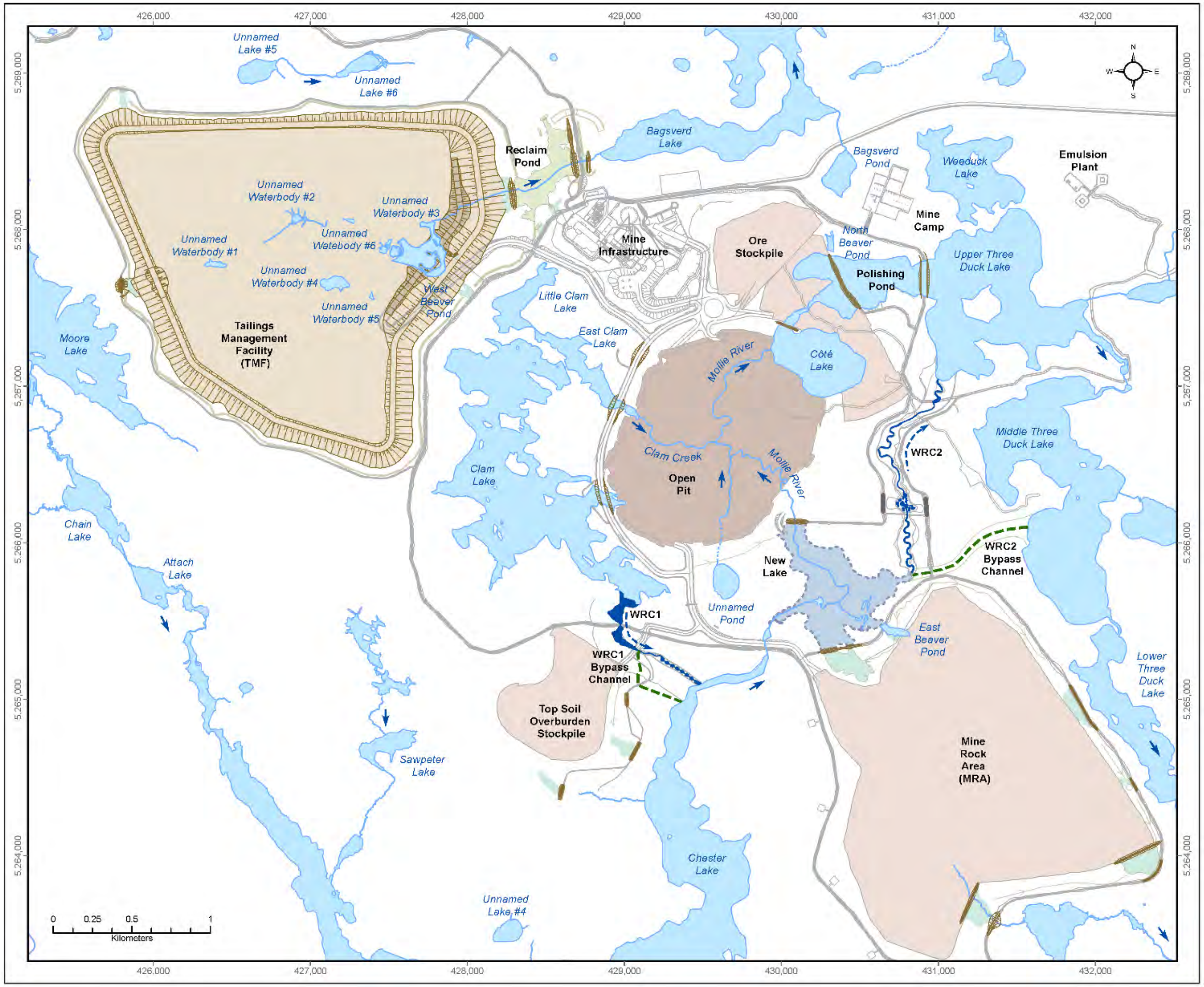
Major Waterbodies within the Site Footprint

- **Côté Lake**
- **Upper Three Duck Lake**
- **Mollie River**
- **Clam Lake and Clam Creek**
- **Several small unnamed waterbodies (less than 2 m in depth)**



What is an Offsetting Plan?

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- **In order for IAMGOLD to develop the Project, they must develop a plan to offset the harm to fish though an Offsetting Plan**
- **Fish habitat losses for the Project are categorized under two sections of the *Fisheries Act*:**
  - Section 35(2) – habitat lost due to infrastructure, and
  - Section 36 (3) – habitat lost due to the deposition of a deleterious substance
- **The plan is required for the submission of a *Fisheries Act* Authorization (Section 35) through DFO and for a Schedule 2 Amendment (Section 36) of the MDMER from ECCC**
- **This Offsetting Plan addresses the habitat losses under both sections of the *Fisheries Act* in a single comprehensive plan that will ensure no net loss of fish habitat and produce sustainable productive fish habitat and communities associated with the Project**

Summary of Lost Fish Habitat

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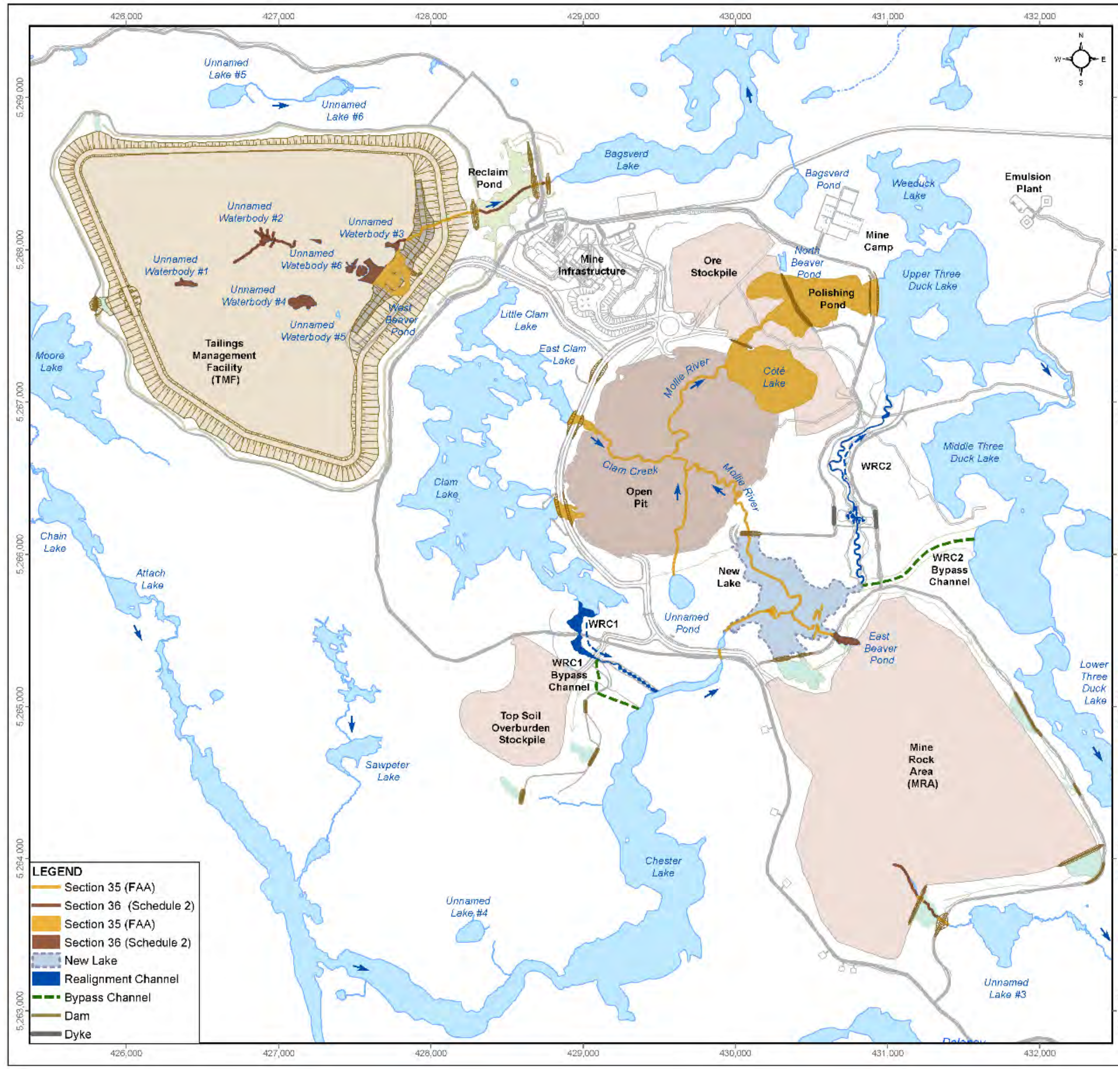
- **Open Pit**
  - Côté Lake
  - Upper Three Duck Lake
  - Mollie River
  - Clam Creek
  - Clam Lake
- **Tailings Management Facility**
  - small unnamed waterbodies
- **Mine Rock Area**
  - East Beaver Pond
  - Unnamed tributary



Proposed Offsetting Habitat

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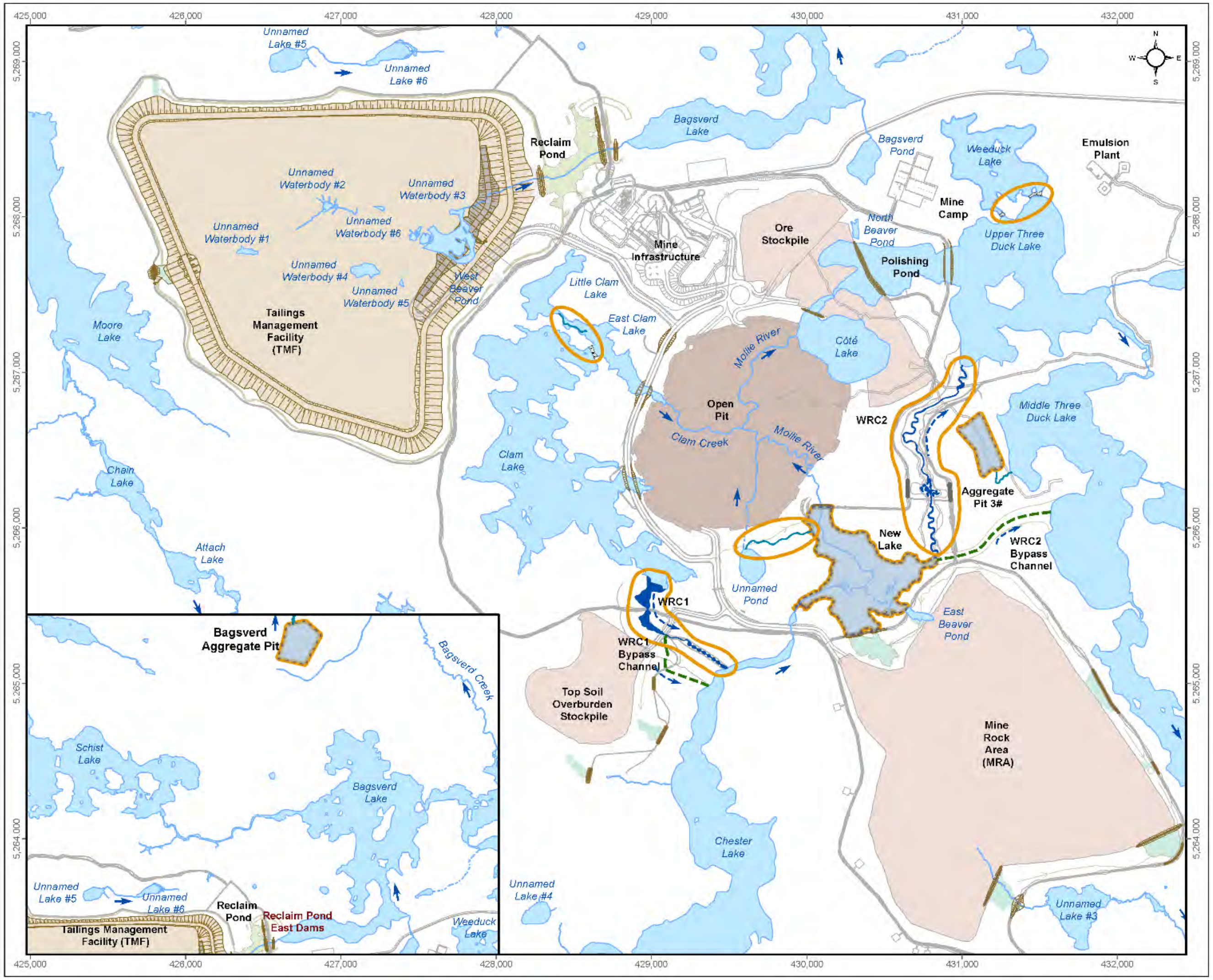
- **Designed Habitat**
  - Mollie River (WRC2)
  - New Lake
  - Clam Creek (WRC1)
  - Unnamed Pond Outlet
  - Little Clam/ East Clam Lake
  - Weeduck Lake
  - Aggregate Pits
    - Bagsverd
    - Pit #3



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Key Habitat Features Incorporated into Designs

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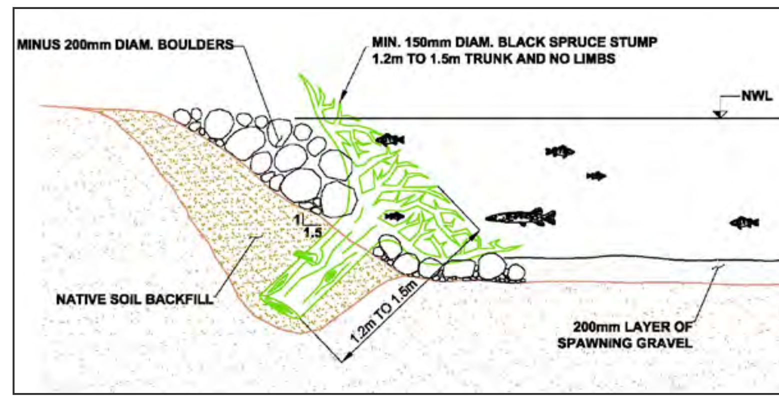
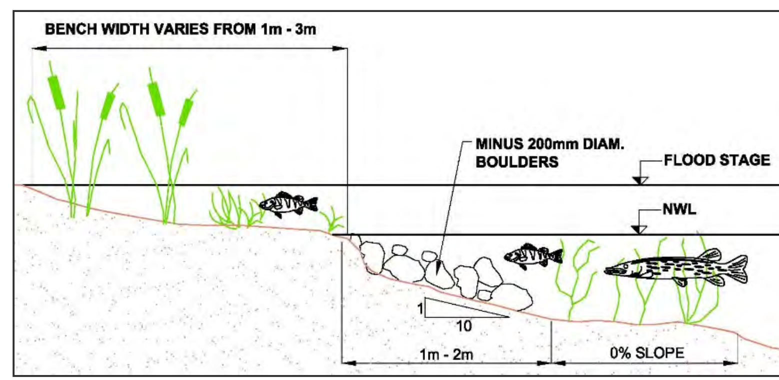
- **Diversity of Habitat**
  - Pool, Riffle, Glide
  - Complex Shoreline/Islands
- **Cover**
  - Large Woody Debris
  - Shoals, Cobbles, Boulders
  - Vegetation
- **Spawning Habitat**
  - Riffle Habitat, Shoals
  - Woody Structures
  - Aquatic Vegetation









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Mitigation Measures

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- **Construction Sequencing**
- **Fish Salvage / Relocation**
- **Construction Best Management Practices**
  - Location of activities
  - Erosion and sediment control
  - Bank stabilization
  - Prevention of fish trapped in intake structures
  - Maintenance of machinery
  - Containment and spill management
  - Development of response plans
- **Monitoring**

Measures to Reduce Lag Times

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- **Incorporation of physical habitat features**
- **Planting of floodplains and shorelines to stabilize soils and promote spawning substrate**
- **Transplanting aquatic invertebrates to expedite the establishment of the aquatic food web**
- **Strategic transfer of fish**
  - Small-bodied fish prior to large-bodied fish

Summary

- **The Offsetting Plan offers a net gain relative to losses**
- **Offsetting habitat will be sustainable, functional and maintain watersheds**
- **Measures will be incorporated to minimize lag times and improve connectivity within the watershed**
- **Submission – draft submitted in April for review**
  - Draft submitted to Mattagami First Nation, Flying Post First Nation, Wabun Tribal Council, Fisheries and Oceans, Environment and Climate Change Canada
  - Comments are welcome and will be responded to in the final submission

Mollie River Realignment (WRC2)

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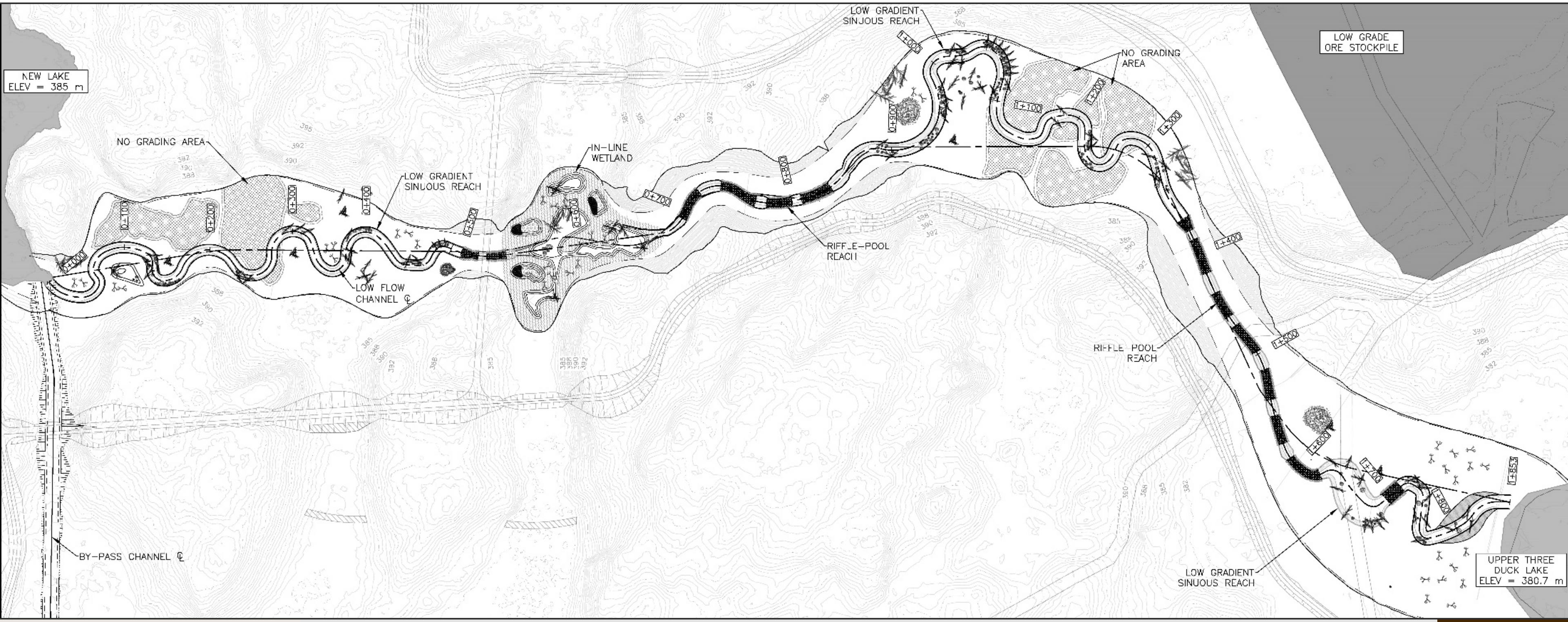
- **Habitat features will include**
  - Spawning habitat for northern pike, yellow perch, and walleye
  - Cover for all fish species
  - Complex habitat (riffle, run, pool) to support a variety of fish species



New Lake

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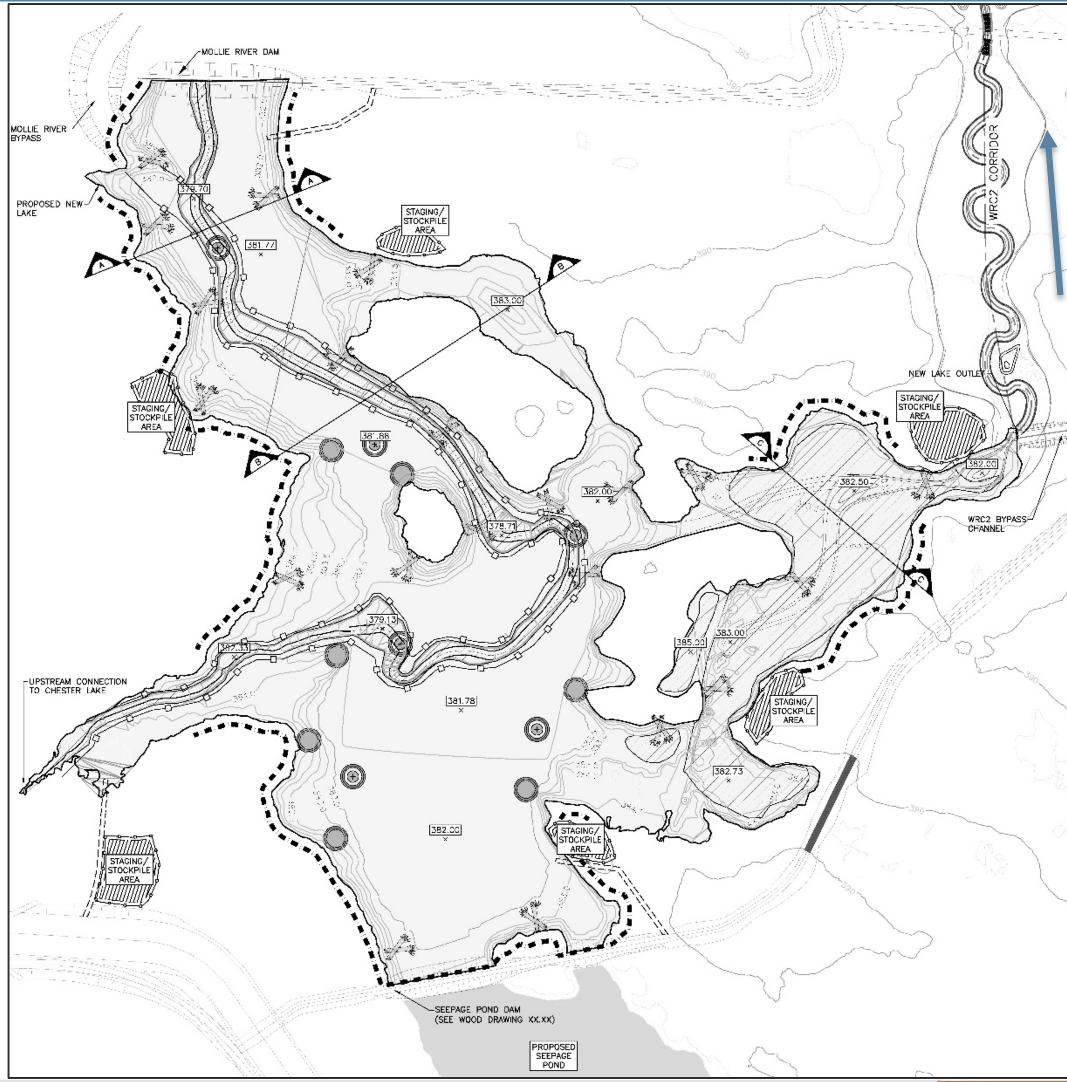
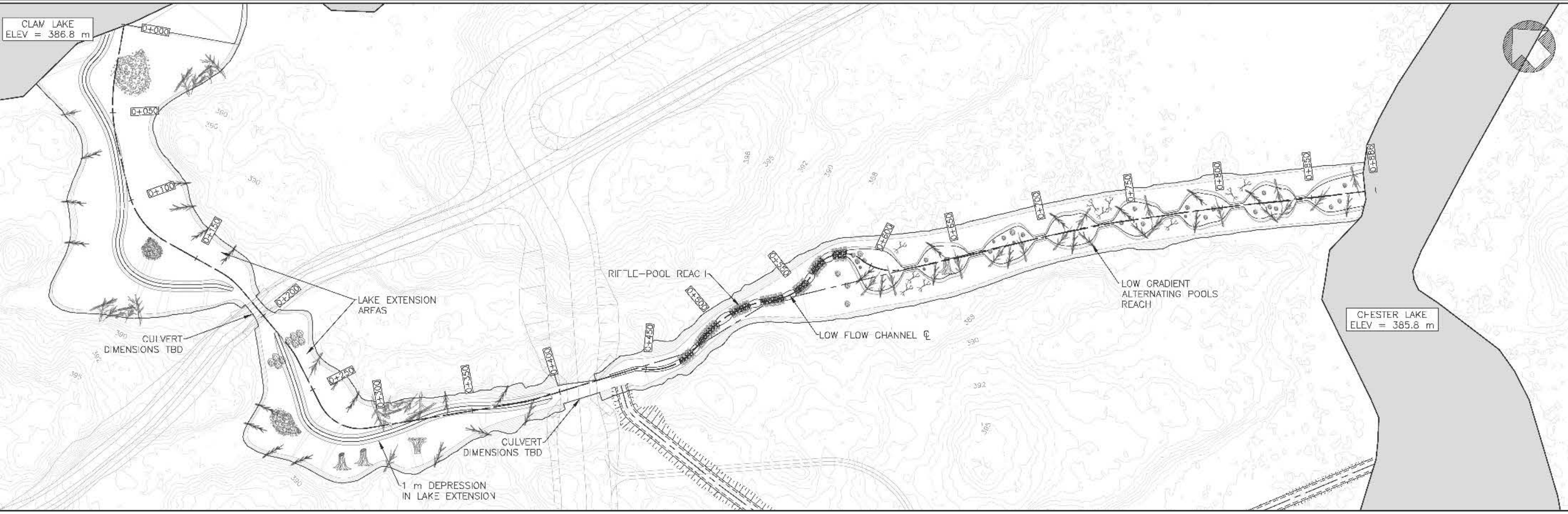
- **Habitat features will include**
  - Spawning habitat for northern pike and yellow perch
  - Point bar shoals for smallmouth bass spawning
  - Near shore habitat to provide cover for fish community
  - Deep water shoals
  - Islands for habitat complexity



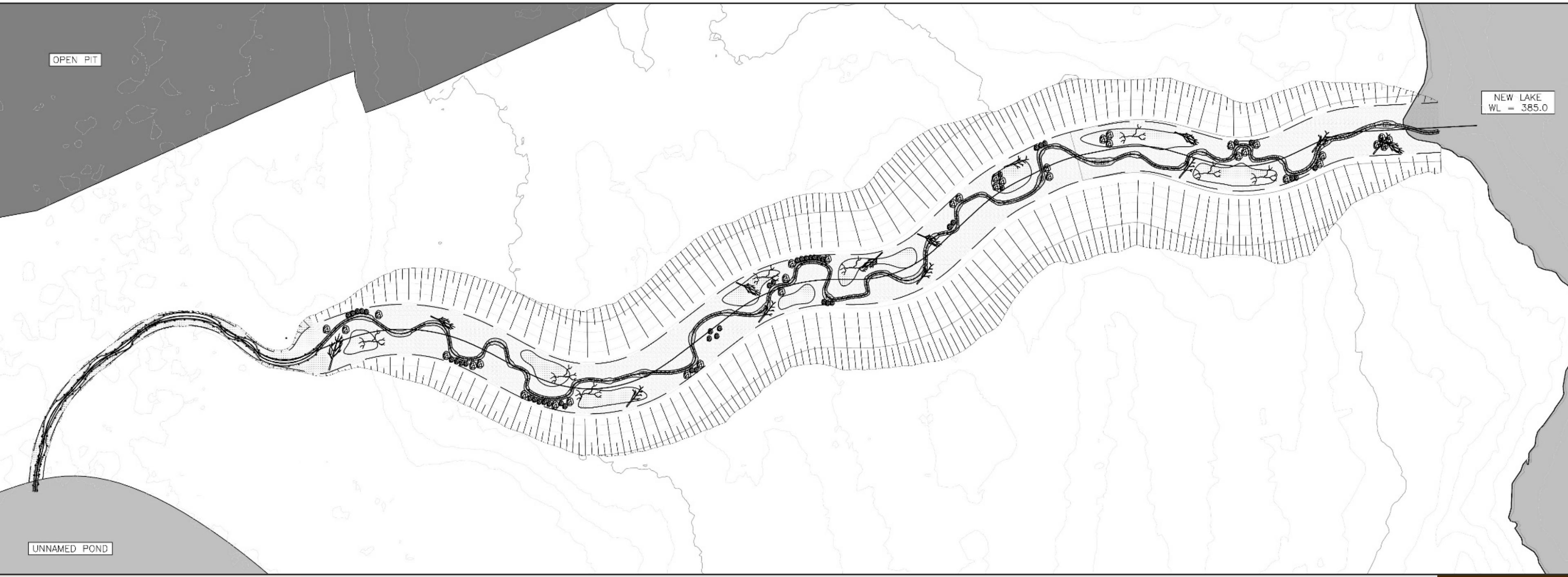
Clam Creek Realignment (WRC1)

- **Habitat features will include**
  - Spawning habitat within lake area for northern pike, yellow perch, and smallmouth bass
  - Spawning habitat within the stream for northern pike and yellow perch
  - Cover for all fish species and life stages



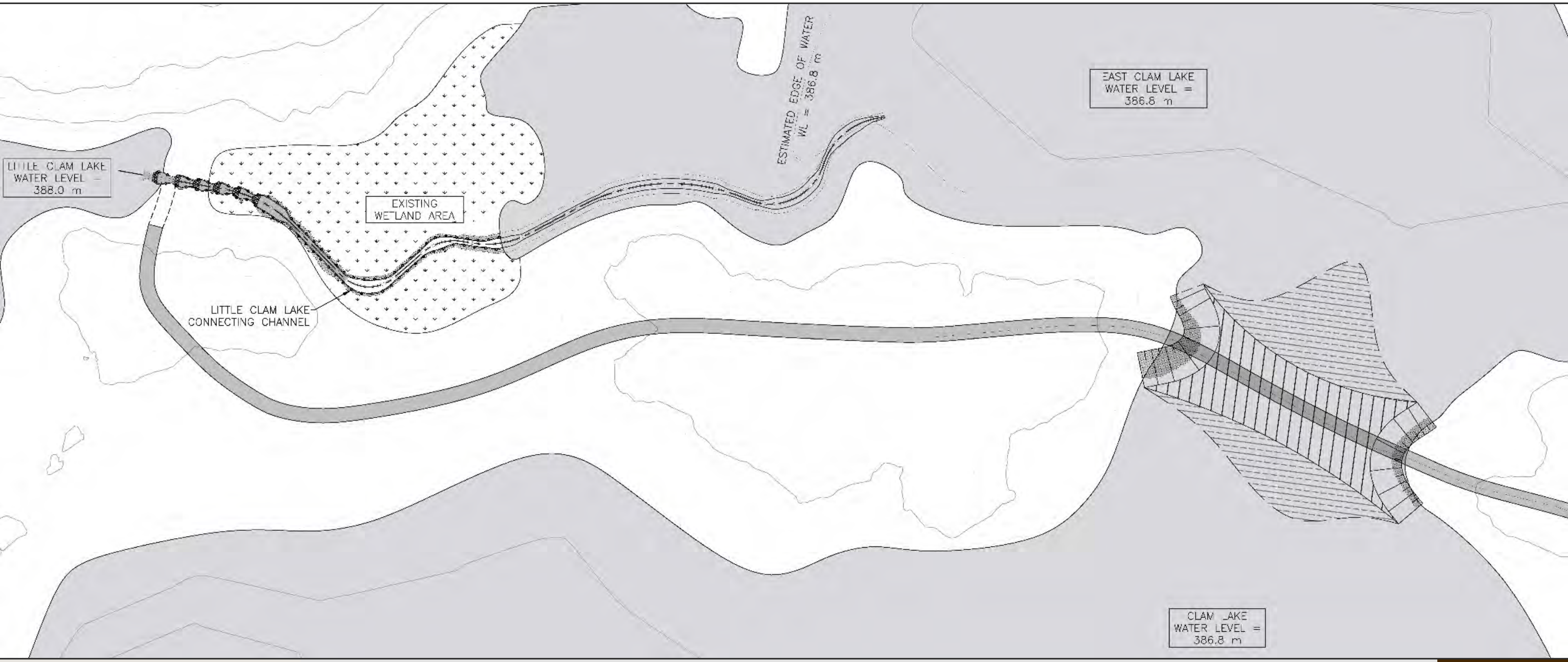
Unnamed Pond Outlet

- Tributary will maintain connection to the watershed
- Habitat will target small-bodied fish species



Connection of Little Clam, East Clam and Clam Lake

- **Access to a variety of habitat and better overwintering habitat**
- **Habitat features will include**
  - Spawning for northern pike, yellow perch, smallmouth bass



Connection of Weeduck Lake to Upper Three Duck Lake

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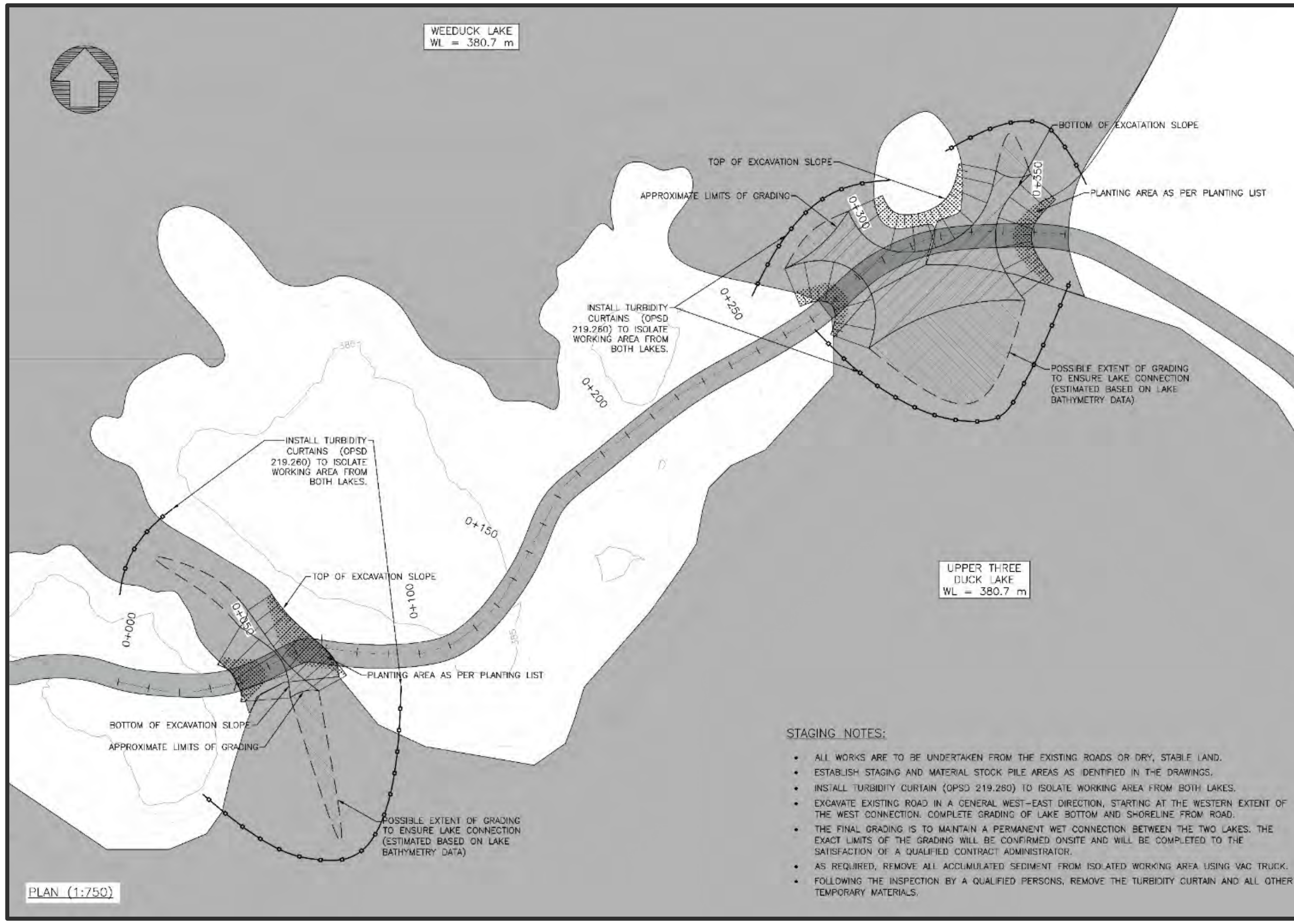
- **Allow the fish community access to a variety of habitat and better overwintering habitat**
- **Restore lake connection to historic configuration**



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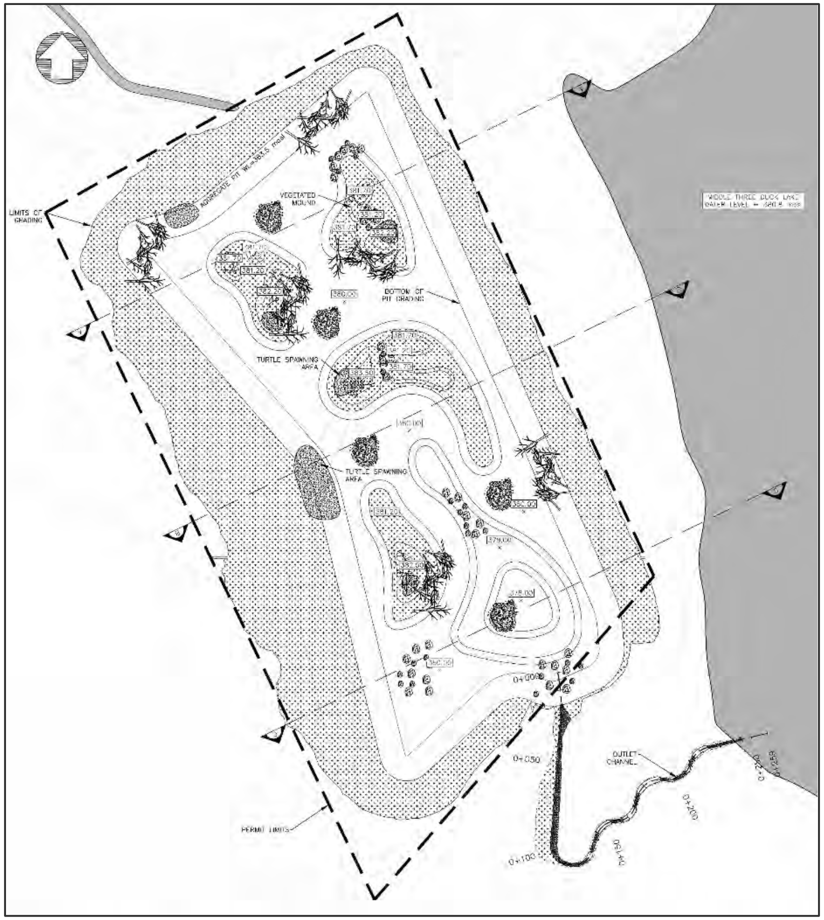
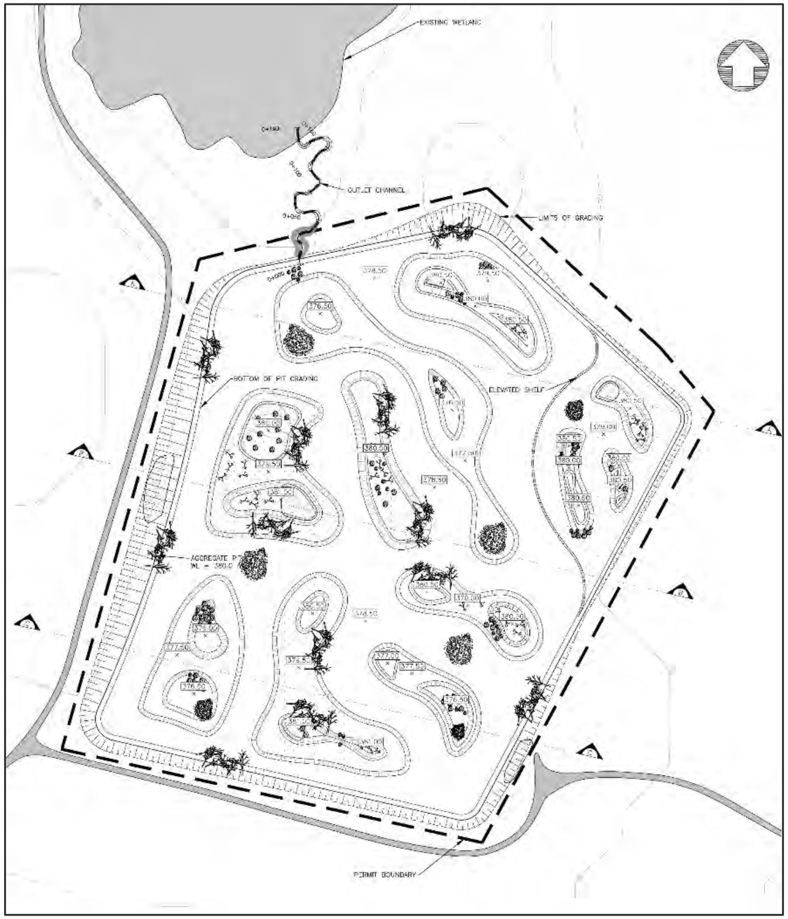
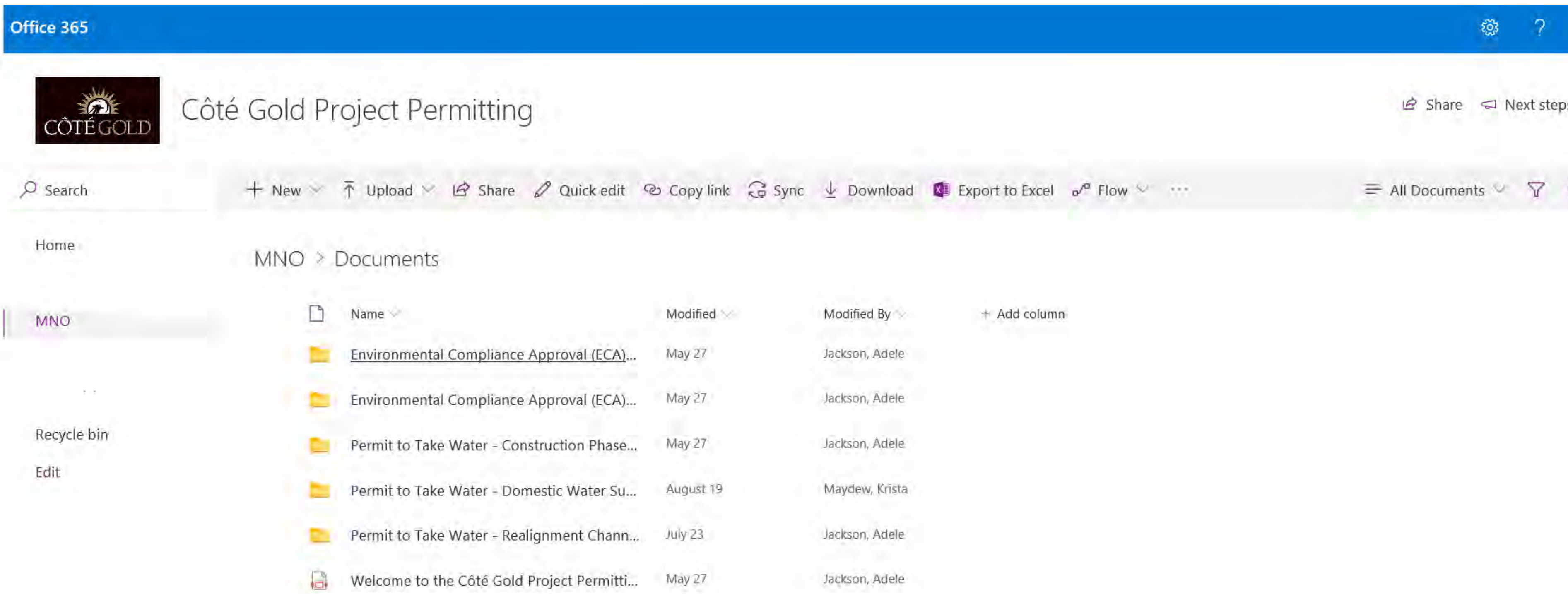
- **Complex habitat to promote both small- and large-bodied fish community**





Permitting

- **SharePoint established June 2019**
  - Provincial Condition to share Environmental Compliance Approvals (ECAs) and Permits to Take Water (PTTW)
  - https://iamgold.sharepoint.com/:f:/s/cg/ps/EnDFc8CSnYhJv5OMeAhGD5kBF5cQ2xGXUBYyhRs8FS_9Kg?e=utcVYG



Lakes and Rivers Improvement Act (LRIA)

CÔTÉ GOLD

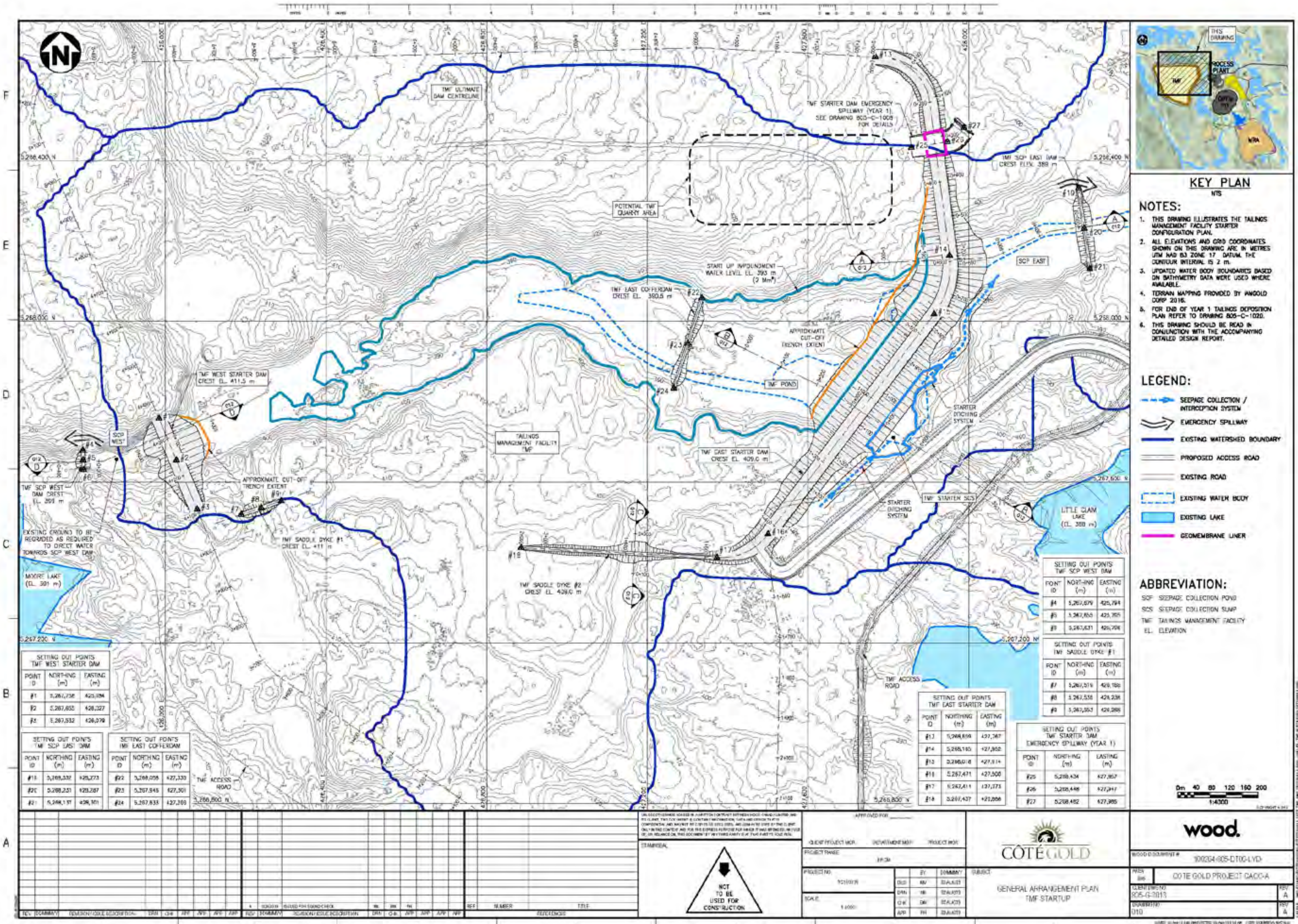
- **What is the LRIA?**
  - Provincial legislation intended for the management, protection, preservation and use of the waters of the lakes and rivers of Ontario and the land under them
  - Administered by the Ministry of Natural Resources and Forestry (MNRF)
  - Water retention structures such as dams across watercourses and alterations to lakes and rivers (channels) require approval under the LRIA

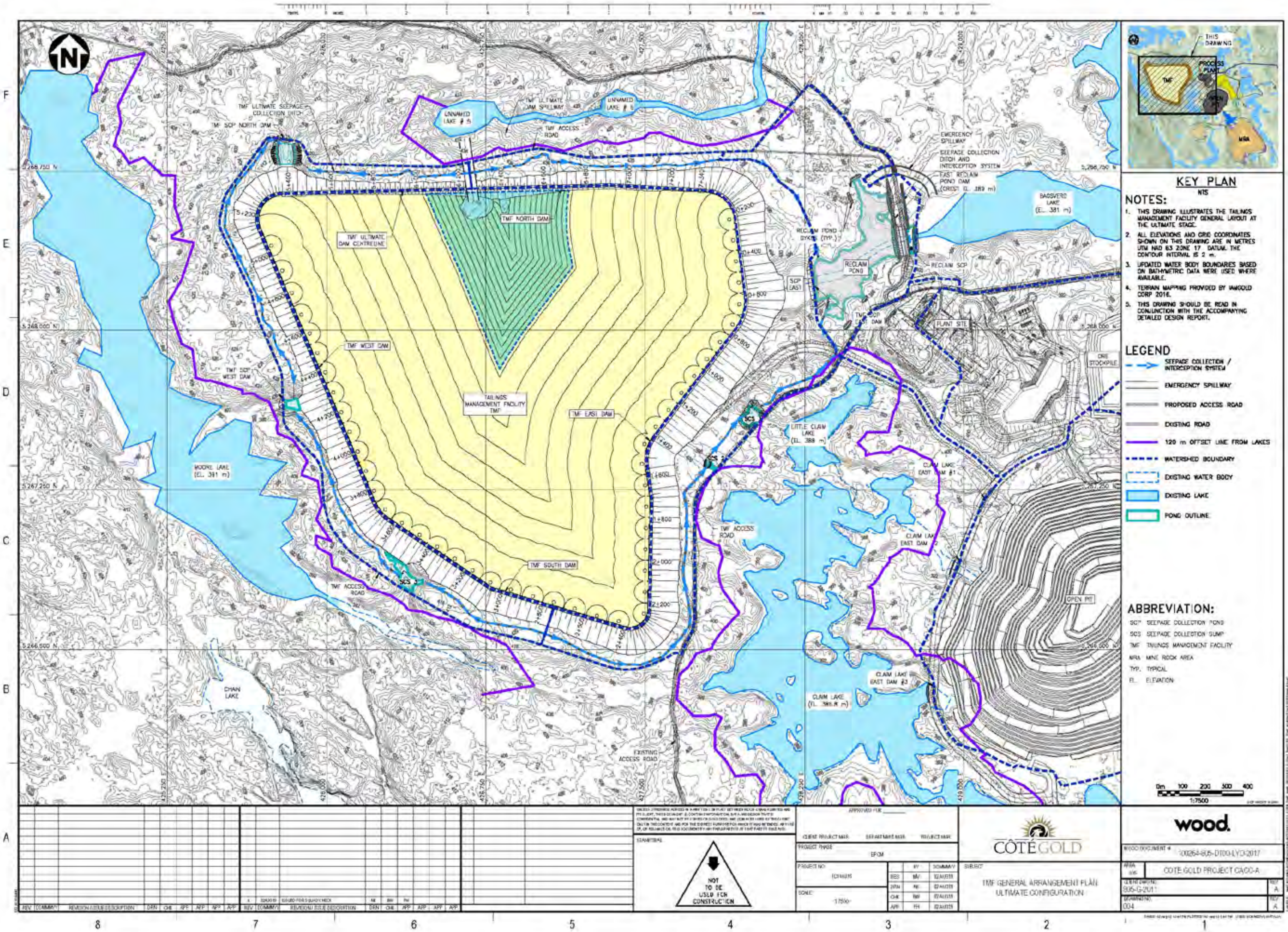
- **LRIA applications have two steps**
  - Location approval (district office determines if the location is suitable)
  - Plans and specifications approval (regional engineers review and approve the detailed design)

LRIA – Tailings Management Facility

CÔTÉ GOLD

- **LRIA for the Tailings Management Facility (TMF)**
  - Submitted to the MNRF March 2019
- **Application request location approval for the ultimate TMF and reclaim pond**
  - TMF will have annual dam raises subject to either MNRF or ENDM approval
- **Plans and specifications approval for TMF starter dam**
  - Reclaim pond is not required for starter dam and not included in the plans and specifications approval
- **Status: currently under review by MNRF**
- **Some optimizations to the design are in progress based on ongoing engineering and geotechnical studies**


TMF ULTIMATE DAM CENTRELINE
TMF STARTER DAM EMERGENCY SPILLWAY (YEAR 1) SEE DRAWING 805-C-1005 FOR DETAILS
POTENTIAL TMF QUARRY AREA
START UP IMPOUNDMENT WATER LEVEL EL. 393 m
TMF EAST COFFERDAM CREST EL. 390.5 m
SCP EAST
APPROXIMATE CUT-OFF TRENCH EXTENT
TMF POND
TMF WEST STARTER DAM CREST EL. 411.5 m
TAILINGS MANAGEMENT FACILITY TMF
TMF EAST STARTER DAM CREST EL. 409.0 m
STARTER DITCHING SYSTEM
TMF STARTER SCS
LITTLE CLAM LAKE (EL. 388 m)
TMF SCP WEST DAM CREST EL. 409 m
EXISTING GROUND TO BE REGRADED AS REQUIRED TO DIRECT WATER TOWARDS SCP WEST DAM
MOORE LAKE (EL. 391 m)
TMF SADDLE DYKE #1 CREST EL. 411 m
TMF SADDLE DYKE #2 CREST EL. 409.0 m
TMF ACCESS ROAD
SETTING OUT POINTS TMF WEST STARTER DAM
SETTING OUT POINTS TMF SCP EAST DAM
SETTING OUT POINTS TMF EAST COFFERDAM
SETTING OUT POINTS TMF EAST STARTER DAM
SETTING OUT POINTS TMF SCP WEST DAM
SETTING OUT POINTS TMF SADDLE DYKE #1
SETTING OUT POINTS TMF STARTER DAM EMERGENCY SPILLWAY (YEAR 1)
KEY PLAN
NTS
NOTES:
1. THIS DRAWING ILLUSTRATES THE TAILINGS MANAGEMENT FACILITY STARTER CONFIGURATION PLAN.
2. ALL ELEVATIONS AND GRID COORDINATES SHOWN ON THIS DRAWING ARE IN METRES UTM NAD 83 ZONE 17 DATUM. THE CONTOUR INTERVAL IS 2 m.
3. UPDATED WATER BODY BOUNDARIES BASED ON BATHYMETRY DATA WERE USED WHERE AVAILABLE.
4. TERRAIN MAPPING PROVIDED BY IAMGOLD CORP 2016.
5. FOR END OF YEAR 1 TAILINGS DEPOSITION PLAN REFER TO DRAWING 805-C-1020.
6. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ACCOMPANYING DETAILED DESIGN REPORT.
LEGEND:
SEEPAGE COLLECTION / INTERCEPTION SYSTEM
EMERGENCY SPILLWAY
EXISTING WATERSHED BOUNDARY
PROPOSED ACCESS ROAD
EXISTING ROAD
EXISTING WATER BODY
EXISTING LAKE
GEOMEMBRANE LINER
ABBREVIATION:
SCP SEEPAGE COLLECTION POND
SCS SEEPAGE COLLECTION SUMP
TMF TAILINGS MANAGEMENT FACILITY
EL. ELEVATION
NOT TO BE USED FOR CONSTRUCTION
CÔTÉ GOLD
GENERAL ARRANGEMENT PLAN TMF STARTUP
wood.
COTE GOLD PROJECT CACO-A



KEY PLAN
NTS
NOTES:
1. THIS DRAWING ILLUSTRATES THE TAILINGS MANAGEMENT FACILITY GENERAL LAYOUT AT THE ULTIMATE STAGE.
2. ALL ELEVATIONS AND GRID COORDINATES SHOWN ON THIS DRAWING ARE IN METRES UTM NAD 83 ZONE 17 DATUM. THE CONTOUR INTERVAL IS 2 m.
3. UPDATED WATER BODY BOUNDARIES BASED ON BATHYMETRIC DATA WERE USED WHERE AVAILABLE.
4. TERRAIN MAPPING PROVIDED BY IAMGOLD CORP 2016.
5. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE ACCOMPANYING DETAILED DESIGN REPORT.
LEGEND
SEEPAGE COLLECTION / INTERCEPTION SYSTEM
EMERGENCY SPILLWAY
PROPOSED ACCESS ROAD
EXISTING ROAD
120 m OFFSET LINE FROM LAKES
WATERSHED BOUNDARY
EXISTING WATER BODY
EXISTING LAKE
POND OUTLINE
ABBREVIATION:
SCP SEEPAGE COLLECTION POND
SCS SEEPAGE COLLECTION SUMP
TMF TAILINGS MANAGEMENT FACILITY
MRA MINE ROCK AREA
TYP. TYPICAL
EL. ELEVATION
TAILINGS MANAGEMENT FACILITY TMF
TMF NORTH DAM
TMF WEST DAM
TMF EAST DAM
TMF SOUTH DAM
TMF ULTIMATE DAM CENTRELINE
MOORE LAKE (EL. 391 m)
LITTLE CLAM LAKE (EL. 388 m)
CLAM LAKE
CHAN LAKE
BAGSVERD LAKE (EL. 381 m)
RECLAIM POND
OPEN PIT
PLANT SITE
ORE STOCKPILE
EXISTING ACCESS ROAD
TMF ACCESS ROAD
NOT TO BE USED FOR CONSTRUCTION
CÔTÉ GOLD
wood.
TMF GENERAL ARRANGEMENT PLAN ULTIMATE CONFIGURATION
CÔTÉ GOLD PROJECT CAGC-A
1:7500

Ongoing Communication and Consultation

We invite you to come and learn about the Project, provide your feedback, ask questions and get involved!

For more information please contact us: cotegold@iamgold.com

Dave Brown
Manager of Environment and Community Relations, Côté Gold Project
david_brown@iamgold.com

Christian Naponse
Coordinator Community Affairs, Côté Gold Project
christian_naponse@iamgold.com

Summary of the public consultation session (Gogama, Ontario)

Proposed authorization for mine waste disposal under the *Metal and Diamond Mining Effluent Regulations* for the Côté Gold Project

Location: Gogama Community Centre, 15 Low Avenue, Gogama, ON

Date: August 27, 2019, Gogama, ON

Time: 6:00pm to 8:00pm

Participants
David Brown: IAMGOLD (Proponent), Presenter
Don Carr: Wood Environment & Infrastructure Solutions (Wood), Presenter
Krista Maydew: Wood Environment & Infrastructure Solutions (Wood)
Kim Connors: Minnow Environmental Inc. (Minnow), Presenter

Augusto Gamero: Environment and Climate Change Canada (ECCC), Presenter
Angelique Petropoulos: ECCC

Brandi Mogge: Department of Fisheries and Oceans (DFO), Presenter

Poster session and opening remarks

The doors opened at 5:30pm and the Proponent, along with Wood and Minnow, set up printed boards around the room with information on: the tailings management facility, the mine rock area, the new lake design, among others. Attendees walked around the room and discussed the posters at their leisure. At 6:30pm, the Proponent began the presentations by giving a status update of the project such as the construction deferral, continuing engagement efforts, permitting and engineering plans, as well as early work programs like tree clearings.

Explanation of the Regulatory Process

The poster session was followed by a presentation by ECCC to explain the regulatory process associated to the proposed regulatory amendments to Schedule 2 of the MDMER for mine waste disposal for the Côté Gold Project. The presentation included information about the objective of the consultations, the scope of the MDMER, the mechanics of the regulatory process and the timelines associated with the approval of the Schedule 2 amendments. ECCC also emphasized that a streamlining approach for the approval of the proposed amendments is available and would exempt the regulatory proposal from pre-publication in the Canada Gazette, Part I. ECCC is seeking the views of Indigenous groups and the public on the application of this approach.

Q: How does the government makes sure that the mines are operating in compliance with the law?
A: The MDMER contain provisions on monitoring and reporting results to ECCC. If the Proponent is not in compliance, any violation can be subject to Enforcement. In addition, Enforcement can conduct inspections to verify compliance. ECCC also reminded the attendees that regulating the mining area is a shared responsibility between the Federal and Provincial Government.
A participant noted that the Government must inspect mine sites rather than enforcing only once a violation has occurred.

Q: Where is the accountability for the Federal Government if the mine closes and the proponent leaves the area?
A: ECCC clarified that, in the context of the proposed authorization for mine waste disposal, the Proponent must submit a Letter of Credit that gives a financial guarantee that the fish habitat compensation plan will be implemented to offset for the loss of fish habitat resulting from the disposal of mine waste. ECCC also added that the project is subject to provincial requirements for closure plans. IAMGOLD added that it consulted on the provincial closure plan and that the province has approved said closure plan. Proponent stated that the Province currently holds $47 million for the proposed disturbance under the mine closure plan and additional financial assurance for the proposed fish habitat compensation will be provided.

Q: What about chemical leaks that could enter clean waters?
A: ECCC responded that the Canadian Environmental Assessment Agency (CEAA) makes sure that the environmental effects of the project are analyzed and that appropriate mitigation measures are identified. In terms of compliance with the MDMER, the Proponent is required to monitor effluent and comply with the limits of certain substances present in mine effluent, including monitoring the downstream receiving environment as well as background. ECCC also added that provincial water quality requirements also apply. IAMGOLD added that they would also need to comply with provincial limits, which can be more stringent than federal requirements. IAMGOLD added that they are responsible for all water leaving the site. They have a monitoring program setup that they have been sampling over 30 locations since 2012 to develop a baseline. The Proponent has incorporated ditching and collection ponds around the tailings management facility and the mine rock area in order to capture, collect and monitor site water.

Q: Why one area close to sources of drinking water for neighbouring towns is chosen as the preferred location for the tailings management facility? Could other areas further away be more appropriate?
A: ECCC noted that the purpose of the consultation is to get the views from the public and Indigenous communities on the proposed location of the tailings management facility. ECCC added that IAMGOLD undertook a very detailed analysis to determine the best location and that a presentation on how IAMGOLD assessed different alternatives for mine waste disposal will follow ECCC's presentation. The Proponent described how the Project area is upstream of Gogama and all the alternatives assessed through the multiple accounts analysis are located in areas that drain past Gogama, either through Mesomikenda Lake or the Mollie River.

Assessment of the compensation plan

DFO delivered a presentation on DFO's role in the assessment of the offsetting/compensation plan. DFO provided an overview on the following:

a. how effects on fish habitat are categorized by the *Fisheries Act* (FA) (section 35 vs section 36 of the FA)
b. how DFO supports ECCC in the MDMER regulatory process
c. the principles that guide DFO's assessment of a compensation plan
d. what the key considerations are in assessing a compensation plan to offset for the loss of fish habitat

Q: What is DFO's involvement in the regulatory process?
A: DFO indicated that the Department is engaged from the beginning of the offsetting planning process and that it stays involved throughout its implementation and does annual site visits throughout the lifespan of the project.

Q: What would happen if the mine proponent leaves without restoring the mine site? Does the government have a closure plan and financial securities?
A: ECCC indicated that a closure plan is required by the province and IAMGOLD added that the plan was approved in December 2018 and includes a financial security from the mine proponent to ensure that the closure plan will be implemented. The Proponent stated that the Province currently holds $47 million to implement the mine closure plan if something should happen to the company.

Analysis of the alternative assessment for mine waste disposal

Wood (IAMGOLD consultant) presented the analysis of the alternatives assessment for mine waste disposal: the waste rock storage area and the tailings management facility. Wood explained in detail the process involved in selecting the best alternative for waste rock and tailings disposal from an environmental, socio-economic, economic and technical perspective and in accordance with Environment and Climate Change Canada Guidelines for the assessment of alternatives for mine waste disposal.

Q: What kind of chemicals would be used in the mining process?
A: Wood responded that cyanide would be used to extract gold and then would be treated in the process plant prior to being discharged to the tailings management area. This primary treatment was not provided by historic mines, which is why some historic mines had problems with cyanide management in the tailings facilities. Wood added that the residual cyanide in the tailings management area would be further reduced by volatilization to air and degradation by sunlight. The Proponent does not expect cyanide to be a problem given that water will be re-circulated in a closed

loop and that the Proponent will need to comply with cyanide limits present in any effluent that enters into the environment.

Q: Why only four options were studied, why and how the proposed TIA was chosen, why the proposed TIA was selected if there are high risks to groundwater and whether there are more environmentally friendly options?
A: Wood responded that it looked at multiple sites during approximately 10 years of evolving project design. 17 candidate sites were considered in the assessment of alternatives. Most of the sites are not viable due to fatal flaws and four sites were carried through the multiple accounts analysis and assessed based on the environmental, technical, economic, socio-economic impacts. The chosen site demonstrates the least impact. Wood added that all alternatives would require seepage collection systems to capture seepage from the tailings management facility, and that the ground conditions are very similar between the alternatives with tight bedrock that reduces the potential for seepage to bypass the tailings management facility's seepage collection systems. The combination of seepage collection systems and tight bedrock reduces the potential for groundwater to affect watersheds around the Project site.

Proposed fish habitat compensation and offsetting plan

Minnow Environmental (IAMGOLD consultant) delivered a presentation on the proposed combined fish habitat compensation and offsetting plan. The presentation explained that one compensation plan had been developed to offset losses under both Section 36 and Section 35. Minnow explained which water bodies will be lost (Côté Lake, a portion of the Mollie River, a portion of Upper Three Duck Lake, a small portion of Clam Lake and other small water bodies), which areas were associated with Section 36 of the Fisheries Act (Schedule 2 amendment under MDMER) and which are associated with Section 35 of the Fisheries Act. Minnow outlined that key habitat offsetting components include, the creation of a new lake, realignment of the Mollie River and connections between disconnected lakes providing fish better access to habitats. The presentation described key habitat features of the proposed plan including diversity of habitat (e.g., pool, riffle, complex shoreline / islands), cover (e.g., large woody debris, shoals, cobbles, boulders, vegetation) and spawning habitat. Minnow also outlined mitigation measures to support success of the offsetting plan such as: construction sequencing, fish salvage / relocation, construction best management practices and monitoring. Measures to reduce lag times were also presented, including incorporation of physical habitat features, planting of floodplains and shorelines, transplanting aquatic invertebrates and strategic transfer of fish.

Conclusion

A recurring comment from the public was the concern for the effects of climate change on water levels, water bodies and the ecosystem as a whole. Participants were also concerned about protecting the environment for when the project ends or when the Proponent leaves the area. Wood noted that the tailings management facility is designed for more extreme flood events than required, which helps to reduce the risk of failure at the facility from potential weather changes associated with climate change, and that the dam engineer of record is required to perform regular dam safety reviews that consider the effects of climate change on the integrity of the dams.

One general comment regarding the Notice was that people in the area only received the Notice 5 days before the public meeting and the Facebook post only the weekend before. ECCC indicated that the consultation documents are available through the consultation webpage and committed to sending a follow-up email with all necessary documentation.

Note: Following the public session in Gogama, ECCC sent out an email to all interested parties with all the relevant links and documentation related to this consultation process. ECCC is accepting comments from the public until November 1, 2019.

The session ended at 9pm.

<u>Summary of the Consultation Meeting with Métis Nation of Ontario</u>

<u>Proposed authorization for mine waste disposal under the *Metal and Diamond Mining Effluent Regulations* (MDMER) for the Côté Gold Project</u>

Location: 30 Algonquin Boulevard West, Timmins, ON

Date: August 29, 2019, Timmins, ON

Time: 10:00am to 12:00pm

Participants:
David Brown: IAMGOLD (Proponent), Presenter
Don Carr: Wood Environment & Infrastructure Solutions (Wood), Presenter
Krista Maydew: Wood Environment & Infrastructure Solutions (Wood)
Kim Connors: Minnow Environmental Inc. (Minnow), Presenter

Augusto Gamero: Environment and Climate Change Canada (ECCC), Presenter
Angelique Petropoulos: ECCC

Brandi Mogge: Department of Fisheries and Oceans (DFO), Presenter

Representatives from Métis Nation of Ontario (MNO):

Andy Lefebvre, Mineral Development Advisor
Marcel Lafrance, Regional Councilor – Region 3
David Hamilton, President Chapleau Métis Council
Urgel Courville, President Northern Lights Métis Council
Liliane Ethier, President MNO Temiskaming Métis Council
Georges Ethier, MNO Temiskaming Métis Council
Come Lefebvre, Metis Nation of Ontario – Timmins

Opening remarks

The meeting began at 10:00 am with a roundtable introduction of the participants. Marcel Lafrance, Regional Councilor, opened the meeting, which was then followed by an opening prayer by the President of the MNO Temiskaming Métis Council.

IAMGOLD started by providing information on the status of the project which included updates on the construction deferral, continuing engagement efforts, permitting and engineering plans, as well as early work programs like tree clearings. Mr. Brown clarified that Environmental Compliance Approval, Permit to Take Water applications and *Fisheries Act* authorizations are uploaded to the SharePoint page created for MNO to access these documents.

Explanation of the Regulatory Process

ECCC presented information on the regulatory process associated to the proposed regulatory amendments to Schedule 2 of the MDMER for mine waste disposal for the Côté Gold Project. The presentation focused on the objective of the consultations, the scope of the MDMER, the mechanics of the regulatory process and the timelines associated with the approval of the Schedule 2 amendments. ECCC also emphasized that a streamlining approach for the approval of the proposed amendments is available which would exempt the regulatory proposal from pre-publication in the Canada Gazette, Part I, and that ECCC is seeking the views of Indigenous groups and the public on the application of this approach.

Q: A representative from MNO asked about the type of criteria or requirements that might influence the decision to use the streamlined process.
A: ECCC explained the difference between when the streamlining policy is applied to the approvals process for regulatory amendments and when it is not. ECCC stated that one of the key conditions of recommending a streamlining approach is that consultations with the impacted Indigenous groups and the public have taken place and their views and concerns have been addressed. ECCC further explained that streamlining essentially puts the consultation efforts at the front-end, or beginning, of the process and that a recommendation to apply the streamlining policy to the Schedule 2 amendments requires the approval of the Treasury Board.

Q. A representative from MNO asked if there would be only one waterbody listed for this Project.
A. It was explained that there will be 7 waterbodies listed.

Assessment of the compensation plan

DFO delivered a presentation on DFO's role in the assessment of the offsetting/compensation plan. DFO provided an overview on the following:

a. how effects on fish habitat are categorized by the *Fisheries Act* (FA) (section 35 vs section 36 of the FA);
b. The recent amendments to the *Fisheries Act*;
c. how DFO supports ECCC in the MDMER regulatory process;
d. the principles that guide DFO's assessment of a compensation plan; and
e. what the key considerations are in assessing a compensation plan to offset for the loss of fish habitat.

Q: A representative from MNO asked if a compensation plan does not work, would Indigenous groups be consulted to help restore the area.
A: DFO said that the Proponent is responsible for proposing a viable plan and the Indigenous communities in the area should be engaged and consulted during the restoration of the site.

Q. A representative from MNO further asked about the financial responsibility of the offsetting plan and other impacts outside of the tailings management facility (TMF).

A: DFO responded that the cost of the compensation plan is the responsibility of the proponent and that a financial warranty is required to ensure funds are available to implement the plan. ECCC added that impacts and compliance outside of the TMF is the responsibility of the mine proponent.

Analysis of the alternative assessment for mine waste disposal

Wood (IAMGOLD consultant) presented the analysis of the alternatives assessment for mine waste disposal (i.e., the waste rock storage area and the tailings management facility). Wood explained in detail the process involved in selecting the best alternative for waste rock and tailings disposal from an environmental, socio-economic, economic and technical perspective and in accordance with Environment and Climate Change Canada Guidelines for the assessment of alternatives for mine waste disposal.

Q: A representative from MNO asked about the harmful substances that would be used in the mine processing.
A: Wood responded that cyanide is used in the extraction process and then would be treated in the process plant prior to being discharged to the tailings management area. Wood added that the residual cyanide in the tailings management area would be further reduced by volatilization to air and degradation by sunlight. The Proponent does not expect cyanide to be a problem given that water will be re-circulated in a closed loop and that the Proponent will need to comply with cyanide limits present in any effluent that enters into the environment. Wood added that IAMGOLD will implement a seepage collection system around the tailings and waste rock storage areas. Water in the tailings seepage collection system would be maintained in a closed loop, and water from mine rock seepage collection system would be pumped to the polishing pond before being discharged.

Q: A representative of MNO asked about the area shown on the figure depicting the preferred tailings management facility with respect to the radius from the centre of the open pit.
A: IAMGOLD said the radius is 10km from the center point of the open pit.

Q: What is the size of the footprint of the tailings management facility?
A: It is approximately 300 hectares.

Q: A representative from MNO sought further clarification on the arsenic found in processing water.
A: Wood indicated that water would contain small amounts of arsenic and that the effluent discharged into the environment need to meet regulatory limits. ECCC added that the mine proponent needs to report final discharge points to ECCC and that the effluent needs to comply with federal and provincial limits for arsenic and other harmful substances.

Q: A representative from MNO asked what happens if there is more treatment needed prior to discharging and whether it can be pumped back in.
A: Wood indicated that if water quality is lower than expected, pumping back the effluent is an option and, if needed, changes to the pH could be used to manage effluent quality.

Q: Representatives from MNO wanted to know how far the mining site was from the watershed boundary.
A: Wood responded that according to the map, the open pit is approx. 10km away from the Hudson Bay Great Lakes Basin Divide.

Q: A representative from MNO asked how long water recycling has been implemented in the mining sector and whether there are other experiences.
A: IAMGOLD provided an example of a site where 98% of the water is recycled in a closed loop.

Proposed fish habitat compensation and offsetting plan

Minnow Environmental (IAMGOLD consultant) delivered a presentation on the proposed fish habitat compensation and offsetting plan. The presentation explained that one compensation plan had been developed to offset losses under both Section 36 and Section 35. Minnow explained which water bodies will be lost (Côté Lake, a portion of the Mollie River, a portion of Upper Three Duck Lake, a small portion of Clam Lake and other small water bodies), which areas were associated with Section 36 of the *Fisheries Act* (Schedule 2 amendment under MDMER) and which are associated with Section 35 of the *Fisheries Act*. Minnow outlined that key habitat offsetting components include, the creation of a new lake, realignment of the Mollie River and connections between disconnected lakes providing fish better access to habitats. The presentation described key habitat features of the proposed plan including diversity of habitat (e.g., pool, riffle, complex shoreline/islands), cover (e.g., large woody debris, shoals, cobbles, boulders, vegetation) and spawning habitat. Minnow also outlined mitigation measures to support success of the offsetting plan such as: construction sequencing, fish salvage/relocation, construction best management practices and monitoring. Measures to reduce lag times were also presented, including incorporation of physical habitat features, planting of floodplains and shorelines, transplanting aquatic invertebrates and strategic transfer of fish.

Conclusion

After all the groups completed their presentations, ECCC asked MNO how they would like to be engaged in the regulatory process going forward. A Representative from MNO said that MNO has been engaged with the Proponent and they will continue to submit their comments directly to the Proponent except with respect to funds or agreements with DFO or ECCC.

September 2019

Let's Talk:

The Côté Gold Project Community Newsletter

Construction Deferral Decision

On January 28, 2019, IAMGOLD announced that the company was deferring the construction decision on the Côté Gold Project due to current market conditions. Although IAMGOLD has made the decision to wait for improved and sustainable market conditions in order to proceed with construction we continue to advance engineering and permitting work for the Project as well as community engagement efforts.

The Côté Gold Project (the Project) is a proposed open pit gold mine that is located approximately 20 km southwest of Gogama and 130 km southwest of Timmins. The Project is a joint venture between IAMGOLD and Sumitomo Metal Mining Co.

Project Permitting Update

Before a mine can be constructed and operated, several permits are required. IAMGOLD started the permitting process in the Fall of 2018 and is continuing to develop various permit applications and submitting them to regulatory authorities.

The following permits have been submitted to date:

- Aggregate Permits – Category 9 and 12 (January)
- Permit to Take Water – Construction Dewatering (February)
- Permit to Take Water – Clam Lake and Mollie River Realignment (July)
- Permit to Take Water – Domestic Water Wells (August)
- *Lakes and Rivers Improvement Act* – Tailings Management Facility Starter Dams (March)
- Environmental Compliance Approval – Air and Noise (March)
- Environmental Compliance Approval – Water Management during Construction (May)
- Forestry Resource License for Phase 2 Clearing (September)
- Metal and Diamond Mining Effluent Regulations – Schedule 2 Amendment (Process underway)

The following permits have received regulatory approval:

- Forestry Resource License for Phase 1 Clearing
- Closure Plan
- Transmission Line Environmental Study Report and Leave to Construct
- Environmental Effects Review (Federal decision statement updated)

Future permit application submissions / authorizations required:

- *Fisheries Act* Authorization / Fish Habitat Offsetting
- Permit to Take Water – Open Pit Dewatering
- Environmental Compliance Approvals – Industrial Sewage Works, and Domestic Sewage Treatment
- *Lakes and Rivers Improvement Act* – Access / Haul Road Crossing, Mollie River Realignment and Fish Habitat Offsets

Activity at the Project Site

A drilling program for geotechnical and hydrogeological field studies has been ongoing at site. These studies will support the detailed design of the Tailings Management Facility.

Activities planned for the remainder of 2019 include continued regional exploration activities, upgrades to the exploration camp at Mesomikenda, surface and groundwater monitoring and site security monitoring.

Drilling Program for geotechnical investigation – split spoon sampling

Community Engagement

IAMGOLD, along with Environment and Climate Change Canada (ECCC), held an open house in Gogama on August 27, 2019. The purpose of the open house was to consult on the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations (MDMER) for the Project. These regulations are part of the *Fisheries Act* and are designed to protect fish and their habitat from the release of deleterious materials from mine waste. At the open house, Fisheries and Oceans Canada presented on the authorization processes related to the *Fisheries Act*. IAMGOLD also provided a Project update with a focus on the Assessment of Alternatives for Mine Waste Storage and the Habitat Compensation and Offsetting Plan which details how IAMGOLD will compensate for loss of fish habitat.

Summary documents describing the Offsetting Plan and Assessment of Alternatives can be found within the MDMER section of www.iamgold.com/cotegold-documents

The Government of Canada is welcoming comments and concerns until November 1, 2019. For more information about the Federal consultation opportunity, please visit: https://www.canada.ca/en/environment-climate-change/services/managing-pollution/sources-industry/mining/amendments-metal-diamond-mining-effluent-regulations/cote-consultations.html

IAMGOLD is committed to ongoing engagement with local communities and Indigenous groups (First Nations and Métis) throughout the life of the Project and strives to ensure that anyone interested in the Project can learn about it. Some of the ways IAMGOLD is doing this is by attending community events, hosting site visits, open houses and review sessions on various aspects of the Project. By establishing positive working relationships, we are able to share information and gather valuable feedback from community members and Indigenous leaders.

IAMGOLD takes part in a career fair in Mattagami First Nation

Access to the Côté Gold Project Site

Entry to and exit from the Côté Gold Project site must occur through designated access points. This is essential for visitor safety as current on-site activities include the use of heavy equipment. Project site access for individuals completing work for the Wood EPCM team will be coordinated through the Wood Site Manager. All other visitors shall contact the IAMGOLD Manager of Environment and Community Relations to make arrangements. The Security office is currently located at the Project Exploration site and everyone accessing the site will need to sign in at this office. The Project site can be accessed via Mesomikenda Lake Road off Highway 144 (approximately 2 km from the turn-off).

Shane Hardwicke - Site Manager, Wood
1-639-999-6171

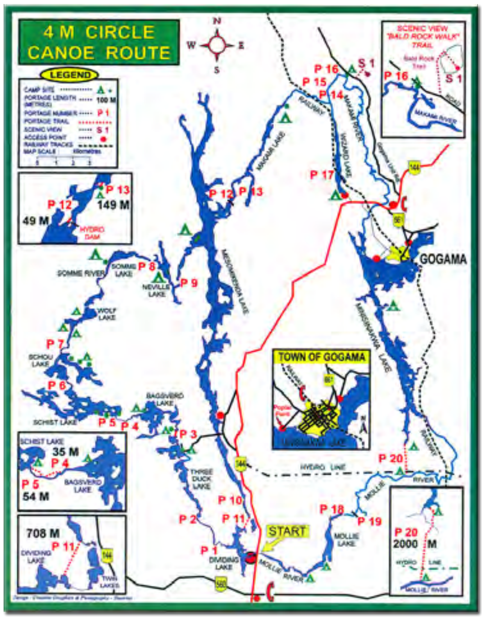
David Brown - Manager of Environment and Community Relations, IAMGOLD
1-705-923-3369

Côté Gold Website Updates

To ensure easier navigability to important Project-related information, we have recently updated the Project's website: www.iamgold.com/cotegold. Visit our website to review in process and approved permitting applications, federal and provincial environmental assessments and to learn more about past and present community events. All previous newsletters are also readily available in the Community Engagement tab of the website.

4M Canoe Route

The 4M Canoe Route crosses through the Côté Gold Project property. IAMGOLD requests that users of the 4M Canoe Route reach out to the Project's Community Relations team prior to embarking on the route to ensure safe passage through the property during Project construction, operations and closure. Please note that the camp site at Portage 3 will no longer be available for use. Please contact us at cotegold@iamgold.com or call 705-923-3369 as part of your trip planning!



Source: Gogama.ca/canoe

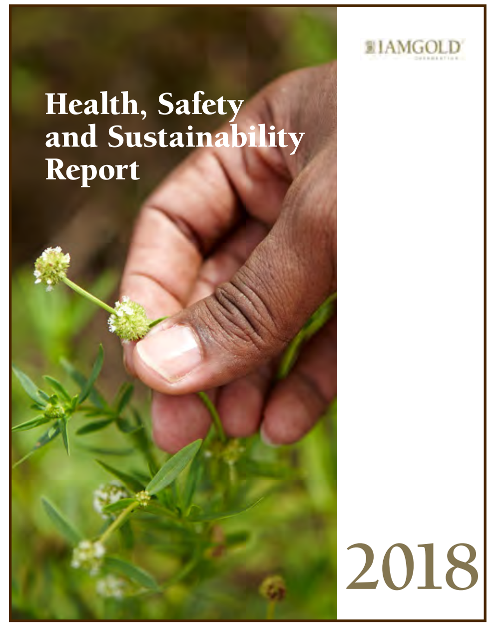
Future Opportunities

Once improved and sustainable market conditions support Construction and Operations, the Project is expected to create over 1,000 Construction jobs and about 300-400 full time jobs during Operations. It will rely heavily on Northern communities for skilled jobs and expertise and we look forward to working closely with Indigenous and local communities to ensure that this is truly a Northern Ontario project.

Once Construction begins, hiring will be done through our contractors. Côté Gold will begin hiring for Operations about six months prior to Operations start-up. Minimum age for employment is 18 years.

If you are interested in providing services or supplies to the Project during Construction and Operations, please reach out to us and share information about your business's services.

IAMGOLD's Commitment to Sustainability



IAMGOLD has published the 2018 Health, Safety and Sustainability ("HSS") Reports. Both reports are available on our HSS website, located at http://hss.iamgold.com/, in both English and French.

IAMGOLD'S 2018 UN Sustainable Development Goals Report outlines many of the key initiatives we have undertaken to ensure our company leaves behind a positive and sustainable legacy in host communities. For data on IAMGOLD's 2018 Health, Safety and Sustainability performance, please view our Global Reporting Initiative Report. To augment 2018 HSS disclosures, IAMGOLD also published details on our tailings management facilities in alignment with the Church of England disclosure request.

As IAMGOLD remains committed to Zero Harm, advancement of the Mining Association of Canada's Towards Sustainable Mining (TSM) initiative at our sites remains a priority, along with active support for the Government of Canada's enhanced Corporate Social Responsibility strategy. Respecting the natural environment, building strong community partnerships and putting the health and safety of our employees first, Zero Harm remains both a goal and a journey. From IAMGOLD's perspective, strong environmental, social and governance practices have always been part of the way we do business. We have worked hard to ensure we rethink the traditional mining model while staying profitable and sustainable in a world that faces new environmental and operational realities. This is illustrated by IAMGOLD's inclusion in the 2019 Corporate Knights Top 40 Sustainable Companies ranking as well as the company's addition to the 2019 Bloomberg Gender Equality Index for organizational commitment to equality and advancing women in the workplace.

Report highlights include:

- Signed an Impact & Benefit Agreement with respect to the development and operation of the Côté Gold Joint Venture Project with Mattagami First Nation and Flying Post First Nation.
- Renewed our financial commitment with Laurentian University in Ontario, contributing $2 million over five years towards the construction of a "collaboration space" for engineering students, lab refurbishments, technology and equipment upgrades, research and scholarship.
- Commissioning the world's largest hybrid solar/thermal plant, considered one of the largest solar facilities operating across all of sub-Saharan Africa.
- Reduced IAMGOLD's CO_2 emissions by 12,000 tonnes in 2018.
- Invested $1.35 million in Suriname to improve community access to high-quality medical care.

CÔTÉ GOLD

For more information please contact us: cotegold@iamgold.com

Join our Project mailing list to be kept informed about the Project and any upcoming events by sending an email to: cotegold@iamgold.com

Ce document est également disponible en français.

APPENDIX D-2
LETTERS OF SUPPORT

FLYING POST FIRST NATION, BOX 1027 NIPIGON, ON POT 2J0

May 9, 2019

Fisheries and Oceans Canada
1028 Parsons Rd SW
Edmonton, AB T6E 0J4

Ministry of the Environment, Conservation and Parks
Ontario Government Complex
Hwy 101 East. P.O Bag 3080
South Porcupine, ON P0N 1H0

SUBJECT: *Fisheries Act* Authorization, Offsetting Plan and Alternatives Assessment for the Côté Gold Project

Flying Post First Nation would like to inform Fisheries and Oceans Canada and the Ministry of the Environment, Conservation and Parks that we have engaged and consulted with IAMGOLD in a respectful and meaningful dialogue about their upcoming application for *Fisheries Act* Authorization, Offsetting Plan and Alternatives Assessment for the Côté Gold Project.

We understand that the Project will result in the loss of Côté Lake, Mollie River, portions of Clam Lake and other small bodies of water including West Beaver pond and associated tributaries and will also result in the realignment of Mollie River. We also understand that this will result in a loss of fish habitat and potential harm to fish within these areas and are informed of the mitigation efforts and Closure Plan requirements for this component of the Project.

Agreements currently in place between IAMGOLD and Flying Post First Nation outline commitments to establish a framework for continued consultation and community engagement on Project activities as well as the coordination of discussions on topics of mutual concern through the formation of a community driven Environmental Committee. The Environmental Committee has received and reviewed the material and have had their questions and concerns addressed by IAMGOLD, therefore we support the issuance of this approval.

The First Nation acknowledges IAMGOLD's efforts in addressing concerns that have arisen and have confidence that the communication and consultation processes outlined in the Exploration Agreement and Impact Benefit Agreement will ensure continued engagement with IAMGOLD's Côté Gold Project. IAMGOLD has meaningfully consulted with Flying Post First Nation on the impacts of the Project on our Traditional lands.

If you have any questions, please contact Jeff Berube – Resource Development Officer for Flying Post First Nation at jjberube21@gmail.com or 807-887-3071

Respectfully,

Chief Murray Ray
Flying Post First Nation

MATTAGAMI FIRST NATION

75 Helen Street
P.O. Box 99
Gogama, Ontario
P0M 1W0

July 17, 2019

Fisheries and Oceans Canada
1028 Parsons Road SW
Edmonton, AB T6X 0J4

Environment and Climate Change Canada
351 St. Joseph boul, 11th floor
Gatineau, Que K1A 0H3

SUBJECT: *Fisheries Act* Authorization, Fish Habitat Offsetting Plan and Assessment of Alternatives for Mine Waste Disposal for the Côté Gold Project

Mattagami First Nation would like to inform Fisheries and Oceans Canada and Environment and Climate Change Canada that we have engaged and consulted with IAMGOLD in a respectful and meaningful dialogue about their application for *Fisheries Act* Authorization and Schedule 2 listing to the Metal and Diamond Mining Effluent Regulations. During an open house session on May 29, 2019 in Mattagami First Nation, IAMGOLD provided a review of the Fisheries Offsetting Plan to our community. We also had the opportunity to review the draft documents provided to us on April 16, 2019. Previously, IAMGOLD presented information about the Offsetting Plan and Assessment of Alternatives during open houses in our community in May 2019.

We understand that the Project will result in the loss of Côté Lake, Mollie River, portions of Clam Lake and other small bodies of water including West Beaver pond and associated tributaries and will also result in the realignment of Mollie River. We have been informed of the mitigation efforts and Closure Plan requirements for this component of the Project as well.

Agreements currently in place between IAMGOLD and Mattagami First Nation outline commitments to establish a framework for continued consultation and community engagement on Project activities as well as the coordination of discussions on topics of mutual concern through the formation of a community driven Environmental Committee. The Environmental Committee has received and reviewed the material and have had their questions and concerns addressed by IAMGOLD, therefore we support the issuance of this approval.

The First Nation acknowledges IAMGOLD's efforts in addressing concerns that have arisen and have confidence that the communication and consultation processes outlined in the Exploration Agreement and Impact Benefit Agreement will ensure continued engagement with IAMGOLD's Côté Gold Project. IAMGOLD has meaningfully consulted with Mattagami First Nation on the impacts of the Project on our Traditional lands.

We understand that your department wishes to conduct another consultation on these plans with our community. It is our belief that we have been adequately consulted and we do not wish to have another consultation on this subject within our community although we appreciate your interest in visiting our community.

If you have any questions, please contact Tim Harvey, Lands and Resources Coordinator for Mattagami First Nation at tim.harvey@mattagami.com or 705-894-2072.

Tel. (705) 894-2072 Toll Free 1-888-269-7729 Fax (705) 894-2887

MATTAGAMI FIRST NATION
75 Helen Street
P.O. Box 99
Gogama, Ontario
P0M 1W0

Respectfully,

Chief Chad Boissoneau
Mattagami First Nation

BRUNSWICK HOUSE FIRST NATION

P.O. BOX 1178
HWY, 101 EAST
CHAPLEAU, ON
P0M 1K0

October 28, 2019

Fisheries and Oceans Canada
1028 Parsons Road SW
Edmonton, AB T6X 0J4

Environment and Climate Change Canada
351 St. Joseph boul, 11th floor
Gatineau, Que K1A 0H3

SUBJECT: Fisheries Act Authorization – Côté Gold Project Offsetting Plan

Brunswick House First Nation would like to inform the Department of Fisheries and Oceans and Environment and Climate Change Canada that we are in support of IAMGOLD's upcoming application for *Fisheries Act* (the "Act") Authorization pursuant to Section 36 of the Act and in accordance with the Metal and Diamond Mining Effluent Regulation.

IAMGOLD has shared the Draft Fisheries Act Authorization Application, the Offsetting Plan and the Assessment of Alternatives on April 16, 2019. We understand that the Project will result in the loss of Côté Lake, Mollie River, portions of Clam Lake and other small bodies of water including West Beaver pond and associated tributaries and will also result in the realignment of Mollie River. We have been informed of the mitigation efforts and Closure Plan requirements for this component of the Project as well.

If you have any questions, please contact Councillor Kevin Tangie at chimokoman@hotmail.com or 705-465-0114 and Bruce Golden – Lands and Resources Coordinator at bhfn.landsandresources@gmail.com or 705-864-0174 ext. 225.

Respectfully,

Cheryl St Denis

Chief Cheryl St. Denis
Brunswick House First Nation

APPENDIX D-3
RECORD OF CONTACT
CONSULTATION ON THE FISHERIES ACT AUTHORIZATION APPLICATION

Record of Contact – Indigenous Consultation on the *Fisheries Act* Authorization Application (April 2019 to February 2020)

ROC	Event Type	Date	Event Summary	Participants	Team
1,284	Conference Call	04/08/2019	IAMGOLD held a bi-weekly permitting and consultation update meeting with Mattagami First Nation and Flying Post First Nation. Topics discussed included: permitting, the permitting schedule, community consultation on the Fisheries Act Authorization and the Socio-economic Management and Monitoring Plan. Final meeting notes were provided on 2019-06-07.	Jeff Berube (Flying Post First Nation), Tim Harvey (Mattagami First Nation), Stephanie LaBelle (Wabun Tribal Council)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Don Carr (Wood E&IS), Zahir Jina (SLR Consulting (Canada) Ltd.), Christian Naponse (IAMGOLD Corporation)
1,189	Email	04/16/2019	On behalf of IAMGOLD, Minnow Environmental shared the draft Fisheries Act Authorization Application, the Offsetting Plan and the Assessment of Alternatives for the Project.	Lisa VanBuskirk (Brunswick House First Nation)	Kim Connors (Minnow Environmental Inc.)
1,192	Email	04/16/2019	On behalf of IAMGOLD, Minnow Environmental shared the draft Fisheries Act Authorization Application, the Offsetting Plan and the Assessment of Alternatives for the Project.	Jeff Berube (Flying Post First Nation), Tim Harvey (Mattagami First Nation), Stephanie LaBelle (Wabun Tribal Council)	Kim Connors (Minnow Environmental Inc.)
1,193	Email	04/16/2019	On behalf of IAMGOLD, Minnow Environmental shared the draft Fisheries Act Authorization Application, the Offsetting Plan and the Assessment of Alternatives for the Project.	Andy Lefebvre (Métis Nation of Ontario)	Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,241	Email	05/05/2019	IAMGOLD inquired about potential new meeting dates to fulfill the requirement for consultation on the Fisheries Act Authorization application with Flying Post First Nation and Mattagami First Nation. Wabun Tribal Council spoke with the Chief of Flying Post First Nation who instructed that the community would not require community consultation on this application. Wabun Tribal Council indicated they would provide a letter of support for this application from Flying Post First Nation.	Stephanie LaBelle (Wabun Tribal Council)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,243	Letter	05/09/2019	IAMGOLD received a letter of support for the Fisheries Act Authorization, Offsetting Plan and Assessment of Alternatives from Flying Post First Nation. The letter indicated that IAMGOLD has consulted and engaged with Flying Post First Nation in a meaningful way on the impacts of Project on the community's Traditional lands.	Murray Ray (Flying Post First Nation), Stephanie LaBelle (Wabun Tribal Council)	David Brown (IAMGOLD Corporation)
1,383	Meeting	05/21/2019	IAMGOLD and the Chief of Flying Post First Nation met with the Major Projects Management Office to discuss outstanding permitting applications with Fisheries and Oceans Canada, Transportation Canada and Environment and Climate Change Canada.	Murray Ray (Flying Post First Nation), Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,248	Community Meeting	05/29/2019	IAMGOLD hosted a Project open house in Mattagami First Nation. The purpose of this session was to provide a general Project update which included information on the recently signed Impact Benefit Agreement, the construction deferral, activities on site, permitting and ongoing communications / consultations. Minnow Environmental presented the Fisheries Offset Plan required as part of the submission of a Fisheries Act Authorization and for a Schedule 2 Amendment of the Metal and Diamond Mine Effluent Regulations. The presentation included information on fish habitat loss, new lake design, watercourse realignments, aggregate pit habitat design and lake connections design. There were 23 participants. IAMGOLD provided a summary of the meeting on 2019-08-08.	Jason Batise (Wabun Tribal Council), Leonard Naveau (Mattagami First Nation), Ivan McKay (Mattagami First Nation), Bonnie Fletcher (Mattagami First Nation), Darlene Naveau (Mattagami First Nation), Unknown Individual (Mattagami First Nation), Irvin Luke (Individual - GP), Tim Harvey (Mattagami First Nation), Tiana Mckay-Golinowski (Mattagami First Nation), Dorothy Naveau (Mattagami First Nation), Melvin Luke (Mattagami First Nation), Joyce Constant (Mattagami First Nation), Katie Hooysma (Mattagami First Nation), Patsy McKay (Mattagami First Nation), Tracey Harvey (Mattagami First Nation), Ava Naveau (Mattagami First Nation), Christine McKay (Mattagami First Nation)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Christian Naponse (IAMGOLD Corporation), Jerry Finisie (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,257	Email	06/03/2019	IAMGOLD shared a link to a new SharePoint site which is intended to facilitate the sharing of permit applications. The SharePoint site will allow for easy access to draft and final Project permit applications for review. IAMGOLD noted that the draft Fisheries Act Authorization, previously sent to the community on 2019-04-16, is also available on the SharePoint site. IAMGOLD also reminded the communities of the consultation period for this application (40 business days; 2019-04-16 to 2019-06-14).	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,412	Email	06/03/2019	Mattagami First Nation (MFN) confirmed they shared the transmittal summary for the Permit to Take Water for the Clam Lake and Mollie River Realignment Construction and the Fisheries Act Authorization for the Fisheries Offsetting Plan and Assessment of Alternatives to all MFN members via their Facebook "Mattagami Engagement Group".	Tim Harvey (Mattagami First Nation)	Christian Naponse (IAMGOLD Corporation)
1,440	Meeting	06/03/2019	IAMGOLD held a meeting with Mattagami First Nation and Flying Post First Nation to discuss permitting and consultation updates. Topics discussed included: upcoming draft permits, recent consultation in Mattagami and a procurement list. Draft meeting notes were provided to attendees on 2019-07-04.	Jeff Berube (Flying Post First Nation), Tim Harvey (Mattagami First Nation)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,286	Email	06/06/2019	Following the community meeting in Mattagami First Nation (MFN) on 2019-05-29 a request was made for the presentation materials to be provided for community members who could not be in attendance that evening. The Project update presentation was provided on 2019-06-03 and the presentation on the Offsetting Plan was provided to MFN on 2019-06-06.	Tim Harvey (Mattagami First Nation)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Christian Naponse (IAMGOLD Corporation)
1,407	Email	06/10/2019	In response to the 2019-06-03 notification of permit documents available on SharePoint, IAMGOLD received an email from the Métis Nation of Ontario (MNO) on 2019-06-06 to discuss potential meeting dates in order to review the permit applications. MNO suggested a meeting in late June or July followed by a second meeting in the fall. On 2019-06-10 IAMGOLD expressed willingness to participate in the proposed meetings and MNO indicated they would confer with their Consultation Committee to determine a suitable date.	Andy Lefebvre (Métis Nation of Ontario)	David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,289	Email	06/14/2019	On 2019-08-09 MNO emailed IAMGOLD to provide the draft agenda prepared by Environment and Climate Change Canada (ECCC) in anticipation of a meeting on 2019-08-29. IAMGOLD suggested some revisions and sent the amended agenda to ECCC for review. On 2019-08-20 MNO followed up with a meeting budget, indicating ECCC would be covering the costs for the meeting room and lunch. IAMGOLD inquired if MNO would be able to remain after the meeting with ECCC to review permit applications as previously discussed.	Andy Lefebvre (Métis Nation of Ontario)	David Brown (IAMGOLD Corporation)
1,441	Text Message	06/30/2019	IAMGOLD received confirmation from Flying Post First Nation and Mattagami First Nation that they do not require further community open house presentation on the fisheries Offsetting Plan and Assessment of Alternatives. A letter of support is forthcoming.	Murray Ray (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation)	David Brown (IAMGOLD Corporation)
1,436	Email	07/05/2019	IAMGOLD contacted Mattagami First Nation and Flying Post First Nation to inform them that a new folder had been created on the SharePoint site titled "Presentations" to house the Project update and Fisheries Offsetting Plan presentations.	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation)	Christian Naponse (IAMGOLD Corporation)
1,414	Social Media	07/10/2019	Mattagami First Nation (MFN) confirmed sharing the Project update presentation from the community open house on 2019-05-29 to all MFN members through a post on the Mattagami Engagement Group Facebook page.	Tim Harvey (Mattagami First Nation)	Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,453	Letter	07/17/2019	Flying Post First Nation provided letters of support for the Environmental Compliance Approval for Air and Noise dated 2019-07-09, the Fisheries Act Offsetting Plan and Assessment of Alternatives for Mine Waste Disposal dated 2019-07-17, the Permit to take Water for Construction Phase Water Takings dated 2019-07-17, the Permit to Take Water for Clam Lake and Mollie River Realignment Construction dated 2019-07-17 and the Permit to Take Water for Domestic Water Takings dated 2019-07-17.	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation)	Christian Naponse (IAMGOLD Corporation)
1,504	Letter	07/24/2019	Mattagami First Nation provided letters of support for: 1. Fisheries Act Authorization, Fish Habitat Offsetting Plan and Alternatives Assessment; 2. Permit to Take Water for Clam Lake and Mollie River Realignment; 3. Permit to Take Water for Construction Phase Water Takings; and 4. Permit to Take Water for Domestic Water Takings.	Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,467	Letter	07/30/2019	Flying Post First Nation provided letters of support for: 1. Fisheries Act Authorization, Fish Habitat Offsetting Plan and Alternatives Assessment; 2. Permit to Take Water for Clam Lake and Mollie River Realignment; 3. Permit to Take Water for Construction Phase Water Takings; 4. Permit to Take Water for Domestic Water Takings; and 5. Environmental Compliance Approval for Air and Noise.	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,448	Email	07/31/2019	IAMGOLD emailed the Métis Nation of Ontario (MNO) to determine a meeting date to discuss permit applications. MNO suggested a meeting date of 2019-08-29. IAMGOLD accepted the tentative meeting date.	Andy Lefebvre (Métis Nation of Ontario), Linda Norheim Brookes (Métis Nation of Ontario)	David Brown (IAMGOLD Corporation)
1,507	Mass Mailout	08/21/2019	IAMGOLD delivered the Notice for an Open House regarding the Proposed amendments to the Metal and Diamond Mining Effluent Regulations (MDMER) for the Project to the Gogama post office for distribution to all local residents.	unknown unknown (Individual - Gogama)	David Brown (IAMGOLD Corporation)
1,533	Email	08/23/2019	On 2019-08-21 IAMGOLD received a formal invitation from Mattagami First Nation (MFN) for the Water Ceremony planned at Côté Lake for 2019-09-07. IAMGOLD advised MFN on 2019-08-22 that a request was sent to IAMGOLD corporate to determine participation numbers. On 2019-08-23 MFN advised IAMGOLD that they would be doing a pre-ceremony on 2019-08-24 and inquired who would take them to the correct location. IAMGOLD provided MFN with the name and phone number for a site contact.	Sue Prince (Mattagami First Nation), Chad Boissoneau (Mattagami First Nation), Dorothy Naveau (Mattagami First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,501	Open House	08/27/2019	Environment and Climate Change Canada (ECCC) hosted an open house in Gogama to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Approximately 11 people attended the event.	unknown unknown (Individual - Gogama), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,493	Site Visit	08/28/2019	IAMGOLD hosted a Project site tour for Fisheries and Oceans Canada and Environment and Climate Change Canada focused on the Open Pit area, Côté Lake, Clam Creek, Mollie River, proposed realignment channels and the Tailings Management Area. The Chief of Mattagami First Nation also participated in the tour.	Chad Boissoneau (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,502	Meeting	08/29/2019	Environment and Climate Change Canada (ECCC) hosted a meeting with the Métis Nation of Ontario to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Following the federal consultation portion of the meeting, IAMGOLD provided an update on permitting for the Project and discussed the Lakes and Rivers Improvement Act application for the Tailings Management Facility Starter Dam.	Andy Lefebvre (Métis Nation of Ontario), Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), George Ethier (Temiskaming Métis Council), Come Lefebvre (Métis Nation of Ontario), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,513	Email	09/04/2019	IAMGOLD provided the support letters from Mattagami First Nation and Flying Post First Nation regarding the Fisheries Act Authorization, Fish Habitat Offsetting plan and Assessment of Alternatives to Fisheries and Oceans Canada and Environment and Climate Change Canada (ECCC), indicating these letters would also be accompanying the final application. ECCC responded and confirmed the letters would inform the Government of Canada's decision-making process on the proposed Schedule 2 authorization for the Project.	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,547	Meeting	09/24/2019	IAMGOLD met with Chief and Council and a representative of the Lands and Resources Department from Brunswick House First Nation (BHFN) to discuss the Project. A brief overview of the Project was provided and previous communications were discussed. BHFN noted that they do not wish to impact timelines for permit approvals and understand that an Impact Benefit Agreement is in place with Mattagami First Nation and Flying Post First Nation. BHFN requested a map showing Project boundaries and water flow directions to confirm if their community would be affected before making a decision about responding in support of the Project. They also requested a copy of all correspondence to date between IAMGOLD and the community in order to understand past communications with previous Chief and Council. They requested that IAMGOLD participate in one of the community's quarterly open houses to share information about the Project. The Lands and Resources Coordinator for BHFN confirmed that they have not yet tried to access the SharePoint site that IAMGOLD established to facilitate sharing permit applications. IAMGOLD provided draft meeting notes to meeting participants on 2019-10-03.	Kevin Tangie (Brunswick House First Nation), Bruce Golden (Brunswick House First Nation), Kevin Lacroix (Brunswick House First Nation), Cheryl St. Denis (Brunswick House First Nation), Gisele Noel (Brunswick House First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,829	Email	09/27/2019	On 2019-09-28, IAMGOLD acknowledged receipt of the comments submitted by the Métis Nation of Ontario to Environment and Climate Change Canada on the Project's Assessment of Alternatives for Mine Waste Disposal and Fish Habitat Compensation Plan.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,771	Ceremony	09/28/2019	Representatives from IAMGOLD, Sumitomo and Wood joined Mattagami First Nation and Flying Post First Nation members at Côté Lake for a Water Ceremony and feast in honour of Côté Lake. A sacred fire was lit on the shores of Côté Lake and the event began with all in attendance taking part in smudging. An Elder performed a ceremony which included prayers to the four directions, songs with women's hand drums, an offering of medicines to the lake and the sharing of water and berries. The ceremony concluded with words from a second Elder and Fire Keeper and while a spirit plate was blessed before the feast. Attendees were treated to traditional foods including moose meat, pickerel and wild rice during a post ceremony feast provided by Mattagami First Nation.	Jeff Berube (Flying Post First Nation), Sue Prince (Mattagami First Nation), Eileen Boissoneau (Mattagami First Nation), Betty Naveau (Mattagami First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation), Wendy Debastos (Mattagami First Nation), Dorothy Naveau (Mattagami First Nation), Clara Prince (Mattagami First Nation)	David Brown (IAMGOLD Corporation), Stephen Letwin (IAMGOLD Corporation), Philipe Gaultier (IAMGOLD Corporation), Steven Bowles (IAMGOLD Corporation), Yasuhiro Kusaba (Sumitomo), Alina Shams (IAMGOLD Corporation), Shunsuke Yamada (Sumitomo), Christian Naponse (IAMGOLD Corporation), Thomas Lee (IAMGOLD Corporation), Tatyana Decker (IAMGOLD Corporation)
1,565	Email	09/30/2019	IAMGOLD provided the maps discussed at the meeting with Brunswick House First Nation on 2019-09-24 and indicated a package of communications to date between IAMGOLD and the community would be sent within the week. IAMGOLD provided maps showing Wabun Territory, Project Land Tenure, the Watershed Divide in relation to the Project and the Project Location Map.	Kevin Tangie (Brunswick House First Nation), Bruce Golden (Brunswick House First Nation), Cheryl St. Denis (Brunswick House First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,588	Email	10/04/2019	IAMGOLD sent an email to Brunswick House First Nation following the 2019-09-24 meeting. During the meeting, IAMGOLD committed to sending a record of engagement and correspondence and an overview of communications. IAMGOLD provided access to the documents as well as hard copy attachments of the Record of Contact and the overview of communications.	Kevin Tangie (Brunswick House First Nation), Bruce Golden (Brunswick House First Nation), Cheryl St. Denis (Brunswick House First Nation)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,613	Conference Call	10/09/2019	IAMGOLD held a bi-weekly permitting and consultation Environmental Committee meeting with representatives from Mattagami First Nation and Flying Post First Nation. Topics discussed included the Permit to Take Water – Open Pit Dewatering, the upcoming Lakes and Rivers Improvement Act Offsetting Plan application (Weeduck Lake), an update on IAMGOLD's meeting with Brunswick House First Nation on 2019-09-24, future support letters and potential consultation on navigable waters for development of the Project. Flying Post First Nation noted that they had no comments on the Permit to Take Water – Open Pit Dewatering. Draft meeting notes were provided to those in attendance on 2019-10-21.	Jeff Berube (Flying Post First Nation)	David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Zahir Jina (SLR Consulting (Canada) Ltd.), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,637	Meeting	10/28/2019	IAMGOLD and the Chief of Mattagami First Nation met with Brunswick House First Nation to discuss the Project location, the record of contact between the Project and the community as well as IAMGOLD's request for a letter of support for the Fisheries Act Authorization application. Brunswick House First Nation provided a letter of support for the application.	Chad Boissoneau (Mattagami First Nation), Cheryl St. Denis (Brunswick House First Nation)	David Brown (IAMGOLD Corporation)
1,645	Email	10/29/2019	IAMGOLD informed Environment and Climate Change Canada that the draft Fisheries Act Authorization, Offsetting Plan and Assessment of Alternatives had been shared with Brunswick House First Nation (BHFN) and that IAMGOLD met with BHFN to discuss and disclose a draft letter of support for IAMGOLD with regards to the applications. IAMGOLD provided a copy of the support letter from BHFN to ECCC.	Murray Ray (Flying Post First Nation), Kevin Tangie (Brunswick House First Nation), Chad Boissoneau (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Cheryl St. Denis (Brunswick House First Nation), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Steven Bowles (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,647	Email	12/09/2019	IAMGOLD provided responses to comments regarding the Assessment of Alternatives and Fish Habitat Compensation Plan. The comments were provided by the Métis Nation of Ontario to Environment and Climate Change Canada on 2019-09-27 and were provided to IAMGOLD on 2019-09-28. On 2019-10-29 ECCC confirmed receipt of the responses and indicated they would be working with DFO to review them and provide additional context if needed. ECCC also confirmed receipt of the updated Assessment of Alternatives and informed that it had been forwarded for review.	Linda Norheim Brookes (Métis Nation of Ontario), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)
1,706	Email	12/10/2019	IAMGOLD provided responses to comments from the Métis Nation of Ontario on the Assessment of Alternatives and Fish Habitat Compensation Plan. These comments were received via Environment and Climate Change Canada (ECCC) and Fisheries and Oceans Canada (DFO) on 2019-08-28. In addition to the responses to comments, IAMGOLD provided a figure showing Alternative A Configuration. IAMGOLD also provided ECCC and DFO with an updated table containing comments from ECCC and DFO regarding IAMGOLD's draft responses to MNO.	Unknown Unknown (Métis Nation of Ontario), Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,729	Email	12/19/2019	Environment and Climate Change Canada (ECCC) provided the Métis Nation of Ontario (MNO) with responses prepared by IAMGOLD to their comments on the Alternatives Assessment Report and Fish Habitat Compensation Plan. ECCC indicated they and Fisheries and Oceans Canada had reviewed all responses and asked MNO to confirm if they determine the responses to be sufficient or if they have any further comments or questions.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,826	Email	01/27/2020	The Métis Nation of Ontario (MNO) informed Environment and Climate Change Canada that they will be submitting responses to IAMGOLD's comments on MNO'S review of the Fish Habitat Compensation Plan and the Assessment of Alternatives.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,837	Email	02/04/2020	IAMGOLD notified Brunswick House First Nation that the final application for the Assessment of Alternatives for Storage of Mine Waste was submitted to Environment and Climate Change Canada. The draft of this application was previously shared on 2019-04-16. IAMGOLD provided a summary of the application purpose and contents as well as a link to the SharePoint site where the application could be viewed.	Kevin Tangie (Brunswick House First Nation), Bruce Golden (Brunswick House First Nation), Cheryl St. Denis (Brunswick House First Nation)	David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,838	Email	02/04/2020	IAMGOLD notified Mattagami First Nation and Flying Post First Nation that the final Assessment of Alternatives for Storage of Mine Waste report was submitted to Environment and Climate Change Canada. The draft of this application was previously shared on 2019-04-16. IAMGOLD provided a summary of the application purpose and contents as well as a link to the SharePoint site where the application could be viewed.	Jason Batise (Wabun Tribal Council), Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation)	Christian Naponse (IAMGOLD Corporation)
1,839	Email	02/04/2020	IAMGOLD notified the Métis Nation of Ontario that the final Assessment of Alternatives for Storage of Mine Waste was submitted to Environment and Climate Change Canada. The draft of this application was previously shared on 2019-04-16. IAMGOLD provided a summary of the application purpose and contents as well as a link to the SharePoint site where the application could be viewed.	Andy Lefebvre (Métis Nation of Ontario), Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council)	Christian Naponse (IAMGOLD Corporation)

Record of Contact – Government Consultation on the *Fisheries Act* Authorization Application (October 2018 to February 2020)

ROC	Event Type	Date	Event Summary	Participants	Team
983	Phone Call	10/02/2018	IAMGOLD and Environment and Climate Change Canada (ECCC) discussed several previously submitted files associated with the draft Assessment of Alternatives Report that are required pursuant to a Schedule 2 listing under the Metal and Diamond Mining Effluent Regulations. ECCC noted their review is ongoing. The submissions were noted to be in good standing and ECCC stated they will provide preliminary comments on pre-screening analysis by the end of the week of 2018-10-05 and all comments by 2018-10-19.	Claude Asselin (Environment and Climate Change Canada)	Don Carr (Wood E&IS)
944	Email	10/24/2018	Wood provided Environment and Climate Change Canada (ECCC) with an update on the status of the assessment of alternatives for the Project and inquired as to when they could expect to receive ECCC's review. Contact information for Brunswick House First Nation, Flying Post First Nation, Mattagami First Nation, and Métis Nation of Ontario representatives was also provided with a request to circulate as needed. ECCC responded that their comments would be available no later than 2018-11-08.	Claude Asselin (Environment and Climate Change Canada)	Don Carr (Wood E&IS)
1,075	Meeting	11/14/2018	IAMGOLD held a meeting with the Fisheries and Oceans Canada (DFO) to provide them with information on the Offsetting Plan for the Project. A copy of the presentation made during the meeting was provided to IAMGOLD on 2018-12-11	Maxime Veilleux (Fisheries and Oceans Canada), Jason Shpeley (Fisheries and Oceans Canada (DFO))	David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,139	Conference Call	01/14/2019	IAMGOLD discussed the Section 35 and Schedule 2 application sequencing process with Environment and Climate Change Canada.	Aimee Zweig (Environment and Climate Change Canada), Nancy Seymour (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,140	Conference Call	01/24/2019	IAMGOLD discussed the Section 35 and Schedule 2 permit sequencing process with Fisheries and Oceans Canada.	Nicholas Winfield (Fisheries and Oceans Canada), Tania Gordanier (Fisheries and Oceans Canada), Helene Marquis (Fisheries and Oceans Canada), Marek Moroz (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Don Carr (Wood E&IS), Stephan Theben (SLR Consulting (Canada) Ltd.), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,144	Meeting	02/01/2019	IAMGOLD met with Environment and Climate Change Canada to provide Project update.	Mikaela McQuade (Environment and Climate Change Canada), Matthew Geraci (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Benjamin Little (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,145	Meeting	02/01/2019	IAMGOLD met with Fisheries and Oceans Canada to provide a Project update and to discuss Section 35 and Schedule 2 permit submission sequencing.	Laura Mitchel (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Benjamin Little (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,146	Meeting	02/01/2019	IAMGOLD met with Environment and Climate Change Canada to provide a Project update.	Aimee Zweig (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,147	Meeting	02/01/2019	IAMGOLD met with Fisheries and Oceans Canada to provide a Project update and to discuss Section 35 and Schedule 2 permit submission sequencing.	Nicholas Winfield (Fisheries and Oceans Canada), Tania Gordanier (Fisheries and Oceans Canada), Marek Moroz (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Benjamin Little (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,148	Meeting	02/01/2019	IAMGOLD met with the Major Projects Management Office to provide a Project update and to discuss Section 35 and Schedule 2 permit submission sequencing.	Kirsten Querbach (Natural Resources Canada), Jeff Labonté (Major Projects Management Office), Erika Uchmanowicz (Major Projects Management Office)	Stephen Crozier (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,165	Letter	02/04/2019	IAMGOLD sent a letter to the Federal Minister of Fisheries and Oceans Canada regarding the Project construction deferral.	Laura Mitchel (Fisheries and Oceans Canada), Helene Marquis (Fisheries and Oceans Canada), Jonathan Wilkinson (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Benjamin Little (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,169	Letter	02/04/2019	IAMGOLD sent a letter to the Federal Minister of Environment and Climate Change regarding the Project construction deferral.	Catherine McKenna (Environment and Climate Change Canada), Mikaela McQuade (Environment and Climate Change Canada), Aimee Zweig (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Benjamin Little (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,074	Email	02/22/2019	IAMGOLD provided Fisheries and Oceans Canada (DFO) with a memo dated 2018-11-23 regarding the offsetting plan outline to confirm conditions outlined in Canadian Environmental Assessment Agency's decision statement. DFO provided a download receipt 2018-11-29. DFO contacted IAMGOLD on 2019-02-18 to inquire on the finalization of the Offsetting Plan before the submission of an application for authorization and to confirm the previous memo required updating. On 2019-02-22 IAMGOLD responded confirming ongoing work on the application and indicated one change to the Tailings Management Facility which will be added to Schedule 2.	Maxime Veilleux (Fisheries and Oceans Canada), Jason Shpeley (Fisheries and Oceans Canada (DFO))	Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)
1,345	Phone Call	03/28/2019	Phone call with the Major Projects Management Office to discuss Navigable Waters Act and Section 35 permitting.	Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,349	Email	03/28/2019	IAMGOLD updated Environment and Climate Change Canada on reaching an agreement on material terms with Mattagami First Nation and Flying Post First Nation on the Impact Benefit Agreement.	Mikaela McQuade (Environment and Climate Change Canada), Matthew Geraci (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,350	Email	03/28/2019	IAMGOLD updated the Fisheries and Oceans Canada on reaching an agreement on material terms with Mattagami First Nation and Flying Post First Nation on the Impact Benefit Agreement.	Laura Mitchel (Fisheries and Oceans Canada), Victoria Windsor (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,355	Email	03/28/2019	IAMGOLD updated Environment Canada and Climate Change Canada on reaching an agreement on material terms with Mattagami First Nation and Flying Post First Nation on the Impact Benefit Agreement.	Aimee Zweig (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,356	Email	03/28/2019	IAMGOLD updated the Fisheries and Oceans Canada on reaching an agreement on material terms with Mattagami First Nation and Flying Post First Nation on the Impact Benefit Agreement.	Nicholas Winfield (Fisheries and Oceans Canada), Tania Gordanier (Fisheries and Oceans Canada), Helene Marquis (Fisheries and Oceans Canada), Marek Moroz (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,190	Application	04/11/2019	Fisheries and Oceans Canada provided receipt of three Fisheries Act Authorization (FAA) Application documents which were electronically submitted by Minnow Environmental via download link on 2019-04-10. The transmittal included a cover letter supporting the Application, the FAA Application, and the Offsetting Plan.	Maxime Veilleux (Fisheries and Oceans Canada)	Steve Woolfenden (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,199	Email	04/12/2019	IAMGOLD submitted the final Assessment of Alternatives for the Project to Environment and Climate Change Canada along with responses to comments made on 2018-11-20.	Claude Asselin (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Steve Woolfenden (IAMGOLD Corporation), Don Carr (Wood E&IS)
1,186	Email	04/15/2019	IAMGOLD submitted the Assessment of Alternatives Report to Environment and Climate Change Canada (ECCC) electronically on 2019-04-12. A Senior Program Engineer for ECCC provided a notice of receipt for the Assessment of Alternatives Report for the Project and stated that the report would be reviewed against ECCC's Guidelines to ensure it is adequate for Schedule 2 consultations.	Claude Asselin (Environment and Climate Change Canada), Maxime Veilleux (Fisheries and Oceans Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Steve Woolfenden (IAMGOLD Corporation), Don Carr (Wood E&IS)
1,185	Email	04/16/2019	The Fish and Fish Habitat Protection Biologist from Fisheries and Oceans Canada provided a letter dated 2019-04-15 via email acknowledging the 2019-04-10 receipt of IAMGOLD's application for a Paragraph 35(2)(b) authorization. The letter also stated that IAMGOLD would receive the Department's assessment of whether or not the application was complete by 2019-06-10 along with a description of the next steps. Further, a new file number and assessor were assigned to the Project.	Maxime Veilleux (Fisheries and Oceans Canada), Brandi Mogge (Fisheries and Oceans Canada)	Steve Woolfenden (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,370	Phone Call	04/18/2019	Call with the Major Projects Management Office to discuss various permitting applications under review by the Department of Fisheries and Oceans, Environment and Climate Change Canada, and Transportation Canada.	Kirsten Querbach (Natural Resources Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,261	Email	05/17/2019	Fisheries and Oceans Canada requested results from sampling Unnamed Waterbody #6 and details on fish capture and water quality data for Unnamed Waterbody #5. Minnow Environmental, on behalf of IAMGOLD, responded with the information requested.	Brandi Mogge (Fisheries and Oceans Canada)	Steve Woolfenden (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.)
1,383	Meeting	05/21/2019	IAMGOLD and the Chief of Flying Post First Nation met with the Major Projects Management Office to discuss outstanding permitting applications with Fisheries and Oceans Canada, Transportation Canada and Environment and Climate Change Canada.	Murray Ray (Flying Post First Nation), Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,585	Email	06/02/2019	Fisheries and Oceans Canada provided preliminary comments on the technical component of the Fisheries Offsetting Plan. IAMGOLD inquired as to when the remainder of the comments (on the HEP and HSI methodology) would be completed.	Brandi Mogge (Fisheries and Oceans Canada)	Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.), Steve Woolfenden (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,454	Letter	06/06/2019	IAMGOLD received a letter from Fisheries and Oceans Canada (DFO) in response to the 2019-02-14 correspondence regarding the proposal to construct starter dams at the Project. DFO provided rationale to three topics of inquiry from IAMGOLD regarding the issuance of a 35(2) Fisheries Act Authorization; 1. Existing DFO policy imposes this requirement; 2. Paragraph 8(1)(e) of the Applications for Authorization under Paragraph 35(2) of the Fisheries Act Regulations imposes this requirement and 3. Decision on the issuance of approvals under subsection 35(2) will no precede the decision o n the section 36 authorization process.	Stephanie Martens (Fisheries and Oceans Canada), Brandi Mogge (Fisheries and Oceans Canada), Marek Janowicz (Fisheries and Oceans Canada (DFO))	Stephen Crozier (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,290	Email	06/10/2019	IAMGOLD received an email introducing the new consultation coordinator from Environment and Climate Change Canada (ECCC) for who will be responsible for coordinating consultations with proponents, agencies and First Nations related to disposal of mine waste subject to the Metal and Diamond Mining Effluent Regulations. ECCC indicated the Assessment of Alternatives for Storage of Mine Waste and the Fisheries Offsetting Plan meet ECCC and Fisheries and Oceans Canada guidelines and stated that once comments sent to IAMGOLD had been responded to, the report would be finalized and preparations for consultation meetings would begin. ECCC also requested the contact names for the stakeholders IAMGOLD met with regarding the two documents. On 2019-06-10 IAMGOLD responded to ECCC indicating the comments received were under review, a report on consultations to date could be provided and provided an updated IAMGOLD contact for further communications.	Christian Doyle (Environment and Climate Change Canada), Julien Lachance (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,389	Phone Call	06/11/2019	Call with Fisheries and Oceans Canada to provide a Project update and to discuss Schedule 2 and Section 35 application sequencing issue.	Caitlin Mullan-Boudreau (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,292	Phone Call	06/19/2019	IAMGOLD spoke with a representative from Environment and Climate Change Canada (ECCC) regarding how to address Comment 37(3) from ECCC's comments dated 201-06-04 related to the Schedule 2 Assessment of Alternatives. IAMGOLD advised ECCC that addressing comment 37(3) would be problematic there aren't enough engineering details to determine haul truck requirements for each alternative. ECCC agreed this would be problematic and rather than editing or removing the indicator, ECCC advised that IAMGOLD could keep the indicator as is if we can update other indicators that use a base case for haul distance.	Claude Asselin (Environment and Climate Change Canada)	Don Carr (Wood E&IS)
1,293	Email	06/19/2019	IAMGOLD attempted to contact Fisheries and Oceans Canada (DFO) on 2019-06-13 and 2019-06-17 to follow-up on comments concerning the Fisheries Offsetting Plan. Messages were left requesting a call back. On 2019-06-19 IAMGOLD spoke with DFO who confirmed they do not have any further comments on the Project's Fisheries Offsetting Plan.	Brandi Mogge (Fisheries and Oceans Canada)	David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)
1,411	Email	06/26/2019	Fisheries and Oceans Canada informed IAMGOLD that the cost estimate for the Fisheries Act Authorization needs to be broken down between the Offsetting Plan and the compensation required for the Schedule 2 Amendment as indicated by Environment and Climate Change Canada. IAMGOLD indicated they would consider this when developing the final submission.	Brandi Mogge (Fisheries and Oceans Canada)	Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,434	Email	06/27/2019	IAMGOLD, via Minnow Environmental, received an email from Fisheries and Oceans Canada stating that the contact person for the Project file would be on leave until 2019-08-05.	Brandi Mogge (Fisheries and Oceans Canada)	Kim Connors (Minnow Environmental Inc.)
1,439	Email	07/10/2019	IAMGOLD was contacted by Environment and Climate Change Canada (ECCC) on 2019-06-06to discuss preparations for consultations for Project for amendments of Schedule 2 of the Metal and Diamond Mining Effluent Regulations. ECCC requested more information about past consultations done by IAMGOLD in relation to the development of documents for the Offsetting Plan and Assessment of Alternatives. On 2019-07-10 IAMGOLD provided the requested information.	Brandi Mogge (Fisheries and Oceans Canada), Christian Doyle (Environment and Climate Change Canada), Julien Lachance (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,447	Email	07/12/2019	IAMGOLD corresponded with the Ministry of the Environment, Conservation and Parks (MECP) regarding consultation with First Nations on the Assessment of Alternatives and the Fisheries Offset Plan. MECP suggested a one to two page summary for each document and indicated which First Nations would like consultation sessions and which stated no consultation is required. MECP suggested dates for consultations with Gogama, Mattagami First Nation, Brunswick House First Nation and the Métis Nation of Ontario.	Christian Doyle (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,426	Phone Call	07/23/2019	IAMGOLD provided a permitting update to the Major Projects Management Office. Topics discussed include: Transport Canada, Canadian Navigable Waters Act; Section 35 and Schedule 2 permit application sequencing.	Erika Uchmanowicz (Major Projects Management Office)	Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,452	Email	07/31/2019	IAMGOLD contacted Environment and Climate Change Canada (ECCC) to encourage them to follow-up and validate the requests from the Chief of Brunswick House First Nation as there had been a Band Council Resolution notifying agencies potentially doing business with the community that there were to be no unilateral decisions made by any one of Chief and Council members. IAMGOLD suggested ECCC seek out confirmation that the Chief has received proper authorization to state the position indicated in her correspondence with ECCC and provided ECCC with a copy of the Band Council Resolution.	Christian Doyle (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,287	Email	08/01/2019	IAMGOLD received comments from Environment and Climate Change Canada on the April 2019 Assessment of Alternatives report for the Project on 2019-06-05. IAMGOLD provided responses to comments on 2019-08-01.	Marc Leger (Canadian Environmental Assessment Agency), Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Christian Doyle (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Nancy Seymour (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada), Denise Fell (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation), Braeden Connor (Wood E&IS)

ROC	Event Type	Date	Event Summary	Participants	Team
1,449	Email	08/12/2019	IAMGOLD and Environment and Climate Change Canada (ECCC) discussed meeting logistics for upcoming community consultations including dates and locations. On 2019-08-06 IAMGOLD provided ECCC with the mailing list for Gogama residents interested in Project information. On 2019-08-07 ECCC suggested summary pages be provided in both French and English and that in preparation for the Gogama public meeting, hard copies of document and summaries be made available at the Gogama Library. ECCC also requested that IAMGOLD provide a copy of meeting presentations before 2019-08-21. ECCC shared a draft agenda for the meeting on 2019-08-29 with MNO. On 2019-08-12, it was noted that the previously discussed meeting in Gogama could not be held on 2019-08-28 and that the meeting with Brunswick House First Nation had yet to be confirmed.	Brandi Mogge (Fisheries and Oceans Canada), Christian Doyle (Environment and Climate Change Canada), Julien Lachance (Environment and Climate Change Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Steve Woolfenden (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,487	Email	08/12/2019	IAMGOLD and Environment and Climate Change Canada (ECCC) discussed plans and details for a public consultation in Gogama scheduled for 2019-08-27. ECCC shared a draft proposed agenda and a draft public notice of meeting announcement.	Brandi Mogge (Fisheries and Oceans Canada), Christian Doyle (Environment and Climate Change Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)

ROC	Event Type	Date	Event Summary	Participants	Team
1,594	Email	08/15/2019	Environment and Climate Change Canada provided the final Public Notice for the consultation session on the proposed amendments to the Metal and Diamond Mining Effluent Regulations (MDMER) for the Project to be held in Gogama on 2019-08-27.	Christian Doyle (Environment and Climate Change Canada)	David Brown (IAMGOLD Corporation)
1,849	Email	08/15/2019	Environment and Climate Change Canada requested that IAMGOLD provide their contact information/coordinates in anticipation of sending a letter regarding the Assessment of Alternatives and Fish Habitat Compensation Plan. IAMGOLD provided the necessary information.	Claude Asselin (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation)
1,527	Email	08/23/2019	IAMGOLD provided plain language summaries for the Assessment of Alternatives and the Offsetting Plan to Environment and Climate Change Canada in preparation for consultations taking place on 2019-08-27 and 2019-08-29.	Angelique Petropoulos (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,850	Email	08/23/2019	Environment and Climate Change Canada (ECCC) provided a letter of notice that the Assessment of Alternatives and Fish Habitat Compensation Plan for Schedule 2 Amendment of the Metal and Diamond Mining Effluent Regulations were ready for use in consultations. ECCC also provided feedback regarding errors in the Project Assessment of Alternatives for Storage of Mine Waste (Rev 1).	Steve Chapman (Canadian Environmental Assessment Agency), Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Christian Doyle (Environment and Climate Change Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Nancy Seymour (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada), Denise Fell (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,501	Open House	08/27/2019	Environment and Climate Change Canada (ECCC) hosted an open house in Gogama to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Approximately 11 people attended the event.	unknown unknown (Individual - Gogama), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,493	Site Visit	08/28/2019	IAMGOLD hosted a Project site tour for Fisheries and Oceans Canada and Environment and Climate Change Canada focused on the Open Pit area, Côté Lake, Clam Creek, Mollie River, proposed realignment channels and the Tailings Management Area. The Chief of Mattagami First Nation also participated in the tour.	Chad Boissoneau (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,502	Meeting	08/29/2019	Environment and Climate Change Canada (ECCC) hosted a meeting with the Métis Nation of Ontario to discuss the proposed authorization for mine waste disposal under the Metal and Diamond Mining Effluent Regulations for the Project. A Project update presentation was provided by IAMGOLD. ECCC and Fisheries and Oceans Canada gave presentations outlining the authorization processes related to the Fisheries Act, specifically sections 35 and 36. IAMGOLD and its consultants also made presentations on the Assessment of Alternatives for storage of mine waste and the Offsetting Plan to compensate for loss of fish habitat. Following the federal consultation portion of the meeting, IAMGOLD provided an update on permitting for the Project and discussed the Lakes and Rivers Improvement Act application for the Tailings Management Facility Starter Dam.	Andy Lefebvre (Métis Nation of Ontario), Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), George Ethier (Temiskaming Métis Council), Come Lefebvre (Métis Nation of Ontario), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,556	Email	08/30/2019	IAMGOLD contacted Environment and Climate Change Canada and Fisheries and Oceans Canada (DFO) to offer thanks for their assistance and participation in the open house and presentations in Gogama on 2019-08-27 and with the Métis Nation of Ontario on 2019-08-29. DFO expressed their appreciation for the site tour provided on 2019-08-28.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)

ROC	Event Type	Date	Event Summary	Participants	Team
1,513	Email	09/04/2019	IAMGOLD provided the support letters from Mattagami First Nation and Flying Post First Nation regarding the Fisheries Act Authorization, Fish Habitat Offsetting plan and Assessment of Alternatives to Fisheries and Oceans Canada and Environment and Climate Change Canada (ECCC), indicating these letters would also be accompanying the final application. ECCC responded and confirmed the letters would inform the Government of Canada's decision-making process on the proposed Schedule 2 authorization for the Project.	Murray Ray (Flying Post First Nation), Jeff Berube (Flying Post First Nation), Chad Boissoneau (Mattagami First Nation), Tim Harvey (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)
1,560	Email	09/12/2019	On 2019-09-10 IAMGOLD received a draft summary of consultation from Environment and Climate Change Canada (ECCC) from the open house public consultation session in Gogama on 2019-08-27. On 2019-09-12 IAMGOLD provided comments on the draft meeting notes, a copy of the sign in sheet and one comment form submitted by an attendee at the open house to include in ECCC's consultation report.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,510	Email	09/13/2019	On 2019-08-15 Environment and Climate Change Canada contacted IAMGOLD to inquire if it would be possible to have a tour of the Project site between meetings scheduled in the area later in the month. IAMGOLD indicated this would be arranged and requested sizing details for personal protective equipment to be provided for the tour. On 2019-08-27 IAMGOLD provided directions and maps to the Project Site.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,577	Email	09/23/2019	Environment and Climate Change Canada (ECCC) contacted IAMGOLD to request detailed information on several waterbodies involved in the Offsetting Plan, including descriptions of geographical areas, coordinates and fish type. ECCC provided an example of a Schedule 2 description to aid in what kind of detail is required. IAMGOLD tasked Minnow Environmental with putting together the required information which was stated in their response to ECCC on 2019-09-23.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)
1,757	Meeting	09/25/2019	IAMGOLD met with Environment and Climate Change Canada to provide a Project update and discuss depth and scope of consultation and community engagement on Section 35 and 36 approvals.	Veronique D'Amours-Garthier (Fisheries and Oceans Canada), Anjala Puvananathan (Canadian Environmental Assessment Agency), Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office), Angelique Petropoulos (Environment and Climate Change Canada), Aimee Zweig (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,580	Email	09/27/2019	Fisheries and Oceans Canada (DFO) provided IAMGOLD with a copy of an email sent from DFO to the Métis Nation of Ontario (MNO) on 2019-09-25 including a letter outlining DFO's understanding of the Project. DFO also requested input from the Métis Nation of Ontario on how they would like to be engaged and consulted with as the Fisheries Act Authorization process continues. IAMGOLD noted that they anticipate meeting again with MNO following moose hunting season to review and respond to any comments or concerns MNO may have.	Brandi Mogge (Fisheries and Oceans Canada)	David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,829	Email	09/27/2019	On 2019-09-28, IAMGOLD acknowledged receipt of the comments submitted by the Métis Nation of Ontario to Environment and Climate Change Canada on the Project's Assessment of Alternatives for Mine Waste Disposal and Fish Habitat Compensation Plan.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,806	Email	09/30/2019	IAMGOLD emailed Environment and Climate Change Canada and the Major Projects Management Office with letters of support from Mattagami First Nation and Flying Post First Nation regarding the Schedule 2 process.	Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)
1,275	Email	10/04/2019	Minnow Resources, on behalf of IAMGOLD, provided responses to comments Fisheries and Oceans Canada provided on the draft Offsetting Plan on 2019-05-28. Responses were downloaded by DFO on 2019-10-04.	Brandi Mogge (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.), Lindsey Taylor (IAMGOLD Corporation)
1,589	Email	10/07/2019	IAMGOLD and Environment and Climate Change Canada (ECCC) exchanged several emails discussing IAMGOLD's review of meeting notes provided by ECCC on 2019-09-10 from the consultation meeting with the Métis Nation of Ontario. The meeting was held to discuss the proposed amendment to the Metal and Diamond Mining Effluent Regulations on 2019-08-29.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)

ROC	Event Type	Date	Event Summary	Participants	Team
1,609	Email	10/07/2019	On the advice of Fisheries and Oceans Canada (DFO) IAMGOLD provided the responses to comments regarding the Projects' Fisheries Offsetting Plan to Environment and Climate Change Canada (ECCC). ECCC confirmed successful download of the document.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,619	Email	10/09/2019	Minnow Environmental, on behalf of IAMGOLD, provided additional information to Environment and Climate Change Canada (ECCC) on the Schedule 2 Amendment - Defined Areas in response to a request from ECCC on 2019-09-16. The additional information included waterbody descriptions and maps to support the Metal and Diamond Mining Effluent Regulations amendment.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)
1,644	Email	10/25/2019	IAMGOLD confirmed to Environment and Climate Change Canada (ECCC) that the draft Fisheries Act Authorization application, Offsetting Plan and Assessment of Alternatives were shared with Brunswick House First Nation (BHFN) on 2019-04-16. IAMGOLD noted they met with BHFN Chief and Council on 2019-09-24 to provide a Project update. IAMGOLD met again with BHFN on 2019-10-28 and received a letter of support from BHFN for the aforementioned applications. A copy of this letter of support was provided in the email to ECCC.	Tuovi Haapakoski (Ministry of Natural Resources and Forestry), Emily Salt (Ministry of Natural Resources and Forestry), Derek Seim (Ministry of Natural Resources and Forestry), Andrea Ellis Nsiah (Ministry of Natural Resources and Forestry), Taiwo Akisanmi (Ministry of Natural Resources and Forestry), LeeAnn Lepage (Ministry of Natural Resources and Forestry)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,646	Email	10/28/2019	Environment and Climate Change Canada shared comments they received from the Métis Nation of Ontario regarding the proposed Offsetting Plan and Assessment of Alternatives for mine waste disposal as well as the Fish Habitat Offsetting Plan. Comments and IAMGOLD's responses are located in ROC 1647.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)
1,635	Email	10/29/2019	Wood, on behalf of IAMGOLD, provided the Assessment of Alternatives (Revision 2) to Environment and Climate Change Canada (ECCC) and Fisheries and Oceans Canada. ECCC confirmed receipt of the files.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Alina Shams (IAMGOLD Corporation)
1,645	Email	10/29/2019	IAMGOLD informed Environment and Climate Change Canada that the draft Fisheries Act Authorization, Offsetting Plan and Assessment of Alternatives had been shared with Brunswick House First Nation (BHFN) and that IAMGOLD met with BHFN to discuss and disclose a draft letter of support for IAMGOLD with regards to the applications. IAMGOLD provided a copy of the support letter from BHFN to ECCC.	Murray Ray (Flying Post First Nation), Kevin Tangie (Brunswick House First Nation), Chad Boissoneau (Mattagami First Nation), Brandi Mogge (Fisheries and Oceans Canada), Cheryl St. Denis (Brunswick House First Nation), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Steven Bowles (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation), Christian Naponse (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,833	Email	10/30/2019	IAMGOLD contacted the Major Projects Management Office to provide a copy of the letter of support received from Brunswick House First Nation regarding the Metal and Diamond Mining Effluent Regulations Schedule 2. IAMGOLD also provided a copy of their responses to the Métis Nation of Ontario's comments on the Assessment of Alternatives for Mine Waste Disposal and Fish Habitat Compensation Plan. A call was also requested to discuss next steps.	Kirsten Querbach (Natural Resources Canada), Erika Uchmanowicz (Major Projects Management Office)	Alina Shams (IAMGOLD Corporation)
1,673	Phone Call	11/05/2019	Fisheries and Oceans Canada informed IAMGOLD that they will be completing the review of comments and responses from the Métis Nation of Ontario regarding the Habitat Compensation Plan by 2019-11-15.	Brandi Mogge (Fisheries and Oceans Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Cynthia Russel (Minnow Environmental Inc.), Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,691	Phone Call	11/05/2019	Fisheries and Oceans Canada (DFO) contacted Minnow Environmental and left a message indicating that DFO is aiming to complete their review of comments submitted by the Métis Nation of Ontario on the proposed Fisheries Offsetting Plan and Assessment of Alternatives by 2019-11-08. DFO also committed to reviewing IAMGOLD's responses to MNO's comments by 2019-11-15. Minnow confirmed receipt of the voice message on 2019-11-06 and asked DFO to confirm if there are any clarifications required to the responses to comments Minnow submitted to DFO on the Fish Habitat Compensation Plan.	Brandi Mogge (Fisheries and Oceans Canada)	Kim Connors (Minnow Environmental Inc.)
1,692	Email	11/17/2019	Fisheries and Oceans Canada (DFO) provided preliminary comments on three of IAMGOLD's responses to the Métis Nation of Ontario's comments on the Fisheries Offsetting Plan and Assessment of Alternatives.	Brandi Mogge (Fisheries and Oceans Canada)	Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,693	Email	11/18/2019	On 2019-11-06 IAMGOLD contacted Environment and Climate Change Canada (ECCC) to inquire about the progress of their review of IAMGOLD's responses to Métis Nation of Ontario's comments on the Assessment of Alternatives and Fish Habitat Compensation Plan and indicated willingness to meet to discuss next steps. ECCC responded that they had questions and would like to meet following their review of responses to be provided to IAMGOLD the following week. ECCC and DFO provided comments on IAMGOLD's responses on 2019-11-14. IAMGOLD provided a preliminary set of further responses/updates on 2019-11-18 and requested a call to review outstanding points to ensure accuracy in responses. ECCC and DFO provided potential meeting dates.	Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,698	Conference Call	11/20/2019	Minnow Environmental, on behalf of IAMGOLD, and Fisheries and Oceans Canada (DFO) discussed DFO's conditions concerning the verification of the Habitat Suitability Index and habitat variables in the Fish Habitat Compensation Plan.	Brandi Mogge (Fisheries and Oceans Canada)	Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,695	Meeting	11/22/2019	IAMGOLD met with Fisheries and Oceans Canada (DFO) and Environment and Climate Change Canada (ECCC) to discuss the comments received from the Métis Nation regarding the Fisheries Offsetting Plan and Assessment of Alternatives. Also discussed was the feedback ECCC and DFO provided on IAMGOLD's proposed responses.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,719	Conference Call	11/22/2019	IAMGOLD, Environment and Climate Change Canada and Fisheries and Oceans Canada met to discuss IAMGOLD's responses to comments from the Métis Nation of Ontario on their review of the Assessment of Alternatives and the Fish Habitat Offsetting Plan which were dated 2019-09-11. Draft minutes were provided to attendees on 2019-12-05.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), Stephen Crozier (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation), Zahir Jina (SLR Consulting (Canada) Ltd.)
1,761	Conference Call	11/22/2019	IAMGOLD and the Ministry of Environment and Climate Change Canada discussed consultation and next steps on the Metal and Diamond Mining Effluent Regulations Schedule 2 process.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,685	Email	11/29/2019	IAMGOLD met with Fisheries and Oceans Canada and Environment and Climate Change Canada to discuss IAMGOLD's responses to comments from the Métis Nation of Ontario on the Assessment of Alternatives report.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Alina Shams (IAMGOLD Corporation)
1,647	Email	12/09/2019	IAMGOLD provided responses to comments regarding the Assessment of Alternatives and Fish Habitat Compensation Plan. The comments were provided by the Métis Nation of Ontario to Environment and Climate Change Canada on 2019-09-27 and were provided to IAMGOLD on 2019-09-28. On 2019-10-29 ECCC confirmed receipt of the responses and indicated they would be working with DFO to review them and provide additional context if needed. ECCC also confirmed receipt of the updated Assessment of Alternatives and informed that it had been forwarded for review.	Linda Norheim Brookes (Métis Nation of Ontario), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)
1,699	Website	12/09/2019	Environment and Climate Change Canada posted the Summary of Public Consultation for the 2019-08-27 Gogama Open House on the Government of Canada website.	Angelique Petropoulos (Environment and Climate Change Canada)	

ROC	Event Type	Date	Event Summary	Participants	Team
1,706	Email	12/10/2019	IAMGOLD provided responses to comments from the Métis Nation of Ontario on the Assessment of Alternatives and Fish Habitat Compensation Plan. These comments were received via Environment and Climate Change Canada (ECCC) and Fisheries and Oceans Canada (DFO) on 2019-08-28. In addition to the responses to comments, IAMGOLD provided a figure showing Alternative A Configuration. IAMGOLD also provided ECCC and DFO with an updated table containing comments from ECCC and DFO regarding IAMGOLD's draft responses to MNO.	Unknown Unknown (Métis Nation of Ontario), Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,713	Email	12/18/2019	Following the 2019-12-11 confirmation of receipt email where Environment and Climate Change Canada (ECCC) stated they would review the final responses from IAMGOLD to the comments provided by the Métis Nation of Ontario (MNO) regarding the Assessment of Alternatives and Fish Habitat Compensation Plan, IAMGOLD inquired about next steps and asked if ECCC had any further questions. On 2019-12-18 ECCC responded noting that they did not have any further questions and would be sending IAMGOLD's responses to MNO.	Claude Asselin (Environment and Climate Change Canada), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,715	Email	12/18/2019	On 2019-12-16 Environment and Climate Change Canada (ECCC) requested additional information be added to the water body figures on the maps contained within the Schedule 2 Amendment of the Metal and Diamond Effluent Regulations. The additional information was added and Minnow, on behalf of IAMGOLD, provided the updated figures to ECCC on 2019-12-17. ECCC responded confirming receipt of the changes.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS)

ROC	Event Type	Date	Event Summary	Participants	Team
1,729	Email	12/19/2019	Environment and Climate Change Canada (ECCC) provided the Métis Nation of Ontario (MNO) with responses prepared by IAMGOLD to their comments on the Alternatives Assessment Report and Fish Habitat Compensation Plan. ECCC indicated they and Fisheries and Oceans Canada had reviewed all responses and asked MNO to confirm if they determine the responses to be sufficient or if they have any further comments or questions.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,731	Email	01/01/2020	On 2019-12-16 Environment and Climate Change Canada (ECCC) requested additional information be updated on waterbody figures 1 and 2 for maps in the Proposed Schedule 2 Amendment of the Metal Diamond Mining Effluent Regulations (MDMER). IAMGOLD provided the updated figures on 2019-12-17 as well as an updated table to reference the letters and numbers added to the figures. On 2019-12-31 ECCC requested the information be provided in French as well. IAMGOLD provided all updated figures in English and French on 2020-01-10.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)
1,739	Email	01/06/2020	IAMGOLD contacted Environment and Climate Change Canada to ask if Métis Nation of Ontario provided comments on the draft notes provided to them from the consultation session on 2019-08-29. IAMGOLD requested a copy of the final meeting notes.	Angelique Petropoulos (Environment and Climate Change Canada)	Krista Maydew (Wood E&IS), David Brown (IAMGOLD Corporation)
1,785	Email	01/07/2020	On 2020-01-06 IAMGOLD sent the Project Assessment of Alternatives, updated to reflect comments from the Metis Nation of Ontario, to Environment and Climate Change Canada (ECCC) and requested confirmation of receipt of the documents. On 2020-01-07 ECCC provided confirmation of receipt of the Assessment of Alternatives.	Claude Asselin (Environment and Climate Change Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada), Patrick Koch (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Don Carr (Wood E&IS), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,742	Email	01/09/2020	On 2020-01-06 Environment and Climate Change Canada (ECCC) contacted IAMGOLD to inquire if any of the water bodies within the Project footprint subject to the Schedule 2 Metal and Diamond Mining Effluent Regulations are subject to a Transport Canada permit under the new Navigable Waters Protection Act. On 2020-01-07 IAMGOLD informed ECCC that no water bodies being overprinted by the Tailings Management Facility fall under the Canadian Navigable Waters Act as they are non-navigable. On 2020-01-09 IAMGOLD contacted ECCC to schedule a call to discuss next steps in the Schedule 2 process. ECCC indicated they did not have any updates at this time and may be looking to provide updates later in the month.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Alina Shams (IAMGOLD Corporation)
1,821	Email	01/20/2020	On 2020-01-13 IAMGOLD inquired with Environment and Climate Change Canada (ECCC) if all updated Schedule 2 Amendment figures had been received and to confirm if ECCC was recommending IAMGOLD's application for an expedited process. On 2020-01-17 ECCC indicated they are recommending the streamlined process for the Project and they were waiting for approval by Treasury Board to apply the streamlined policy. ECCC noted that if the process is approved, they have a tentative date of June 2020 for publication.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.), Don Carr (Wood E&IS), Giancarlo Drennan (Maple Leaf Strategies), Alina Shams (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,826	Email	01/27/2020	The Métis Nation of Ontario (MNO) informed Environment and Climate Change Canada that they will be submitting responses to IAMGOLD's comments on MNO'S review of the Fish Habitat Compensation Plan and the Assessment of Alternatives.	Marcel Lafrance (Métis Nation of Ontario), David Hamilton (Chapleau Métis Council), Urgel Courville (Northern Lights Métis Council), Liliane Ethier (Temiskaming Métis Council), Amy Sen (Canadian Environmental Assessment Agency), Linda Norheim Brookes (Métis Nation of Ontario), Jacques Picotte (Métis Nation of Ontario), Margaret Froh (Métis Nation of Ontario (MNO)), Joanne Meyer (Métis Nation of Ontario (MNO)), Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,743	Conference Call	01/29/2020	IAMGOLD and Environment and Climate Change Canada discussed consultation and next steps on the Metal and Diamond Mining Effluent Regulations Schedule 2 process.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation), Michel Payeur (IAMGOLD Corporation)

ROC	Event Type	Date	Event Summary	Participants	Team
1,841	Email	01/29/2020	On 2020-01-28 IAMGOLD and Environment and Climate Change Canada (ECCC) discussed plans for a teleconference to discuss the submission of comments from the Métis Nation of Ontario to IAMGOLD's responses on their review of the Fish Habitat Compensation Plan and Assessment of Alternatives for Mine Waste Disposal. IAMGOLD and ECCC held a teleconference as planned and also discussed the Schedule 2 process on 2020-01-29.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,747	Phone Call	01/31/2020	On 2019-11-25 following the 2019-11-20 teleconference, Fisheries and Oceans Canada (DFO) indicated that the verification of the Habitat Suitability Index and habitat variables needs to be further discussed and requested verification on the approach IAMGOLD used to calculate losses. On 2019-12-02, DFO and Minnow Environmental agreed that this uncertainty should be addressed. DFO agreed that they would send conditions from previous Fisheries Act Authorizations to provide an example of the expectations and level of effort required. These expectations could then be identified within the Fish Habitat Compensation Plan and responses to Métis Nation of Ontario comments.	Brandi Mogge (Fisheries and Oceans Canada), Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Kim Connors (Minnow Environmental Inc.)

ROC	Event Type	Date	Event Summary	Participants	Team
1,843	Email	02/03/2020	Environment and Climate Change Canada inquired if the revised Assessment of Alternatives could be made available for the Métis Nation of Ontario for viewing in SharePoint. IAMGOLD responded that the document was available.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), David Brown (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)
1,848	Email	02/07/2020	IAMGOLD and Environment and Climate Change Canada discussed plans provide an update on the status of IAMGOLD'S application for a Schedule 2 Amendment.	Angelique Petropoulos (Environment and Climate Change Canada), Augusto Gamero (Environment and Climate Change Canada)	Stephen Crozier (IAMGOLD Corporation), Alina Shams (IAMGOLD Corporation)

APPENDIX D-4
COMMENTS AND RESPONSES RELATED TO FISHERIES ACT AUTHORIZATION
JULY 2012 TO NOVEMBER 2018

Comments and Responses Related to Fisheries Authorization – Indigenous - July 2012 to November 2018

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
68	Meeting	02/13/2013	1) Lynn Ray (Flying Post First Nation); 2) Robert (Bob) McLeod (Flying Post First Nation)	1) How will the fish be transferred from Côté Lake? 2) When you move the lake and change the water flow, will there be monitoring of the fish?	The fish will be transferred in a staged draw down process. The fish population is comprised of small pike, whitefish, and white sucker. In the first baseline study performed by AMEC in the fall of 2010 pickerel were captured as part of the investigation. A follow up study, performed to identify fish populations in the summer of 2012 by Minnow Environmental, captured no walleye species. This suggests that pickerel use Côté Lake as a travel corridor because the lake is shallow. We will recreate the habitat and transfer breeding populations of fish to the new lake location, which has not yet been determined. The lake is about the same size as the one at Detour Gold. Yes there will be monitoring of the fish to ensure the population survives and there will be monitoring ongoing throughout the life of the project and beyond closure.
71	Meeting	02/20/2013	1) Walter Naveau (Mattagami First Nation)	1) Individual asked what kind of fish are in Côté Lake.	IAMGOLD answered White fish, Sucker and Pike.
85	Meeting	02/22/2013	1) Andy Lefebvre (Métis Nation of Ontario)	1) Métis Nation of Ontario asked what kind of fish are in the surrounding lakes.	IAMGOLD said that it's sucker, pickerel, pike and perch.
196	Open House	05/22/2013	1) James Naveau (Mattagami First Nation)	1) Water - concerned about the removal of lakes - fish, eagles nest - disturb nesting time. Displacement of wildlife.	Thank you for your comment. These concerns will be addressed in the Environmental Assessment.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
196	Open House	05/22/2013	1) Unknown Unknown (Mattagami First Nation)	1) Creates migration problems for birds, fish, moose, beaver. The whole area will be affected. Spawning beds will be ruined. Bird migration will be altered.	Thank you for your comment. These impacts will be assessed in the Environmental Assessment.
196	Open House	05/22/2013	1) Unknown Unknown (Mattagami First Nation)	1) It would stop people from enjoying the land, such as fishing, camping, hunting, etc.	Thank you for your comments. These impacts will be addressed in the Environmental Assessment.
281	Meeting	08/14/2013	1) Kevin Eshkawkogan (M'Chigeeng First Nation)	1) On 2013-03-15 an individual indicated that there are several members of the M'chigeeng First Nation (MFN) that utilize the territory close to the location of the Côté Gold Project and that it is felt that a project of this magnitude will have an impact on the hunting and fishing rights identified under the Robinson Huron Treaty. The so-called treaty border between Robinson-Huron and Treaty 9 is the "height of land" which is watershed road. Even though the mine is not going to exactly be in the M'chigeeng First Nation.	Thank you for your comment. IAMGOLD has discussed the impact of the Project with the Lake Huron Regional Chief.
362	Email	10/04/2013	1) Shawn Batise (Wabun Tribal Council)	1) The proposed ToR indicates the following: The cumulative effects analysis presented in the EA will therefore be restricted to the analysis of cumulative effects on the existing environmental baseline related to identified projects and activities that "will be carried out"; and to those projects of significance within the broader regional context, which may overlap the undertaking in regards to type of effect, time and space. In proposing this approach, the Proponent is relying	Thank you for your comment. The cumulative effects assessment is not a MOE requirement under the Code of Practice for the Preparation of an Environmental Assessment. Cumulative effects assessment has been included as it is a requirement under the Federal EA Process. There is no requirement by the MOE with regards to "pre-development baseline". The CEA Operational Policy Statement issued in May 2013 states the following with regards to the cumulative effects assessment and the need for "pre-development baseline". Present-day environmental conditions reflect the cumulative environmental effects of many past or existing physical activities may be helpful: f

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				on the "existing project baseline" to adequately characterize the effects of past projects and activities. We are concerned that this approach is inconsistent with the intentions of CEAA 2012, CEA Agency guidance, and recent case law. The recently published CEA Operational Policy Statement states that: Information on the environmental effects of past or existing physical activities may be helpful: - If the effects of past or existing physical activities on a specific VC will help predict the environmental effects of a designated project; - If information on past or existing physical activities will assist in the identification of appropriate mitigation measures for the designated project; or - If an existing physical activity will be decommissioned in the future and this decommissioning would affect the future condition of a specific VC. The "gold standard" in cumulative environmental effects assessment involves the determination of a pre-development baseline. Such a baseline often provides the most "help" in predicting the environmental effects of a designated project and 'assistance in identifying appropriate mitigation measures. While there are sometimes challenges to creating a pre-developed baseline in terms of the	the effects of past or existing physical activities on a specific VC will help predictf information on past or existing physical activities will assist in the identification of appropriate mitigation measures for the designated project; orif an existing physical activity will be decommissioned in the future and thisdecommissioning would affect the future condition of a specific VC.The baseline studies carried out for the Project reflect the cumulative environmental effects of past and ongoing physical activities. This baseline was carried out over various years. It is not believed that a description of past environmental conditions will help in the understanding of cumulative environmental effects, as identified in the CEA Operational Policy Statement. The intent of the cumulative environmental assessment is consider the overall effect of the planned projects on the environment based on the existing baseline conditions. It should be noted that historic use of the area will be documented in the archaeology baseline. Additionally, IAMGOLD is actively working with Aboriginal people to gather Traditional Knowledge and Traditional Land Use Information to complement the existing baseline studies done to date. Should this information be available upon submission of the EA, it will be considered in the cumulative effects assessment. IAMGOLD understands the importance that Aboriginal people give to the land and resources inthe vicinity of the Project and will work with Aboriginal communities to determine what mitigation and monitoring measures are preferred. After Project closure is completed, the area occupied by the Project will be rehabilitated.The cumulative effects assessment will be presented in the EA. As part of this assessment IAMGOLD will look at the combined

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				availability of suitable pre-development data, this is not the case. While there will likely be some uncertainty associated with pre-development conditions the same can be said for the existing project baseline due to the inherent limitations in data gathering. The Proposed ToR do not indicate why a pre-development baseline is not being proposed or what efforts have been taken to determine a pre-development baseline or to determine its limitations. The use of an existing project baseline provides information related to what remains in the environment as a result of the effects of prior projects and activities. However, a pre-development baseline allows the characterization of what has been lost or gained as a result of the effects of prior projects and activities. This is fundamental, for example, to determine the remaining potential for a region to support the exercise of Aboriginal land-based rights protected in Treaty 9. By providing insight into what has been lost, a pre-development baseline sheds light on the importance of what remains intact (e.g. in terms of ecosystem functions, habitat, preferred species populations, biodiversity, cultural landscapes, etc.) and what still remains possible (e.g. hunting, fishing, gathering, quiet enjoyment of the land, etc.). The loss of fish and wildlife habitat and harvesting opportunities associated with the proposed Project take on greater importance as a result of what has already been lost	footprint of this Project and other reasonable foreseeable projects within the local and/or regional study area.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				or taken up by other projects and activates. The Proposed ToR should require presentation of available information concerning the historical circumstances prior to the development of projects and` activities in the regional study areas for each environmental component, the residual effects of these projects and activities on the environment, and the implications of these residual effects for the potential and established Aboriginal and treaty rights and related interest of Aboriginal groups. Further, the Proponent must be required to consult with Aboriginal groups on the available information and seek to augment this information with available traditional knowledge concerning the historical context. Additionally, in describing the "existing project baseline", the Proposed ToR must give consideration not only to a snapshot of current conditions, but must also include trend or comparative analysis, as appropriate to the available data, to provide insight into whether conditions are becoming more or less favourable in relation to the environmental components or indicators under study (e.g. are species populations rising, stable or falling?)	
369	Meeting	10/09/2013	1) Richard Ray (Flying Post First Nation)	1) Is IAMGOLD investigating the effects of blasting on fish?	Yes, the results of this investigation will be presented in the EA.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
369	Meeting	10/09/2013	1) Rick Hendricks (Wabun Tribal Council)	1) Will Project staff be allowed to hunt and fish around the site?	How exactly this will be managed has not been fully decided yet. There will likely be a hunting ban for staff, and fishing, if any, will be carefully managed.
370	Meeting	10/15/2013	1) Shawn Batise (Wabun Tribal Council)	1) Will mine staff be allowed to go fishing and hunting? How will that be managed?	How exactly this will be managed is not fully decided. There will likely be a hunting ban for staff, and fishing, if any, will be carefully managed in consultation with the community and agencies.
370	Meeting	10/15/2013	1) Shawn Batise (Wabun Tribal Council)	1) When you rescue fish, won't they just take space from other fish?	Lakes typically have the capacity to accommodate additional fish.
370	Meeting	10/15/2013	1) Rick Hendricks (Wabun Tribal Council)	1) Why not just fish and consume the fish from Côté Lake, rather than relocate?	The common mitigation measure to reduce the impact on fisheries is to capture and relocate them within the system. IAMGOLD will gladly discuss alternative options.
370	Meeting	10/15/2013	1) Walter Naveau (Mattagami First Nation)	1) Moving fish from Côté Lake may bring diseases to other lakes.	IAMGOLD will consider this concern. Note that the plan is to relocate fish within the same watershed.
370	Meeting	10/15/2013	1) Rick Hendricks (Wabun Tribal Council)	1) Will methyl mercury be an issue with TMF seepage?	Methyl mercury is currently not considered to be an issue. However, the geochemistry reports in the EA will provide further details.
392	Presentation	02/26/2014	1) Unknown Unknown (Unknown Individual)	1) Is it possible to return fish to open pit and will IAMGOLD vegetate the Tailings Management Facility at closure?	We plan to incorporate the flooded pit into the Mollie River system which will provide a large lake area for fish to inhabit. The TMF surface will be vegetated as part of the plan.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
392	Presentation	02/26/2014	1) Unknown Unknown (Unknown Individual)	1) Will there be restrictions to staff for fishing?	Yes, currently the plan is to restrict fishing as the lakes within the area are not very productive and would likely be impacted by the fishing pressure.
453	Meeting	06/05/2014	1) David Flood (Matachewan First Nation); 2) David Flood (Matachewan First Nation); 3) Kevin Tangie (Brunswick House First Nation)	1) What is the proposed width for the realignments? 2) Who are the proposed contractors/engineers being considered to design the watercourse realignments? 3) We would like to understand from an aerial perspective how the watercourse realignments will look. Are there pictures that show this from an aerial perspective in the environmental assessment?	The new valleys will be approximately 50 metres wide with a channel ranging in width similar to the existing watercourse. We have not yet selected any contractors/engineers yet for the construction plans needed for the development of the watercourse realignments. Once we have completed the feasibility study, and are closer to Project construction, we would be happy to accept bids from local contractors for the development of these realignments. Our Project maps show the proposed channel realignments from an aerial perspective.
463	Open House	06/18/2014	1) Unknown Unknown (Flying Post First Nation)	1) To confirm, as one of the mitigations, IAMGOLD will not allow Project staff to hunt or fish on site?	Correct. While on shift, Project staff will not be allowed to hunt or fish on the site property during construction and operations phases.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) G-2. Aquatic Environment. Overall, the Proponent has appropriately sited the Project activities to minimize the footprint and aquatic disturbance of what is a very large project. Our main concerns relating to the assessment of the effects on the aquatic environment are the need for a more complete and better-described baseline data set. This would include more consistent sampling of reference and potentially affected waters and addressing missing baseline data (i.e. mercury in fish tissue, zooplankton, phytoplankton and periphyton). The	Your comment has been noted.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				Proponent has not presented or summarized data for specific water bodies, but has provided descriptive statistics for populations of lakes, ponds and streams and uses these as input to predictive models. Baseline data and interpretation for geochemistry are not well elaborated. The lack of clarity regarding the points of effluent discharge and the water management plan do not provide high confidence in the impact assessment, which contains uncertainties that go unaddressed.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#9: Makeup water requirements, Project Description, Section 5.10 "Mesomikenda Lake is also expected to provide a potential source of makeup water for use in the ore processing plant, as needed. This uptake would not exceed 20% of the daily flow, and would occur seasonally when sufficient flow is available. (p.5-20) Freshwater will be taken from Mesomikenda Lake via a single-walled HDPE freshwater pipeline to a tank located in the ore processing plant. This freshwater pipeline intake will be designed to meet applicable Federal guidelines so as to prevent the impingement and entrainment of fish." (p.5-23) It is unclear how "sufficient flow" would be defined and determined on a day-to-day basis. We have been unable to locate in the EIS sufficient information concerning the timing, seasonality,	a) Although at this time the freshwater removal rate is not expected to be greater than 20% of the process water demand at the ore processing plant, the maximum freshwater removal rate will be determined during the Permit to Take Water application phase. Freshwater will be taken in accordance with conditions associated with the Permit to Take Water, when approved. The water removal is intended to supplement recycled site water and provide for truck washing, potable and fire reserve requirements.b) The predicted change to flow and water level in Mesomikenda Lake are assessed under operational conditions in Appendix I (Hydrology TSD). An Addendum to Appendix I has been prepared which includes the sensitivity of Mesomikenda Lake to various climate and removal scenarios.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				frequency and extent of water taking that are proposed from Mesomikenda Lake or an assessment of the potential environmental effects of this activity. a) Please describe how "required flow" would be determined and how the takings would be related to 20% of required flow. b) Please indicate the location in the EIS where the potential effects of water taking from Mesomikenda Lake are assessed, or complete and provide the assessment.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#40: Lack of reference sites, Appendix N – Appendix C Schist Lake was sampled as a potential reference lake for future studies. However the benthic communities in both the shallow and deep stations proved to be quite different and it is not recommended that it be used in future studies. (p.iii) The benthic community within Bagsverd Creek was very different than Errington Creek in density, taxon richness, Simpson's Evenness and community composition. Despite that Errington Creek represented a similar size water course and upstream watershed size, was located within the same watershed as Bagsverd Creek and appeared to be a good reference, the benthic communities were very different and it is therefore recommended that Errington Creek not be used as a reference in the	At the time of the baseline field studies, Schist and Errington Creek were selected as possible reference locations based on their location within the watershed, size and structure. When in the field Errington Creek looked very similar yet smaller than Bagsverd Creek. However, as noted the benthic communities in the proposed areas differed. A survey will be undertaken before mine development to locate appropriate reference areas for all identified mine exposure areas. This will require field observations and sampling prior to effluent discharge.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				future for Bagsverd Creek. (p.iii) Reference locations are needed during the construction and operations phases to provide a comparable dataset and allow for spatial comparisons in the future. The east arm of Schist Lake was the only reference area deemed to be an appropriate reference for fish. Both the lentic (Schist Lake) and lotic (Errington Creek) benthic invertebrate reference sites were considered inappropriate because of the natural differences in community assemblage between these sites and potentially impacted sites. Please provide alternate lentic and lotic reference sites for benthic invertebrates and lentic reference sites for fisheries.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#43: Fish tissue results, Appendix N, Appendix C, Section 6 and Appendix N, Appendix C, Appendix F Fish tissue contaminant results are presented in Appendix F but not discussed in the text. Please provide a description of fish tissue results and how these results relate to fish consumption guidelines.	While fish tissue results are not presented in the HEHRA, fish consumption is acknowledged and addressed as a potential exposure pathway.This exposure pathway was evaluated through an examination of predicted changes in surface water quality obtained through modelling. Predicted concentrations of contaminants of concern during each of the phases of the Project were compared to Human Health benchmarks. The benchmarks used are considered protective of all exposure pathways relevant to surface water including direct ingestion, dermal contact during swimming and indirect ingestion of fish.Comparison of the predicted concentrations to human health benchmarks indicated no exceedances; therefore, it was concluded that there would be no incremental risks attributable to the Côté Gold Project from fish

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					consumption in the Project area. Further information is available in Appendix W (HEHRA), Section 2.2.3.3.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#44: Fish tissue results, Appendix N – Appendix C, Appendix F Fish tissue was not analyzed for methylmercury. The decomposition of flooded organic matter in soils and vegetation will occur at the Côté Gold Project and this enhances the methylation of mercury to the bioavailable and toxic form, which can biomagnify within the food chain. Please provide a commitment and procedure to collect baseline methylmercury concentrations in forage and predator fish and water prior to site disturbance.	It is true that methyl mercury represents the biologically available form of mercury accumulated by fish in their tissue. Therefore, the mercury concentrations measured in fish tissue represent methyl mercury (Grieb et al. 1990) and it does not need to be analyzed as methyl mercury. Total mercury (representing methyl mercury) has been analyzed in forage and sport fish from most water bodies within the study area.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#45: Mark-recapture population estimates, Appendix N, Appendix C, section 6.2.2 Mark-recapture studies designed to estimate fish population size were performed in Côté Lake and Unnamed Lake #1 but not in any other water bodies. Population sizes of northern pike, white sucker and walleye were assessed against appropriate comparisons to indicate the general productivity of the two lakes but it is unclear why these two lakes were the only ones selected. We assume that these two lakes will be removed during site construction and, if so, this would provide the needed rationale as population estimates are required to develop habitat	When the baseline work was initiated in 2012, the final location for the TMF was not selected and there was a potential that Unnamed Lake 1 would be lost. Therefore, mark-recapture studies were conducted in Côté and Unnamed Lake 1 to assess the lakes potentially lost due to the Project development.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				compensation plans. Please provide rationale for the selection of Côté Lake and Unnamed Lake #1 as the locations for the mark-recapture estimates.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#46: Site selection, Appendix N – Appendix C, Section 2, p. 7 There were no standardized methodologies used to determine an appropriate number of sample sites to characterize fish and benthic invertebrates in each water body. Five sites were sampled in each water body regardless of surface area or homogeneity of benthic habitat. Please provide justification for the number and location of sample sites and indicate if benthic invertebrate sites were chosen in equal proportion to the type of benthic habitat.	The number of benthic samples collected from each lake was established to take within-area variability into account and to allow for comparisons among lakes. Assuming Environment Canada's minimum criterion for risk of type 1 (alpha or false positive) and type 2 (beta or false negative) errors of 10% (0.1; Environment Canada 2012), and having a goal of detecting differences between areas of ± two times the reference area standard deviation, then a minimum number of five stations per area is required to provide adequate statistical power. Stations were standardized to the extent possible for habitat factors (i.e., depth, substrate, position relative to the thermocline) to reduce variability among lakes and allow for more meaningful comparisons.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#48: Aquatic species at risk, Appendix N – Appendix C, Section 6 and Appendix N – Appendix C – Appendix A Fish habitat was described in great detail but was not assessed in accordance with the habitat requirements of any provincially or federally listed Species at Risk. Fish communities were assessed for the presence COSEWIC listed endangered, threatened or special concern but not COSSARO (Committee on the Status of Species at Risk in Ontario) species.	a) As of May 2014, a total of 159 fish species have been placed into the 5 Committee on the Status o f Endangered Wildlife in Canada (COSEWIC) risk categories. Of these 56 are endangered, 40 are threatened and 54 are listed of special concern (COSEWIC 2014). Five of the endangered species listed are found in Ontario, however none of these are within the vicinity of the Côté Gold development. Of the 40 threatened fish species, 7 are observed in Ontario, however all of these species can only be found in southern Ontario. None of the 11 special concern species are found within the vicinity of the Côté Gold development. Thus

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				a) Please characterize fish habitat in terms of habitat requirements for provincially and federally listed Species at Risk. b) Please determine the presence of any COSSARO listed species.	characterization of habitat for these species is not applicable.b) The only Committee on the Status of Species at Risk in Ontario listed fish species found in the Sudbury region is the lake sturgeon. The southern Hudson Bay / James Bay population is listed as special concern and the Northwestern Ontario and Great Lakes-Upper St. Lawrence River populations are listed as threatened. Mesomikenda Lake is part of the headwaters of the Moose River Basin. In the Moose River Basin, lake sturgeon are found throughout many of the larger rivers and their tributaries, however are mostly absent from the most southern Canadian shield portions of the basin where the Côté Gold Project lies (Ministry of Natural Resources 2008). Lake sturgeon preferred habitat is larger lakes and river, with soft bottoms of mud, sand or gravel. They are usually found at depths from 5 to 20 m. Spawning habitat is typically found in relatively shallow, fast flowing water with gravel and boulder substrate, however they will spawn in deeper water or on open shoals.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#49: Fish habitat surface area, Appendix N – Appendix C, Section 6 and Appendix N – Appendix C – Appendix A Water bodies and fish habitat sites were not identified that could potentially be rehabilitated, restored or created to offset losses from the proposed Project. Please provide potential water bodies and fish habitat sites that could be utilized in the future to offset losses from the proposed Project.	The Project will result in changes in fish habitat through the loss of Côté Lake and parts of Bagsverd Creek, Upper Three Duck Lake, Clam Lake and the Mollie River. These losses will be off-set by the construction of the realignment channel that will connect Bagsverd Lake to Unnamed Lake #2, the realignment channel from Chester Lake to Clam Lake, the increase in water level in Chester Lake and the south arm of Bagsverd Lake (Figure 1.2 Appendix N). In addition, at closure the open pit will be allowed to fill and will be reconnected to Upper Three Duck Lake which will provide additional fish habitat, although this habitat was not

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					considered in the impact assessment as it will take more than 50 years for the pit to fill following closure.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#50: Fish habitat surface area, Appendix N – Appendix C, section 6 The resilience of fish species to potential impacts was not discussed. Please discuss the resilience of resident fish species to potential impacts.	The predominant fish species found in the local study area are northern pike and yellow perch. Both northern pike and yellow perch are known for their tolerance to broad water temperature ranges and low dissolved oxygen concentrations (Inskip 1982, Krieger et al. 1983). The occurrence of northern pike over a broad latitudinal belt in North America demonstrates their adaptability to a variety of thermal regimes and conditions (Inskip 1982). In addition to northern pike and yellow perch, walleye, white sucker and lake whitefish were also common and varied in abundance depending on lake habitat. White sucker are highly adaptable fish species found in both lake and river habitat over a broad range (Twomey et al. 1984, Scott and Crossman 1998). Walleye are generally not located within areas that will be lost due to the mine development and lake whitefish were only found within Côté Lake (very low abundance) and potentially use the habitat within the arm of Upper Three Duck Lake. Walleye are tolerant of a wide range of environmental conditions but are generally most abundant in moderate-to-large lacustrine (>100 ha) or riverine systems characterized by cool temperatures, shallow to moderate depths, extensive littoral areas, moderate turbidities, extensive areas of clean rocky substrate and mesotrophic conditions (McMahon et al. 1984). Lake whitefish are widely distributed in Ontario and typically inhabit deep inland lakes. In its northern distribution whitefish will live in streams flowing into Hudson Bay and regularly descend into brackish water. It is not anticipated that many walleye or lake whitefish will

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					require relocation from lost habitat areas. As for changes in habitat within lakes where these species do reside, it is anticipated that water levels will generally not be altered greater (up or down) than 1.2 m. Little Clam Lake is the only water body that will fall outside this where water level may decrease by 2.4 m. Neither walleye nor lake whitefish are present within this lake.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#51: Fish statistics, Appendix N, Appendix C, section 6, figures 6.1 – 6.5 The relationship between fish statistics (age, length and weight) was only displayed visually through a scatterplot. A linear regression would allow for better incorporation of these relationships into future assessments and a statistical detection of change. Please provide results of a linear regression between fish statistics (age, length and weight).	The length and weight relationship for fish data was only displayed visually through a scatter plot in the baseline report. The objective of this figure was to demonstrate that the growth was similar in all the lakes surveyed within the local study area. The distribution of data, sample sizes and range of data available for each lake varied greatly, therefore the data was displayed in this fashion as some samples sizes are insufficient to apply a linear regression. Linear regressions were applied to length at age relationships where age data was observed in greater than three age classes. All raw data is available for future comparisons.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#54: Fish communities, Appendix N, Section 2.4.2 A number of fish species were selected and assessed for future impacts based on their potential to support recreational opportunities and a subsistence food base. The updated Fisheries Act includes protection for fish that support these commercial, recreational and Aboriginal fisheries and contribute to productivity, but they are not discussed in the impact assessment.	In the Aquatic Baseline report, the habitat requirements of forage fish is described together with a description of the existing habitat for these species in each water body assessed. In the impact assessment, the protection of forage fish is indirectly addressed through the assessment of water quality to a standard of the protection of fish and aquatic life; and the assessment of loss of habitat which incorporates habitat for both sport and forage fish.

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				Please include an assessment of future impacts on fish that support commercial, recreational and Aboriginal fisheries.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#56: Magnitude levels for fish, Appendix N, Table 4.1 and Appendix N, Section 4.2 "During construction of the mine, as many fish as possible will be collected and relocated from all habitats that will be lost due to the development of the mine. However, it will not be possible to collect and move all fish and therefore, some individuals will likely be affected during construction" (Table 4.1). Individual fish will be lost during development due to lost habitat but the magnitude of this impact is only deemed level 1. A more detailed analysis is needed to make this conclusion. Please provide a more detailed analysis of population estimates and targeted relocation numbers to support the argument that project activities will not impact fish communities or populations, and that the magnitude is not level 2.	The criteria for level 1 impact to commercial, recreational and aboriginal fish was "There is no measurable effect to sport fish communities or populations". Based on experience at other sites, IAMGOLD expects the relocation of fish to be successful such that it will result in the salvage of fish of all year classes of all resident species. It is likely that thousands of fish will be moved but it is not possible to capture every fish and as a result some individual fish will be lost. However, the losses of individuals are not expected to have a measurable effect on the community or population and hence the assignment of a level 1 impact.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#57: Fish habitat description, Appendix N, Table 4.1 and Appendix N, Section 4.2 "Blasting from the open pit may affect fish habitat and spawning in adjacent water bodies during construction and the early years of operation (Table	Blasting has been predicted to have effects to fish spawning at a distance of 238.5 m from the pit during construction and at 349 m during operations. These distances overlap the south eastern portion of Clam Lake (see Figure 4.1 from the Aquatic Biology TSD). The dominant species found in this lake are smallmouth bass

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				4.1). ... However, the area potentially affected will either be overprinted by the construction of dams or is largely profundal (deep) and provides limited spawning habitat for the resident fish within this lake." It is stated that the area affected by blasting is primarily profundal habitat and of limited value for spawning. Additional description of this habitat would be useful for determining its importance, not only for spawning, but also for other sensitive life processes. The rationale for blasting impacts only to profundal (vs. littoral) habitat was not provided. Please provide a rationale for the habitat types and additional habitat description of the areas affected by blasting and its potential importance for all sensitive fish life processes.	which typically spawn within the first meter of water over and around cobble, gravel and sandy bottoms. All the other species found within Clam will typically use the first two meters for spawning substrate. Of all the species found in Clam, only smallmouth bass, burbot and johnny darter use sandy, rock substrate for spawning. All other species spawning substrate are associated with the presence of vegetation. Minimal vegetation is present within the area affected by the blasting. The habitat present is largely cobble, rock, sand and silt substrate which is abundantly present in Clam Lake. During construction, the shoreline perimeter affected by the blasting will be approximately 240 m and 892 m during operations. The predominant area affected during operations falls in water depths greater than two meters of water, therefore it is anticipated that the area affected for spawning will be minimal when taking the entire area of the lake into consideration and the habitat present.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#60: Best Management Practices for erosion control, Appendix N, Section 4.2 "It is expected that through the implementation of best management practices for erosion control and timing of the construction periods relative to life history stages of resident fish, potential effects will be largely mitigated, and no residual effects to fish communities and populations are expected (Table 4.2). Monitoring of the effectiveness of these mitigation measures will be required (see Section 5.0)." (p.19)	Best management practices are described in the mitigation section (Chapter 10) of the EA document. The EA identifies the mitigation for erosion as "Best Management Practices (BMPs) and engineering design to limit soil erosion and mobilization/transport of sediments from disturbed areas" These best management practices are described as follows; "During construction, operations and closure phases, BMPs for erosion and sediment control include: design of physically stable mine rock and tailings storage facilities, the use of earthwork methods to minimize slope length and grade, ditching, sediment ponds / traps, channel and slope armoring, use of natural vegetation buffers, vegetation of disturbed soil, and runoff controls (i.e.,

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				It is stated that best management practices (BMPs) for erosion control will mitigate residual impacts on fish, but specific BMPs are not discussed, nor is the resilience of various fish species to the potential impacts. The effectiveness of BMPs as mitigation cannot be assessed in the absence of descriptions of their operation and use. Please explain what BMPs will be used for erosion control and how these will mitigate residual impacts. Discuss the resilience of fish species present to the potential impacts.	sediment fencing and small check dams). During post-closure, erosion and sediment control would be focused on monitoring the success of closure activities".
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#61: Duration of effects, Appendix N, Section 4.2, p.19 Impacts to fish will be pronounced in the first year of operations because watercourse realignments and constructed habitats may not be functional, but effects are expected to be short (i.e., one season). The duration of effects should be assessed in terms of impacted species and their life spans, not the lifespan of the mine, and more specific timing for the introduction of offsetting habitat should be presented. a) Please evaluate the duration of effects in terms of impacted species. b) Please provide more detail on the specific timing for introducing offsetting habitat.	a) The levels of duration described in Chapter 11 are somewhat related to the duration of each Project phase, however, the prediction of effects on aquatic species does consider the actual expected duration of each effect. b) Details on the specific timing of offsetting measures will be developed as part of the Fisheries Authorization. Ideal timing windows for minimizing fish and egg stranding during watercourse realignments will be considered. Timing of spawning for all fish found within the local study area indicated that the optimal window for all species will be later summer, early fall (attached Table 1). By August all species young-of-the-year should be large enough to catch and transfer. Only golden shiner spawn into August. Since their spawning window is quite large, it is not anticipated that the entire year class would be lost or that the species could not spawn in the new area they are transferred too. It is proposed that the transplanting of vegetation, benthic invertebrates and forage fish be carried out to expedite the establishing of compensatory habitat. Minnow

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					Environmental (Minnow) has previously implemented this approach at another site (Agrium Kapuskasing Phosphate Operations 2006) and results were quite effective (e.g., no loss in year class of any of the fish species relocated to the newly constructed lake). In areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted providing cover for juvenile fish and decreasing erosion from construction and wind. Transplanting activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas to the newly constructed channels and therefore reduce lag times. Transplanting activities will likely include the transplantation of macrophytes (aquatic plants), benthic invertebrates, and the relocation of small-bodied fish (forage fish) and of large-bodied fish. The sequence of transfers will take into account spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish. The objectives of these transplants will be to accelerate the establishment of the ecosystem and food chain within the newly constructed areas prior to the placement of the key fish species, thus reducing lag times. Therefore, it is expected that the lag time within the functioning habitat created to be minimal.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#62: Transplanting of species, Appendix N, Table 4-2 and Appendix N, Section 4.2 Transplanting of forage fish and benthic invertebrates is to be carried out to expedite the establishment of compensatory habitat, but no details on this activity	It is proposed that the transplanting of vegetation, benthic invertebrates and forage fish be carried out to expedite the establishing of compensatory habitat. The source areas for these transplantations will be the areas to be lost within the same watershed. Therefore the transplant activities will not impact the source areas as they are to be lost with the

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				are provided. What are the source areas? How will the transplants impact source populations? Will this activity be any faster or better than allowing for natural recolonization? Please provide details on the transplanting of forage fish and benthic invertebrates and how this will promote the establishment of constructed habitat.	construction of the mine site. Minnow has previously implemented this approach at another site and results were quite effective (e.g., no loss in year class of any of the fish species relocated to the newly constructed lake). In areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted providing cover for juvenile fish and decreasing erosion from construction and wind. As for natural colonization of the benthic community, sedentary taxa would take much more time to colonize in the constructed areas if they were not transplanted. Forage fish will also be relocated from areas to be lost with the constructed mine site. This will promote a food base for the sport fish. Fish will be relocated within the same watershed.Transplanting activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas to the newly constructed channels. They will likely include the transplant of macrophytes (aquatic plants), benthic invertebrates, plankton, and the relocation of small-bodied fish (forage fish) and of large-bodied fish. The sequence of transfers will take into account spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish. The objectives of these transplants will be to accelerate the establishment of the ecosystem and food chain within the newly constructed areas prior to the placement of the key fish species.
533	Email	07/20/2014	1) Rick Hendricks	1) WTC-IR#63: Mercury concentrations, Appendix N, Section 4.2	a) Additional discussion on the fish tissue mercury results at baseline has been included in the Addendum to Appendix N (Aquatic Biology TSD).b) Agreed. Fish tissue monitoring

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			(Wabun Tribal Council)	"There are currently fish consumption advisories for mercury in lakes within the local study area, (OMOE 2013) and therefore the potential to affect the recreational value of these lakes would be minor. (p.20) Fish tissue monitoring for mercury should also be conducted on all lakes where water levels are going to increase as a result of watercourse realignments. "(p.26) Fish consumption guidelines are not static and if mercury concentrations increase in fish in these waterbodies, the guidelines will reflect the increased concentrations, that in turn limit recreational opportunities. Consumption guidelines will not protect wildlife or waterfowl. The fish tissue mercury results are not presented or discussed in the baseline report of impact assessment. In addition to completing fish tissue monitoring on all lakes where water levels are going to increase, monitoring should also occur on downstream waterbodies that will be affected by elevated mercury concentrations. a) Please provide more emphasis on the fish tissue mercury results by discussing them in the baseline report of impact assessment. b) Please add fish tissue monitoring to downstream water bodies that will be affected by elevated mercury concentrations.	for mercury is a component of the proposed monitoring program.c) As noted in the aquatic impact assessment, effects associated with methyl mercury production due flooding are expected to be very limited as areas that will be flooded (i.e., Chester Lake and parts of the south arm of Bagsverd Lake) are currently inundated seasonally and do not represent terrestrial soils and vegetation which would contribute to methyl mercury production. The areas to be flooded which are currently terrestrial are small and will have vegetation and organic soil removed prior to the implementation of water course realignments. Fish within the watershed are currently restricted for consumption due to regionally elevated mercury levels, thus it is not likely that there will be any significant change in methyl mercury exposure.

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				c) Please provide a full discussion on the likelihood of mercury methylation and increase, and the duration of any changes.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#65: Fish and egg stranding, Appendix N, Section 6.0 "Some potential effects have been identified for fish, primarily during construction: potential for elevated TSS; loss of individual fish during relocation from habitat that will be removed; reduced functionality of constructed fish habitat in the first year; potential for terrestrial vegetation decay and methyl mercury production in some small areas (e.g., the south arm of Bagsverd Lake) where terrestrial lands will be inundated; potential for entrainment and impingement of fish in the freshwater intake structure; and, effects from blasting on spawning habitat during construction and the early years of operations." (p.29). A considerable amount of effort was expended to determine what fish species are resident throughout the study area. Given this information, it should be possible to calculate ideal timing windows for minimizing fish and egg stranding during watercourse realignments. Please provide details on optimal time periods for watercourse realignments that will minimize fish and egg stranding.	A detailed response on the optimal time periods for watercourse realignments that will minimize fish and egg stranding has been provided in the Addendum to Appendix N (Aquatic Biology TSD).
533	Email	07/20/2014	1) Rick Hendricks	1) WTC-IR#66:HHRA – Methylmercury, Chapter 12, Section 12.3.2	a) The HEHRA (Appendix W) considered all relevant pathways for the potential release of methyl mercury into

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			(Wabun Tribal Council)	"As mercury is not expected to be present in process elements in appreciable quantities, exposure to this contaminant was not evaluated. It is noted, however, that the construction of the watercourse realignments will result in the flooding of former terrestrial lands. While the areas to be inundated are prone to flooding under existing conditions, it is possible that the decay of terrestrial vegetation would result in the production of methyl mercury that could be taken up by resident fish. However, the removal of vegetation prior to flooding will eliminate the potential for methyl mercury production." (p.12-6) It appears that the only inundated areas considered in the assessment of the potential for release of methylmercury into the environment were those in the areas of the realignments. Inundated regions of Clam Lake, Chester Lake and elsewhere do not appear to have been considered. The clearing of vegetation is generally acknowledged to have minimal benefits in terms of reducing peak methylmercury concentrations, on the order of 10%-15%. In order to have more meaningful effects, the soil must also be thoroughly removed, which can usually only be done at considerable cost. a) Please clarify that the environmental and human health risk assessment considered all pathways for potential release of methylmercury into the environment, and update the findings of the	the environment. Additional text has been added for clarification as appropriate. b) The text has been will be updated to indicate that vegetation and the top layer of organic soils will be removed to limit methyl mercury production.

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				assessment, as appropriate. b) Please update the text to acknowledge the limitations to the proposed vegetation clearing mitigation in reducing levels of methylmercury in the environment.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#67: Duration of impacts, Chapter 11, Section 11.4.1 and Chapter 11, Table 11-1 The levels of the duration assessment were established in relation to the life of the Project. Duration of impacts should be assessed in relation to life stages of fish and ultimately it should be determined whether the impacts diminish the ability of fish to carry out one or more life processes. Please determine the levels of the duration assessment in relation to life stages of fish, and their ability to carry out one or more life processes.	The levels of duration described in Chapter 11 are somewhat related to the duration of each Project phase, however, the prediction of effects on aquatic species does consider the actual expected duration of each effect. Specific details in relation to life stages of fish will be developed as part of the Fisheries Act Authorization.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#68: Numbers of fish for relocation, Chapter 11, Table 11-3 "Relocate fish (representative numbers of the community) to established habitats." (Table 11-3, p.11-24) It is difficult to determine the number of fish that will be collected because of various logistics, but at the least, targets based on mark-recapture studies and population estimates should be determined, or best	A population estimate for Côté Lake is presented in Appendix N (Aquatic Biology TSD), Appendix C, Section 6.2.2. As many fish as practically achievable using best efforts will be moved during the relocation. The Fisheries Act authorization will take into consideration the best efforts employed to maximize fish relocation. In practice the amount of fish that are relocated is typically close to the estimated population.

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				efforts should be quantified. Please establish fish collection targets based on mark-recapture studies and population estimates.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#69: Fish habitat protection, Chapter 11, Table 11-3 "Spawning habitat within the waterbodies affected will be included in the Fisheries Act authorization for the site as a loss of habitat and will be addressed through the compensation plan. " (Table 11-3, p.11-24) The Fisheries Act includes the protection of nursery, rearing, food supply and migration habitats, in addition to spawning habitat. These different habitats have been discussed in general terms in the baseline report, but also should be included in the compensation plan. Any of these habitats that occur in potentially impacted areas should be measured to ensure that future offsets can adequately mitigate future impacts. Please incorporate consideration of fish habitat used for nursery, rearing, food supply and migration into the compensation plan, in addition to spawning habitat, and measure any of these habitats that occur in potentially impacted areas.	All habitat within the waterbodies affected will be included in the Fisheries Act authorization for the Project as a loss of habitat. IAMGOLD is currently working with Fisheries and Oceans Canada (DFO) to outline the analysis of how the in-kind habitat creation measures proposed will offset the serious harm to fish.IAMGOLD in discussions with DFO, is now using habitat suitability indices to complete a more detailed prediction of potential effects on the commercial, recreational, and Aboriginal fisheries. This method uses all pertinent habitat suitability indices from the literature to document optimal habitat for all life stages of each of the species included in the assessment. In consultation with DFO, it was agreed that the same guild of five species used in the EIS / Draft EA Report (northern pike, yellow perch, walleye, lake whitefish and smallmouth bass) are considered representative of the commercial, recreational, and Aboriginal fisheries and supporting species within the Project area. This information is provided in the addendum to Appendix N (Aquatic Biology TSD). This additional detail does not changes the results of the effects prediction presented in Chapter 9 of the Amended EIS / Final EA Report, nor does it change the impact assessment results presented in Chapter 11.
533	Email	07/20/2014	1) Rick Hendricks	1) WTC-IR#72: List of Environmental Effects Indicators, Appendix B, Appendix B-2, #67 and	The EA indicators identified and used for the aquatics effects prediction encompass the gamut of Project effects

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			(Wabun Tribal Council)	Section 9.1.1 Since the Fisheries Act provides protection for fish that support recreational, commercial and Aboriginal fisheries, these support fish species should be included in the List of Environmental Effects Indicators in Table 9-1 of Section 9.1.1. Aquatic species at risk should also be included in these indicators. It is important to consider potential effects to these species. Please include fish that support recreational, commercial and Aboriginal fisheries, and aquatic species at risk, in the list of environmental effects indicators and provide an assessment of potential project effects to these.	on the aquatic environment. An effects prediction for the protection of forage fish is indirectly addressed through the assessment of water quality to a standard of the protection of fish and aquatic life and the assessment of loss of habitat. This incorporates and is representative of habitat for both commercial, recreational, and Aboriginal fisheries and forage fish. IAMGOLD in discussions with DFO, is now using habitat suitability indices to complete a more detailed prediction of potential effects on the commercial, recreational, and Aboriginal fisheries. This method uses all pertinent habitat suitability indices from the literature to document optimal habitat for all life stages of each of the species included in the assessment. In consultation with DFO, it was agreed that the same guild of five species used in the EIS / Draft EA Report (northern pike, yellow perch, walleye, lake whitefish and smallmouth bass) are considered representative of the commercial, recreational, and Aboriginal fisheries and supporting species within the Project area. This information is provided in the Addendum to Appendix N (Aquatic Biology TSD). This additional detail does not change the results of the effects prediction presented in Chapter 9 of the Amended EIS / Final EA Report, nor does it change the impact assessment results presented in Chapter 11.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#80: Assessment of Alternatives for Project Components, Chapter 7, Section 7.3.9 Watercourse Realignments In this section it is suggested that minimizing impacts to water flow and fish habitat would also address minimizing disturbance to existing terrestrial flora	As discussed in the EA, IAMGOLD plans to implement a natural channel design approach to the watercourse realignments. This approach will include natural design components intended to offset impacts to fish habitat. Additionally these features will provide suitable habitat for larger mammals. Therefore no additional alternatives assessment with respect to terrestrial fauna is warranted.

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				and fauna. A direct correlation between disturbance to fish habitat and terrestrial flora and fauna has not been established and it seems that the alternatives assessment did not directly consider the realignment impacts on local fauna, particularly larger mammals such as moose, deer and bear. Please provide alternatives assessment for the watercourse with respect to impacts to the terrestrial fauna.	
534	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#134: Scope of TK/TLUS, Appendix P, Section 3.1 and Appendix P – Appendix I "No specific concerns were raised about wildlife in the TK/TLUS. The study states that the majority of hunting takes place within other sensitive areas." (p.3-3) "No specific comments or concerns were raised with respect to traditional harvesting of fish within the Project area." (p.3-4) "No specific comments or concerns were raised with respect to canoeing." (p.3-5) "The TK/TLUS does not discuss the importance of, or any specific concerns with the eagle's nest." (p.3-5) The scope of work for the Draft Traditional Land Use and Knowledge Background Study Report was as follows:	The TK / TLU study was intended to determine if traditional resources and land uses will be affected by the Project and identify ways to protect or mitigate the resources or sites. The Study was also intended to provide information about traditional ecological or environmental information to assist in the identification of effects on biophysical resources in the regional study areas. IAMGOLD prepared the Appendix P (Traditional Land and Resource Use TSD) based on the information provided through engagement efforts with affected First Nations as well as the input from the completed TK / TLU studies. The EA accurately describes the information gathered through the TK / TLU study as well as comments and concerns expressed by Aboriginal groups. IAMGOLD will continue to discuss potential Project effects on traditional activities with potentially affected Aboriginal communities throughout the life the Project. Should additional information regarding an Aboriginal community's traditional practices become available, the Proponent will review and consider any potential effects, and develop and implement necessary mitigation measures, as appropriate.

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				This Traditional Knowledge and Land Use Background Study Report (the report) provides information on Aboriginal (First Nation and Métis) use of land and resources and Aboriginal knowledge of the environment in the region overlapping with the Côté Gold Project (the Project). This includes information on resources used by Aboriginal people and knowledge of cultural sites or environmental information as provided in publicly available secondary sources. Where available, information gathered from traditional knowledge and land use studies, given under consent, through an information sharing agreement, from Aboriginal communities, is included. (p.1-1) The Data Sharing Agreement between the Proponent and the First Nations, appended to the Background Study Report, indicates the following: Traditional Environmental Knowledge (TEK): For the purposes or this study, Traditional Environmental Knowledge will focus on factual knowledge about the environment and knowledge about its past and present use by the community. This will include (but is not limited to) knowledge about fish, animals, or plants in the study area, their abundance, patterns of use, and other observations. Culturally based value statements and belief systems, if appropriate, will also be documented and used in the environmental assessment, if approved by the First Nation.	

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				The TEK/TLUS was an information gathering exercise. It was not an issues scoping study, impact pathway analysis or impacts assessment. The references in the EIS to the lack of comments or concerns about the Project are misleading, as the TEK/TLUS was not designed to gather comments, concerns or other information about potential effects. Please remove from the EIS the references to the lack of comments or concerns in the TEK/TLUS about the potential effects of the Project.	
534	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#135: Traditional Land and Resource Use, Appendix P, Section 3.1 "The construction of Project components is predicted to overlap with some traditional hunting areas, as described above. It is not expected that this will impede the ability to carry out traditional hunting activities in the area." (p.3-3) "No lakes overprinted by the Project have been identified as popular fishing lakes. Therefore, no traditional fishing area losses will be incurred due to Project construction." (p.3-4) "The Project footprint does not overlap any Sensitive Area lakes identified in the TK/TLUS". (p.3-4) The above conclusions reflect an oversimplified understanding of the interrelationships between the Project components, the biophysical environment and	The Project will result in some displacement of wildlife species from the Project site; however, this displacement is not expected to have long-term effects on wildlife resources available for traditional purposes. The Project will not limit the ability to carry out traditional activities in the area. Appendix L (Wildlife TSD), Appendix M (Terrestrial Biology TSD), and Appendix N (Aquatic Biology TSD) identify the potential effects of the Project on terrestrial and aquatic species. Evaluation of potential effects on traditional activities is based on direct overlap of site components – a quantitative assessment. An evaluation outside of the overlap would be qualitative based on indirect potential effects. Studies conducted as part of the EA process have shown no traditional land and resource uses within the Project footprint. With the implementation of the proposed mitigation measures for wildlife and traditional activities, IAMGOLD does not anticipate any significant impacts outside of the overlap.

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				Aboriginal traditional land use. Please explain and justify why a direct overlap between the Project footprint and traditional land use is required in order to conclude that there will be no losses in hunting, trapping or fishing areas.	
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#74: Impact assessment on aquatic species at risk, Appendix B, Appendix B-2, #165 and Section 11.0, Tables 11-3 to 11-6 There is no assessment of the impacts on aquatic species at risk (SAR), presumably because none were found in the Project area. However, their absence from surveys does not rule out the possibility that SAR occur here, as suitable habitat exists for them in the area (e.g., lake sturgeon, Blanding's turtle). The Guidelines indicate that a precautionary approach should be taken when documenting the analyses included in the EIS. An assessment of the impacts on potential aquatic SAR is thus warranted. Please include an evaluation of the environmental effects of the Project on potential SAR and habitat likely to occur in the Project area.	The purpose of baseline studies is to establish a thorough understanding of species existing in the study areas as well as the condition of their habitat. It is not common practice to predict effects on species that have not been identified in the study areas. However, IAMGOLD has investigated the potential for the existence of lake sturgeon in the local study area. Mesomikenda Lake would be the only water body in the local study where lake sturgeon could potentially be found. No reports have been identified confirming the presence of lake sturgeon in Mesomikenda Lake.Should future monitoring identify any SAR species, or should the catalogue of SAR species change to include SAR species in the study area, then IAMGOLD would adapt its management strategies, as appropriate.
533	Email	07/20/2014	1) Rick Hendricks (Wabun Tribal Council)	1) WTC-IR#16: No measures for methylmercury, Appendix J, Attachment I – Water Quality Baseline Report, Section 4.3 and Appendix J, Attachment I – Water Quality Baseline Report, Appendices A and C Methylmercury was not measured in baseline water	As noted in the aquatic impact assessment, potential effects associated with methyl mercury production due to flooding are expected to be very limited because currently the areas that will be flooded (i.e., Chester Lake and parts of the south arm of Bagsverd Lake) are inundated seasonally. Generally, any methyl mercury production

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				samples. Methylmercury is a toxin that may be transformed from mercury naturally present at the site runoff as a result of flooding of wetlands, soils and vegetation - activities that are proposed for the Côté Gold Project. To model and predict the impact the Project will have on methylmercury concentrations, and to provide a baseline for future comparisons it is important to know the current concentrations in local waters and sediment. Please update the baseline report with methylmercury information. If no methylmercury information exists, collect additional samples to improve upon baseline data collection.	associated with flooding of shallow areas, such as those proposed for the Côté Gold Project, is realized within 2 to 3 years of flooding and does not represent long-term issues as observed at large reservoirs (Bodaly et. al, 1997; Canada-Manitoba Governments, 1987). Therefore, the seasonal flooding of the areas of concern are not expected to significantly contribute to methyl mercury production upon development of the Project. Additional information regarding methyl mercury production at the Project site has been added in the Addendum to Appendix N (Aquatic Biology TSD). The key issue with methyl mercury is the increase in tissue concentrations of fish that reside in the lakes where flooding of terrestrial areas is expected. It is important to note that fish within the local area are currently restricted for consumption due to regionally elevated mercury levels. Thus, if any small increases in methyl mercury occurred in fish tissues, these increases will not likely change the consumption restriction on the fish. More information on fish tissue concentrations are discussed in Appendix W (HEHRA) as they relate to the possible impacts associated with human consumption of fish.Methyl mercury that is generated from inorganic mercury that is sequestered by terrestrial vegetation from the atmosphere typically occurs at very low total concentrations (i.e., nanograms per litre). The generation of methyl mercury depends upon the development of favourable geochemical conditions (i.e., sulphate reducing) to allow for sulphate reducing bacteria to transform the inorganic mercury to organic mercury. The rate of the microbial-induced methylation of the mercury depends on a number of factors including: distribution and concentrations of inorganic mercury in biodegradable

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					organic matter, geochemical conditions (pH, redox, temperature), presence of compounds that can complex with inorganic mercury (e.g., dissolved organic carbon and sulphide), and presence and activity of sulphate-reducing bacteria (Benoit et al., 2003). Uncertainties associated with the source term, geochemical conditions and microbial communities, compounded with uncertainties associated with modelling exposure pathways and bioaccumulation in fish, makes modelling trace-level concentrations and the overall effect of potential methyl mercury production very challenging and carries a range of uncertainty that is likely to be significantly greater than the range of the predicted magnitudes. Therefore, modelling methyl mercury does not provide value in the context of this EA, and would not eliminate the need to follow through with the proposed mitigation and monitoring commitments that are discussed below.Although methyl mercury production is not expected to be a concern, IAMGOLD is committing to remove terrestrial vegetation within the small areas that are expected to experience flooding prior to the construction of watercourse realignments (Chapter 10, Table 10 2). The mitigation commitments have been expanded to include the removal of shallow organic-rich soils in the small areas expected to become flooded due to the watercourse re-alignments. The removal of the terrestrial vegetation and organic-rich soils in these areas will further reduce the potential for methyl mercury production (Windham-Myers et al., 2009). Furthermore, low-level total mercury and methyl mercury have been added as parameters to the baseline water quality sampling, including interstitial water of the near-surface sediments in the flooded areas, and fish

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					tissue monitoring as part of the overall monitoring commitments for the Côté Gold Project.
473	Site Visit	09/03/2014	1) Bruce Golden (Brunswick House First Nation)	1) Côté Lake is not very big. What kind of fish are in the lake?	Côté Lake is approximately 19 hectares in area with an average depth of 6 feet and 12 feet deep at the deepest location, which is the middle of the lake. It hosts predominantly Northern Pike, but also some Walleye, White Fish and Perch.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Q. The Proponent should confirm that the wetlands are not crucial to fish rearing.	Vegetated areas that are aquatic (inundated with water) have been assumed to provide juvenile rearing habitat and have been accounted for in the habitat offsetting plan for the water course realignments.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Fish and Fish Habitat - Sampling methods could have covered a broader time range, including sampling in spring, fall and winter to capture the variety in usage seasonally and to gain a better understanding of use of habitat across critical life periods.	Baseline studies were conducted in the summer of 2012, and the spring and fall of 2013 providing good seasonal coverage of fish communities and habitats within the local study area. Water depths greater than 2 m have been assumed to provide over wintering habitat for resident fish.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Fish and Fish Habitat - Q. The Proponent should provide a comprehensive table which identifies timelines for construction activities and the interaction with critical life periods for fish species	The exact construction start dates and timelines are not known at this point. Construction activities will be scheduled and executed in a manner such that effects on aquatic species will be minimized.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Q. The study area for aquatic biology should be extended to include a definition and baseline data for an RSA. Any spills, leaks or ruptures originating from the Project site have the potential for regional effects across multiple watersheds. There is also a risk for methyl mercury contamination as a result of flooding from watercourse re- alignments. Methyl mercury	The Amended EIS / Final EA Report does not assess the impacts of catastrophic events. Water quality modelling predicted that potential changes to water chemistry would not extend beyond the local study area and no physical changes to the aquatic environment will extend beyond the local study area. Therefore, the baseline and assessment work was focused on the local study area.The potential for

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				contamination would impact the health of fish and the ability of Metis people to safely harvest fish for consumption and/or sale. The Proponent should demonstrate a more thorough conceptualization of methyl mercury contamination potential in terms of geographic locations, extent and magnitude.	methyl mercury has been addressed through changes to the Aquatic Biology TSD in addition to supplemental information provided in the Addendum to Appendix N of the Amended EIS / Final EA Report (Aquatic Biology TSD). Briefly, in order to address the potential concern associated with methyl mercury production in areas to be flooded, IAMGOLD is committing to removing terrestrial vegetation within the areas that are expected to experience flooding due to the construction of watercourse realignments (Section 10, Table 10-2 of the Amended EIS / Final EA Report). This commitment has been expanded to include the removal of shallow organic-rich soils in the small areas expected to become flooded. Section 4.2 and Tables 4.1 and 4.2 in Appendix N (Aquatic Biology TSD) of the Amended EIS / Final EA Report have been revised. The removal of the terrestrial vegetation and organic-rich soils in these areas will further reduce / eliminate the potential for methyl mercury production (Windham-Meyers 2008). Thus, methyl mercury production due to flooding of terrestrial vegetation is not expected as the proposed mitigation will remove the source of organics (carbon) and the potential for decaying organic matter to result in anaerobic conditions. Further, the flooded area will be shallow (<2 m) and thus will be expected to remain oxic preventing the establishment of anaerobic conditions required for methyl mercury production.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Q. Baseline fish tissue samples were reported to have been taken in Minnow Environmental's baseline work, but do not appear to be reported anywhere in the EIS. This data is important because it helps to inform our assessment of the potential for changes	Baseline data is described in the Aquatic Biology TSD (Appendix N of the Amended EIS / Final EA Report). In the Amended EIS / Final EA Report key information relevant for describing the effects on the selected environmental assessment indicators is presented. Baseline fish tissue

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				which may have an effect on MNO harvesters, as well as, knowing whether there is a baseline available for comparison to future MMER-based monitoring results. This information needs to provided and discussed.	sampling results will be used for comparative purposes when carrying out monitoring later on.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Fish and Fish Habitat Q. Compensation plans should be provided for MNO to review in terms of the ability of the plans to demonstrate accountability for habitat destruction and appropriate habitat compensation for the fish species present at each watercourse. Q. A more detailed plan regarding re-location of fish from overprinted watercourses should be indicated and rationale included. Relocation plans should be comprehensive and demonstrate that fish are being relocated to watercourses with genetically similar populations within species and suitable habitat for critical life periods across species. Q. It is important that if any impacts from any phase of the Project occur within MNO`s Abitibi/Temiscamingue and James Bay Traditional Territory that Métis people are able to be adequately compensated and the environment remediated based on an understanding of the	The MNO will be provided with and consulted on regulatory submissions which are required to support approvals of the Project. Full compensation packages will be developed prior to Project implementation.Fish captured as part of the relocation program will be released within the watershed they are captured and as there are no barriers to movement within these systems, fish will not be removed from their current population.The assessment of potential effects on fish and fish habitat has focused on key species known to be important to commercial, recreational and Aboriginal fisheries.

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				existing environment. Based on forthcoming Traditional Land Use studies, the current fish and fish habitat assessment should be updated to reflect species and/or habitat important to the MNO. If any local Métis citizens harvest fish commercially, or for supplementary income and effects from relocation and other Project components will cause effects to one or multiple year-classes of fish, some harvesters may need to be compensated for the losses they will experience.	
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) General Q. The final closure to a stable site seems like an excessive amount of time and infers a long-time before the site is stable for use by humans and wildlife. The Proponent should provide a plan for closure within 10 years of operation. Q. Based on the review of the Project and the aspects of the Projects' interaction with the existing natural environment, it is of primary concern that the monitoring program provided by the Proponent is largely incomplete and insufficient in relation to the overall magnitude of impact the Project will have. The Proponent should provide a more extensive monitoring program that includes:A comprehensive table indicating the habitat use during critical life	The duration of the post-closure phases is based on the expected duration for the open pit to flood. The duration of all potential effects are described in Chapter 9 and are also provided in the impact assessment matrices provided in Chapter 11 of the Amended EIS / Final EA Report.Mitigation measures are described in Chapter 10 and are included in the impact assessment matrices in Chapter 11 of the Amended EIS / Final EA Report. IAMGOLD is committed to considering relevant information by the MNO if and when the information is provided. IAMGOLD agrees that adaptive management maybe required (see Section 16.2 of the Amended EIS / Final EA Report) and is a fundamental component of IAMGOLD's approach to operating their projects. As described in Chapter 16 of the Amended EIS / Final EA Report, applicable monitoring programs will carried out throughout the post-closure phase of the Project.

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				periods of all animal species (or groups of species using the same habitat during the same time), how all phases of the project will interact with those periods, and how long the interaction/impact will last; A comprehensive plan for a monitoring program that is continuous during all phases of the Project and includes a pronounced component of reporting that incorporates observations from land users/harvesters/Metis and the impacts observed and/or experienced over the course of the Project lifetime; More specific and explicit mitigation strategies for all aspects of the natural environment especially related to matters of wildlife, fish and plants; As these plans will be developed post-EA, it is important to confirm that the plans will reflect the results of the Métis input and not the final approved EA; These monitoring plans must include adaptive management measures should issues be identified and require response, including response time measures; Monitoring plans and adaptive management measures should be valid until the closure is deemed complete.	
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Q. Monitoring for cadmium and lead in fish tissue should also be included in the fish tissue monitoring program, described in Appendix N, as a means to protect MNO citizens harvesting fish for subsistence purposes in the LSA and downstream.	In all instances fish muscle tissue concentrations of cadmium and lead were well less than consumptions benchmarks in baseline studies (see Table F.47 in Addendum to Appendix N (Aquatic Biology TSD) of the Amended EIS / Final EA Report). The water quality modelling is not anticipating elevated concentrations of cadmium or lead in water downstream of the mine so there is no reason to expect a change in fish tissue chemistry for

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					these substances. Fish tissue will be monitored for mercury concentrations.
547	Email	10/16/2014	1) James Wagar (Métis Nation of Ontario)	1) Hydrology and Hydrogeology Q. Hydrogeological and hydrological monitoring programs are described in somewhat specific terms in the Technical Support Documents for these disciplines in the EIS, although the proposed monitoring networks are not mapped. Generally, these monitoring program descriptions appear detailed enough for an EIS, with the following caveats: Mapping and identification of the proposed hydrological and hydrogeological monitoring networks, including screen depths and other salient characteristics of monitoring wells, should be provided in order to understand the spatial extent of monitoring relative to potential effects; Nested groundwater monitoring wells to monitor groundwater-surface water interactions need to be placed in areas of most vulnerability for such interactions, not based on proximity to hydrological monitoring stations as stated in the hydrological monitoring plan; Lake levels- for those lakes adjacent to or within the drawdown cone for pit dewatering- need to be monitored for the effects of any reduced groundwater inflows on lake levels and related effects on fish habitat. There is currently no plan to monitor lake levels for this effect.	The hydrological and hydrogeological monitoring program will incorporate existing monitoring locations as well as additional locations as necessary. Lake level monitoring stations, which were used in the hydrological baseline and effects assessment, have been installed since approximately 2012 and will continue to be used to observe temporal and spatial variation in lake levels.Nested groundwater wells, if necessary, will be installed to further observe surface-water groundwater interaction. Placement of these wells will be based on the assessed potential areas for these interactions with an emphasis on the lake systems. As noted, lake water level monitoring stations exist and can be coupled with groundwater wells for this type of analysis.The hydrological and hydrogeological monitoring network will rely on the existing locations as well as the proposed monitoring program outlined in the Hydrogeology TSD (Appendix H of the Amended EIS / Final EA Report) to assess spatial extent of predicted effects. Annually the results of this monitoring will be assessed in consideration of ongoing operational activities, and additional stations may be incorporated into the program depending upon the results of the ongoing monitoring.

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560	Meeting	04/23/2015	1) James Wagar (Métis Nation of Ontario); 2) Nichole Fraser MacDonald (Shared Value Solutions Ltd.)	1) During a discussion on the flooded areas, the MNO identified an interest in seeing a map of these areas. 2) Shared Value Solutions identified an interest in seeing sediment testing for methylmercury.	
560	Meeting	04/23/2015	1) James Wagar (Métis Nation of Ontario)	1) The MNO noted a potential agreement to offsetting as an accommodation measure.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Aquatic Environment Overall, the Proponent has appropriately sited the Project activities to minimize the footprint and aquatic disturbance of what is a very large project. Aquatic habitat and fish populations were well described and the majority of our concerns regarding aquatic biota have been adequately addressed, including the formation of a Habitat Evaluation Procedure developed by IAMGold and Fisheries and Oceans Canada that alleviates previous concerns with future habitat compensation. The Canadian Environmental Assessment Agency (CEAA), Ontario Ministry of Environment and Climate Change (MOECC) and HESL presented various concerns centred on the potential for increased methyl mercury concentrations in water and in fish tissue. These were acknowledged through modelling, monitoring and mitigation efforts but the current state of methyl mercury prediction in Ontario is relatively poor and future efforts should be guided by ongoing advancements made in the hydropower	We agree that the water quality data shows some variability but it is IAMGOLD's opinion that in the context of deriving the water quality model inputs; the differences are not material when considering how the data was used in developing the water quality effects assessment. This is supported by the trends in the trace metal and cyanide concentrations, which are the key parameters with aquatic toxicity thresholds; concentrations of trace metals and cyanide are at or near the method detection limit concentrations throughout the Mollie River and Mesomikenda Lake watersheds. The only parameters that show a greater degree of variability are aluminum, iron, and major ions. Concentrations of aluminum and iron that were more variable and typically highest were those in shallow lakes (Delaney Lake, Chester Lake, and Unnamed Lake). The result of incorporating the aluminum and iron data from these shallow lakes into the average baseline concentration for aluminum and iron skews the values high for the larger lakes that have lower average baseline concentrations; therefore, including this data is conservative for the larger

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				industry to ensure that methyl mercury generation is minimized and properly managed. Another major gap in the baseline for aquatic biota is fish population estimates in lakes and watercourses that will be lost during future development, to allow for a future quantitative assessment of the effectiveness of fish mitigation and compensation measures. Several issues are still outstanding with respect to the discussion of natural heritage features and species at risk. Wetlands and species at risk habitat are not mentioned in the overall description of the Project Area's geographical setting, and their inclusion is necessary to present an accurate and detailed overview of the existing landscape. It is especially surprising that wetlands are not mentioned, as they make up 4% of the regional study area and 6% of the local study area, and will be affected by the Project. In addition, there is a lack of consideration of effects of the Project on significant wildlife habitat that has been identified as occurring or likely occurring in the Project Area. Although HESL and others (e.g., CEAA, Environment Canada, Northwatch) have identified missing or insufficient baseline data (e.g., relating to benthic invertebrates, fish populations, aquatic habitat etc.), IAMGold does not provide an explicit evaluation of the statistical robustness of the existing baseline data. This assessment is required to determine whether the quantity and quality of baseline data is sufficient to act as a useful benchmark against which to measure future impacts of the Project on aquatic habitats and communities. Many of the comments regarding the water quality	lakes. Concentrations of some major ions in Dividing Lake and Mesomikenda Lake (i.e., sodium, chloride, calcium, magnesium and potassium) are higher than in other lakes, but these concentrations may reflect the influence of road salt/de-icers used on the adjacent stretch of Highway 144 and associated side roads. In short, the differences in iron, aluminum and major ion concentrations between stations is not sufficient enough to change the conclusions of the water quality effects assessment because: i) the predicted major ion values are protective of aquatic life, and therefore the impact assessment would be unchanged for the major ions regardless of the approach taken, ii) the baseline variability of aluminum and iron concentrations is strongly related to the smaller lakes and including this variability into an averaged model input is more conservative for the larger (and vast majority) of the lakes. The MOECC requested that the 75th percentile concentrations be used as they were concerned that using baseline concentrations with the 95th percentile instead of the 75th percentile could change the Impact Magnitude Level in a situation where predicted concentration is greater than water quality guideline but less than 95th percentile. To address these MOECC concerns, the concentrations that are predicted to be greater than the water quality guideline but less than the 95th percentile baseline concentration were identified for all water quality effects assessment locations; these are as follows: the maximum monthly average concentration of aluminum in Delaney Lake (0.10 mg/L), Unnamed Lake #1 (0.11 mg/L) and Bagsverd Creek (0.082 mg/L); and, the maximum monthly average concentration of iron in Delaney Lake (0.37 mg/L) and Unnamed Lake #1 (0.38 mg/L). The

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				baseline were adequately addressed and resolved, however we still disagree with the proponent's modelling approach (see comments 188, 192, 199, and 204). The proponent has used an average surface water quality as input for the modelling that was calculated by using baseline data from several different water features, and has compared the results to 95th percentile concentrations calculated from the same water features. It is rationalized that, due to similar geology, water quality across the study area is similar. The proponent does not provide the statistical analysis to support this statement, and we have found that the water quality between the features differs both spatially and temporally. Grouping water quality statistics together for streams, lakes, rivers and wetlands does not provide for an explicit prediction of water quality changes in specific impacted features, and inflates the variance of the baseline water quality, thereby increasing the chances of not detecting any effects that may be present when assessing future water quality changes in specific water features. This is also referred to as a Type II statistical error. The CEAA and MOECC have identified similar concerns with the approach used for modelling and effects assessment. Comment 110 (and 679) by the MOECC – Northern Region confirms our assessment that a single baseline percentile does not take into account spatial variability and that baseline characterization needs to be site-specific. They requested that the proponent use 75th percentiles to define background water quality, and use baseline water quality according to individual	predicted concentrations of aluminum does not account for attenuation (or mass loss) in the surface water system and incorporates the total mass that reports to the receivers. As a result, the concentrations that are calculated by the water quality model include mass in addition to the 'dissolved' mass. As such, comparing the predicted concentrations to the PWQOs and CWQGs, which are applicable on the clay-free fractions, is conservative. In addition, it is important to note that the baseline concentrations of aluminum in Delaney Lake, Unnamed Lake #1 and Bagsverd Creek are up to 0.12 mg/L, 0.19 mg/L, and 0.13 mg/L, respectively; the maximum baseline concentrations that were measured are greater than the predicted maximum monthly average concentrations in all three cases. Therefore, because the predicted aluminum concentrations are within the range of baseline levels for those lakes, the conclusions of the effects assessment do not change despite the fact that the conservative comparisons show that the predictions are slightly greater than the PWQO/CWQG for aluminum. Comments on the methods of screening the baseline water quality are acknowledged. (Response continued below)

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				sampling locations for the effects assessment. We fully support these concerns. Comment 457 by CEAA questions the need to use a pH of 7, temperature of 15°C, and hardness of 30 mg/L as CaCO3 to evaluate compliance with guidelines (PWQO and CWQG) when the actual values are known for the specific sample sites. They requested that the baseline summaries be updated using the criteria derived for the specific water features. These comments support the need to use site-specific water quality data for conducting the effects assessment to properly evaluate potential risks to water quality.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Future monitoring efforts should be informed by the "Best Management Practices for New Ontario Waterpower Development Surface Water Quality and Fish Sampling Programs" (Ontario Waterpower Association, 2014) to characterize impacts from mercury generation as accurately as possible and in keeping with current best practices. There is still no description of existing fish tissue data to define baseline conditions and assess the suitability of future monitoring efforts besides raw data presented in appendices.	IAMGOLD thanks the WTC for identifying the aforementioned document. This information will be reviewed and considered during ongoing Project development. Fish tissue consumption benchmarks and fish tissue concentrations relative to the benchmarks have been provided in the Addendum to the Aquatic Biology TSD (Appendix N).
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Fish population estimates are required in lakes and watercourses that will be lost during future development, to allow for a future quantitative assessment of the effectiveness of fish mitigation and compensation measures. If mark-recapture studies were completed in Côté Lake and Unnamed Lake #1 to inform future success of fish compensation	See response to Comment #F276

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				measures, then similar information should be collected from other waterbodies that will be lost during future development.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) A Best Management Practice (BMP) is currently being developed by the Ontario Waterpower Association with input from MOECC to provide guidance on predictive methyl mercury modelling and risk management of potential methyl mercury risks to humans and wildlife in the case of uncertain model outcomes for small hydropower and methyl mercury. The OWA expects to publish the BMP in late April 2015. The proponents should review the BMP (once published) to address modelling shortcomings, assess risk and develop mitigation as these issues relate to the Côté Gold Project. It is noted that removal of terrestrial vegetation and shallow organic-rich soils in the areas that are expected to experience flooding to reduce the potential for methyl mercury generation is a commonly accepted mitigation measure and may be appropriate in Chester Lake. Low level total mercury and methyl mercury have been added as parameters to the baseline water quality sampling, and mercury in fish tissue monitoring has been completed and will be again during construction and post-construction. Future monitoring efforts should be informed by the "Best Management Practices for New Ontario Waterpower Development Surface Water Quality and Fish Sampling Programs" (Ontario Waterpower Association, 2014) to characterize impacts from	IAMGOLD will consider this document in future monitoring programs.

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				mercury generation as accurately as possible and in keeping with current best practices.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Fish tissue monitoring has been added to the monitoring program, and it is noted that modelling the potential increase in mercury concentrations in surface waters was attempted and results proved to be unreliable because of over-prediction. Fish tissue results are presented in Appendix F but no associated interpretation is provided. It would be beneficial to gain some understanding of and to document current fish tissue mercury concentrations in the study area to better understand baseline conditions and assess the suitability of future monitoring efforts. Future monitoring efforts should be informed by "Best Management Practices for New Ontario Waterpower Development Surface Water Quality and Fish Sampling Programs" (Ontario Waterpower Association, 2014) to characterize impacts from mercury generation as accurately as possible and in keeping with current best practices. A Best Management Practice (BMP) for small hydropower and methyl mercury to provide guidance on predictive methyl mercury modelling and risk management of potential methyl mercury risks to humans and wildlife of in the case of uncertain model outcomes is currently being developed by the Ontario Waterpower Association with input from MOECC. The OWA expects to publish the BMP in late April 2015. The proponents should review the BMP (once published) to address modelling limitations, assess risk and develop mitigation as these issues	See response to Comment #F276. Fish tissue concentrations were screened in Table F.47 of the Addendum to the Aquatic Biology TSD (Appendix N) against consumption benchmarks and values greater then benchmarks were highlighted. Generally, with respect to mercury the concern is associated with human consumption of fish. The tissue data was also used as part of the HEHRA TSD (Appendix W). Monitoring has been described in Section 5.0 of the Aquatic Biology TSD (Appendix N) and is summarized in Chapter 16, Table 16-2. Monitoring will also be dictated through the ECA, Fisheries Act authorization and environmental effects monitoring.

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				relate to the Côté Gold Project. Future monitoring is not described in any level of detail but monitoring should be completed in waterbodies and downstream waterbodies where water levels are expected to increase not only "in lakes where water levels are expected to increase", and efforts should include the most up-to-date information from the waterpower industry where advancements in methyl mercury monitoring are ongoing.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Response accepted. The assumption that methyl mercury accounts for the entire proportion of total mercury in fish tissue is conservative but this assumption should be stated in the EA for clarification.	IAMGOLD is of the opinion that assumptions used to consider mercury and methyl mercury in the environment are adequately accounted for in the EA.
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Mark-recapture studies were conducted in Côté Lake and Unnamed Lake 1 because there was potential that they would be lost due to the Project development. The location of the tailings management facility, low grade ore stockpile, open pit and mine rock area indicate that a number of waterbodies or parts of waterbodies will be lost, including: Bagsverd Creek, unnamed tributary to Bagsverd Creek, Upper Three Ducks Lake, East Beaver Pond, Clam Creek and Mollie River. Habitat descriptions and qualitative assessments of the fish community were completed in these waterbodies but mark-recapture studies were not completed. If mark-recapture studies were completed in Côté Lake and Unnamed Lake #1 to inform future success of fish compensation measures, then similar information	See response to Comment #F276.

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				should be collected from these waterbodies that will be lost during future development.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) If data are not collected in enough abundance to calculate a linear regression in a given waterbody, it seems unlikely that there will be sufficient statistical power to detect statistical change in the future. It is understood that the length and weight relationships were established over the local study area but relationships between fish size and mercury concentration is an important relationship to define in order to understand natural variability in specific lakes where mercury concentrations could increase. Please document the linear regressions that were applied to length at age relationships where age data was observed in greater than three age classes.	Northern pike and walleye were collected over a broad age and size range which provides adequate baseline data to detect a meaningful change in mercury in fish tissue (see attached figures). These data provide an indication of the range in concentrations at a given age. Effort was made in the baseline study to limit the number of fish killed. During on-going fish tissue monitoring, fish at a standard age could be compared over time to improve data resolution and minimize by-catch. Given that pre-operation monitoring will be conducted for EEM and fish tissue work, the baseline data is considered adequate for the EA.
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) If mark-recapture studies are not completed in lakes that will be lost, it will not be possible to determine if the impacts to fish populations are "measureable".	See response to Comment #F276.
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Potential for methyl mercury production is discussed in theory while associated modelling efforts and a description of drivers are explained. There is still no description of existing fish tissue data to define baseline conditions and assess the suitability of future monitoring efforts besides raw data presented in appendices.	Fish tissue consumption benchmarks and fish tissue concentrations relative to the benchmarks have been provided in the Addendum to the Aquatic Biology TSD (Appendix N).
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Response accepted. The Fisheries Act authorization will include a more detailed definition of best efforts or fish collection targets. If targets are	See response to Comment #F276.

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				included, it is not clear how these will be made considering baseline information as mark-recapture studies were not completed in many lakes that will be lost.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Tables 2.1, 4.1 and 4.2 of Appendix N still refer to predicted effects on sport fish only. It is recommended that text be added to clarify that these effects predictions are assumed to encompass other species beyond just sport fish (i.e., commercial, recreational and Aboriginal fisheries and forage fish).	Tables in Appendix N refer to commercial, recreational and Aboriginal (CRA) fish. CRA fish include sport fish and the species (forage fish) that support these species. In the EIS / Draft EA Report these tables incorrectly used the term sport fish but this was corrected for the Amended EIS / Final EA Report.
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) The reviewer has not been provided with a copy of the list of criteria for completing the TK/TLU Study apparently provided to the study consultant. We cannot confirm whether a request for a rationale for the study areas was made of the consultant, or whether the proponent provided any direction to the consultant in determining the study areas. Based on Figure 3 and Figure 4 of Appendix P, as well as the four figures contained in the TK/TLU Study, it appears that the traditional land use local study area consists of six Sensitive Areas, and a traditional land use regional study area was not defined in the TK/TLU Study but was assumed by IAMGold for the purposes of the assessment to be equivalent to the terrestrial and aquatic regional study areas, as appropriate. The lack of a rationale for the local and regional traditional land use study areas presents limitations for the effects assessment. For example, the relationship of the Sensitive Areas relative to the other areas within the regional study areas, and	On October 15, 2014 IAMGOLD provided Wabun Tribal Council with copies of documents developed to support the execution of the TK / TLU Study. These documents were originally provided to Wabun Tribal Council and its selected contractor, W.C. McKay Consulting Services prior to the commencement of the Study. Amec Foster Wheeler provided a Draft TEK / TLU Study Questionnaire; however, the Final TK / TLU Study Report did not contain the questionnaire(s) used by W.C. McKay Consulting Services during the Study so it is unknown what modifications, if any, were made to the original draft questionnaire. It is understood that not all of the requested TK / TLU deliverables were provided to IAMGOLD; however, it is also IAMGOLD's understanding that the study was confirmed as a final product by Wabun Tribal Council. As noted in the response to Comment #259 (Appendix Z) from Wabun Tribal Council, in the absence of a study area rationale for the TK / TLU Study, using best professional judgement the prediction of effects was based on the terrestrial and aquatic biology study areas. IAMGOLD is committed to

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				within the broader traditional territory is not provided, and cannot be determined based on the information contained in the Amended EIS / Final EA. The lack of rationale also promotes confusion and misunderstanding that leads to inaccurate conclusions. For example, Appendix P of the Amended EIS / Final EA indicates that: A Sensitive Area is described as a key area where traditional land use and the majority of hunting, fishing, trapping and gathering take place. (p.2-1) However, the TK/TLU Study says something quite different about the meaning of the Sensitive Areas: Majority of Traditional Land Use within these Sensitive areas include, hunting, Fishing/Netting, Trapping and gathering. The TK/TLU Study provides information about the nature of the activities within the Sensitive Areas, not the importance of these activities relative to other activities within the regional study areas or within other areas of the traditional territory. The proponent mistakenly assumes a very different meaning for the Sensitive Areas than is provided in the TK/TLU. This error permeates its assessment in Appendix P, particularly in relation to effects on hunting. Our initial comment remains unaddressed as the rationale for the TLU study areas has yet to be provided: In general, the regional study area for assessment of effects on traditional land use should encompass the traditional land use activities as these are carried out across the territory (or, at minimum across the territory used by the affected land users) in order to place the significance of the environmental effects in the appropriate context. A territory wide	working with potentially affected Aboriginal groups to develop a socio-economic / community management plan to address potential Project-related socio-economic / community effects identified through the EA process and/or at later stages of the Project. This would include any Project-related effects on traditional land use activities.

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				assessment area is also relevant to the assessment of cumulative environmental effects.	
663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) It is assumed that the slight increase in phosphorus concentrations predicted through Lakeshore Capacity Modelling in Mesomikenda Lake will not materially change dissolved oxygen with respect to the resident biota but, beyond the modeled phosphorus concentrations, little information is provided to justify this assumption. We note that, in our experience, even small changes in dissolved oxygen are not acceptable to MNR if they cause the oxygen to fall below the MNR lake trout criterion. Please provide a description of late summer hypolimnetic dissolved oxygen concentrations in Mesomikenda Lake and/or hypolimnetic dissolved oxygen modelling based on changing phosphorus concentrations in relation to the MNR's criterion of 7 mg/L of volume-weighted end of summer hypolimnetic dissolved oxygen for lake trout to provide the scientific basis for the conclusion that the slight increase in phosphorus concentrations predicted through Lakeshore Capacity Modelling in Mesomikenda Lake will not materially change dissolved oxygen.	As noted, phosphorus modelling was undertaken for Mesomikenda Lake through the lakeshore capacity model using baseline water quality and predicted phosphorus concentrations. The predicted increase in phosphorus concentrations, using conservative model assumptions is very small (i.e., less than 2.5 µg/L) and results in a water concentration (12.2 µg/L) that is less than PWQO (20 µg/L) and the lake specific PWQO defined by the lakeshore capacity model (16.4 µg/L). The lakeshore capacity model was designed to consider the potential impacts to hypolimnetic oxygen concentrations based on changes to primary productivity associated with an increase in phosphorus loading to a lake. Thus, if the predicted concentrations are below the lake specific PWQO, they should also be protective of dissolved oxygen. MNRF's dissolved oxygen criteria for lake trout is 7 to 8 mg/L in the hypolimnion. Dissolved oxygen profiles taken in the north basin of Mesomikenda Lake in June and September indicate a hypolimnetic dissolved oxygen concentration of approximately 10 mg/L (88%) in both seasons. These dissolved oxygen concentrations are above the limit set to protect lake trout recruitment even nearing the end of the summer stratification period. Therefore, it is expected that the sensitivity of dissolved oxygen within this basin to the very small incremental increase in phosphorus will be limited. In summary, the predicted phosphorus concentrations are not expected to affect dissolved oxygen concentrations relative to the requirements for lake trout.

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663	Letter	06/09/2015	1) Shawn Batise (Wabun Tribal Council)	1) Response accepted. It is accepted that Lake Sturgeon are thought to be rare in the most southern Canadian Shield portions of the Moose River Basin but it is unlikely that any Lake Sturgeon population surveys were completed in the study area and because of this uncertainty, any potentially limiting habitat such as spawning habitat should be characterized based on previous field surveys and interpreted as part of ongoing impact assessments. Issues Validation interviews with MFN land users indicated that lake sturgeon was extirpated from many regions of the upper Mattagami River as a result of hydroelectric development.	No response requested.
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) MNO is asking for the identification of the timing of critical life stages for species that are known to use local wetlands for habitat (fish, SAR or breeding birds) and which activities will be prohibited or mitigations applied during these critical times, if the activity, location and life stage do coincide. Partially Resolved MNO recommends that IAMGOLD prepare a Wildlife Management Plan with MNO input once the construction date is known.	IAMGOLD has committed to several measures to protect flora and fauna such as avoiding clearing during bird breeding seasons and considering in water works timing windows. IAMGOLD is committed to ongoing consultation with the MNO, including, but not limited to discussing timing of site and construction development as Project planning continues.
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) MNO is asking for identification of the timing of critical life stages for local (fish) species, and which activities will be prohibited or mitigations applied during these critical times, if the activity, location and life stage do coincide. E.g., Northern Pike spawn in	Thank you for your comment. IAMGOLD is committed to consulting with the MNO during the Fisheries Act application phase.

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				time period X at location X, Y and Z – no blasting will be permitted at this time. Partially Resolved MNO recommends that IAMGOLD prepare a Fisheries Management Plan with MNO input once the construction date is known.	
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) The tables reporting fish tissue sample results are provided in Appendix N and a high number of samples exceed benchmarks for human and wildlife consumption. This should be addressed explicitly in terms of cumulative effects. Unresolved. IAMGOLD should provide an explicit indication that mercury levels found in fish tissue samples are above benchmarks (Appendix N p.16-23) and identify the number of samples exceeding benchmarks and the implications of this in terms of cumulative effects.	Mitigation, as committed, is intended to prevent incremental increases in methyl mercury concentrations in fish tissue due to Project activities. Therefore, there are no anticipated cumulative effects with respect to fish tissue mercury concentrations.IAMGOLD has committed to fish tissue monitoring to verify mitigation effectiveness.
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) The EIS / EA Report speaks to trap line losses (Chapter 11 - Based on discussion with the MNRF no compensation is required for trap line losses); loss of access to traditional harvesting of plants (Chapter 11 – no need to mitigate); and impacts to harvesting (Chapter 11 – mitigation limited to not having workers harvest). The MNO feels the response is insufficient, and	Upon review of the draft MNO TK / TLU study, IAMGOLD does not expect significant adverse effects on identified Métis cottages / outfitters, plant harvesting, traditional hunting and fishing and canoeing areas.

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				appropriate mitigation will be needed. Not Resolved The TK/ TLU has been completed. The content of the report needs to be considered in the final EIS, and done before the review is completed. The MNO will need to discuss impacts and mitigation, as required. The inclusion of the TK / TLUS information may result in changes in the findings for, - cottage and outfitters - plant harvesting - traditional hunting and fishing – canoeing.	
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) Closure There is no reason that other closure activities such as securing the site, safety measures, revegetation and regrading need to wait for flooding of the open pit. Unresolved Additional details need to be provided on the timing of closure activities that are not contingent on flooding of the open pit, and IAMGOLD should commit to additional consultation with MNO on closure plans and closure plan amendments. Further, IAMGOLD can provide modelling estimates for time to flood and use that information in closure planning. Wildlife This response is insufficient. The Amended EIS/Final	The conceptual closure plan detailing the closure activities during all Project phases is provided in Section 5.16. Activities occurring immediately after closure are described in Section 5.16.2. Note that close out of all Project infrastructure, with the exception of the flooding of the open pit and associated activities, will be completed at the end of the closure phase.IAMGOLD is open to discussions with MNO about opportunities for ongoing participation during development and subsequent update of the Closure Plan.IAMGOLD has committed to several measures to protect flora and fauna such as avoiding clearing during bird breeding seasons and considering in water works timing windows. IAMGOLD is committed to ongoing consultation with the MNO, including, but not limited to discussing timing of site and construction development as Project planning continues.

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				EA still does not satisfy the initial requests of the MNO, specifically related to: a) comprehensive table(s) indicating critical life periods for fish and wildlife within the PSA, and the activity restriction or mitigation that will occur during these times, should activity/location/critical life period coincide, b) a monitoring program that is comprehensive and on-going through all project phases and includes input from local land users, c) specific and explicit mitigation strategies for the natural environment, fish, wildlife and plants. All three of these comments/issues are discussed in more detail in their respective sections of this comment-response table. Unresolved IAMGOLD to provide a) comprehensive table(s) indicating critical life periods for fish and wildlife within the PSA, and the activity restriction or mitigation that will occur during these times, should activity/location/critical life period coincide, b) a monitoring program that is comprehensive (direct surveying to assess) and on-going through all project phases and includes input from local Métis land users.	
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) Suggest a commitment to include these parameters in fish tissue sampling if elevated concentration of these constituents are detected in surficial sediments during mine operations.	The EEM studies will be designed to detect and measure changes in aquatic ecosystems. The metal mining EEM program is an iterative system of monitoring and interpretation phases that is used to assess the effectiveness of environmental management measures, by evaluating the effects of effluents on fish, fish habitat and the use of fisheries resources by humans.Long term effects

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					are assessed using regular cyclical monitoring and interpretation phases designed to investigate the impacts on the same parameters and locations. In this way, both a spatial and temporal characterization of potential effects to assess changes in receiving environments are obtained.
659	Letter	06/10/2015	1) James Wagar (Métis Nation of Ontario)	1) The proponent should indicate the locations (using a map-figure) that are projected to experience flooding and potential methyl mercury production. It is important for the proponent to identify potential for these types of events even if they are unexpected impacts. Partially resolved MNO recommends that the proponent indicate the locations (using a map-figure) that are projected to experience flooding and potential methyl mercury production.	As per discussions with the MNO, IAMGOLD has committed to removing terrestrial vegetation and organic-rich soils, which will prevent the potential for methyl mercury production. With the application of mitigation, no areas with methyl mercury potential are anticipated to exist.
561	Site Visit	06/30/2015	1) Andy Lefebvre (Métis Nation of Ontario)	1) Will fishing opportunities in the local waters be affected or limited? There is a traditional canoe route that passes through the proposed mine Site.	IAMGOLD has committed to realigning the freshwater courses in such a way so as to maintain the integrity of the existing aquatic ecosystems through a solid habitat compensation plan that will in some cases enhance the available habitat for some fish species like the resident walleye and perch populations.
628	Meeting	02/26/2016	1) Shawn Batise (Wabun Tribal Council)	1) Regarding the draft condition (Condition 6.4.3) for methylmercury monitoring, WTC noted that they will likely recommend to the CEA Agency the inclusion of sampling of forage fish with the supportive rationale being that it would be useful to implement mitigation measures at the bottom of the food chain, rather than	IAMGOLD will discuss other potential sampling species with technical leads.

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				the top to preemptively mitigate the initial and subsequent effects.	
785	Open House	05/28/2018	1) Unknown Unknown (Mattagami First Nation)	1) Will the fish adapt to the new lake and continue to thrive?	Yes, the realignment channels and the new lake are being designed by specialists in a manner such that they will be suitable for local fish species.
785	Open House	05/28/2018	1) Unknown Unknown (Mattagami First Nation)	1) The following general comments were made; (a) Concerned about the effects of the Project on downstream water quality; fish keep getting smaller. (b) Clearing trees will destroy the ecosystem – trees produce oxygen. (c) Concern over including a ceremonial component to the removal and storage of artifacts. This would need community feedback. (d) First Nation members need to be priority on hiring.	IAMGOLD noted the comments.
785	Open House	05/28/2018	1) Unknown Unknown (Mattagami First Nation); 2) Unknown Unknown (Mattagami First Nation); 3) Unknown Unknown (Mattagami First Nation); 4) Unknown Unknown	1) What are your questions or comments related to the updates to the Cote Gold Project? First Nation members need to be priority on hiring. 2) Do you have any comments or questions about the Project's proposed Tailings Management Facility and Mine Rock Area? How do you plan on keeping ammonia levels down and also from seeping into the surrounding waterways? 3) Do you have any comments or questions about the Project's plans for Mine Closure? Do you have any suggestions about how the land could be restored once mining activities end? (a) Will the area be monitored after closure to ensure	

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			(Mattagami First Nation)	the environment will continue to be protected? (b) Replant trees, picnic/camp area, keep grounds maintained for future years. 4) Do you have any comments or questions about the proposed plans to offset fish habitat (new watercourses and new lake)? Will the fish adapt to the new lake and continue to thrive?	
785	Open House	05/28/2018	1) Unknown Unknown (Mattagami First Nation)	1) Why will the New Lake disappear post-closure? We want it to remain once established.	This comment is noted, IAMGOLD will investigate options to maintain new lake post closure.
846	Email	06/27/2018	1) Chad Boissoneau (Mattagami First Nation)	1) It was suggested that the fish removed from Cote Lake could be given to MFN members for food.	That is an option that IAMGOLD is open to discussing with the MFN.
846	Email	06/27/2018	1) Chad Boissoneau (Mattagami First Nation)	1) There was a comment that seepage from the Tailings Management Facility would impact downstream water quality and fisheries.	Seepage from the TMF has the potential to affect receiving waters and fish. However, cyanide will be destroyed, and the tailings do not have the potential to generate acid. In addition, the TMF is designed to minimize seepage. IAMGOLD has modelled receiving water quality and has identified that water quality guidelines will be met, and that fish will not be harmed due to seepage from the TMF.
846	Email	06/27/2018	1) Chad Boissoneau (Mattagami First Nation)	1) There was an interest in having an MFN monitor on site for monitor impacts to fish, water quality.	IAMGOLD is committed to support employment for local community members (First Nation, Métis communities and Gogama), including opportunities to support environmental monitoring activities.
846	Email	06/27/2018	1) Chad Boissoneau	1) Use of chemical sprays to manage vegetation along the transmission line corridor and in particular	IAMGOLD remains committed to the use of mechanical clearing for clearing and managing vegetation along the

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			(Mattagami First Nation)	near water crossings was a concern. Chemical sprays adversely impact birds, animals and fish that are harvested for food near transmission line corridors. The approval condition and company commitment to only use mechanical methods for controlling vegetation in the right of way must be honoured.	transmission line corridor, as committed to in the EA and as per the federal condition of approval (5.1).
846	Email	06/27/2018	1) Chad Boissoneau (Mattagami First Nation)	1) There was a concern about possible flooding of downstream areas due to the dewatering of Cote Lake and diversion of the streams. Neil Hutchison (environmental advisor to MFN) estimated it would be like pouring a 5-gallon tank of water into the river every minute.	It was clarified that the water would be discharged into the Mollie River and would flow through the waterbodies downstream including Three Duck Lake.
882	Email	09/25/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.)	1) Numerous Species at Risk have been identified on the project site. The Closure objectives for vegetation are focused on long-term physical stability of the site (e.g. erosion control) and improvement of site aesthetics (p. 108). p. 112 indicates areas of revegetation but these are not related to natural heritage features. We would like to see additional consideration of how the revegetation plans affect SAR habitat or that of other wildlife. For example, the fisheries component speaks to the need for considering individual species and habitat for specific life stages. Information Request: Please explain how the proposed revegetation plans	The EA and updated UTM confirm there are no residual adverse effects on species at risk (SAR). Therefore the primary objectives of rehabilitation/rehabilitation do not specifically focus SAR. However, it is generally anticipated that SAR may utilize some of the habitat types that are broadly identified in the Closure Plan.As discussed in Section 9.18 of the Closure Plan, The primary aim of the site revegetation / rehabilitation program is to control erosion and ensure physical stability, improve the aesthetics of the site, promote vegetation communities that support habitat for local species.Revegetation of disturbed areas will be accomplished through seeding and planting of seedlings of indigenous plant species, as appropriate, to initiate colonization and regeneration. The species mix / mixes for the site revegetation will be determined through onsite testwork programs during the Operations phase, and will be refined during progressive rehabilitation. The programs will assist with revegetation success at closure.Re-

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				were designed to address species habitat restoration of specific SAR species and other wildlife species	vegetation is anticipated to result in the following habitat types (Closure Stage II, Figure 9-2):• Successional grassland = 325 ha;• Successional forest = 280 ha;• Wetland = 20 ha;• Mixed exposed rock slope and successional forest = 200 ha; and• The remainder will comprise of exposed rock slopes.A description of the types of habitats used by various SAR in the Project area, and the amount of habitat loss that will result from Project construction and operations, is described in the original EA. All of these habitat types are very abundant in the region, immediately outside the Project footprint.As noted in the terrestrial baseline report "Five of these [SAR] species, Bald Eagle, Rusty Blackbird, Common Nighthawk, Canada Warbler and Olive-sided Flycatcher were confirmed within the Project Study area during the spring and summer 2013 surveys. The remaining species, Eastern Whip-poor-will, Chimney Swift, Black Tern and Barn Swallow were not observed during the surveys; these species may occur on the site and were undetected or use the site intermittently making detection very difficult." The five species confirmed during the 2013 surveys are provincially designated as Special Concern and are not afforded individual or habitat protection under the ESA. Of these species, only Bald Eagle have been known to exhibit nest fidelity. However, management of the Bald Eagle nest site will take place during the development of the mine, as such it is not addressed in the Closure Plan. It is therefore reasonable to expect all five SAR birds to relocate to suitable nearby available habitat, eventually recolonizing the footprint as progressive rehabilitation measures result in the return of suitable habitat.

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882	Email	09/25/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.)	1) Quotations: The primary objective of the Closure Plan is to rehabilitate the Project site area to as near a natural state as practical, promoting vegetation communities that support habitat for local species diversity and aquatic habitat that supports healthy fish populations. Once the open pit is flooded the open pit lake will be reincorporated into the existing water systems to return the subwatersheds to their pre-mining conditions, as much as practicable. Access will be maintained or re-established for traditional and non-traditional land users.----- This appears to be a reasonable objective but the statement "as near a natural state as practical" provides considerable latitude for interpretation, and the criteria for success in this objective will need to be developed as the plan proceeds. It is not clear whether this objective aligns with the objectives of the First Nations for mine closure, and makes no mention of First Nation uses and definitions of significance. Additional consultation is required to develop the closure objectives.	IAMGOLD believes that the intent of the statement is already met in the objectives – to restore use of the site. In addition, as discussed in the Closure Plan, the intent of re-vegetation is to promote sustainable plant growth and biological monitoring will be undertaken until a self-sustaining vegetation cover is established.IAMGOLD sought input from Flying Post First Nation and Mattagami First Nation during community open houses in May 2018 and during the Mattagami First Nation Community Open House in August 2018 on mine closure planning. Specifically, IAMGOLD requested input from community members about how the land could be restored once mining activities end and asked for input on possible future uses of the mine site. Future uses of the site may be further defined in ongoing consultation with communities.
897	Community Meeting	09/26/2018	1) Unknown Unknown (Flying Post First Nation); 2)	1) The FNP environmental advisors reviewed their initial comments on the draft Closure Plan and the comments recorded at the Mattagami First Nation meeting on August 30th. They asked FPFN they had	IAMGOLD noted that the realignment channels will be designed for the fish and will compensate for habitat loss. The end pit lake is not intended as fish habitat compensation.

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			Unknown Unknown (Flying Post First Nation); 3) Unknown Unknown (Flying Post First Nation)	any specific closure objectives. They noted that returning the site to pre-mining conditions is not possible. 2) There was a discussion about the fate of certain types of fish that live in different depths of water in relation to the pit lake. Some fish stay at one level and others like to go deeper. The FNP environmental advisors stated that fish species that prefer deeper water are not in this water system now. At closure, it is likely that only the top layer of the lake will be used by fish. 3) The FNP environmental advisors said they have asked IAMGOLD about water quality in the very deep end pit lake. There is concern that deep lakes will stratify (different water chemistry and temperatures at different depths) and can turn over. They noted that the end pit lake won't be colonized by lake trout and that lake water quality will need to be continually monitored.	
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.)	1) The concern with it being higher than PWQO is the potential for contamination or health effects to benthic invertebrates and fish that may move downstream or be harvested and eaten. Unless this can be shown to be insignificant, this will be an issue for the FNs. Would the arsenic be persistent post closure when there is a possibility of FNs using the area and drinking the water? a) Please provide an assessment of the threat to fish and aquatic life resulting from the predicted increase in arsenic, or complete a Site Specific Water Quality Objective demonstrating that the generic PWQO is	a) The maximum predicted concentrations of arsenic in the receiving water were less than the Ontario Drinking Water Quality Standard for arsenic during all Project phases, connoting no unacceptable risk to human health attributable to the Project via this exposure pathway. When compared to risk-based toxicity reference values protective of sensitive species (Scenedesmus obliquus), the maximum predicted concentrations are not indicative of unacceptable risk. b) The Water Quality UTM provides detailed results of the predicted concentrations for the Project and considers each Project phase. Predicted water quality indicated that fewer substances were elevated above benchmarks relative to the EA, and concentrations of most substances achieve

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				not applicable. b) Please provide an assessment of the concentrations of arsenic in surface water during operations, closure and post closure.	water quality guidelines with the exception of arsenic, which is expected to periodically exceed the water quality guideline (CCME) during a 1:25 dry year. However, the maximum predicted monthly average concentration is only marginally over the guidelines (0.0071 mg/L) and does not exceed toxicity thresholds.
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.)	1) a) What is the extent of flooding proposed under the original and the revised project footprint? b) Were the Hg consumption advisories put in place due to mercury caused by historic mining activities? c) Will Hg contamination persist post closure and if so, then the fish will continue to be impacted – given the relationship between FNs and the value they place on fish (consumption – fish are a major part of their diet/subsistence, spiritual/family) this is an unacceptable impact. Please: a) Ensure that the EER and UTM describe the conditions guiding the original EA and the revised EER; b) Describe the causes of the existing Hg consumption advisories and whether they reflect local or regional conditions; and c) Describe the time course of Hg contamination in fish in the closure and post closure periods and the factors governing the effects.	Effects of the Project related to methyl mercury were assessed in the EA, and changes to the Project design are not anticipated to result in greater effects. Commitments to managing these effects have also not changed and include stripping of organic soil in areas prior to flooding.a) The amount of terrestrial flooding is reduced by 33% in the Project mine plan compared to the EA, therefore the potential for methyl mercury production will be reduced.b) The existing consumption advisory is not associated with historic mining activities but rather is indicative of flooded watercourses and wetland habitats typical of northern Ontario.c) Fish tissue is not expected to be impacted, as flooding of Chester Lake is no longer proposed and areas to be flooded will have vegetation and organic soils removed prior to flooding. Therefore, fish consumption limits are not expected to be reduced compared to baseline conditions
891	Email	11/16/2018	1) Neil Hutchinson (Hutchinson	1) The potential change in average annual surface water flows were predicted for waterbodies throughout the study area. Predicted changes to average annual flow range from -16 to 18%.	The model is intended to reflect the potential longer-term changes to the hydrological system.

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			Environmental Services Ltd.)	Changes in average annual flow does not predict changes to hydrograph during all times of the year, especially during the most critical low flow period, when flow reductions may be most pronounced, and have the greatest effect on aquatic habitat. Fisheries and Oceans Canada (DFO) state that flow alterations ±10% of the instantaneous flow "…have a low probability of detectable impacts to ecosystems that support commercial, recreational or Aboriginal fisheries" based on "expert consensus" and recommend that site-specific studies should be completed where flows are subjected to >10% flow alteration. Changes to the instantaneous flow or hydrograph were not provided in the Hydrology UTM, therefore evaluation of flows per DFO guidance cannot be undertaken. Although a 13-16% reduction in average annual flow from Little Clam Lake during operations is predicted, the seasonal reductions or instantaneous reductions in flow, especially during spawning or the low flow period may be important and should be quantified, along with any potential for effects on aquatic habitat. Changes to instantaneous flow (or annual hydrograph) should be predicted for all project phases to quantify the reduction in instantaneous flows (if any). If a reduction is greater than 10%, then the potential for effects on aquatic habitat should be evaluated.	
891	Email	11/16/2018	1) Brent Parsons (Hutchinson	1) A benchmark for mercury is listed in Table 2-2 to assess water quality predictions but mercury	a) The Project site layout has been reduced from the EA and is within the same footprint used for the previously

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			Environmental Services Ltd.)	concentrations are not predicted for any waterbodies under any scenario. To determine the expected extent of potential changes to the aquatic environment, predictive mercury modelling should be completed, and the results should be used to inform the monitoring plan. Monitoring of mercury concentrations in water and fish tissue should be completed in waterbodies located downstream of New Lake as increased mercury concentrations are not restricted to that area. Table 3-3 - Simulated Surface Water Elevation Changes indicates that increased water levels are anticipated in Three Ducks (Upper), Three Ducks (Lower), Chester Lake and Schist Lake. a) Predictive methylmercury modelling was completed previously for the last version of the project. Predictive modelling should be updated based on the altered site plan. b) Ensure that the comprehensive monitoring plan assesses mercury in water quality and fish tissue from all waterbodies where water levels are predicted to increase or are directly connected to a realignment channel.	completed methyl mercury modelling. Therefore, the previously completed modelling is considered valid. b) Noted. The monitoring program will meet all regulatory requirements and conditions of EA approval.
891	Email	11/16/2018	1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) More conservative consumption guidelines exist such as the Guide to Eating Ontario Sport Fish (Ministry of Environment 20173) consumption guidelines for women of child-bearing age and children under 15 (0.26 mg/kg Hg) and should be utilized as part of the monitoring plan. Monitoring methylmercury in fish tissue is a previous EA condition.	a) In the 2016 baseline supplementary assessment, the MOECC 2015 consumption advisory and restriction levels for mercury were used. While benchmarks for the operational monitoring program have not yet been determined, it is expected that the most recent provincial or federal values will be used.b) Both federal and provincial EA approvals include conditions related to the monitoring of methylmercury. These conditions of approval continue

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				a) Include conservative consumption guidelines when assessing mercury concentrations in fish. b) Monitor methylmercury in fish tissue, in addition to total mercury, during monitoring per EA conditions.	to be applicable to the Project, and the monitoring program will meet these requirements, including conducting the sampling and analysis in accordance with provincial guidance and protocols. It should be noted that mercury found within the tissue of fish is predominately methyl mercury, since this is the organic form of mercury that can be taken up and incorporated into tissue. Therefore, the proposed monitoring of total mercury in fish tissue is appropriate and compliant with the Project's EA conditions.
891	Email	11/16/2018	1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) Predictions are updated in the UTM but no updated data are presented Please indicate whether or not additional aquatic biology data such as fish communities and abundance, fish tissue metal concentrations, sediment quality or benthic macroinvertebrate information has been collected since 2013 and provide updated baselines for these components that reflect the changes to the project footprint.	Please see attached data report. Additional baseline studies were conducted in 2016 and focused on fish habitat and community characterization but also included fish tissue and water quality monitoring to update the baseline information to reflect the change in the mine plan.
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons	1) The Federal Ministry of Environment and Climate Change Condition 3.7 states that, "The Proponent shall, to the satisfaction of Fisheries and Oceans Canada and Environment and Climate Change Canada, and in consultation with Indigenous groups, develop and implement any plan(s) required to offset the loss of fish and fish habitat associated with the carrying out of all phases of the Designated Project." It is not clear if the above-mentioned approach was developed in consultation with First Nations. The scope of potential CG fish habitat compensation	

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			(Hutchinson Environmental Services Ltd.)	projects should be widened for consultation and include potential “out of kind” projects. Application of “in-kind” habitat offsetting designed to ensure that there is “no net loss” of habitat is a challenge as noted by Quigley and Harper (2006) who determined that the ability to replicate ecosystem function is clearly limited after reviewing the no net loss habitat principle at 16 sites across Canada. The Fisheries Act allows for offsetting that is removed from a project site and can target factors which limit fish productivity by means other than replacing what is lost, so long as the offset: •Supports fisheries management objectives or local restoration priorities •Benefits balance project impacts •Measures provide additional benefits to the fishery •Generates self-sustaining benefits over the long term Also, DFO (2017) lists seven classes of equivalency metrics that should be used when predicting impacts and benefits and one includes “other value-based metrics, focused on economic or societal values”, so it is clear that more creative, “out-of-kind” offsetting projects with a focus on local restoration priorities and societal values should be developed by IAMGOLD and considered by First Nations. For example, a fish habitat compensation plan was developed based on input from Matachewan and Temagami First Nations as part of the Young Davidson mine expansion by Alamos Gold Inc. The compensation plan included the development of 3.72 hectare baitfish habitat, enhancement of 4 walleye	

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				spawning areas and funding for research on environmental DNA barcoding (https://www.macleans.ca/news/canada/how-to-destroy-a-lake/). Please: a)Describe how First Nations have been consulted on the development of the planned fish habitat compensation plan. b)Develop additional habitat compensation projects, including "out-of-kind" projects, so that First Nations can provide input on preferred projects.	
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) It seems that fish habitat will be impacted in a number of waterbodies and watercourses yet only habitat alterations in Clam Lake and New Lake will be addressed through the offsetting/compensation plan. Please increase the number of waterbodies where fish habitat will be affected and addressed through the future offsetting/compensation plan or provide rationale for the inclusion of only Clam and New Lakes.	
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado	1) CEAA EA condition 6.4.3 states, "monitoring methylmercury concentrations in water and fish of pike, walleye, whitefish or perch in all waterbodies where an increase in water level is predicted or waterbodies directly connected to realignment	

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			Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	channels." Surface water elevations for the operations phase were simulated and presented in Table 3-3 within the Aquatic Biology UTM. It is clear that fish tissue monitoring needs to be completed in more than New Lake and reference lakes to meet CEAA condition 6.4.3. Please include all of the waterbodies where an increase in water level is predicted, are located downstream of a waterbody where an increased water level is predicted and waterbodies that are directly connected to realignment channels within the fish tissue monitoring program.	
891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) P. 19 - "Unlike the EA, which predicted a reduction in flow and water level in Bagsverd Creek that had the potential to effect fish habitat and passage, no reductions in water levels are predicted under the Project mine plan (Table 3-3). The only material change in water elevation will be a slight increase in the water level of Lower Three Duck Lakes (0.11 m) whiuch is not expected to materially affect fish habitat. During Closure, water levels and flow will be adjusted towards baseline conditions as channel realignments and the New Lake are removed". The above-mentioned simulated surface water elevation changes only reference average year modelling. Clam Lake (-0.15 m) and Upper Three Ducks Lake (0.49 m) exhibit substantial changes in water levels in dry years. Please update the assessment of simulated water level change on fish habitat to include wet and dry modelling as necessary.	

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891	Email	11/16/2018	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) Construction of the Project totally eliminates the ability and willingness of MFN members for many generations to fish in the Lakes and other waterbodies impacted by the Project. The Project perpetuates the impacts of historic and current mining and exploration in this area on traditional fishing as well as other indigenous land uses. Please consider revising the magnitude of effect predictions for traditional fishing in the construction, operations and closure phase tables.	

Comments and Responses Related to Fisheries Authorization – Government - July 2012 to November 2018

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
10	Meeting	07/26/2012	1) Glenn Seim (Ministry of Northern Development and Mines); 2) Christy Marinig (Timmins Economic Development Corporation); 3) Karen Hamel (Northern College); 3) Tom Laughren (City of Timmins); 3) Diane Leblond (Northern College)	1) MNDM recommended IAMGOLD involve groups downstream of the Côté Gold Project through the use of a communications strategy. MNDM recommended IAMGOLD to start engaging environmental non-governmental organizations (ENGOs), including Northwatch and Mining Watch. MNDM recommended IAMGOLD do community outreach across Northeastern Ontario and participate/sponsor the annual Mattagami Fishing Derby. 2) TEDC suggested IAMGOLD get involved in the Wabun Tribal Council Golf Tournament, use the TEDC's job postings board for IAMGOLD employment opportunities, deliver a presentation to City Council, issue a press release to local media distributing more detailed information about the acquisition and goals of the project, communicate if both English and French, attend Mining Expo in Las Vegas, September 21-23, 2012 as part of the Northeastern Ontario mining group, meet with MPP and MP for the Timmins-James Bay ridings, appoint a community representative for Timmins area to liaise locally on a regular basis. 3) NC and the City of Timmins requested that IAMGOLD attend 'Welcome to Timmins' event held in September for companies or groups new to Timmins and contribute to the Northern Training Program. NC and the City of Timmins requested that IAMGOLD attend/sponsor the National Aboriginal Day and sit on Northern College Advisory Boards and to work with NC to develop high school education programs so that students enter the labour market down the road with the skills needed in order to work for IAMGOLD.	1) IAMGOLD has engaged in dialogue with Northwatch and Mining Watch as per the recommendation. 2-3) IAMGOLD acknowledges your feedback, and it will be considered and implemented where appropriate.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
152	Meeting	11/08/2012	1) Dave Ballak (Ministry of Natural Resources)	1) Individual responded that in Gogama most of the land is private patented land. The MNR is responsible for all wildlife/fish management even on private land. MNR does not want to sell lots to private land owners since there are other already serviced lots in the town. MNR would like there to be a legitimate need for these lots before they are sold. MNR lots may be available but not for permanent residence, only seasonal. Individual stated that in the last 10 years Gogama has been quiet due to the loss of employment (Domtar, CN). In the past Gogama had a CN work camp, there was a rail station, movie theatre, bowling alley back in 1960's. The area has lost a lot of employment int he last 10-20 years due to forestry.	Thank you for your comment. No further response required.
152	Meeting	11/08/2012	1) Dave Ballak (Ministry of Natural Resources); 1) John Radigan (Ministry of Natural Resources)	1) Individuals stated the following about fishing: the RSA is a very busy fishing area; angling pressure is high to very high in some lakes (Biscotassi, Mesomikenda, Ramsay and Rice Lakes); Mesomikenda Lake has a Lake Trout Policy that limits the kind of development that can occur. This policy can be found on their website or call them to obtain; Minisinakwa Lake (Gogama) has high angling pressure; Dividing Lake has medium angling pressure; there are tourism lakes to the North East; Mekenda Lodge on the north end of Kenda Lake (but joined to Mesomikenda) as well as on the Rice Lakes; provided list of stocked lakes: Dividing Lake (Walleye); Mesomikenda (Lake Trout, Pike, Walleye, Bass); and the RSA is in Fish Management Zone 10 - there is an active Zone Council that is looking at mining development (generally) and impacts to fisheries.	Thank you for your comment. No further response required.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
46	Meeting	11/15/2012	1) Steven Momy (Ministry of the Environment); 2) Doug MacMillan (Ministry of Natural Resources)	1) MOE states that the construction of any domestic/municipal solid waste facilities (i.e., on-site landfill) will need approval. If using a hauler, MOE still wants to be consulted. 2) MNR states that any dam construction will require location approval and plans/specs approval under the Lakes and Rivers improvement Act (LRIA). A "Class D" project (i.e., having potential for high negative effects and/or public/agency concern) would likely go through MOE to an EA process. Forestry Licence Permit(s) would be required for wood removal. A work permit under the Cultural Heritage Technical Guidelines may be triggered if there are "findings" within the development areas. Permits may be required regarding endangered species and there will be potential timing restrictions to minimize impacts on fish and wildlife.	
46	Meeting	11/15/2012	1) Kees Pols (Mattagami Region Conservation Authority)	1) Mattagami Region Conservation Authority (MRCA) has limited staff and limited delegated authority under the Lakes and Rivers Improvement Act, but would coordinate with the Ministry of Natural Resources (MNR) and Fisheries and Oceans Canada (DFO) to provide input regarding water quantity, land hazards and alteration of water bodies. MRCA should be included in correspondence sent to the MNR and DFO, and would prefer receipt of document hard copies if possible. IAMGOLD should contact the Source Water Protection Committee and provide some sort of short presentation on the Project, and also to City Council.	IAMGOLD has already met with City Council. IAMGOLD will contact the Committee and arrange for a presentation.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
46	Meeting	11/15/2012	1) Stephanie Davis (Canadian Environmental Assessment Agency); 1) Debbie Dyck (Wood E&IS)	1) Discussions with Fisheries and Oceans Canada (DFO) to date have only been by phone. DFO will want a draft of the Project Description (PD) before going into detailed discussions. A draft of the Project Description (PD) should be forwarded to Environment Canada. IAMGOLD should contact Environment Canada (only the biologists are available now).	IAMGOLD will contact Environment Canada.
150	Meeting	04/30/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) Bait Fish Permit Licences are required and there may be some issued in the site area.	IAMGOLD asked MNR to contact the bait licence holders and see if they would allow MNR to provide their contact information to IAMGOLD so that IAMGOLD may consult with them directly.
252	Letter	05/21/2013	1) Carole-Anne Gervais (Ministry of Transportation)	1) The MTO would like to learn more about the potential impacts to Hwy 144 related to how impacts to fish and/or fish habitat will be mitigated or if there is any alteration to fish habitat with the realignment of the Mollie River.	Fish habitat will be affected due to the Mollie River realignment. At this stage of the Project, proposed habitat compensation measures have not been developed but will be as additional field studies and assessment are carried out. Fish habitat compensation will be overseen by Fisheries and Oceans Canada, the Ministry of Natural Resources, and the Mattagami Region Conservation Authority.
221	Meeting	05/23/2013	1) Todd Copeland (Ministry of Natural Resources); 1) Suzanne DeForest (Ministry of Natural Resources)	1) Has there been any thoughts about invasive fish species (such as Bass) during transferring fish to other water bodies?	When transferring fish, we will put them in lakes or streams that already have these species – so will not be introducing any new species. The Environmental Assessment will discuss the fish rescue at a higher level. A more detailed fish rescue plan will come during the permitting phase.
218	Email	06/05/2013	1) Ed Snucins (Ministry of the Environment); 2)	1) The first bullet (i.e. Indicators for the Assessment of Alternatives) of the Criteria "Effect on Fish and Aquatic Habitat" and "Effect on Wetlands" should be reworded to	Indicators reflective of these objectives will be adopted for the assessment of alternatives.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Ed Snucins (Ministry of the Environment)	be consistent with Ontario MOE Water Management Policies, as follows: "Attainment or maintenance of water quality guidelines for the protection of aquatic life, or where pre-mine water quality does not meet the Provincial Water Quality Objectives it shall not be degraded further." 2) Similarly, add following Indicator for the criterion "Effect on Fish and Aquatic Habitat":"Maintain stream flow/level and lake level to protect natural function."	
218	Email	06/05/2013	1) Ed Snucins (Ministry of the Environment)	1) Assessment of alternatives should consider the impacts of domestic sewage nutrient loading on the water quality of surface water receivers. If discharge will enter a lake trout lake the impacts of nutrient loading on lake trout dissolved oxygen habitat should be evaluated; this will include baseline characterization of end-of-summer dissolved oxygen/temperature profiles and mean volume-weighted hypolimnetic dissolved oxygen.	Agreed, assessment of alternatives will consider sewage nutrient loading on receiving waters. No change in the ToR required.
218	Email	06/05/2013	1) Ed Snucins (Ministry of the Environment); 2) Ed Snucins (Ministry of the Environment); 3) Ed Snucins (Ministry of the Environment)	1) It appears that not all surface waters that may be affected by the mine have been part of baseline assessment to date. Obvious ones that appear to be missing include Weeduck Lake, Three Duck Lakes, Chester Lake, the main basin of Bagsverd Lake, and Mesomikenda Lake. 2) Figure 2 should clearly indicate the names of all lakes that have been surveyed and listed in Table 6-2. 3) Being considered as potential receivers of treated mine effluent are Mesomikenda Lake and Bagsverd Creek. It is important that those waters be described physically, chemically and biologically, including critical aquatic habitat (e.g. spawning areas) that may be affected by mine effluent, in particular within the potential future mixing	The Proposed ToR will be revised to include more information with regards to the surface water and acquatic baseline data collection in the potentially affected lakes. We will physically, chemically and biologically describe the Mesomikenda Lake and Bagsverd Creek in the baseline characterization reports. Baseline water quality data is being collected within Bagsverd Creek at three locations: the upstream end, downstream end, and one location immediate to the upstream and downstream locations. Furthermore, baseline water quality data is being collected in Neville Lake, which is the receiving lake downstream of

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				zone(s). Bagsverd Creek should have baseline sampling that includes characterization of the stream with distance downstream of the mine past the potential future mixing zone; if Bagsverd Creek empties into a lake or joins a larger stream those should be included in baseline assessment.	Bagsverd Creek. No modification to the Proposed ToR required.
224	Letter	06/07/2013	1) Jim Antler (Ministry of Tourism, Culture and Sport)	1) Table 5-4 outlines a number of proposed indicators for a variety of environmental component criteria, including maintenance or provision of fish habitat, and area, type and quality of terrestrial habitat that would be displaced/altered. However, there is no reference to species population indicators for either fish or wildlife. Consideration should be given to incorporating some direct population indicators for both fish and wildlife in this section.	The Proposed ToR will be revised to include direct indicators for fish and wildlife population.
224	Letter	06/07/2013	1) Jim Antler (Ministry of Tourism, Culture and Sport)	1) In Section 5.2.2.5, the specific reference to tourism is appreciated; however the related indicator of “maintenance or improvement of tourism and recreational opportunities” could be strengthened. It may be useful to add an indicator for tourism that speaks to continued access to nearby natural resources (e.g. fish and wildlife).	The Proposed ToR will be revised to include the indicator "continued access to areas used for natural resource harvesting by tourism operators". These areas will include Bear Management Areas which are located in the region. IAMGOLD has identified where tourism operators are located and are discussing their operations and activities as they may relate to the Project area. A map showing the location of these outfitter establishments will be provided in the Proposed ToR. IAMGOLD continues to identify and meet with stakeholders. Information gathered during these meetings will be incorporated in the land and resource use baseline study and appended to the environmental assessment report.

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224	Letter	06/07/2013	1) Jim Antler (Ministry of Tourism, Culture and Sport)	1) Table 6-2 identifies the fish species captured for a variety of water bodies in the vicinity of the Project. However, Weeduck and the Three Duck Lakes chain are not included despite their close proximity. What was the rationale for not including them in the assessment work?	Baseline studies are currently being carried out for the lakes mentioned. Effects on these lakes will also be assessed as part of the environmental assessment.
224	Letter	06/07/2013	1) Jim Antler (Ministry of Tourism, Culture and Sport); 2) Jim Antler (Ministry of Tourism, Culture and Sport)	1) Section 7.2.2 raises the concept of compensation, as a component of mitigation, using the example of providing alternative fish habitat to offset adverse effects. Does IAMGOLD intend that compensation could also be available to address any potential impacts to nearby businesses such as tourism (e.g. monetary or non-monetary)? For example, if use of a Bear Management Area is impacted or lost? 2) Some other mining-related environmental assessment (EA) ToR that we have reviewed have included language to indicate that the EA will address avoidance of, minimization of, and/or compensation for negative socio-economic effects that could result from projects. We encourage IAMGOLD to consider this as part of the final ToR.	The Proposed ToR will be revised to clarify that mitigation could also include compensation for other areas (i.e., not only fish habitat). This methodology has been accepted by both the Canadian Environmental Assessment Agency and the Ministry of the Environment for various other Federal and Provincial mining EAs.
224	Letter	06/07/2013	1) Jim Antler (Ministry of Tourism, Culture and Sport)	1) Table 7-1 documents a preliminary summary of potential effects for various Project components. For several different components (e.g. mine operations, buildings etc.) there are effects noted for things like water quality and loss of aquatic/terrestrial habitat but nothing relating to fish and wildlife species/populations. Again we would suggest more direct language relating to potential species effects.	Table 7-1 in the Proposed ToR will be modified to include effects on fish and wildlife species/populations. IAMGOLD will assess the economic effects (either positive or negative) of the proposed Project and will present these in the environmental assessment report. IAMGOLD will engage potentially affected tourism operators and determine the nature of any impacts on their operations, and identify and implement mitigation measures, if necessary, to avoid or minimize and negative impacts.

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228	Letter	06/07/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) What is being done with the fish that will be transferred? Where will they be putting them? Will they be going from a lake into lake, or a stream into stream? Need to ensure we are not introducing new and/or unwanted species into systems where they are not known to occur. What will be done if invasive species or introduced species are encountered?	Information regarding dewatering of Côté Lake and habitat compensation will be provided in the EA. The general idea when transferring fish will be to place species in comparable adjacent lakes or streams such that new or unwanted species will not be introduced to other systems.
228	Letter	06/07/2013	1) Todd Copeland (Ministry of Natural Resources); 1) Suzanne DeForest (Ministry of Natural Resources)	1) Using aggregate pits as fish habitat compensation needs to be detailed very thoroughly to determine if it would be an acceptable use.	Suitable fish habitat compensation measures are currently being developed. It is unlikely that these measures include aggregate pits. The Proposed ToR will be revised to eliminate this statement.
246	Email	06/07/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) With reference to Page 4-3, what is being done with the fish that will be transferred? Where will they be putting them? Will they be going from a lake into lake, or a stream into stream? There is a need to ensure we are not introducing new and/or unwanted species into systems where they are not known to occur. What will be done if invasive species or introduced species are encountered?	Information regarding dewatering of Côté Lake and habitat compensation will be provided in the EA. The general idea when transferring fish will be to place specied in comparable adjacent lakes or streams such that new or unwanted species will not be introduced to other systems.
228	Letter	06/07/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) MNR disagrees that Bagsverd Creek is being realigned. This entire section is being removed (along with its tributaries). As previous comment, we need to be carful with terminology. Under the LRIA these are watercourse channelizations that are diverting water; they are not simply realignments. With the construction of the new stream and subsequent flooding of it what measures are proposed to limit the	No change in the Proposed ToR is necessary. Permitting under LRIA will use terminology consistent with the legislation. IAMGOLD is proposing to apply natural channel design principles that have been used throughout Ontario to remediate or realign natural corridor systems. As a result, the realigned system will both convey flows in a natural manner and mimic or where possible, enhance the ecological function of the watershed. Preliminary construction details reported in

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				initial sedimentation? Will these new streams be monitored? What will be the plan if the stream realigns itself or there is excessive/ unacceptable erosion?	the EA will address sedimentation and outline monitoring plans.
246	Email	06/07/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) With respect to Section 5.3.1.9, the MNR disagrees that Bagsverd Creek is being realigned. This entire creek section is being removed (along with its tributaries). Under the Lakes and Rivers Improvement Act (LRIA), these are watercourse channelizations that are diverting water; they are not simply realignments. With the construction of the new stream, and subsequent flooding of it, what measures are proposed to limit the initial sedimentation? Will these new streams be monitored? What will be the plan if the stream realigns itself or there is excessive/unacceptable erosion?	No change in the Proposed ToR is necessary. Permitting under LRIA will use terminology consistent with the legislation. IAMGOLD is proposing to apply natural channel design principles that have been used throughout Ontario to remediate or realign natural corridor systems. As a result, the realigned system will both convey flows in a natural manner and mimic or where possible, enhance the ecological function of the watershed. Preliminary construction details reported in the EA will address sedimentation and outline monitoring plans.
236	Letter	06/10/2013	1) Wesley Wright (Ministry of the Environment)	1) Section 4.2.1 states that the sequencing of construction activities "will also consider" fish spawning and bird nesting seasons. Depending on input from government agencies, IAMGOLD may be required to not simply "consider" spawning and nesting seasons, but to limit/cease construction (for all or some of the Project components, in all or some of the study area) during these spawning/nesting windows.	Thank you for the comment. Text will be revised to reflect that activities will be staged with input from government agencies.Text will be revised as suggested for clarity.
236	Letter	06/10/2013	1) Wesley Wright (Ministry of the Environment)	1) Table 6-2: some lakes in the study area (Mesomikenda Lake, Three Duck Lakes, Weeduck Lake, Schist Lake) seem to be absent from the fish sampling. Also, please clarify if the 'Unnamed Lake' in Table 6-2 is Unnamed Lake #1 or Unnamed Lake #2 in Figure 2. At any rate, this would suggest that the other Unnamed Lake was also absent	Baseline studies are currently being carried out for the lakes mentioned. Effects on these lakes will also be assessed as part of the EA.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				from the fish sampling program. Why were fish species not captured in these water bodies?	
236	Letter	06/10/2013	1) Wesley Wright (Ministry of the Environment)	1) Table 5-4: for the criterion of "effect on fish and aquatic habitat," please explicitly state that one of the indicators will be attainment or maintenance of water quality guidelines for surface water bodies in the study area; only groundwater quality is explicitly mentioned, and there are many surface water bodies that are expected to be impacted by the proposed undertaking.	The first bullet will be revised to specify "surface water" for clarity.
273	Meeting	06/25/2013	1) Kelly Eggers (Fisheries and Oceans Canada)	1) Given that the Project is consistent with Fisheries Management Plans, IAMGOLD could consider implementing supporting compensation initiatives if compensation provided by proposed realignments was not sufficient.	Habitats credit approach will only be used if any compensation initiatives were undertaken that provided more compensation than required for the Project. These credits could potentially be used in the future to support First Nation initiatives. IAMGOLD will pursue habitat credits if the opportunity warranted it.
273	Meeting	06/25/2013		1) Given the timeline of the EA and of the Project, it is critical that IAMGOLD identify any significant issues with the realignments and approach to fish compensation.	All comments received were considered in preparation of the baseline study reports and the EIS / EA as appropriate.
273	Meeting	06/25/2013	1) Kelly Eggers (Fisheries and Oceans Canada)	1) Have all Harmful Alteration, Disruption or Destruction of fish habitat been identified in this presentation?	There may be other, smaller HADD of fish habitat identified (i.e. discharge for sewage, water taking), however the majority was presented and discussed within the presentations given.
273	Meeting	06/25/2013	1) Kyle Stanley (Ministry of Natural Resources); 1) Rob Whyte (Calder Engineering)	1) How much time will be given for vegetation to establish prior to flooding and what will be done to prevent erosion? How will the timing of the channel construction be dealt with?	Construction will occur during winter months with the intent that a minimum of one growing season would be provided for vegetation growth. In addition, other methods will potentially be used to assist in the stabilization of the constructed channel and minimize

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					erosion (i.e. core matting and use of coffer dams to control flow).
346	Email	07/31/2013	1) Ed Snucins (Ministry of the Environment)	1) My review identified a shortcoming in Table 5-4 (Effects to the Physical and Biological Environments Evaluation Criteria and Indicators); the Indicators for Assessment of Alternatives do not adequately identify the potential ecosystem effects of changes in the quantity of surface water. Specifically, the criterion "Effect on Fish and Aquatic Habitat" includes proposed indicators ('Maintenance or provision of fish habitat" and "Maintenance of water flows or conditions suitable for fish passage") that do not represent the entirety of ecosystem services provided by natural water flow and water level in streams and lakes. This could be remedied by including a more holistic indicator such as "Maintenance of natural water flow and water level in streams and lakes to protect the habitat of aquatic biota, including fish".	Thank you for your comment. The assessment of alternatives in the EA will consider the indicator "Maintenance of flows and water levels in streams and lakes suitable to support aquatic species and habitat" rather than the two indicators included in the ToR ("Maintenance or provision of fish habitat" and "Maintenance of water flows or conditions suitable for fish passage").
350	Email	08/14/2013	1) Dawn-Ann Metsaranta (Ministry of Northern Development and Mines)	1) 4.2.3.1- Rehabilitation of the pit is by flooding. It should be noted that at least one sloped enterance shall be left or created to allow a reasonable exit point should inadvertent access occur.	Thank you for your comment. This will be taken into consideration in the EA and in the detailed Closure Plan
306	Interview	08/16/2013	1) Suzanne DeForest (Ministry of Natural Resources); 2) Suzanne DeForest (Ministry of Natural	1) The MNR will need to get an idea of the expected impact on trappers and bait fish harvesters in the area. For example, would they be prohibited from trapping on leased land? Would IAMGOLD allow the trapper to trap to prevent the occurance of nuisance beaver problems? The MNR needs to know specifically what area they will not be allowed to trap on so that we can better determine the	IAMGOLD has engaged with the trapper whose cabin is currently located on the Site's leased property. IAMGOLD is committed to ongoing engagement with the trapper to discuss potential mitigation measures, and will provide more information to the MNR on what

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Resources); 3) Suzanne DeForest (Ministry of Natural Resources)	impact. A map showing tenure (both present and proposed) would be helpful for the MNR to make a determination of impact; the map does not have to be an official map, just something that would provide an idea of what IAMGOLD owns, leases, etc and what land IAMGOLD hopes to acquire in the future. We realize there may be some sensitivity around this. 2) The MNR does not compensate trappers for loss of trapline areas, fewer mammals, loss of cabin, etc. Examples would be the area that was burned by fire last year, flooded areas, or areas where a forest company is cutting trees. If a trapper decides that he no longer wants their trapline area (for whatever reason), they can relinquish it to the Crown. In keeping with provincial trapline policies, the MNR cannot transfer the head trapper to another trapline area. All trappers apply for vacant traplines, which they are interested in acquiring, and a provincial point system is used to determine the allocation of each vacant line. 3) The MNR has previously provided IAMGOLD with the contact information for the two bait fish harvesters. Bait fish harvesters pay for a township, regardless of how much Crown land is within the township. In the interest of the province dealing fairly with each harvester, there is no compensation for areas that any harvester cannot access.	areas of the Project site may be available for trapping as the Project moves into the planning phase.
311	Phone Call	08/27/2013	1) Suzanne DeForest (Ministry of Natural Resources)	1) Bait fish harvest blocks (based on townships) are more common and available than trapline areas or BMAs. There are a number of bait fish harvest blocks available in the District. Bait fish harvesters are charged a fee by township allocated. Harvesters can have more than one township allocated and usually harvest from one and move to another the next year. They have to show their harvest	All comments received were considered in preparation of the baseline study reports and the EIS / EA as appropriate.

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				plans to prove use and submit reports on harvesting to the MNR.	
320	Email	08/29/2013		1) Bait fish harvest areas that overlapped by the Project site are located in Chester and Neville townships and to a lesser extent in Potier and Yeo townships.	Thank you for your comment. This information will be used to support the Land and Resource Use Baseline study.
524	Email	07/10/2014	1) Ed Snucins (Ministry of the Environment)	1) Appendix J Water Quality: Water Quality Modeling Report 2.4 Modeled Parameters Modeled parameters did not include mercury. Watercourse re-alignments will result in flooding of land. There is high potential for existing elemental mercury to be converted to its bio-available form, methyl-mercury, leading to increases in the concentration of methyl-mercury in rivers, lakes and residing fish. The proponent should (1) define baseline conditions for water chemistry and fish tissue using advanced sampling and analytical protocols for low level total and methyl mercury according to guidance from MOECC Northern Region; and (2) model the potential impact of flooding on mercury levels in fish tissue (e.g. Johnson et al. 1991. Can. J. Fish Aquatic. Sci. 48: 1468 1475) Also include evaluation of the potential for increased sulphate levels to influence mercury methylation.	Section 2.4 Modelled Parameters in Appendix J, Attachment II did not indicate that mercury was not modelled; rather, the text indicates that mercury was not included in the presentation of the results of the water quality predictions because concentrations, including mine site components, were below or very near the MDL. Given that the concentrations were below or very near the MDLs, the drainage from the mine site is not a tangible source of mercury and presenting simulated concentrations of mercury would not provide any value to the water quality effects assessment in this context. Inorganic mercury can be bound in terrestrial vegetation and organic-rich soils and can become mobilized in terrestrial areas that become flooded where reducing conditions develop sufficiently to result in the methylation of the mercury. However, as noted in the aquatic impact assessment with respect to the Côté Gold Project, potential effects associated with methyl mercury production due to flooding are expected to be very limited because currently the areas that will be flooded (i.e., Chester Lake and parts of the south arm of Bagsverd Lake) are small (i.e., less than 80 ha) and are inundated on a seasonal basis. Generally, any methyl mercury production associated with flooding of shallow areas,

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					such as those proposed for the Côté Gold Project, is realized within 2 to 3 years of flooding and does not represent a long-term issue as observed at large reservoirs (Bodaly et. al, 1997; Canada-Manitoba Governments, 1987). Furthermore, the areas predicted to be flooded will form littoral shallow habitat that is expected to remain oxic and will thereby not create the anoxic conditions required for methyl mercury production. Therefore, the seasonal flooding of the areas of concern are not expected to significantly contribute to methyl mercury production upon development of the Project.The key issue with methyl mercury is the potential increase in mercury tissue concentrations of fish that reside in the lakes where flooding of terrestrial areas is expected causing restrictions in fish consumption rather than effects to the fish themselves. It is important to note that fish within the local area are currently restricted for consumption due to regionally elevated mercury levels. Thus, if any small increases in methyl mercury occurred in fish tissues, these increases will not likely change the consumption restriction on the fish. More information on fish tissue concentrations are discussed in Appendix W (HEHRA) as they relate to the possible impacts associated with human consumption of fish.Although methyl mercury production is not expected to be a concern, IAMGOLD is committing to remove terrestrial vegetation within the small areas that are predicted to experience flooding prior to the construction of watercourse realignments (Section 10, Table 10-2); this commitment has been expanded to include the removal of shallow organic-rich soils in these small areas. The

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					removal of the terrestrial vegetation and organic-rich soils in these areas will further reduce the potential for methyl mercury production (Windham-Meyers, 2009). Furthermore, low-level total mercury and methyl mercury have been added as parameters to the baseline water quality sampling and fish tissue monitoring as part of the overall monitoring commitments for the Côté Gold Project. Methyl mercury that is generated from inorganic mercury that is sequestered by terrestrial vegetation from the atmosphere typically occurs at very low total concentrations (i.e., nanograms per litre). The generation of methyl mercury depends upon the development of favourable geochemical conditions (i.e., sulphate reducing) to allow for sulphate reducing bacteria to transform the inorganic mercury to organic mercury. The rate of the microbial-induced methylation of the mercury depends on a number of factors including: distribution and concentrations of inorganic mercury in biodegradable organic matter, geochemical conditions (pH, redox, temperature), presence of compounds that can complex with inorganic mercury (e.g., dissolved organic carbon and sulphide), and presence and activity of sulphate-reducing bacteria (Benoit et al., 2003). Uncertainties associated with the source term, geochemical conditions and microbial communities, compounded with uncertainties associated with modelling exposure pathways and bioaccumulation in fish, makes modelling the overall effect of potential methyl mercury production very challenging and carries a range of uncertainty that is likely to be significantly greater than the range of the

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					predicted magnitudes. Therefore, modelling methyl mercury does not provide value in the context of an EA, and would not remove the need to follow through with the proposed mitigation and monitoring commitments that are discussed above.Additional information regarding methyl mercury production has been added in the Addendum to Appendix N (Aquatic Biology TSD).
524	Email	07/10/2014	1) Ed Snucins (Ministry of the Environment)	1) Appendix J Water Quality: Water Quality Modeling Report 2.4 Modeled Parameters Total Phosphorus (TP) was modeled using GoldSim. The majority of TP sample analyses had a high detection limit (20 ug/L). The province's recommended model for TP in Ontario lakes on the Precambrian Shield is the Lakeshore Capacity Model. This model can calculate water quality effects from point source discharges and shoreline development. Model input includes TP data, measured with low detection limit, to characterize average ice-free period lake TP concentration. The TP Interim PWQO and Revised PWQO for Precambrian Shield Lakes are intended to help maintain recreational water quality and to protect cold water fish habitat. Cold water fish habitat in Neville Lake is located in a proposed mixing zone. Mesomikenda Lake, another of the proposed receivers, contains lake trout. The proponent should: (1) Obtain low-level TP data for	Total phosphorus concentrations that were measured from the baseline surface water quality samples were originally analyzed via inductively coupled plasma mass spectrometry to a MDL of 0.02 mg/L. To better understand the baseline total phosphorous concentrations, IAMGOLD submitted samples during August 2013 for analysis via spectrophotometry to attain a lower MDL of 0.006 mg/L. Therefore, low-level total phosphorous data has already been attained and is being collected as part of the ongoing surface water quality baseline program. Furthermore, the total phosphorus baseline concentrations that were analyzed via spectrophotometry are solely used for the water quality model inputs to calculate baseline loading rates as part of the effects predictions. However, source-term loading rates that use the humidity cell data were conservatively estimated from humidity cell leachate that was analyzed via inductively coupled plasma mass spectrometry.In response to comments regarding total phosphorous concentrations in the receiving surface water environment, further modelling and analysis was completed and included in the Addendum to Appendix J (Water Quality TSD). A description of the methodology and assumptions are also provided in the Addendum.

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				potential receivers; (2) Determine the impact of the mine on TP concentrations and cold water dissolved oxygen habitat. Guidance on TP sampling, analysis and modeling are provided in the document "Lakeshore Capacity Assessment Handbook Protecting Water Quality in Inland Lakes on Ontario's Precambrian Shield. May 2010 " prepared by Ministry of Environment, Ministry of Natural Resources, and Ministry of Municipal Affairs and Housing.	The predicted annual average total phosphorus concentrations for Neville Lake and Mesomikenda Lake were calculated using the Lakeshore Capacity Model, as recommended by the Ontario MOECC (MOE et al., 2010), which is a mass-balance based approach that estimates average phosphorous concentrations in lakes. The approach of using the Lakeshore Capacity Model to evaluate phosphorous loads includes derivation of a revised PWQO for each lake (i.e., background + 50%). The results of the Lakeshore Capacity Model analysis were compared to the revised PWQOs.The Lakeshore Capacity Model results indicates that lakes in the Mollie River Watershed are not good candidates to simulate using the Lakeshore Capacity Model, whereas Neville Lake and Mesomikenda Lake are good candidates; see further explanation in the Water Quality TSD Addendum.The predicted average total phosphorus concentration in Neville Lake and Mesomikenda Lake using the Lakeshore Capacity Model are presented in table format in the Water Quality TSD Addendum. The predicted average concentrations in lakes directly downstream of the treated sewage effluent discharge are also presented in tables in the Addendum to Appendix J Water Quality TSD.The average concentrations in Neville Lake and Mesomikenda Lake were predicted to be less than the revised, lake-specific PWQOs. Similarly, the average concentrations for Bagsverd Lake (south) and Three Duck Lakes were predicted to be less than the original PWQO. Therefore, any changes in phosphorus concentrations are not expected to result in meaningful changes in dissolved

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					oxygen concentrations nor cause a shift in the productivity of the lakes.
527	Email	07/14/2014	1) Dawn-Ann Metsaranta (Ministry of Northern Development and Mines)	1) Section 4.4.2 talks about the comments received by Aboriginal groups and generally what they were related to. Is there somewhere within the or throughout the document that you address specifically lets say the effect on fish habitat with regards to the comments or concerns of the First Nations group? It would be good to tie the two together and not just mention the concerns and then not specifically address them in the alternatives (which you may do, I just haven't gotten there yet).	Section 9 of the EIS / Draft EA Report includes a series of tables that addresses comments and concerns raised by government, Aboriginals and the public during the EA consultation phase. For example, comments that pertain to aquatic biology, including fish, are addressed in Table 9-8.All comments raised during review of the EIS / Draft EA Report, included those by Aboriginal groups, have been addressed through this response matrix included as Appendix Y of the Amended EIS / Final EA Report. The Amended EIS / Final EA Report has been updated to reflect comments raised during review of the EIS / Draft EA Report. Column 6 of this table provides a summary of where the Amended EIS / Final EA has been revised to address comments on the Draft EA.The evaluation of alternatives was undertaken in consideration of comments received and the results of consultation and discussions with the general public, Aboriginal communities and government reviewers. Information collected during this engagement helped to determine the choice of alternatives considered and the relative importance of the individual performance objectives. For example, initial MRA alternative locations were to the northeast, southeast and south of the open pit. As a result of engineering design and comments received, one MRA to the south of the pit will be developed.
538	Email	08/01/2014	1) Sherry Boodram (Canadian	1) PD1-1	The location of the retention dam was driven by safety considerations for the mining operation. Based on the

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			Environmental Assessment Agency)	EIS Report, Section 1.3, Section 5.5.2 The EIS states that the location of the low-grade ore stockpile was available because the safe setback distance away from the open pit for the retention dam on Three Duck Lake (upper) will expose "an area suitable for this application". It is unclear how the distance for the setback of the retention dam was selected and whether it was controlled strictly by the safety case for mining operations within the open pit or whether the dam was pushed back further into Three Duck Lake away from the open pit than needed strictly for the safety case to accommodate plans for a low-grade ore stockpile. If the latter situation, then this results in a greater impact on Three Duck Lake than absolutely necessary for safe operation of the mine. The response to this information request will assist the Agency to determine the project's potential effects to fish habitat. a) Provide a description of any alternative areas considered for the low-grade stockpile area	analysis of the results of the geotechnical investigations, the safest location for each retention dam was selected. The specific location of the retention dam east of the future low-grade ore stockpile was selected based on a multitude of factors, however, key considerations were the fact that the rock conditions are favorable at this location, and also the fact that the lake narrows at this location, thereby reducing dam length, which in turn adds safety to the structure. Based on the available land created by the retention dam, and optimal location relative to the open pit and ore processing plant, the low-grade ore stockpile location was determined to be optimal and no suitable alternatives have been identified.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) PD1-2 EIS Report, Section 5.3.3 The EIS states that 225 tonne off-highway haul trucks will be used to transport to the primary crusher or stockpiles ore and waste rock. However, the haul roads are not	The foreseen truck routes were used for the prediction of effects. They are shown in Appendix G (Noise and Vibration TSD), Figures 10 and 11 and Appendix F (Air Quality TSD), Figure 6.

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				shown on any map or figure, so potential effects (dust, runoff, spills) cannot be fully appreciated. The response to this information request will assist the Agency to determine the project's potential effects to the terrestrial landscape, migratory birds, water quality, fish and fish habitat. a) Provide in a map or figure for the location of the ore and waste rock haul roads for use by the 225 tonne heavy trucks.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) GW1-1 EIS Report, Sections 5.7, 5.10.4; 5.14.2, 6.0, 9.0, Appendix H Hydrogeology TSD Tailings Management Facility - IAMGold has provided limited information on the hydrostratigraphy of the area in the vicinity of the proposed Tailings Management Facility (TMF) and no cross- sections depicting the hydrostratigraphy and groundwater flow directions are presented for the TMF. Additionally, there are no diagrams depicting groundwater flow patterns near the TMF for baseline conditions (e.g. plan view diagram). The proponent plans to collect water seeping from the TMF to groundwater through the use of ditches and seepage collection ponds, however details on seepage collection are not provided. Specifically, the proponent has not provided information on the effectiveness of containment of tailings fluids in the TMF.	Seepage control measures were included in the TMF and MRA designs. The seepage control measures put in place follow standard industry practice with the intent of reducing to the extent practical seepage losses from both the MRA and TMF. At the TMF, seepage control measures include the seepage collection ditches and ponds as well as the use of geomembrane liner in the perimeter containment embankments. A total of 6 pump stations will be provided at topographic low points around the perimeter of the TMF dams to collect and pump seepage back to the TMF. At the MRA, seepage control measures include seepage collection ditches and ponds in low lying areas. It should be noted that the ore stockpile is located within the extent of drawdown of the open pit, and as such, seepage from the ore stockpile would report to the open pit from where it is pumped to the mine water pond and treated prior to discharge. As part of the pre-feasibility study design of the MRA and TMF, the effectiveness of the proposed seepage control measures was evaluated with

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				This information is important to determine if there will be impacts to groundwater resulting from the construction and operation of the TMF. It is noted that groundwater modelling was not utilized to model baseline conditions or potential impacts to groundwater in the vicinity of the TMF. The proponent does not anticipate that water quality in the TMF will be poor, however predictions indicate that TMF water will contain residual cyanide, ammonia and metals (Cu) and there is the possibility that sewage sludge may also be disposed of in the TMF. Given these concerns, it seems reasonable that additional characterization of the groundwater regime and seepage be provided. Open Pit - The proponent has presented a significant amount of baseline hydrogeological information for the area around the proposed open pit and Mine Rock Area (MRA), and has presented a detailed numerical 3D model predicting drawdown-related impacts to groundwater resulting from pit dewatering. This information is generally sufficient and well presented. However, information on groundwater flow paths and rates for the baseline case and project case are lacking. There are no maps depicting groundwater flow directions and rates. It is important to understand the baseline flow regime and to predict how this regime may change as the pit is dewatered and then allowed to fill once mining has	a two dimensional seepage analyses for steady state condition using the SEEP/W module of the commercially available software package GeoStudio 2007. Details of this seepage modelling are included in the Addendum to Appendix H (Hydrogeology TSD). The seepage estimates that were calculated for the TMF and MRA were subsequently included in the Water Quality Modelling and are included as a load to the receiving environment.More detailed information on the hydrostratigraphy of the area in the vicinity of the proposed TMF, which includes cross-sections, groundwater elevations and flow maps have been incorporated into the Addendum to Appendix h (Hydrogeology TSD).

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				ceased. The proponent has modelled drawdown resulting from pit dewatering, but it has not modelled or considered how groundwater flow will change once the pit has filled following closure. If there is a significant change in groundwater flow regime, water from the filled open pit could be transported via shallow groundwater to surface water bodies, providing a conduit for potential contaminants present in the pit water. This information is requested as a clarification and to be able to determine potential environmental effects to water quantity and quality, and subsequently fish and fish habitat. a) Provide cross-sections through the location of the proposed TMF depicting the hydrostratigraphic units and groundwater flow directions (baseline case). b) Provide a plan view diagram of the proposed TMF, open pit area depicting groundwater flow directions and rates (baseline case). c) Conduct numerical groundwater modelling to better understand baseline hydrogeological conditions at the TMF, to characterize seepage from the TMF and to quantify potential impacts resulting from the TMF (i.e. changes to groundwater flow patterns and rates, and water quality impacts resulting from seepage). d) Provide details on the effectiveness of TMF containment to minimize seepage. (e.g. predicted seepage	

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				rates beneath the TMF and through the TMF dams and sides without dams). e) Provide information on the effectiveness of the project's proposed seepage collections measures. Specifically, how deep will seepage collection ditches or ponds be? What percentage of seepage will be collected? What will be the fate of seepage that is not collected? f) Provide a discussion of how the groundwater flow regime will change in the vicinity of the open pit as a result of the project. g) Provide a plan view diagram of the proposed open pit area depicting groundwater flow directions and rates (baseline case). h) Provide a discussion of how the groundwater flow regime will change in the vicinity of the open pit as the pit is allowed to fill following closure. i) Provide a discussion of potential effects to groundwater quality and surface water receptor quality resulting from groundwater pathways originating from the filled open pit.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-1 EIS Report, Section 5.10.5, Section 5.10.6 The preferred final effluent discharge location in the downstream end of Bagsverd Creek at Neville Lake has	The pipeline route will not cross Bagsverd Creek or any other water feature. The exact alignment has yet to be determined. In essence, the discharge pipeline will go directly north from the polishing pond towards the discharge point and will follow topographically suitable terrain.The polishing pond is shown in Figure 1-2 as the

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				been identified but the location of the pipeline from the polishing pond to the discharge location has not been explicitly identified in any figures. The response to this information request will assist the Agency in determining potential environmental effects on water quality and fish and fish habitat due to discharges to the environment. a) Provide in a map or figure the location of the polishing pond and discharge pipeline at Bagsverd Creek.	area labelled 'Polishing Pond Area' and is located immediately north of the TMF.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-2 EIS Report, Sections 5.4, 5.5, 5.5.1, 5.5.1.2, 5.5.2, 5.7, 5.8.2, 5.10, 5.10.5, 5.10.6.1, 5.11, 5.16.2.3, Water Quality Technical Support Document (TSD) The EIS states that engineered water management systems will be in place to collect surface drainage (runoff) and seepage from the TMF, MRA, low-grade ore stockpile, and other parts of the mine. The conceptual design of these systems has not been adequately described in the EIS. For example, the Water Quality TSD states: a series of 15 collection ponds (Mine Rock Storage Ponds; MRSPs) with connecting ditches are to be constructed around the perimeter of the MRA to collect runoff and toe seepage; low-grade ore will be stockpiled to the north of the open pit and east of the processing plant, as shown on Figure 1-2. Approximately 2km of water collection ditches and	A discussion on the expected efficiencies of the various collection systems and structures has been included in the addenda to Appendix H (Hydrogeology TSD) and Appendix J (Water Quality TSD).+E120H120D120:I120D120:I120C120:I120H120

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				four storage ponds will be constructed to collect runoff and toe seepage at the perimeter of the stockpiles, with water pumped back to the mine water pond; seepage losses from the TMF and runoff from the tailings dams will be collected at six Tailings Dam Seepage Ponds (TDSPs) and associated ditches located at the downstream toe of the tailings dams, with the collected seepage water pumped back to the reclaim pond; ...runoff from the area of the processing plant and associated facilities will be directed to the mine water pond. Descriptions of the proposed mitigation measures, including but not limited to the above examples, should include the expected efficiencies of the various collection systems and structures, with details supported by an appropriate technical backdrop. The response to this information request will assist the Agency to determine whether the proposed water management measures are appropriate and effective for mitigation of the project's predicted water quality effects on fish and fish habitat. a) Provide conceptual designs and descriptions including figures and maps of the proposed water management systems to manage, contain, collect, and monitor surface drainage (runoff). b) Provide a quantitative assessment of the effectiveness of these measures for surface water runoff collection.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian	1) SW1-5	Section 5.3.4 provides a brief summary of open pit material geochemistry. Section 6.3.4 of the Amended

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			Environmental Assessment Agency)	EIS Report, Section 5.3.4 The EIS provides results of the mine rock characterization program in reference to Metal Leaching and compares these results to the O.Reg. 560/94 and Provincial Water Quality Objectives. For the Federal Environmental Assessment and specifically for determining the lethality of the leachate to aquatic life, a comparison should be made to the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life and to the Metal Mining Effluent Regulations. The response to this information request will assist the Agency to determine effects of the project on water quality, and fish and fish habitat. Provide mine rock leachate comparisons to the MMER and to the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life in the EIS and in particular in Section 5.3.4.	EIS / Final EA Report provides additional information on geochemistry and Appendix E includes all information related to geochemistry. To carry out the prediction of effects on water quality this information is then used in the water quality prediction of effects, which is provided in full detail in Appendix J.Predicted concentrations in the drainage from the MRA and low-grade ore stockpile are compared to applicable Federal and Provincial metal mining effluent limits in Appendix J, Section 4.3.2, Table 4-1. The drainage from the MRA and the low-grade ore stockpile report to the mine water pond prior to pumping to the polishing pond. Most of these flows will be recycled within the Project. However, surplus water is predicted to be discharged periodically during the open water season. The effect of these discharges with regards to aquatic toxicity are summarized in Section 9.9 of the EA reports and are described in full detail in Appendix N.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-6 Water Quality Technical Support Document (TSD), Attachment II Water Quality Modelling Report IAMGold indicates, on page 12 of the Water Quality Modelling Report, that "Contact water loading rates from the MRA were derived from estimates of rock tonnage and the results of humidity cell testing. Expected tonnages of mine rock over the Project life-of-mine were provided	a) Humidity cells were selected for this work since this type of testing is recognized as appropriate for measuring primary reaction rates in the materials. Loading rates from humidity cells are expected to be conservative in terms of constituent release (less influenced by sorption and solubility constraints than column methods of testing). For the mass balance modeling approach utilized, humidity cells are an appropriate method for developing mass release source terms.b) Field cell upgrades were completed in 2014

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				by G Mining Services Inc. (G Mining 2013, pers. comm.) and AMEC (AMEC 2013, pers. Comm.). Lithology-specific loading rates were assigned based on the relative tonnage proportions of the different rock lithologies and the results of humidity cell testing of 14 rock samples (labeled HC-1 through HC-14) from the Project. AMEC provided loading rates (in mg/kg/week) for the 14 humidity cell test samples, as well as sample lithologies and leach test data. The loading rates from week 0 to week 20 were not included in the load calculations, as it was assumed that these represented "first flush" conditions and are not representative of longer term, "steady state" conditions. As such, loading rates from weeks 20 through 34 were used to derive the loading rates; noting that kinetic testing is ongoing and expected to continue beyond the date of this report. 34 weeks humidity cell testing is a short time to determine steady state. Based on NRCan's review, humidity cell loadings include weekly flushing that greatly exceeds site-specific drainage input. The first 20 weeks of humidity cell tests can provide some information on whether soluble sulphides exist initially in the sample and whether handling of the sample has led to some oxidation. The response to this information request will assist the Agency to determine effects of the project on water quality and subsequently fish and fish habitat. a) Provide an explanation of why column tests using site-	and a comparison of field and humidity cell results is planned for early 2015.c) The humidity cell loading rates from weeks 20 through 34 were applied as a means of selecting data to model the longer term, "steady state" release rates of mass from the MRA, low-grade stockpile, and open pit at the end of operations or when the site facilities are at their ultimate extent; this approach was taken to conservatively account for the ultimate mine rock tonnage and ultimate open pit area at the site. In this context, and to simulate water quality over a range of climatic conditions, the water quality model simulated mass loading over a period of a calendar year (January to December) for average, dry, and wet climate years. The water quality modelling was not intended to be temporal, in that it did not simulate mass loading rates through time (i.e., over a number of consecutive years). Therefore, the recommendation of including the first 20 weeks of the humidity cell tests into predicted loading with time-based weighting does not fit with the modelling approach. Furthermore, at the end of operations, the mine rock pile is considerably larger (ultimate extent) and the freshly deposited material within the hydrologically connected zones would represent an immaterially small volume of the overall mine rock tonnage. For example, during the last year of operations, less than 1% of the overall mine rock will be deposited into the MRA. The use of the first 20 weeks would therefore be better applied to simulate the mass release rates from the mine rock during the early stages of operations, where water-rock interactions with freshly oxidized materials would be greater, and do not represent well the expected conditions at the end of

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				specific leaching rates were not conducted to provide loading measurement. b) Provide a comparison of the results of the humidity cell loadings with the results of the field cells for samples with similar sulphide and trace element content. c) Incorporate the first 20 weeks of the humidity cell tests into predicted loading with weighting based on portion of period of time being assessed. d) Provide an update on the humidity cell results. Indicate and discuss any changes that have occurred.	mine life. d) Humidity cell results to week 90 have been inspected. For all 14 Humidity Cells, average release rates have in almost all cases declined or remained similar to previously reported average rates (weeks 20 to 34). The only consistent exception to this trend was aluminum which exhibited somewhat increased release rates for most humidity cells (HC-1, HC-2, HC-3, HC-4, HC-5, HC-6, HC-7, HC-11, HC-12, HC 13) with a typical increase of 30% observed in comparison to the previously reported average rates. Manganese release rates for two cells (HC-6 and HC-12) exhibited marginal increases on the order of 10% over previous average rates. It was also noted that for two cells (HC-9 and HC-10) while molybdenum exhibited an overall steady to decreasing long-term trend, there were a few oscillations observed with maxima up to 2x higher than previous average estimates for those cells. A detailed review of humidity cell data is planned for early 2015.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-8 Water Quality TSD, Attachment II Water Quality Modelling Report, EIS page 10-14 of Chapter 10 Summary of Mitigation The Water Quality TSD states: “During the post-closure phase, approximately 25% of the MRA will be covered; as such, it is assumed that 25% of the runoff from the MRA will have a non-contact (i.e., natural runoff) water quality and the remaining 75% will have a contact (i.e., interaction with mine rock) water quality.”	The assumption that 25% of the MRA will be revegetated was based on the Conceptual Closure and Reclamation Plan developed by IAMGOLD and as described in Section 5.16. According to the Conceptual Closure and Reclamation Plan, approximately 25% of the total MRA surface area (i.e., the flat surfaces on the benches) will be covered with a layer of overburden and vegetated during the closure phase. Areas outside of the targeted areas for vegetation will also become naturally vegetated over the course of several decades post-closure as a result of spreading of some rogue species.During stage I of the post-closure phase it is assumed that 100% of the water that lands on the

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				Water coming into contact with covered portions of the MRA may temporarily possess similar attributes to natural runoff but when that water flows to areas that are not covered it soon takes on the contact water quality. The approach of assuming 25% of the surface drainage (runoff) to have non-contact water quality is not appropriate and results should be provided for post-closure phase water quality modeling that does not utilize this approach. It is stated in Chapter 10 of the EIS that mine contacted water will be collected and managed, and mitigation measures will be provided for all project phases. However, management of collected water is only provided for the operations phase. Furthermore, The MRA is surrounded by natural water bodies with very little space for collection and diversion. The response to this information request will assist the Agency to determine effects of the project on water quality and subsequently fish and fish habitat. a) Provide a rationale for why assuming 25% of runoff from the MRA not having contact water characteristics is valid. b) Provide a discussion of how the effects predictions to water quality in closure and post closure would change if the assumption is not appropriate. c) Provide a description of mitigation measures for mine contact water for the closure and post closure phases of	surface of the MRA becomes contact water. As vegetation becomes established over the course of decades during the post-closure phase, precipitation that lands on the vegetated surface of the MRA will be subject to increased evapotranspiration with the remaining surplus assumed to infiltrate into the MRA subsurface. The mine rock source term in the water quality model for stage II of the post-closure phase (>50 to 80 years after closure) assumes that about 25% of the precipitation will be lost back to the atmosphere through evapotranspiration on an average annual basis. It is assumed that the remaining 75% of the water that lands on the MRA becomes contact water, either through runoff or subsurface flow, on an average annual basis. Assuming that about 25% of the precipitation is effectively non-contact water (>50 to 80 years after closure) is reasonable because up to 70% of water can be lost via evapotranspiration from lands bearing vegetation (MOE, 2003; Ayres et al., 2012). The text of the water quality modelling report has been revised to clarify this assumption and its use.Mitigation measures for the closure and post-closure phases can be found in Table 10-1 in Chapter 10 of the Amended EIS / Final EA Report. During post-closure, the establishment of vegetation will be monitored and its effects on the water balance will be assessed. The water from the MRA will report to the open pit for the first 50 to 80 years during post-closure (stage I), and the monitoring during this time will assist with modifications to the adaptive management and closure plan on an as needed basis.

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				the project. d) Provide a discussion of the feasibility and efficacy of these proposed mitigation measures.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-11 Appendix J, Attachment 2 - Water Quality Modelling Report January 31, 2014 The EIS States that "The concentration of aluminum is assumed to be controlled by the low solubility of aluminum hydroxides under near-neutral pH conditions. Solubility modelling was conducted using the geochemical speciation model PHREEQC (Parkhurst and Appelo 1999) to simulate the removal of a portion of mass of aluminum from solution due to solubility controls. A correction factor of 5% was applied to the aluminum concentration predicted for the contact water (i.e., it is assumed that only 5% of the aluminum remains dissolved and the remaining mass precipitates from solution)." It is unclear why a correction factor was applied instead of using the number obtained from solubility modelling. The response to this information request will assist the Agency to determine effects of the project on water quality and subsequently fish and fish habitat. a) Provide a rationale for why a correction factor was applied instead of using the number obtained from	GoldSim was used for the water quality modelling, which is not capable of accounting for solubility controls in the way an equilibrium geochemical speciation / mass transfer model like PHREEQC accounts for these controls. Therefore, in order to partly account for the attenuation of aluminum through solubility controls at circum-neutral pH, a correction factor was applied to remove mass within the GoldSim model. This correction factor was conservatively based on PHREEQC solubility modeling, where predicted concentrations incorporating solubility controls were compared to original concentrations to determine the percentage of aluminum removed through solubility controls. The 5% correction factor was then applied as a data element in GoldSim and multiplied by the predicted concentrations of the MRA contact water, the open pit sump water and the low-grade stockpile contact water. The 5% correction factor is conservative because PHREEQC modelling suggests that the concentrations predicted in the contact water from the MRA, low-grade ore stockpile and open pit without solubility controls, which range from 1 to 34 mg/L, will decrease by more than 95% under circum-neutral pH conditions.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				solubility modelling for predicting the concentration of aluminum.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-12 Appendix J – Water Quality Baseline - Pg. 15 The proponent states, "For parameters where the criteria was dependent on one or more of pH, temperature, and hardness, an assumed pH of 7, temperature of 15C, and hardness of 30 mg/L as CaCO3 was applied". It is unclear why these assumptions are necessary. It is assumed that the pH, temperature, hardness are known for the sampled sites given that they are reported in Appendix A of the Water Quality Baseline TSD. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide a discussion as to why comparing a concentration of a contaminant to criteria derived from fixed values is valid, given the pH, temperature and hardness of the samples is known. b) Provide a summary of Baseline Water Quality Results using the criteria derived from data in Appendix A . c) Provide a discussion of how the description of the baseline water quality is affected by comparing to the criteria specific to samples.	The average pH and hardness values were used to assign guideline values that depend on these parameters, which were evaluated versus the predicted water chemistries to confirm that the approach was scientifically sound. This approach is taken to develop a single set of benchmarks, which allows a transparent and consistent evaluation of the baseline water quality data and prediction of Project effects for all assessment locations. For parameters that have guidelines dependant on the value of other parameters, the predicted Project impacts need to be assessed by assigning water quality guidelines that reflect the predicted water chemistry of the surface water environment, not the water chemistry under existing conditions; this is particularly important for parameters that have guidelines that depend on variables such as hardness that will vary from existing conditions due to the predicted changes in water quality.The only parameter that has a water quality guideline that depends on temperature is dissolved oxygen, and dissolved oxygen is not expected to be decreased to below guideline values based on the predicted concentrations of nutrients in the receiving surface water environment. Un-ionized ammonia concentrations depend on temperature, but the PWQO and CWQG for un-ionized ammonia are fixed at 0.020 mg/L and 0.019 mg/L, respectively; noting that the water quality model calculated the un-ionized ammonia concentrations from the total ammonia concentrations

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					for each time step using varying temperature data throughout the year. The only parameter that has a water quality guideline that depends on pH is aluminum. Based on the geochemistry of the mine rock and tailings (i.e., the non-acid generating nature of the mine rock and tailings), the surface water receiving environment is expected to have pH values that are circum-neutral. The use of the water quality guideline for aluminum based on circum-neutral pH is therefore valid.Predicted hardness concentrations for the assessment locations, which can be derived from the predicted calcium and magnesium concentrations, range from 23 to 70 mg/L as CaCO3. Using a hardness of 30 mg/L as CaCO3 to derive the water quality guidelines for purposes of comparison to predicted concentration is a scientifically sound approach given that 30 mg/L as CaCO3 is at the low end of the predicted hardness concentration range.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-13 Appendix J – Water Quality Baseline – Appendix D Pg.1-6 The EIS indicates that there were 4 Quality Assurance and Quality Control (QA/QC) blanks with detectable parameters and/or values that were not within acceptable CWQG and PWQO ranges. Furthermore, the EIS indicates that there are 46 non-acceptable QA/QC blanks with greater than 30% relative difference between the testing results and the control.	As presented in Appendix J, Attachment I, Appendix D, the total number of duplicate samples evaluated for relative percent differences is 23. As presented in Appendix J, Attachment I, Appendix D, Table 1, there were 16 samples in which the sample concentration and duplicate concentration had greater than a 30% relative percent difference (when broken down by parameter there were 46 instances of relative percent differences greater than 30%). In 5 of the samples, the only parameter with a relative percent difference greater than 30% was zinc and the results are suspected to be related to a laboratory source of zinc which has since been investigated and resolved. IAMGOLD is collecting

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				It is unclear if these discrepancies are indicative of methodology or testing errors without knowing the number of QA/QC blanks taken for QA/QC purposes. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide the total number of QA/QC blanks taken. b) Provide a discussion of the implications of the reported non-acceptable QA/QC blanks on the data and subsequent conclusions.	duplicate samples during each water quality monitoring round according to industry-standard protocols. In the analysis of the baseline dataset and the calculation of the average baseline water quality for model input, suspect laboratory results were flagged, identified to the analytical laboratory and not included in the calculations to derive inputs for the water quality model. Therefore, any data suspected to be anomalous were not included as part of the effects predictions.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-14 Appendix J – Water Quality Baseline In the Water Quality TSD, Tables 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7 and 4-8 only include minimum and maximum values despite the titles of these tables implying that average values are presented. The range of values is of little significance without the mean and the median to provide an indication of the type of spread found in the summarized data. Furthermore, Table 4-2 provides a prediction of water quality conditions at 2 separate receivers options, however the concentrations of cyanide at these locations is not predicted. Given the nature of the selected gold recovery process, it would be prudent to predict the	For average year conditions, wet year conditions and dry year conditions, the average predicted concentration in a given month was calculated for each parameter. The values presented in Appendix J (Water Quality TSD), Tables 4-1 through 4-8 are minimum and maximum monthly averages and encompass the range of predicted monthly average concentrations during the climatic conditions evaluated; these are suitable for comparison to water quality benchmarks for the purposes of the water quality effects assessment, as the maximum concentrations determine the magnitude level, not the average or the median.As described in Appendix J, Section 1.1.4, drainage from the tailings, including the process water containing cyanide, will be directed toward a central reclaim pond within the TMF. The water management strategy is designed to recycle water from the reclaim pond for use at the processing plant. Figure 3 of Appendix J, Attachment II has been

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				concentrations of cyanide at these two receivers also. Finally, while total phosphorus is not itself toxic to aquatic organisms, excess phosphorus can create the conditions necessary for eutrophication which can be very damaging to aquatic ecosystems. Effects of eutrophication due to excess phosphorus found in the effluent, as predicted in the EIS, are lacking. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide, where possible, the median and mean values for parameters in Tables 4-1, 4-2, 4 3, 4-4, 4-5, 4-6, 4-7 and 4-8. b) Include the concentration of cyanide as a predicted parameter in Table 4-2. c) Provide a discussion regarding potential effects to water quality, fish and fish habitat as a result of increased eutrophication due to release of effluent with phosphorus in concentrations above indicated parameters.	corrected to remove an erroneous arrow denoting flow from the processing plant to the mine water pond. Water that reports to the mine water pond, which is then pumped to the polishing pond, consists largely of runoff and seepage from the open pit, MRA, and low-grade ore stockpile. The water that reports to the mine water pond and polishing pond does not include an input from the TMF reclaim pond (i.e., the TMF reclaim pond has been designed to not discharge water to the mine water pond nor the polishing pond). Therefore, the water management has been designed such that the effluent discharge to the environment from the polishing pond does not contain cyanide. Accordingly, because Table 4-2 compares the receiving environment water quality for effluent discharge options and the effluent from the polishing pond does not contain cyanide, Table 4-2 does not present cyanide concentrations and there is no value in providing predicted cyanide concentrations for this purpose.In response to comments regarding total phosphorous concentrations in the receiving surface water environment, further modelling and analysis was completed and included in the Addendum to Appendix J (Water Quality TSD). A description of the methodology and assumptions are also provided in the Addendum. The predicted annual average total phosphorus concentrations for Neville Lake and Mesomikenda Lake were calculated using the Lakeshore Capacity Model, which has been designed for Precambrian lakes in Ontario and has been recommended by the MOECC (MOE et al., 2010). The approach of using the Lakeshore Capacity Model to evaluate phosphorous loads includes

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					derivation of a revised PWQO for each lake (i.e., background + 50%). The results of the Lakeshore Capacity Model analysis were compared to the revised PWQOs.The predicted annual average total phosphorus concentration in Neville Lake and Mesomikenda Lake are presented in table format in the Addendum to Appendix J. The predicted annual average concentrations were determined to be less than the revised, lake-specific PWQOs. Therefore, any changes in phosphorus concentrations are not expected to result in meaningful changes in dissolved oxygen concentrations nor cause a shift in the productivity of the lakes.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-15 Appendix N - Aquatic Biology Technical Support Document – Pg.6 It is stated in Appendix N: "Predictions of potential effects on sediment quality, due to the Project, have not been completed…" On page 22 of the EIS Guidelines it reads: "the EIS will describe surface water quality, hydrology and sediment quality within the area of influence of the project. The baseline will provide the basis for the assessment of potential effects to surface water, presenting the range of water and sediment quality and surface water hydrology." This gap in the assessment needs to be completed, as sediment quality may adversely affect aquatic biota.	Predictions of potential effects on sediment quality, due to the Project, have not been completed, but are implicitly considered through the water quality effects assessment and mitigation planning. Changes to sediment quality will be the result of: 1) geochemical processes that form precipitates directly on the sediments or colloids in the water column that become part of the sediments through sedimentation and settling processes, and 2) discharge of a suspended solid load that results in the accumulation of mineralic grains over the existing sediments. However, it is expected that changes to sediment quality associated with total suspended solids (TSS) loads will be limited based on Federal and Provincial metal mining sector effluent discharge requirements (e.g., MMER). Effects to sediment quality that are caused by geochemical processes will depend on changes to the water quality, and only substantial changes to water quality will result in meaningful change to sediment quality. Effects to

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide a completed prediction of effects due to changes to sediment quality caused by project activities. b) Provide, if necessary, appropriate mitigation measures to mitigate predicted effects of changes to sediment quality. c) Summarize any residual effects that may remain after mitigation due to changes to sediment quality. d) Provide a discussion of predicted effects to fish and fish habitat as a result of predicted changes to sediment quality.	biota are addressed through the assessment of predicted water quality, which should also address any potential changes to sediment quality.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-16 Chapter 5, 5.16.3; Appendix J, Attachment II, Water Quality Modelling Report Section 5 of the EIS states that, “Following the removal of infrastructure and waste, as well as the revegetation of disturbed areas, the open pit will continue to flood. It is anticipated that this stage could last approximately 50 to 80 years” (Post Closure Stage I). The pit walls may contain rock material with acid generating or metal leaching potential, which if left exposed for extended periods of time may affect water	The open pit mine walls consist of the following: tonalite, magma mixing breccia, diorite, diorite breccia, diorite mega breccia, mafic dykes, quartz diorite, diabase, intrusive feldspar porphyry, intrusive mafic lamprophyre, fault, intermediate and felsic dykes, fault breccia, quartz carbonate heterolithic breccia, quartz sericite schist, mafic breccia and hydrothermal breccia. For a discussion on the geochemistry of the rock in the open pit, see Appendix E (Geochemical Characterization Report), Section 7.0. The water quality model assumes a reactive thickness of 1 m across the exposed open pit area of 1,924,856 m2 (ultimate extent area) for the water quality predictions. This is a conservative assumption and takes into consideration any surface

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				quality. Appendix E, Figure 6 suggests that mine lacks samples from around the upper edge of the pit, which may remain exposed post closure. Finally, the surface water quality modelling of the contact water in the open pit during closure assumes that there is a constant 1,924,856 m2 exposed to the elements. Historically, rock collapse and raveling over the course of the closure phase will lead to a surface area greater than that of just the mine walls. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide information about characteristics of mine walls and talus as well as the lithology and geochemical characteristics of that material. b) Provide information about how much bedrock will remain exposed after flooding and the lithology and geochemical characteristics of that material. c) Provide a discussion of how the increased surface area from talus would impact predictions in the water quality model during closure and post closure d) Provide a discussion as to which wall lithologies are more likely to collapse.	area effects that rock collapse and the formation of talus' on pit benches may have on the mass loading within the open pit. As described in Appendix I (Hydrology TSD), the water level in the open pit lake during post-closure (stage II) will have recovered to an elevation sufficient to cause overflow (and reconnection) of the pit lake to the upper basin of Three Duck Lakes. As shown in Appendix I, Attachment II, Appendix C, Table C-2, the average annual water level of water the open pit lake under average conditions during post-closure (stage II) is predicted to be 380.2 meters above sea level. A figure has been provided in the Addendum to Appendix J (Water Quality TSD) that shows the limited exposed rock during post-closure phase stage II (i.e., once the water level reaches static elevation).Knight Piesold conducted a pre-feasibility slope design study for the proposed open pit (Knight Piesold, 2013). Acknowledging that open pit design is ongoing, the proposed pit outline indicates that very little bedrock will remain after flooding, and will be limited to localized topographical highs (see figure in Addendum to Appendix J). The exposed bedrock (almost entirely tonalite) is predicted to be non-acid generating (Appendix E). The predominant lithology exposed at the pit edge (tonalite) was classified based on laboratory strength testing as good quality rock. Pit slope angles will be designed such that pit walls will be physically stable over the longer term under flooded conditions. During post-closure phase (stage I), runoff and seepage collected from the MRA will be pumped to the open pit and there will be no discharge from the open pit. During post-closure phase (stage II), runoff

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					and seepage from the MRA will no longer be collected and pumped to the open pit, and will passively discharge in part to the open pit lake. The loadings associated with the small area of exposed rock once the open pit has flooded are expected to be negligible and similar to natural runoff over the longer term.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-17 Chapter 5 Section 5 of the EIS states that "Considering the limited proportion of PAG samples identified, the overall low sulphide content of the rock, and the prevalence of non-acid generating rock to be produced as waste, the likelihood of net acid conditions occurring in the mine rock piles is considered to be very low. Therefore the inclusion of any PAG materials with the bulk of the waste will likely be an appropriate management method and segregation of any PAG materials does not appear to be necessary". Although only 5% of the waste rock has a neutralization potential ratio of less than 2 and is classified as PAG, 5% of 850 million tonnes is 43 Mt. This is a large amount of material, capable of producing deleterious drainage depending on the details of its composition and how it is mixed into the non-PAG waste rock. Without an understanding of the location of the PAG material is located, (e.g. a block model), it is unclear how the proponent proposes to adequately mix the PAG	Investigations carried out on the Project to date indicate that PAG rock is present as small isolated volumes that are distributed randomly through the significantly greater mass of the Non-PAG mine rock. These PAG materials likely represent occasional clusters of sulphides that occur within the mineralized area of the Côté gold deposit. Further the PAG rock tends to be composed of low sulphide (mean = 0.36% S) material with lower contents of minerals that provide acid neutralization capacity. The Non-PAG rock is also low sulphide but contains much higher concentrations of minerals that neutralize acidity. In fact the Non-PAG rock contains an excess of acid neutralization capacity. A mass-balance comparison of the net acid generation capacity of the PAG rock compared to the net acid neutralization capacity of the Non-PAG rock suggests that the overall acid neutralization capacity of the Côté mine rock is approximately 120 times greater than the acid generation capacity. Therefore the potential for net acidic conditions to occur in the Côté mine rock is considered to be extremely small.i. Data suggests the PAG samples are randomly distributed. There was no observed spatial or geological control on the location of the PAG samples. Additional discussion regarding the distribution of PAG samples is provided in the

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				material with material that has a net neutralizing potential to minimize the potential that pockets of PAG materials will form and potentially lead to areas of the waste rock pile generating low pH run-off. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide additional details including: i. Where PAG samples were located, ii. The timing of the PAG material extraction during operation, iii. A geological explanation for their occurrence, iv. A description of their physical properties compared to non-PAG, v. The predicted maximum discrete volumes of PAG within the waste rock and low-grade ore stockpiles, and vi. A description of the measures that will be employed to ensure mixing with the non-PAG waste rock and prevent large discrete masses of PAG waste rock.	Addendum to Appendix E (Geochemical Characterization Report).ii. As the PAG samples are randomly distributed through the deposit, it is anticipated that the proportions of PAG material extracted from the deposit will remain relatively constant throughout the mine operation. iii. The Côté Gold deposit is unusual for an Archean-age gold deposit and has been described as a porphyry gold deposit, characterized by gold mineralization that occurs in both a disseminated form and within occasional veins / veinlets through the deposit. Sulphides (e.g., pyrite) are associated with the occurrence of gold. However, the deposit is considered to be low sulphur with incomplete conversion of iron oxides into pyrite and considerable iron remaining in biotites and chlorites (RPA 2012). An important implication of this regarding ARD is that the concentration of pyrite in the deposit rocks is low, occurring either in a disseminated form or within occasional isolated veinlets at somewhat higher concentrations. Therefore, the low frequency of PAG samples can be attributed to the 'nugget effect' where samples with isolated grains of sulphide are occasionally sampled and analysed resulting in a higher than normal result. iv. No differences in the physical characteristics of the PAG and non-PAG materials were noted. v. Based on the random distribution of PAG samples in the deposit, adequate mixing of the PAG materials to prevent formation of discrete PAG masses can be achieved by the normal mining procedure of dumping mine rock within the waste rock piles. The mixing of the isolated PAG materials with the

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					significantly greater (~20 times) volume of acid consuming non-PAG rock will result in mine rock with an overall acid consuming character. vi. Specific details regarding the management of the mine rock will be developed as the Project moves forward and detailed engineering studies are completed on the mine waste management plan. This would include a definition of 'discrete volume'. However based on the low proportion of PAG materials and the proposed method of mining and placement of waste rock, it is anticipated that the greatest discrete volume that would be encountered within the mine rock pile would be equivalent to a single dump truck load worth of material.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-18 Chapter 5 5.16.2.3 The EIS proposes for the project to process all stockpiled low-grade run of mine (ROM) ore during the operations phase. Thus, reclamation of these stockpiles is not expected. If necessary, any residual stockpiled ore will be stabilized in the same fashion as the MRA. It is unclear whether or not there is a contingency plan for managing low grade ore in the event that it is not processed. Additionally, the proponent has indicated that "results from ongoing exploration activities indicate that the ore may contain copper levels such that extraction of copper could be viable in the long term. It is therefore foreseen	IAMGOLD assumes that these comments are on Section 5.16.2.3. Section 5.5.15.2.3 does not exist.a) As part of the Project Description it is fully anticipated that the low-grade ore stockpile would be fully consumed by the end of the operations phase. As described in Section 5.16.2.3, if this were not the case the stockpile would be closed out in the same fashion as the MRA. In the very unlikely scenario that the low-grade ore stockpile, or portions thereof, were to remain at the commencement of closure, the Closure Plan would be revised accordingly.b) It is not assumed that the low-grade ore is similar to the mine rock. The low-grade ore is of the same mineralization as the ore and, therefore the tailings. c) As described in Section 9.6.2.2.water that has come into contact with mine rock, low-grade ore, the walls of open pit, or the tailings is predicted to have near-neutral pH, as the geochemistry study suggests that the mine rock and tailings are non-acid generating,

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				that, in the future, the ore processing plant may be expanded to include a copper recovery circuit. However this copper recovery circuit is not included in the scope of the current Project when predicting environmental effects. Finally, it is unclear how it was determined to be reasonable to assume that mineralization and therefore loadings in low grade ore are equivalent to waste rock given the large mass of material which is classified as low-grade ore. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide a contingency plan for managing low grade ore, in the event low-grade ore stock pile is not processed, including: i. An assessment of geochemical characteristics of low grade ore stockpiles. ii. The maximum tonnage of the low-grade ore stockpile. iii. A description of potential environmental effects associated with the low-grade ore stockpile, mitigation measures that would be implemented to minimize impacts to the environment and residual effects. b) Provide a rationale for assuming that the mineralization of the low grade ore is equivalent to waste rock.	and contain major ions and metals at concentrations lower than the Federal and Provincial effluent discharge limits. Contact water from the MRA, low-grade stockpile, and open pit is predicted to contain ammonia and nitrate from the dissolution of residual explosives. Contact water in the TMF will be influenced by process water that is discharged from the cyanide destruction circuit, which is expected to contain residual cyanide species, ammonia and metals (i.e., copper).The water collected from the MRA, low-grade stockpile, and open pit reports to the mine water pond, with the surplus pumped to the polishing pond (see proposed water management system in Figure 5-2). Seepage from the low-grade ore stockpile would report to the open pit.d) Copper recovery is not included in the Project described and assessed in this EA. If a copper circuit were to be included the requested additional information would be provided as part of the EA / approvals process.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				c) Provide a discussion of the implications of locating the low-grade ore stockpile partially in former lake bed created by retention dam for Upper Three Duck Lakes (e.g. what are the implications for seepage, how will the placement impact potential metal leaching rates). d) Provide a discussion regarding how the predictions from the water quality model would change and the project's potential environmental effects if copper recovery does occur.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-19 5.16.2.4 The EIS states that "The closure concept for the TMF has been developed to promote long-term chemical and physical stability, minimize erosion, provide long-term environmental protection, and minimize long-term maintenance requirements. Initial assessment indicates that the tailings will be NAG. Additional geochemical test work is underway to confirm the geochemical characteristics of the tailings". Based on the review of the EIS, the tailings results during test milling show the concentrations of total sulphur were generally low (<0.3%) ranged from 0.007% to 1.9%, with a median value of 0.07%., and predominantly occurring as sulphide. The maximum measured sulphide content was 1.9%. For the majority of samples (90 of 93 samples or 97%) the NPR was greater than two. Similarly 87 of 93 samples (94%) had a Carbonate NPR >2. Of the samples	a) Three tailings samples are undergoing humidity cell testing. Rates of sulphide oxidation and metal release are low, with sulphate release rates averaging approximately 10 mg/kg/week (5 week averages of 3, 6 and 25 mg/kg/week). Updated results from ongoing geochemical testing are provided in the Addendum to Appendix E (Geochemical Characterization Report).b) The Côté tailings have a very low risk of metal leaching / ARD. The tailings are net acid consuming and have low metals concentrations. Based on these observations no treatment options are considered necessary. c) Simulated tailings were generated in a process that is based on the processing method described in the EA including; crushing / grinding, gravity cyanide leaching, carbon-in-pulp gold recovery, followed by carbon stripping and electro-winning. Different processing methods such as heap leach are not proposed for the Project and tailings generated by other methods do not need to be assessed. d) Monitoring of tailings humidity cells is ongoing. No further testing of tailings is contemplated at this time.e) A single tailings sample

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				with NPR and Carbonate NPR <2, two and one samples respectively have NPR <1 (see Graphics 8-3 and 8 4). Furthermore, the EIS indicates that tailings test work is ongoing. The EIS has not provided information on the types of treatment that would be implemented, should it be required. It is understood that additional tailings test work is being conducted. The results of this test work will support future determinations of potential effects and conclusions. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide the results of humidity cell work on tailings samples from test milling to predict the rate of sulphide oxidation. b) Provide a description of the treatment options being considered (e.g., effluent treatment vs. tailings treatment) in the event that treatment should be required. c) Provide a description of how different methods of processing impacted the test mill results and will impact geochemical effects during operation. d) Provide a description of the additional tailings test work that will be undertaken, including when it will be undertaken.	reported a sulphide content of 1.9%. Median sulphide content of the tailings was 0.07%. This outlier value (1.9%) is consistent with the observation that the distribution of elevated sulphide values within the ore and waste is random and occurs at a low frequency.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				e) Provide an explanation for the samples with 1.9% Sulphide content and a NPR < 1.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-21 Appendix J The EIS indicates that the tailings produced from ore processing, which will contain some residual cyanide and dissolved metals, will be directed to an in-plant cyanide destruction and precipitation circuit. Prior to discharge to the TMF, the process water and tailings will be treated at the process plant for cyanide, dissolved metals and potentially ammonia. The water quality of discharge will meet the provincial and federal effluent discharge limits. It is unclear what mitigation measures are being considered to ensure that dissolved metals and ammonia aren't exceeding the discharge limits. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide additional information regarding the mitigation measures that will be implemented to remove dissolved metals and ammonia.	As described in Appendix Y (EA Commitments Table), IAMGOLD has committed to the monitoring and treatment of effluent from the polishing pond, as required, before discharge to the receiving environment. IAMGOLD can provide treatment to concentrations less than the effluent discharge requirements (MMER and O. Reg. 560/94, Effluent Monitoring and Effluent Limits – Metal Mining Sector). If required, treatment may be via a treatment plant to be located before the effluent discharge point at Bagsverd Creek. As presented in Appendix J (Water Quality TSD), Attachment II, Table A10, the predicted water quality in the polishing pond is not expected to exceed the MMER limits and is not anticipated that additional treatment will be necessary beyond the cyanide destruction circuit in the processing plant.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) SW1-22 Appendix J, Attachment 2 - Water Quality Modelling	Waste rock at the Equity Mine is considerably acid generating, with lime treatment ongoing to adjust pH of drainage to near-neutral values. The acidification of

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Assessment Agency)	Report January 31, 2014 In presenting the water quality model, the EIS states that, "A correction factor was applied to the MRA load to account for decreased reactivity over time as the MRA reaches a steady-state condition. Using arsenic as an analog, concentrations in the 14 humidity cells decreased between 9 and 60% over -weeks 1 through 34. It is assumed that it is reasonable to expect loading rates from the MRA to decrease 50% over the decades between the operations phase and the post-closure phase stage II. As such, a correction factor of 0.5 was applied to the lithology-specific loading rates in the post-closure phase stage II model to account for the decreased reactivity over time." There is empirical evidence that a build-up of oxidation products may increase loadings over time (E.g. Waste Rock monitoring at Equity Mine, B.C.) The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. Reference: W.A. Price, M. Aziz and K. Bellefontaine. Increase in Contaminant Concentrations Over Time From Waste Rock - 2011 Review of 2010 Financial Security at Equity Silver Mine. Mine Closure Conference Lake Louise, Alberta (http://www.trcr.bc.ca/httpwww-trcr-bc-ca-publications/) a) Provide evidence to support the assumption that the	waste rock over time can result in increased loading rates as metals become more soluble at lower pH values, which may reflect the apparent build-up of oxidation products and increased loading rates over time noted by the reviewer at Equity Mine. Nonetheless, the mine rock for the Côté Gold Project is non-acid generating (Appendix E; Geochemical Characterization Report), and therefore the example of Equity Mine is not analogous and the geochemical evolution is not expected to be similar. The loading rates calculated from the humidity cells containing mine rock show a decreasing trend over time for many parameters. If the current trends are extrapolated into the future, the loading rates would exhibit a decrease in mass load over time; note that this assumption was only applied to the post-closure phase stage II (i.e., >50 to 80 years after closure). The assumption that there is a decrease in the mass loading rate into the future is reasonable as the future mass load will decrease as reaction rates slow over the longer term. This is because the reaction kinetics will decrease exponentially over time due to increased oxygen ingress pathways and the formation of secondary mineral coatings on the reactive mineral surfaces. Since the early time mass loading rates calculated from the humidity cells reflect a combination of sulphide oxidation reaction kinetics and in part some solubility controls, it is therefore reasonable to assume that the mass loading rate will decrease 50 to 80 years after post-closure.The water quality model, including the derivation of mass loading rates to simulate contact water quality, uses a scientifically sound approach with the available information to provide conservative, to at

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				build-up of oxidation will not increase loadings over time, which may offset the assumption that loading rates from the MRA to decrease 50% over the decades between the operations phase and the post-closure phase stage II. b) Provide a discussion of how the fish and fish habitat effects predictions would change if the loading rates of the MRA do not decrease over time.	worst realistic, predictions of effects to water quality. When comparing the predicted water quality of the drainage from the MRA, low-grade ore stockpile, and open pit to the discussions and data presented in Appendix E (Geochemical Characterization Report), the simulated water qualities of the contact water from the various mine site components aligns well with the general geochemical characteristics of the mine rock. Given that all model predictions carry some uncertainty, IAMGOLD is committing to conduct water quality monitoring of mine site components and receiving groundwater / surface water environments. Information attained through monitoring will be used to adjust the adaptive management plan for the Project, on an as needed basis.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-23 Attachment 2 - Water Quality Modelling Report January 31, 2014 Section 2.5.6 states that, “No information exists as to the specific quality of the process water that will be produced by the processing plant; as such, assumed concentrations were derived from typical process water compositions observed at analogous sites and using professional judgment (with the exception of cyanide species, as discussed below). Table 10 presents the assumed process water concentrations. The destruction of cyanide will create ammonia as a by-product. Based on total ammonia observed in tailings	As noted by the reviewer, the total ammonia concentration of 90 mg/L at the Equity Mine, which operated from 1980 to 1994, is a single day ultimate maximum concentration taken from a decade’s worth of monitoring data (Price and Aziz, 2012). The total ammonia concentration data presented in Price and Aziz (2012) reflects site-specific conditions, the cyanide leaching requirements for gold extraction, and the management of cyanide and ammonia in waste water that took place at the Equity Mine. Subsequent to the water quality modeling and EA submission, ageing tests were conducted on three composite tailings samples that were produced using bench-scale metallurgical and cyanide destruction tests for the Côté Gold Project. Laboratory analysis was performed on the ageing test decants on Day 0, Day 7, Day 29 and Day 60. Total

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				ponds at analogous sites, the cyanide destruction process is estimated to generate total ammonia concentrations in the process water of approximately 20 mg/L." However there is empirical evidence that total ammonia concentrations following cyanide destruction can greatly exceed 20mg/L. The concentration of ammonium at the Equity Mine in B.C. has reached 90 mg/L. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. Reference: Price, W.A, and M. Aziz. 2012. The Flooded Tailings Impoundment at the Equity Silver Mine. 36th B.C. Mine Reclamation Symposium, Kamloops, British Columbia Sept 17th to 20th (http://circle.ubc.ca) a) Provide details of the examples of analogous sites and evidence to support how the Cote Gold Project's process water quality will mimic the process water of the analogous sites mentioned in Section 2.5.6. b) Provide a discussion of effects to fish and fish habitat should the ammonia concentrations differ from the predicted process water quality.	ammonia concentrations ranged from 3.1 mg/L to 11.2 mg/L in the ageing test data. Based on the ageing tests that were completed on process water derived from Project-specific test work, the assumption that total ammonia in the process water will be about 20 mg/L is reasonable and conservative. This is consistent with other large gold operations in Ontario, and may perhaps be overly conservative.The water quality and aquatic effects assessments only include an assessment on predicted effects. A discussion on the effects to fish and fish habitat should the ammonia concentrations differ from the assumed process water quality is not relevant given that the assumption is conservative and the water quality model does not account for degradation of ammonia in neither the reclaim pond nor the receiving surface water environment. Given that all model predictions carry some uncertainty, IAMGOLD is committing to conduct water quality monitoring of receiving groundwater / surface water environments, including aquatic toxicity testing. Information attained through monitoring will be used to adjust the adaptive management plan for the Project, on an as needed basis.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) SW1-24 Attachment 2 - Water Quality Modelling Report January	The open pit is predicted to flood over a period of decades (50 to 80 years). The water quality model was designed to predict the water quality of the open pit

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			Assessment Agency)	31, 2014, 2.6 Key Model Limitations and Assumptions Section 2.6 of Attachment 2 of Appendix J states that, "Screening-level static testing was not conducted on the rock samples selected for humidity cell testing and, as such, there is some uncertainty regarding the suitability (or the representativeness) of the existing humidity cell data to predict the drainage characteristics of the mine rock and pit walls. For the purposes of modelling, it is assumed that the available humidity cell test data is representative of the range of geochemical characteristics present in the mine rock, pit walls, and low-grade ore. Static test data for the humidity cell samples is partially available in Appendix E Section 7.5" Section 2.6 of Attachment 2 of Appendix J also states that, "No geochemistry data is available for the Project-specific tailings, as geochemical test work has not been completed on tailings samples. For the purposes of modelling, it is assumed that the available humidity cell test data collected from the 14 rock samples is representative of the range of geochemical characteristics present in the tailings. There is geochemical data for tailings available in Appendix E. " The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide a discussion of the environmental effects should the pit flood faster than predicted.	lake and the downstream lakes (Three Duck Lakes) regardless of when the open pit lake is re-aligned with the Mollie River Watershed. Therefore, if the open pit lake flooded faster than predicted due to unaccounted for variances in natural groundwater inflow, the effects to water quality would be similar to those presented for the post-closure phase.Appendix J, Attachment II, Section 2.6 states that screening-level static testing was not conducted on rock samples selected from humidity cell testing and, as such, there is some uncertainty regarding the suitability of the existing humidity cell data to predict the drainage characteristics of the mine rock and pit walls at the time of the effects predictions stage of the EA. Subsequent analysis of the geochemistry, as presented in Appendix E, suggest that the humidity cell test samples are representative of the range of geochemical conditions expected to be encountered in the mine rock. Graphics that show the cumulative values or concentrations of NPR, carbonate NPR, and various metals for the fourteen humidity cell samples plotted with the overall geochemical reference dataset are presented in Appendix E. The NPR values, carbonate NPR values and trace element concentrations measured in the humidity cell samples generally cover the wide range of values observed in the overall geochemistry dataset. Based on a review of the geochemistry data to date, it is our opinion that the humidity cell test results represent a reasonable range of geochemical conditions.At the time of the effects prediction stage of the EA, and prior to the EIS / Draft EA Report submission, no site-specific data was available for neither the geochemistry of the tailings nor

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				b) Provide a discussion, using the partially available data in Appendix E, Section 7.5 regarding the validity of the assumption that the humidity test cell data is representative the range of geochemical characteristics present in the mine rock, pit walls, and low-grade ore. c) Provide an updated prediction using geochemical data available in Appendix E and any other data that has become available to update their water quality predictions for tailings. d) Provide sample calculations for modelling results, including but not limited to calculations for arsenic and copper for the 'A' series of tables (predictions during operations).	the process water quality produced by the processing plant. For the purposes of the water quality modeling, the tailings geochemistry, including metal leaching characteristics, were assumed to be similar to the mine rock; as such, the model input for the tailings geochemistry was assigned based on MRA loading rates. Process water quality was derived using knowledge of analogue gold mining project sites and professional judgement; the exception was cyanide concentrations in the process water that were assumed based on the concept-level cyanide destruction treatment specifications.Subsequent to the EIS / Draft EA Report submission, humidity cell testing was performed on three tailings samples produced for the Project. The samples were composites of various tailings prepared as part of IAMGOLD's bench-scale metallurgical and cyanide destruction testing program. The humidity cells were initiated in March of 2014. Preliminary geochemical source terms are based on the average loading rates obtained over 18 weeks of testing of the three tailings humidity cells. Furthermore, laboratory analysis was performed on the process water quality through an ageing test procedure on Day 0, Day 7, Day 29 and Day 60. The addendum to Appendix J (Water Quality TSD) provides a tabular comparison of the:i) original versus new average tailings humidity cell loading rate input data, and ii) original versus new process water quality input data. The new tailings humidity cell loading rates and process water quality data were input into the water quality model and predictions were re-simulated. The TMF reclaim pond has been designed to not discharge water to either the

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					mine water pond nor the polishing pond. The only expected discharge from the TMF to the receiving surface water environment is via seepage to Bagsverd Lake, Unnamed Lake and Bagsverd Creek, all located within the Mesomikenda Lake Watershed. It is important to note that seepage was incorporated into the simulations of both the original (i.e., as presented in the EA) and revised versions of the water quality model. The Mollie River watershed does not receive seepage from the TMF, and the predicted water qualities for receivers in the Mollie River Watershed are therefore unchanged from those presented in the EA. To assess the effect that applying the new tailings humidity cell loading rates and process water quality inputs have on the surface water receiving environment, the original predicted water qualities of key surface water features in the Mesomikenda Lake Watershed were compared to the revised predictions. These comparisons are presented in tables that can be found in the Addendum to Appendix J (Water Quality TSD). For the average, dry and wet year conditions, the following parameters show a marginal increase in concentrations due to the revised tailings humidity cell loading rates and process water quality data: aluminum, calcium, cobalt, copper, iron, molybdenum, nitrate, potassium, sodium, strontium and sulphate. For the average, dry and wet year conditions, the following parameter concentrations were unchanged due to the revised tailings humidity cell loading rates and process water quality data: total ammonia, un-ionized ammonia, antimony, arsenic, boron, cadmium, chloride, lead, manganese, nickel, total phosphorus, uranium, vanadium and zinc. For the

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					average, dry and wet year conditions, the following parameters show a decrease in concentrations due to the revised tailings humidity cell loading rates and process water quality data: barium, cyanide (total), cyanide (free) and magnesium. The limited change to the water quality predictions is related to the transport pathway between the TMF and the surface water receiver, which is through seepage only. Because the seepage rates that bypass the seepage collection system are low relative to the flow in the surface water receivers (e.g., Bagsverd Creek), changes to the seepage water concentrations have limited effect on the overall mass load within the surface water environment. As such, the revised tailings humidity cell loading rates and process water quality inputs did not result in material changes to the effects predictions or conclusions of the effects predictions. The original model assumptions for tailings geochemistry and process water quality were therefore reasonable and the revised model results do not change the outcome of the impact assessment. In support of the water quality component of the EA, deterministic water quality models were developed for the Project using GoldSim. GoldSim is a graphical, object-oriented mathematical modelling program where all input parameters and functions are defined by the user and are built as individual objects or elements linked together by mathematical expressions. The water quality model is extraordinarily complex, which incorporates the site wide and receiving environment water balances, and water quality / geochemistry source terms for many model components. The integrated system was simulated using a daily time step for

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					thousands of time steps. Sample calculations for the "A" series tables are incredibly onerous and cannot be duplicated by hand for example purposes.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-25 Attachment 2 - Water Quality Modelling Report January 31, 2014, 2.5.4 Residual Explosives Inputs The EIS indicates in the Water Quality Modelling report in Appendix J, Attachment 2 that, "Residual explosives inputs are estimated to be: ANFO: 94%, NH4NO3, 6% Fuel Oil, Emulsion: 80% NH4NO3, 6% H2O, 6% Fuel Oil, 6% Mineral Oil, 1% Thiourea and 1% acetic acid." "An explosives usage rate (powder factor) of 0.30 kg per tonne mine rock and ore is assumed for the purposes of water quality modelling, assuming 70% ANFO use and 30% emulsion. The fraction of explosive residues remaining after blasting (i.e., "waste rate") is assumed to be 5%. The residual mass of nitrogen species by rock type is presented in Table 9. Half of the explosives waste is assumed to be contained within the MRA and low- grade stockpile, split based on the relative tonnages of each of the two (with the tonnage of waste rock and ore being 71.5% and 28.5% of the total mine rock tonnage, respectively). The other half is assumed to remain within the open pit. Loading rates were assigned assuming that 1% of the nitrogen is available per year, which is consistent with observations at mine site where studies have been completed on water quality effects due to residual explosive loading rates associated with mine rock	As detailed in Appendix J (Water Quality TSD), Section 1.1.6, the contact water from the open pit, the MRA and the low-grade ore stockpile is directed to the mine water pond. Surplus water in the mine water pond not required for processing activities is directed to the polishing pond and eventually discharged to the environment in accordance with Federal and Provincial discharge requirements. As the predicted water quality in the mine water pond already incorporates the combined residual explosives load from the open pit, the MRA, and the low-grade ore stockpile, adjusting the percentage of residual explosives assigned to the MRA/low-grade ore stockpile to be higher would not materially change the conclusions of the effects predictions.

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				(Ferguson and Leaks 1988)." It is unclear how 50% of explosive waste would be left in the pit over the course of the mine life given that residual explosives waste will be extracted along with mine rock, ore and low-grade ore during the entire operations phase. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide an supporting evidence for why half of the explosives waste would remain in the pit. b) Provide a discussion of how the water quality effects predictions would change should more or less waste remain in the pit over the life of the mine. c) Provide a discussion of how water quality prediction changes would affect the fish and fish habitat effects predictions.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-26 Appendix E, Cote Gold Project Geochemical Characterization Report, December 2013, Mine Rock Characterization The EIS indicates that 14 humidity cell tests were conducted on composite rock core samples from only 4 mine rock units (Tonalite, Magma Mixing Breccia, Diorite and Diorite Breccia). The other rock units such as quartz	a) The four rock types tested (Tonalite, Magma Mixing Breccia, Diorite and Diorite Breccia) represent approximately 93% of the mine rock volume. The quartz diorite and mafic dyke units represent approximately 1.4% and 1.5% of the rock volume respectively and are characterized by low sulphide and high neutralization potential values with only one sample of mafic dyke reporting an NPR <2. Overall both these rock types reported higher NPR values than most other rock types and were considered to have a very low risk for ARD.b)

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				diorite and mafic dykes do not appear to have been run for humidity cell tests. So the humidity cell test results may not be representative of the entire mine rock mass. The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Provide a rationale for not including mine rock samples from quartz diorite and mafic dykes in humidity cell tests b) Provide a discussion of how incorporating other major lithologies (e.g., quartz diorite and mafic dyke lithologies into the humidity cell testing would alter the water quality modelling predictions and predictions of effects to fish and fish habitat.	The "other" lithologies were accounted for in the water quality modelling. Because the geochemistry of the "other" lithologies is not notably different than that of all the major rock types, the data from all 14 humidity cells was used to calculate loading rates for the "other" rock types. This was done by taking the median of the loading rates for the 14 humidity cells. Therefore, it is being assumed that the loading rates from the "other" rock types are statistically in the middle between the highest and lowest loading rates observed as part of the humidity cell testing. As discussed above, this is a reasonable (conservative to at worst a realistic) assumption given that: i) the "other" rock types are a relatively small percentage of the overall mine rock, and ii) any geochemical differences between the "other" rock types and the major rock types is not significant. Therefore, the "other" rock types are predicted to contribute a small percentage of the overall mass load via mine rock drainage, and have limited to negligible influence on surface water quality.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-27 Appendix E, Cote Gold Project Geochemical Characterization Report, December 2013, Mine Rock Characterization The ML-ARD characterization program for tailings included static testing only. It appears that kinetic tests (both laboratory and field cell) were not conducted on the tailings samples.	Analysis of the acid-base accounting and proxy data for the waste rock has not indicated that any discernible spatial trends are present regarding the distribution of sulphides or neutralization potential. The occurrence of occasional higher sulphide concentrations appears to be random and not controlled by any lithological or structural features. It is anticipated that these occasional higher sulphide concentrations, and their resulting lower NPR values, will occur as minor random volumes within the pit rock that will be surrounded by low sulphide materials with high neutralization potential

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				The response to this information request will assist the Agency to determine potential effects of the project on water quality and subsequently fish and fish habitat. a) Conduct and provide the results of kinetic testing of tailings samples in order to determine the primary reaction rates of these materials under laboratory and field weathering conditions and understand the geochemistry of the resulting leachate in the context of potential for ML-ARD generation.	that will neutralize any acidity that could occur from these low NPR volumes.IAMGOLD intends to conduct a monitoring and verification program of the mine rock geochemistry during operations. Chapter 16, Table 16-1, of the EA report.Kinetic testing is continuing on mine rock samples and has been underway since March 2014 on three tailings composite samples produced during the test milling program. Results from the tailings testwork indicate that the tailings leachates are circum-neutral with low metals concentrations. These results are consistent with the static testing results that indicate the vast bulk of the tailings are non-acid generating with a low content of sulphide and metals. This test monitoring program is ongoing and will be updated periodically with results provided for review and comment.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-28 EIS Report Figure 1-2, Section 5.10.7.2, 5.10.7.3; Appendix I, Attachment I, Section 5.5, Table 12 As part of the channel realignment around the mine site, the EIS states that some lakes will gain water depth and others will lose water depth. Information has not been provided on how new water levels were predicted. Further, insufficient information was provided on the predicted range of new water body levels, which needs to take into account seasonal variations in flow and precipitation. A complete understanding of the range of water levels that may occur at various times of the year (i.e. spring flood, summer low flow) is key to understanding how changes to	The predicted effects on water quantity, water quality and aquatic biology are provided in detail in Appendix I (Hydrology TSD), Appendix J (Water Quality TSD) and Appendix N (Aquatic Biology TSD) and are summarized in the Amended EIS / Final EA Report, Sections 9.4, 9.6 and 9.9. More detailed mapping and information on the flow controls will be developed during Project permitting.More detailed information on watercourse realignments has been provided in the Addendum to Appendix N (Aquatic Biology TSD).

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				water body levels may impact the environment, level changes to assess impacts and determine any required mitigation (i.e. in relation to habitats, erosion, methyl mercury formation). The information (mapping) that is provided is also very unclear and of too small a scale to conduct an analysis of the potential impact. In addition, area calculations of areas of each water body to be flooded (or of wetted area loss) are not also provided. Such calculations would serve to quantify the predicted changes to surface water and habitats. The maps shown in Appendix I, Attachment I, Appendix C should clearly show locations where lakes are wetted now and where they will be wetted after channel realignments and damming. Areas of loss of wetted area and gain of wetted area should be calculated for each lake and watercourse. Subsequent loss and gain of each habitat type should also be calculated. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide an analysis of lake level changes including predictions for new flooded area, loss of existing wetted area, and changes in expected seasonal variations in lake level variations. b) Provide a description of how and the degree to which	

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				the new water course outlets will drain, including a description of approximate outlet levels that will control the new proposed lake levels.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-29 Appendix I Section 4.1.2 The quantification of impacts to surface water flow and mine water budget were predicted using average annual values. In order to assess the significance of impact, seasonality should be incorporated into the analysis. This analysis should include assessment of water flow changes and water takings during low flow periods for at least fall, winter and summer. 840 m3/day is provided as an estimate of daily water demand for mine operations and it is estimated at 1% of average annual of Mesomikenda Lake outflow. However substantial impacts could occur at seasonal low flows but not at average annual flows. The proposed extraction rate should be compared to seasonal low flows in order to assess the significance of the impact during this critical period. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide an assessment of the impact of low flow periods on the ability to discharge water from the polishing pond to Bagsverd Creek and Neville Lake due to water quality issues. Provide an assessment of the impact	The ability for Bagsverd Creek and Neville Lake to accept discharge water from the polishing pond is dependent on the rate of discharge from the polishing pond. Discharge from the polishing pond is expected to be minimal, if any, during dry years due to process plant water demand and recycling of process water on site. Seasonal discharge for Bagsverd Creek, Neville Lake and Mesomikenda Lake are provided in the Addendum to Appendix I (Hydrology TSD).Discharge from Mesomikenda Lake is also related to the operation of the Mesomikenda Lake Dam, where operating level objectives have been set. Additional simulations regarding Mesomikenda Lake are outlined in Addendum to Appendix I, and the modelled scenarios simulated a maximum of 0.2 m change during the dry summer conditions. It is recognized that the ultimate water withdrawal rate from Mesomikenda Lake will be subject to further analysis during the Permit to Take Water application process.

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				of water taking from Mesomikenda Lake during low flow periods. Seasonal low flow values (e.g. at least fall, summer and winter values) should be provided and a comparison made to the proposed water withdrawal for mine operations.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-30 Appendix I, Attachment I, Section 5.1.1, 6.1.1 Yearly water shortages for mine operations during low precipitation and high evaporation years do not appear to have been considered. With high evaporation and low precipitation years there may be no water excess for mine operations. Individual yearly evaporation rates may be significantly higher than the 400 - 600 mm average value cited in the EIS report. This may lead to higher than expected water taking needs and, in turn, increased water quality and aquatic habitat impacts. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. Provide an analysis of multiple years of high evaporation and low precipitation to ensure that appropriate contingencies are in place for mine operations and to assess the potential water quality and aquatic habitat impacts that may occur.	The 1:25-year dry year simulated the hydrological response to a year in which 734 mm of precipitation and 646 mm of evaporation occurred. This provides a total water surplus of 88 mm during the year. For an analysis of multiple years of high evaporation and low precipitation, IAMGOLD completed an additional model scenario that simulated this 1:25-year climate occurring for ten consecutive years with consequential increased freshwater process water demand. This simulation did not result in a decreasing trend in water level or discharge in Mesomikenda Lake. Further detail is presented in Addendum to Appendix I (Hydrology TSD). The water withdrawal rate from Mesomikenda Lake will be subject to further analysis during the Permit to Take Water application process.

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538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-31 EIS Report Section 5.7, 5.10.7, Appendix I The EIS states that "natural channel design" will be used for significant lengths of channel realignment which are proposed to route water around the mine site. In order to ensure that excess channel erosions does not occur this will include construction of active channel (bankfull channel) and floodplain function of the new channel. The channel characteristics of a natural channel play an important part in attenuating flow to prevent erosion. It is unclear whether both the active channel and floodplain will be constructed. The feasibility of the construction of these channels in the locations proposed was not provided. Large amounts of earth movement or significant construction of channel through Canadian Shield rock could be technically problematic and carry its own set of potential impacts. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide a description of the channels to be constructed, including a description of characteristics such as roughness, energy dissipation in riffles and pools, channel length and sinuosity. b) Indicate whether these channels will be constructed in	A detailed description of the physical characteristics of the realignment channels has been provided in the Addendum to Appendix N (Aquatic Biology TSD).

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				such a manner that pre and post hydrographs are the same by maintaining natural channel characteristics mentioned in the description requested above. c) Provide an assessment of soils and topography in the areas identified for new channel construction confirm that the channel construction and design are feasible.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-32 EIS Report, Section 1.1.7, Appendix I The proposed channel realignment will result in significant increases in flow to some natural sections of channel (e.g. channels connecting Unnamed Lake #2 and Unnamed Lake #1 to Bagsverd Creek, and channels connecting Little Clam Lake to Bagsverd Lake). The high amount of flow through the natural channels could result in substantial channel erosion. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide a fluvial geomorphology assessment to ensure that the existing natural channels can handle additional flow without significant erosion. b) In the event erosion is determined likely, provide a description of the mitigation measures and monitoring plans in place to prevent erosion in the existing natural	Further detailed engineering will be completed to develop channel features capable of minimizing erosion in locations where flow increases will occur. As such, no erosion is anticipated in these locations. Additional analysis along Bagsverd Creek with respect to changes in water level and velocity are provided in the Addendum to Appendix I. Note that a geomorphological survey of Bagsverd Creek has been initiated in 2014 and will continue during the development of the Project.

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				channels (e.g., modifications to the natural channels) c) Provide a discussion of potential effects to fish and fish habitat should unexpected erosion occur.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-33 EIS Report Section 1.1.7, 5.16.4, Figure 5-5, Appendix I In the EIS, it is proposed that after closure of the mine and filling of the open pit with water that some of the channel realignments will be redirected so that water that had been redirected from Bagsverd Creek to the Mollie River during operation of the mine will be redirected back to Bagsverd Creek, while connecting the pit lake to Three Ducks Lake. It is estimated to take approximately 80 to 100 years from the time that the realignment channels are constructed for the pit to fill with water. The realignment proposed in Mine Closure Phase II may have unanticipated and potentially adverse effects to the ecosystem that has re-established itself to its new realignment. All post-closure options should be considered, such as leaving the flow regime as is or altering it, and the impacts of all options should be assessed with respect to changes and impacts to all social and ecological components. Further, long-term monitoring would be required to determine when the pit is finally filled with water. The flow conditions (and possibly habitats) that exist when the pit if filled will likely be quite different from what exists at the	As described in Section 5.16.3 it is anticipated that it would take approximately 50 to 80 years for the open pit to flood. Once the open pit is flooded it is the most technically and environmentally feasible option to remove most of the retention dams. The flow systems will be designed such that the removal of the dams will not negatively affect existing fisheries. Also, IAMGOLD aims to re-establish currently existing watershed. The effects prediction and assessment of impacts consider this scenario. No other alternatives are feasible.

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				end of operations, and will need to be factored into any realignments that eventually do occur. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Update the alternatives assessment to include the any technically or economically feasible option of leaving the flow regime in place indefinitely following the operations phase. b) Provide a description of the predicted effects to the environment of altering the flow regime following closure for a second time.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-34 Appendix I Section 5.2.1 It is indicated that WSC gauge on the Mollie River and OPG Mesomikenda Lake Dam data will be used in the monitoring. However, if the aforementioned data is not available, it is important to have some contingencies and/or redundancy in the monitoring to ensure that mitigation is applied appropriately. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat.	A site water monitoring network will be developed through Provincial ECA approvals and a Federal Fisheries Act authorization. This network is expected to provide more comprehensive information about site flows than existing WSC gauges. The network is expected to include multiple water level / flow measurement devices on surrounding streams and rivers, which will provide redundancy if individual devices fail.

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				Provide a description of the contingency plans for gathering of data for monitoring and follow-up should sources of data indicated in the EIS no longer be available.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-35 Appendix I, Attachment I, Section 4.2.2 and Appendix A Many of the rating curves have issues that make the curves relatively inaccurate. These issues include changes in control due to beaver dam construction, change of the culverts at the gauge site and ice conditions. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide a discussion regarding the validity of the rating curves based on data from current onsite flow monitoring stations. b) Provide a discussion of how the prediction of effects may change if the rating curves derived from current flow monitoring stations are inaccurate.	During the development of the hydrological model, the simulated discharge based on the applied rating curves was compared to the relative contributing area of the flow monitoring stations in each of the major studied watersheds (i.e., the Mesomikenda Lake and Mollie River watersheds). As detailed in the Addendum to Appendix I (Hydrology TSD), the relative flow contributions to the model outflow locations were within 5% of the relative watershed contributing areas. In this respect, the applied rating curves were considered acceptable. As noted, hydrological monitoring is ongoing at the Côté Gold Project Site in order to refine the rating curves developed for the Draft EA Report.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) SW1-36 EIS Report Section 5, Section 8 In the EIS, it is proposed that water within the mine site	The total volume of the various storage ponds will be confirmed during detailed engineering phases of the Project. These will be commensurate with requirements based on the assigned Hazard Potential Classification under the Lakes and Rivers Improvement Act or

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				will remain on the site using the mine rock pond, TMF and other ponds on site. Estimates of the volumes of the individual ponds in relation to high precipitation events do not appear to be provided. High precipitation events can result in higher than predicted water levels and inadequate storage. A purely qualitative description of management of excess water supply is provided in Section 8 of the EIS, however this is considered insufficient to determine whether or not it will mitigate the potential for environmental effects in the result of a high precipitation event. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide the volumes and surface catchment areas for the various ponds used for the collection of water. b) Provide a more in depth discussion of how high precipitation events will be addressed, including a numeric description of the capacities of the collection ponds relative to their catchment areas. c) Provide a discussion of effects should any of the collection ponds overflow during high precipitation events.	Canadian Dam Safety Guidelines. As such, each pond will incorporate an allowance for storm storage (e.g., a 1-in-100 year, 24-hour event). IAMGOLD will provide a table in Appendix Z in the Response to Comment # 480 which provides information related to the catchment areas for each storage pond. IAMGOLD defined design criteria for the collection ponds carefully and conservatively and does not expect that they would overflow during any of the Project phases. However, Chapter 13 of the EA addresses accidents and malfunctions, and, in more detail, Section 12.2.3 addresses seepage collection system failures.
538	Email	08/01/2014	1) Sherry Boodram (Canadian	1) SW1-37	The upstream areas for each hydrological station are provided in the baseline Hydrology and Climate report

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			Environmental Assessment Agency)	Appendix I, Attachment I, Table 14 The flow values in Table 14 would indicate that increases in flow are not proportional to watershed area; however no explanation was given for this. It is important to have relatively accurate flow values so that changes in flow due to channel realignment can be estimated and the impact can be assessed. The response to this information request will assist the Agency to determine potential effects of the project on water quality, water quantity and subsequently fish and fish habitat. a) Provide upstream drainage area for each of the stations in Table 14 b) Provide a rationale if flow increases are not proportional to drainage area.	(Table 3). Asdescribed in the response to Comment #479 and detailed in the Addendum to Appendix I, the relative flow contributions were within 5% of each of their respective relative contributing areas.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) TL1-1 Chapter 9 – p.9-50, 9-53, Chapter 10 – p.10-17, Chapter 11 – p.11-24, 11-44, Figure 5-3, Figure 6-2, Figure 6-6, Appendix E – Geochemical Report p. 3-1, Table 6-2 p. 7-1-7-3, Table 7 2, Chapter 5, Chapter 9 of the EIS- Section 9.9.2.1 (Construction Phase) In the EIS it is stated that, "flooding of terrestrial vegetation for watercourse realignments may cause increased methyl mercury production which may reduce the usability of sport fish for recreation" (9-50) and, "it is	A response to comments on the potential for methyl mercury production has been provided and detailed in the Addendum to Appendix N (Aquatic Biology TSD) in light of changes to mitigation measures proposed for the Project.Although methyl mercury production is not expected to be a concern, IAMGOLD is committing to remove terrestrial vegetation within the small areas that are expected to experience flooding prior to the construction of watercourse realignments (Section 10, Table 10-2); this commitment has been expanded to include the removal of shallow organic-rich soils in the small areas expected to become flooded. Table 4.2 in

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				possible that the decay of terrestrial vegetation will result in the production of methyl mercury that will be taken up by resident fish. This could reduce the value of recreational fishing within the watershed although it would not be expected to harm the fish themselves. The removal of vegetation prior to flooding will reduce the potential for methyl mercury production. There are currently fish consumption advisories for mercury in lakes within the local study area, (MOE, 2013) and therefore, the potential to affect the recreational value of these lakes would be minor". Further information could not be found in the EIS and supporting documents on methyl mercury and the composition of the organic and mineral horizons of the soils (i.e. mercury and carbon concentrations) to support the prediction "that flooding may cause increased methyl mercury production" or evidence to support the conclusion that removal of vegetation prior to flooding would be an effective mitigation measure. Given that the methyl mercury concentrations in water depend on several factors, including the composition of the organic and mineral horizons of the soils in the vicinity of an area that will be flooded, additional information is required. The response to this information request will assist the Agency in determining potential environmental effects to migratory birds, wildlife and wildlife habitat that support Aboriginal activities, and/or impacts to Aboriginal peoples as a result of the Project.	Appendix N has been revised (see Addendum to Appendix N). These mitigation measures are expected to further limit methyl mercury production (Windham-Meyers 2008). Furthermore, low-level total mercury and methyl mercury have been added as parameters to the baseline water quality sampling and fish tissue (total mercury only) monitoring as part of the overall monitoring commitments for the Côté Gold Project. Section 5.0 (Monitoring) of Appendix N (Aquatic Biology TSD) has been modified to include mercury monitoring (see Addendum).Methyl mercury that is generated from inorganic mercury that is sequestered by terrestrial vegetation from the atmosphere typically occurs at very low total concentrations (i.e., nanograms per litre). The generation of methyl mercury depends upon the development of favourable geochemical conditions (i.e., sulphate reducing) to allow for sulphate reducing bacteria to transform the inorganic mercury to organic mercury. The rate of the microbial-induced methylation of the mercury depends on a number of factors including: distribution and concentrations of inorganic mercury in biodegradable organic matter, geochemical conditions (pH, redox, temperature), presence of compounds that can complex with inorganic mercury (e.g., dissolved organic carbon and sulphide), and presence and activity of sulphate-reducing bacteria (Benoit et al. 2003). Uncertainties associated with the source term, geochemical conditions and microbial communities, compounded with uncertainties associated with modelling exposure pathways and bioaccumulation in fish, makes modelling the overall effect of potential methyl mercury

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				a) Provide baseline information (from field work and/or literature review as applicable) on the mercury and methyl mercury levels in the project area, particularly in soils/terrains that will be flooded. As part of this, characterize the organic and mineral horizons of soils in terms of mercury and carbon concentrations in representative vegetation cover areas. b) Provide evidence to support the statement that removal of vegetation would mitigate the potential effect of increased methyl mercury in the environment; and, examples of other sites where this technique has been effective (if available).	production very challenging and carries a range of uncertainty that is likely to be significantly greater than the range of the predicted magnitudes. Therefore, modelling methyl mercury does not provide value in the context of the EA, and would not remove the need to follow through with the proposed mitigation and monitoring commitments that are discussed above.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-1 EIS Appendix N, Section 2.4.2 page 6 ; Table 2.1, and page 19; Section 4, EIS Report Section 9, Description of Project Effects, subsection 9.9, page 9-49 The assessment of effects on fisheries has been based on five fish species: northern pike, yellow perch, walleye, whitefish and smallmouth bass. Baseline information and the potential effects of the proposed project on all fish species and their habitat need to be assessed. This includes fish species and their habitat that are of importance to the health and socio-economic conditions, cultural heritage and the current use of resources for traditional purposes by Aboriginal peoples.	See Appendix N (Aquatic Biology TSD) for complete details on the methodology and rationale for the fish baseline date collection.The EA indicators identified and used for the aquatics effects prediction encompass the gamut of Project effects on the aquatic environment.

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				If using a few fish species and their habitat as a surrogate for evaluating the effects on all fish and fish habitat that are part of or support a fishery, the fish chosen must be representative of all the fish species found in the study area, i.e. they represent the same habitat requirements, food requirements, life histories, etc. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat and/or impacts to Aboriginal peoples as a result of the project. In relation to information request FH1-1, see DFO-01 and DFO-02 in Annex 3. a) Provide a rationale for fish baseline survey methodologies, including how the chosen fish species are representative of all fish species and fish habitat in the study area. If those five species are not representative of all species and habitat, add other species for determining the baseline and effects assessment.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-2 EIS Report Section 9.9.2.1, page 9-53, EIS Report Section 10, Table 10-2 page 10-18 EIS Report Section 11, Table 11-6, EIS Appendix N Table 3.1 Environmental effects from blasting in the open pit may affect fish habitat and spawning (such as for Burbot) in the adjacent Clam Lake (south basin) during construction and the early years of operation. The report indicates effects	a) Table 11-6 summarized the impact in the post-closure phase. No blasting is planned during this phase therefore the effects of blasting were not assessed within this table. When blasting does occur, effects for spawning have been predicted at 238.5 m from the pit during construction and at 349 m during operations. This overlaps Clam Lake in the south eastern portion of the lake (see Figure 4.1 from Appendix N; Aquatic Biology TSD). The dominant species found in this lake are smallmouth bass which typically spawn within the

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				are determined to be likely limited to individuals and not result in a community or population level effect. All potential effects should be in the Impact Assessment Matrix, Table 11-6 and mitigation proposed, as applicable. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. In relation to information request FH1-2, see DFO-05 in Annex 3. a) Include all potential effects to fish and fish habitat in the Impact Assessment Matrix and identify mitigation, as applicable. This should include effects of blasting in the open pit on Burbot in Clam Lake and applicable mitigation.	first meter of water over and around cobble, gravel and sandy bottoms. All the other species found within Clam will typically use the first two meters for spawning substrate. Of all the species found in Clam, only smallmouth bass, burbot and johnny darter use sandy, rock substrate for spawning. All other species spawning substrate are associated with the presence of vegetation. Minimal vegetation is present within the area affected by the blasting. The habitat present is largely cobble, rock, sand and silt substrate which is abundantly present in Clam Lake. During construction, the shoreline perimeter affected by the blasting will be approximately 240 m and 892 m during operations. The predominant area affected during operations falls in water depths greater than two meters of water, therefore it is anticipated that the area affected for spawning will be minimal when taking the entire area of the lake into consideration and the habitat present.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-3 EIS Appendix N, page 22 and Table 4.8; page 19 and Table 4.1, EIS Appendix I Section 1.1.7 Page 4 It is not clear in the EIS if environmental effects are being fully mitigated by offsetting measures. When evaluating whether proposed offsetting measures, such as watercourse realignments, fully mitigate potential effects to fish and fish habitat, the lag time in the functioning of the offsetting measures should be factored in to the mitigation. This may require creation or	a) IAMGOLD is currently working with DFO to outline the analysis of how the in-kind habitat creation measures proposed will offset any serious harm to fish. As described in the policy entitled, Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting (the Policy), dated November 2013, if there is likely to be serious harm to fish after the application of avoidance and mitigation measures, then the proponent must develop a plan to offset the residual serious harm. The avoidance and mitigation of effects to the fishery has and will be an integral part of the design and engineering of the Project, but as noted, the Project is anticipated to permanently alter or destroy some

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				enhancement of additional habitat. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. In relation to information request FH1-3, see DFO-06, DFO-07, and DFO-13 in Annex 3. a) Quantify the habitat loss to determine effects to fish and fish habitat as a result of the watercourse realignments and other proposed changes to existing waterbodies. b) Indicate whether the watercourse realignments to be decommissioned upon mine closure are those that are to be constructed with fish habitat features as part of mitigation. If habitat created as mitigation is to be destroyed or permanently altered upon mine closure, then include how this subsequent loss of fish habitat will be mitigated. c) Indicate whether there is a lag time in functioning of the offsetting measures and if it is incorporated into the mitigation. If not, discuss the duration of potential adverse environmental effects and how the significance of adverse effects to fish and fish habitat may be affected.	existing fish habitat. The avoidance and mitigation of effects to the fishery will be addressed in two ways; first through reducing the number of fish harmed, and the duration and spatial extent of fish habitat being affected and second to develop and "in-kind" approach to offsetting that will be incorporated into the channel realignment plan, such that habitat that is destroyed or permanently altered is replaced by habitat of similar quantity and quality, with consideration of uncertainty and time lags. The approach will define a dimensionless habitat unit by multiplying the life stage-specific rating of habitat quality by the spatial area of the habitat type affected (e.g., m2). This will be calculated for all the habitat that will be lost as well as the habitat gained (created or enhanced) because of offsetting. These dimensionless units will be used to calculate the gain-to-loss ratio. A description of the methodology to be used in the assessment is provided in the Addendum to Appendix N (Aquatic Biology TSD).b) The watercourse realignments will be constructed to accommodate the development of the open pit and the TMF. The Mollie River will flow into Clam Lake which will flow north through the South Arm of Bagsverd Lake and then be redirected south into Weeduck Lake and on to Upper Three Duck Lake where it will resume its original watershed configuration (see Figure 1.2 of Appendix N; Aquatic Biology TSD). Furthermore, the outlet of Bagsverd Lake (Bagsverd Creek) will be realigned to the west of Bagsverd Lake where it will flow north around the TMF and enter Unnamed Lake #2 and rejoin the original Bagsverd Creek. The Mollie River (from Chester Lake to Clam Lake) and Bagsverd Creek realignment will

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					remain in perpetuity. Once the pit is filled (anticipated to take approximately 50 yrs.) some of the realignments will be decommissioned as follows: the Mollie River water realignments (Clam Lake to West Beaver Pond) will be removed; and south arm of Bagsverd Lake to Bagsverd Pond to Weedubck Lake and the watershed will be returned to its original configuration (see Figure 1.3 of the Aquatic Biology TSD). All habitat altered or destroyed upon mine closure will be mitigated through the newly constructed or enhanced fish habitat provided by the pit lake and restoring the channels that will connect Clam Lake to the pit lake and the pit lake to Upper Three Duck Lake. c) It is proposed that the transplanting of vegetation, benthic invertebrates and forage fish be carried out to expedite the establishing of compensatory habitat. Minnow has previously implemented this approach at another site (Agrium Kapuskasing Phosphate Operations 2006) and results were quite effective (e.g., no loss in year class of any of the fish species relocated to the newly constructed lake). In areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted providing cover for juvenile fish and decreasing erosion from construction and wind. Transplanting activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas to the newly constructed channels and therefore reduce lag times. Transplanting activities will likely include the transplantation of macrophytes (aquatic plants), benthic invertebrates, and the relocation of small-bodied fish (forage fish) and of

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					large-bodied fish. The sequence of transfers will take into account spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish. The objectives of these transplants will be to accelerate the establishment of the ecosystem and food chain within the newly constructed areas prior to the placement of the key fish species, thus reducing lag times. Furthermore, the realignments will be constructed using natural channel design and will incorporate habitat structure to support successful utilization of the constructed habitats by resident fish. Therefore, it is expected that the lag time within the created habitat will be minimal. A description of the natural channel design and habitat structure to be incorporated into the channel realignments is provided in the response to Comment #475.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-4 EIS Appendix N pages 7,9, & 19 Potential waterbodies and fish habitat sites that could be rehabilitated, restored or created for possible habitat gains to offset losses from the project must be identified, with considerations made to fish relocation and fish loss. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. In relation to information request FH1-4, see DFO-08 in	a) Fish will be required to be relocated from habitats lost during the development of the mine (i.e., the construction of the open pit and the TMF). It is anticipated that fish will be relocated at ideal timing windows to minimize fish and egg stranding during the watercourse realignments. Timing of spawning for all fish found within the local study area indicated that the optimal window for all species will be late summer, early fall. By August all species young-of-the-year should be large enough to catch and transfer. Only golden shiner potentially spawn into August. Since their spawning window is quite large, it is not anticipated that the entire year class would be lost or that the species could not spawn in the new area they are transferred to. To

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				Annex 3. a) More information is required to assess the effects of the relocation and loss of fish. Include a justification for: why it is anticipated that some fish will not be able to be relocated; any specific species or size of fish that is expected to be difficult to capture of relocate; the number of fish estimated to be lost; the number of fish to be relocated; effects of the fish relocations on existing fish populations in the waterbodies connected to the constructed habitats. b) Update the Impact Assessment Matrix accordingly to reflect these potential effects and identify mitigation as applicable.	concentrate fish, it is anticipated that a series of progressive water drawdowns will be conducted (taking into consideration ideal timing for fish removal) to catch and relocate fish from areas being lost to newly constructed habitat. A variety of fish gear will be employed to capture fish to ensure all sizes and species are caught. Fish will be relocated within the same watershed. As the fish being relocated will be moved to newly constructed areas, minimal effects on existing populations are anticipated. The only location where fish may be relocated to another water body is for Côté Lake. Fish from Côté Lake will likely be relocated to Upper Three Duck Lake. Côté Lake and Upper Three Duck Lake are currently only separated by culverts and fish can move freely between the two water bodies. As many fish as practically possible will be moved during the relocation, however it is anticipated that some fish will not be able to be relocated either through stranding during drawdowns or not being able to catch the fish. It is not possible to estimate the number of fish that will be lost in all areas. Minnow has previously conducted a complete fish removal at Agrium Kapuskasing Phosphate Operations, where the estimated population of northern pike was successfully relocated (population estimate [95% confidence limits] = 525 [232-1054] and 575 northern pike were relocated).
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) FH1-5 EIS Appendix N page 23, page 10, Table 4.1, EIS Section 10 Table 10-2 page 10-19, EIS Appendix I Table 4.2 , Table	Additional investigations were completed in 2014 to address concerns with respect to potential changes in water levels within Bagsverd Creek. The outcome of these investigations and the response to Comment

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			Assessment Agency)	4.3, Table 4.4 Table 4.5 Reductions in flows to Bagsverd Creek are anticipated to begin during operations and remain in perpetuity. Fish habitat may be affected. It is proposed to survey the stream morphology prior to construction to assess the potential for exposure of habitat and barriers to fish passage. Then, if required, the mitigation proposed is to modify the stream bed to ensure an adequate depth of water for fish to utilize habitat and allow for fish passage. Without defining the effects, it is unknown whether the proposed mitigation will be effective and whether it will completely mitigate potential adverse effects to fish and fish habitat. Appendix N of the EIS indicates that predicted changes in water flow have been considered in the assessment of potential effects to fish habitat, however the only water flow changes assessed in Table 4.1 are the changes to Bagsverd Creek. Some watercourses will experience an increase in flows greater than 100% of the pre-development flow. These watercourses are not all identified as the constructed watercourse realignments. It is noted the constructed alignments will be designed for the expected flow, however the effects of increased flows to the existing watercourses (for example, Un-named Lake #2 Outflow) is not evaluated, and mitigation is not proposed.	#489 a, b, and c, are provided in the Addendum to Appendix N (Aquatic Biology TSD).

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				The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. In relation to information request FH1-5, see DFO-10 and DFO-14 in Annex 3. a) Explain the effects to Bagsverd Creek as well as downstream effects (for example what will be the effects to Neville Lake). b) Evaluate the effects to fish and fish habitat arising from increased flows from mine activities, including effects related to increased erosion and sedimentation, high flows as a barrier to fish migration, and direct changes to habitat. c) Update the Impact Assessment Matrix accordingly to reflect these potential effects to fish and fish habitat and identify mitigation measures as applicable. d) Provide an analysis of the feasibility of the proposed mitigation, indicating the extent to which mitigation will offset the effects.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-6 EIS Appendix N Table 4.1 Effects have been considered post-mitigation in Appendix N, Table 4.1. However, all potential effects to fish and fish	a) The methodology for the EA considers only effects including mitigation as mitigation is in many instances inherent to the proposed design. b) No update necessary.

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				habitat, pre-mitigation, are unclear. For example, the impact of whole-lake destruction is not clear, including, for instance, but not limited to the use of the lake by Aboriginal people. The habitat offsets by building habitat into the watercourse diversions/realignments is a mitigation measure. Pre- mitigation there is the loss of either whole or parts of waterbodies and watercourses. The effects of the project need to be clearly stated, and then the mitigation applied. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. a) Include all potential effects to fish and fish habitat (i.e. death of fish or destruction or permanent alteration of fish habitat), and evaluate them pre- mitigation. b) Update the Impact Assessment Matrix accordingly to reflect these potential effects to fish and fish habitat and identify mitigation measures.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) FH1-7 EIS Appendix N Section 5, EIS Section 16, Table 16-1, Table 16-2 Effects of blasting and reduced flows to watercourses, (particularly, but not limited to Bagsverd Creek) should be described in the monitoring outlined in Section 5 of Appendix N.	a) Please see the response to Comment #486 for effects of blasting. Since the effects of blasting are expected to be minimal, no monitoring was proposed. The area affected will be included in the habitat loss for the Fisheries Act Authorization. Furthermore, it has been proposed that fish health monitoring should be conducted every three years in accordance with EEM guidance and that the newly created habitat be monitored to ensure it is functioning as designed. These programs will assess endpoints for population dynamics

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				Monitoring of blasting should confirm the EA predictions regarding the setbacks as well as monitor for effects to fish and fish habitat. It is not clear if this is covered in EIS Section 16, Table 16-1 under Noise and Vibration on page 16-6. Flow monitoring should also confirm the EA predictions as this will be important in determining the effects to fish and fish habitat in watercourses such as Bagsverd Creek that may require offsetting. It appears this is covered in EIS Section 16, Table 16-1 under Hydrology and Climate on pages 16-8 and 16-9. EIS Section 16, Table 16-2 does not include monitoring of the functioning of habitats created to offset potential effects to fish and fish habitat. This monitoring is mentioned within Appendix N but should also be included in the Aquatic Biology section of Table 16-2. Monitoring should also consider potential changes to fish population dynamics as a result of the project activities. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the project. a) Provide information on effects of blasting and reduced flows to watercourses in the monitoring plan. Provide details of how changes to fish population dynamics as a result of project activities will be monitored.	(e.g., catch-per-unit-effort, growth and reproduction endpoints).
538	Email	08/01/2014	1) Sherry Boodram (Canadian	1) FH1-8	It is true that methyl mercury represents the biologically available form of mercury accumulated by fish in their

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			Environmental Assessment Agency)	EIS Report, Section 6.4.8.2, page 6-92 to 6-113; Section 6.4.8.3, page 6-113 to 6-114; Appendix N. Section 2.4.2; Section 3.0 In the EIS, baseline metal levels, particularly mercury and methyl mercury, in fish is not discussed. Methyl mercury is more toxic than total mercury. Furthermore, in Appendix N, baseline information on methyl mercury levels in fish is not described in sufficient detail to determine potential effects and residual effects and draw conclusions about bioaccumulation as a function of fish weight or length and chemical consumption limits. In addition, reference areas for fish and benthic invertebrate species studies were not found. For example, it is not clear if a reference area (i.e. area without mercury exposure) was used when studying mercury in fish tissue. No information on the total mercury in fish tissue in a reference area was found. This information is necessary for results and conclusions to be meaningful. In order to evaluate any changes in methyl mercury concentrations in fish, methyl mercury should be monitored as part of a fish monitoring program that captures the peak and subsequent decline in methyl mercury over time. The response to this information request will assist the Agency in determining potential environmental effects on fish and fish habitat as a result of the Project. a) Provide a discussion on baseline information on metal	tissue. Therefore, the total mercury concentrations measured in fish tissue represent methyl mercury (Grieb et al. 1990) and it does not need to be analyzed as methyl mercury. Total mercury (representing methyl mercury) has been analyzed in forage and sport fish from most water bodies within the study area.a) The fish tissue baseline concentrations were provided (see Appendix N; Aquatic Biology TSD, Appendix C, Appendix F) and assessed in Appendix W (HEHRA). b) Fish consumption benchmarks were developed for metals analyzed in fish tissues. These benchmarks were compared to the tissue concentrations of fish collected during the 2012 and 2013 aquatic baseline studies (see Tables F.46 and F.47 in the Addendum to Appendix N which represent additional tables to Appendix F of the Aquatic Baseline Report found in Appendix N of the EA document). Comparison to benchmarks found that mercury tissue (muscle) concentrations in northern pike and/or walleye were above consumption benchmarks for the general population in almost all lakes sampled within the local study area (Table F.47). Mercury was above the consumption guideline for sensitive populations (woman of child bearing years and children under 15) for these species as well as for small-mouth bass where they were sampled. Yellow perch was below the consumption guidelines for mercury but this is likely a function of the small size of the fish collected (typically juveniles). Arsenic was above the consumption benchmark based on a carcinogenic threshold in all fish collected from all areas but below a more general consumption benchmark based on USEPA data (Tables F.46 and F.47). The tissue concentrations of all other

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				levels in fish, particularly mercury, and provide an assessment of potential effects on fish related to changes in metal levels as a result of the project. b) Provide a description of fish tissue results, particularly in regards to mercury and methyl mercury, and how these results relate to fish consumption limits. c) Provide information on the mercury levels in fish for the reference area. Effects on fish usability should be evaluated by measuring concentrations of mercury from fish in the exposure and reference areas. d) Provide a fish monitoring program that includes methyl mercury.	metals were less than the consumption benchmarks. Fish tissue concentrations were also screened against the CCME wildlife benchmark of 0.033 ug/g (CCME 2000) and are provided in Table F.47 in the Aquatic Biology Addendum.c) All the fish tissue concentrations collected in 2012 and 2013 were baseline, prior to any areas being affected by the mine and therefore, can all be considered reference areas. Future monitoring after mine construction and during operations, fish tissue metal concentrations will be evaluated in a control-impact design where areas have been affected by flooding (due to realignments) will be compared to reference and baseline.d) Fish tissue monitoring for mercury has been proposed (see Section 5 of the revised Aquatic Biology TSD). It should be conducted in all lakes where water levels are going to increase as a result of watercourse realignments. A table has been added to Appendix N (Aquatic Biology TSD), Appendix C, Appendix F such that Table F.46 shows the consumption benchmarks used to evaluate fish tissue and the rationale / reference and Table F.47 provide the fish tissue concentration for each fish sampled together with the fish species and size (total length) of the specimen sampled compared to the benchmark (see Addendum to Appendix N.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) AP1-1 Executive Summary, pg 36; EIS Report, Section 9.16.3, pg 9-85; Appendix O, Land and Resource Use, Section 3.1.6, pg 3-16, Section 3.1.8, pg 3-20, Section 3.2.6, pg 3-24, Section 3.2.8, pg 3-25; Section 4.3.2.8, pg 4-23; Appendix	a) Effects on users of the waters surrounding the Project site are described in Sections 9.10 and 9.11. It should be noted that IAMGOLD is committed on keeping the 4M Canoe Route functional and available to the public and Aboriginals throughout all phases of the Project. Environmental effects of the works in watercourses are

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				P, Traditional Land and Resource Use In the EIS it is unclear whether works involving dewatering, depositing, and/or infilling will occur in any waterways subject to NPA and if these works will result in potential environmental effects or impact navigation by Aboriginal peoples (including in the event that the IAMGOLD chooses to "opt-in"). Information about dewatering, depositing, and infilling of waterways will assist in predicting potential environmental effects, as well as predicting impacts on Aboriginal peoples and other users about their rights such as the potential loss or restriction of rights to access navigable water as a result of the project. The following comment applies for infilling/throwing/dewatering works and those works requested to be opted-in: Section 9.1.3 of the EIS Guidelines requires that the "in describing how the project may impede navigation, the EIS will identify any project components and a description of any activities (e.g., dredging, alteration of water bed and/or water banks, loss/realignment of waterbodies) that may affect waterways and water bodies and limit or access to those waterbodies (e.g. roads, trails, portage routes); describe any recreational uses of natural waters (i.e. swimming, canoeing, fishing); and provide information on current and/or historic usage of all waterways and waterbodies that will be directly affected by the project, including current Aboriginal uses, where available". The response to this information request will assist the	described in detail in Appendix I (Hydrology TSD), Appendix J (Water Quality TSD), and Appendix N (Aquatic Biology TSD) and are summarized in Chapter 9 of the EA. As per Table 10-3, in consultation with users, IAMGOLD will establish a suitable portage / connection such that the portage route will still be usable or that an alternative route be developed. All of the effects described above are assessed for their significance in Chapter 11 of the EA. In summary, Chapter 11 concludes that there will be no significant impacts on users of the waters surrounding the Project site.IAMGOLD is currently planning to use the opt-in process provided by Transport Canada. Additional information will be provided through this process.b) Information on current use of the waterways and waterbodies surrounding the Project site is provided in Appendix O (Land and Resource Use TSD). Traditional uses of these waterways and waterbodies are described in Appendix P (Traditional Land Use TSD).c) As discussed in items a and b above, effects on waterways and waterbodies are fully considered and their impacts assessed throughout the EA report. Therefore, these considerations do not change the conclusions in regards to any EA indicators.

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				Agency in determining potential environmental effects and/or impacts to Aboriginal peoples as a result of the project. Specific information will be required to determine navigability of each waterway affected (see http://www.tc.gc.ca/eng/programs-622.html) and construction methodology for dewatering/infilling activities. a) If any waterways are deemed to be navigable, provide information on environmental effects of the works as well as impacts to Aboriginal peoples and their rights and other users as a result of the works, such as impacts of the loss to navigation (including socio-economic effects). b) Provide information of current and/or historic usage of all waterways and waterbodies that may be directly affected by the project, including current Aboriginal and other users. c) Discuss whether these considerations change the conclusions in regards to any indicators (valued components) in the EIS.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) AP1-3 EIS Report, Section 6.5.1.2, p. 6-119, 4th paragraph; Section 9.9.1, pg. 9-49, Section 9.9.2, pg. 9-52, pg. 9-54, pg. 9-56; Appendix N Areas identified to be (or supporting) recreational or	a) Information on recreational and Aboriginal fisheries was determined through consultation with outfitters, the public and Aboriginal groups as well as discussions with the MNRF. b) There are no known commercial fisheries in the land and resource use regional study area (see Appendix O, Land and Resource Use TSD, Section 5.33) and no Aboriginal-identified Sensitive

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				Aboriginal fisheries in potentially affected surface waters are not clearly identified and not sufficiently discussed. It is unclear from what source the information on fisheries, particularly Aboriginal fisheries, were obtained, and which water bodies in the local study area (LSA) and regional study area (RSA) are used for Aboriginal fisheries. The response to this information request will assist the Agency in determining potential environmental effects and/or impacts to Aboriginal peoples as a result of the Project. a) Provide information on recreational and Aboriginal fisheries. Also discuss where information on fisheries was sourced. b) Identify Aboriginal and non-Aboriginal fisheries in the Project area c) Provide information on potential effects to fisheries, including potential effects to fish in these fisheries, and how these potential effects will impact Aboriginal and non-Aboriginal peoples (socio-economics, employment, human health, etc.) d) Discuss any socio-economic or cultural impacts to Aboriginal and non-Aboriginal peoples due to loss of access to existing fisheries e) Provide information on how effects to recreational and Aboriginal fisheries will be mitigated, in consultation with fisheries users	Area Lakes overprinted by the Project (see Appendix P, Traditional Land Use TSD, Section 3.1.3). c) IAMGOLD does not anticipate any effects to fisheries as there are no commercial or Aboriginal fisheries in the area. With respect to recreational fishing, most of the popular fishing lakes in the area will not have any access restrictions (see Appendix O, Section 3.1.6.3). d) There are no net losses are anticipated to Aboriginal or non-Aboriginal fisheries.e) The proposed effects management strategy for limiting adverse effects on fishing areas includes designing or timing construction phase activities so limited or no in-water work is required.f) IAMGOLD will continue to discuss potential Project effects on traditional activities with potentially affected Aboriginal communities throughout the life the Project. Should additional information regarding an Aboriginal community's traditional practices become available, the Proponent will review and assess any potential effects, and develop and implement necessary mitigation measures, as appropriate.g) IAMGOLD does not anticipate any impacts on non-Aboriginal peoples due to the proposed mitigation measures identified in the water quality and aquatic biology studies (see Appendix J, Water Quality TSD; and Appendix N, Aquatic Biology TSD). Most of the popular recreational fishing spots in the region are outside of the controlled access area for the Project. h) IAMGOLD is committed to building and maintaining a strong relationship with potentially affected Aboriginal groups. As part of that commitment, IAMGOLD is negotiating impact benefit agreements with potentially affected First Nations (Mattagami First Nation and Flying Post First Nation)

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				f) Outline if arrangements have been made to mitigate impacts to Aboriginal peoples as a result of potential effects to Aboriginal fisheries. g) Outline if arrangements have been made to mitigate impacts to non-Aboriginal peoples as a result of effects to recreational fisheries h) Discuss offset plans in relation to compensation for Aboriginal peoples on a community by community basis i) Discuss whether these considerations change the conclusions in regards to any indicators (valued components) in the EIS.	and with the Métis Nation of Ontario – Region 3. These agreements are expected to include a number of topics, including an ongoing process for socio-economic effects management. This document is not meant to be prejudicial to those negotiations.i) These considerations do not change the conclusions in the EIS; however, should additional information become available regarding Aboriginal fisheries, IAMGOLD will consider this in consultation with Aboriginal groups.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) AP1-5 EIS Report, Section 9.9.2.1; Section 5; Appendix W- Human and Ecological Risk Assessment Pg. 2-20; Appendix N - Aquatic Biology Technical Support Document – Pg.8; Appendix Y It is stated in Appendix N that, "the created fish habitat associated with the watercourse realignment will involve the flooding of some existing terrestrial habitats. It is possible that the flooding of vegetation within these water bodies will result in methyl mercury in production that may be taken up by fish and limit their ability for consumption. This could potentially impair their use for recreational fishing." The potential for methyl mercury production and the effects that this may have on	a) Mesomikenda Lake and Middle Three Duck Lake both have consumption guidelines in the 2013-2014 Guide to Eating Ontario Sport Fish (MOE 2013). For Mesomikenda Lake, there are current guidelines for the consumption of ling (burbot), northern pike, walleye and white sucker (Sport Fish Consumption Advisory 2013-2014). Middle Three Duck Lake has guidelines for the consumption of northern pike (Sport Fish Consumption Advisory 2013-2014).b) See response to Comment #482.c) The potential for increases in methyl mercury production as a result of the Project have been assessed in the Aquatic Biology effects assessment (Section 9.9 of the EA). In order to address the potential concern associated with methyl mercury production in areas to be flooded, IAMGOLD is committing to removing terrestrial vegetation within the areas that are

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				ecological and social receptors, prior to mitigation, has not been quantified and assessed. It is further stated in Appendix W (Human and Ecological Risk Assessment) that, "there are currently fish consumption advisories for mercury in lakes within the study area, it is considered unlikely that project-related activities will have the potential to increase exposure to mercury for anglers in the area." However, an increase in mercury in fish tissue may have some impact on any advisories. For example, cause a reduction in the size of fish or number of meals of fish per month that are safe to eat, and may result in additional fish species added to the advisory. In addition, based on the 2013-2014 Guide to Eating Ontario Sport Fish, none of the water bodies (lakes, rivers) in the immediate vicinity of the site are listed as being under advisory for fish consumption. Not all anglers or subsistence fishers may be aware of and follow any advisories. In addition to environmental effects from increased methyl mercury, it is unclear what impact an increase in methyl mercury concentrations in fish would have on Aboriginal peoples in term of their consumption patterns and access to traditional fishing resources. Finally, if methyl mercury levels increases in fish, it is unclear what impacts may result in other species that consume fish and are subsequently consumed by Aboriginal peoples. For example, Aboriginal peoples consuming waterfowl that have been consuming fish with elevated levels of methyl mercury. The response to this information request will assist the Agency in determining potential environmental effects	expected to experience flooding due to the construction of watercourse realignments (Section 10, Table 10-2). This commitment has been expanded to include the removal of shallow organic-rich soils in the small areas expected to become flooded.IAMGOLD does not expect a significant increase in methyl mercury production post-inundation, and therefore does not expect significant changes in body burdens in the fish populations present in the lakes affected by the Project. Significant increases in mercury concentrations are not expected for two reasons: a) the area to be flooded is small (and is already subject to seasonal changes in water levels) and b) mitigation measures in the form of removing organic material and topsoil have been proposed which will serve to limit conditions favourable for methyl mercury production post-flooding.Fish tissue monitoring for mercury levels will be ongoing and should monitoring identify mercury concentrations that indicate that the current advisory levels are no longer protective of human health, then IAMGOLD will revise the advisories accordingly, taking into consideration consumption patterns. Affected communities will be notified.d) See response to Comments #190, #482 and the Addendum to Appendix N for additional information.e) As above, IAMGOLD does not expect a significant increase in methyl mercury flux in the lakes near the Project, and therefore does not expect significant effects to Aboriginal people. This is due to both the limited area subject to flooding and proposed mitigation measures to that will serve to limit conditions favourable for methyl mercury formation. f) Mitigation for methyl mercury production is described in the

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				and/or impacts to Aboriginal peoples as a result of the Project. Assess and explain the potential for the watercourse realignments to result in increased methyl mercury in the environment (e.g. in fish tissue) and the potential impacts to Aboriginal and non-Aboriginal peoples (e.g. human health, socio-economic, employment, etc.). For each of the following, discuss on a community by community basis. a) Provide a list of the water bodies with fish consumption advisories b) Provide a prediction and characterization of the likely increase to methyl mercury production and implications to current consumption advisories c) Provide an assessment of environmental effects (e.g. wildlife that eats fish) and impacts to Aboriginal and non-Aboriginal peoples, including anglers, resulting from increased methyl mercury levels, prior to mitigation (considering all pathways when determining the environmental and human health risk assessment and update the findings, as appropriate) d) Provide an explanation of the methodology, rationale for mitigation measures, and effectiveness of the proposed mitigation (with alternative mitigation approaches as applicable), including residual effects e) Provide an explanation of how , increased methyl mercury levels may impact Aboriginal peoples, including:	response to Comment #482. Although increases in methyl mercury production are not expected, should there be an increase then consumption advisories will be revised taking into consideration consumption patterns.g) Fish tissue monitoring for mercury has been proposed (see Section 5 of the Aquatic Biology TSD). It should be conducted on all lakes where water levels are going to increase as a result of watercourse realignments.h) An Addendum to Appendix N (Aquatic Biology TSD) has been prepared which includes additional information related to methyl mercury production.i) No new effects assessment indicators have been added to the effects assessment in Chapter 9 of the EA. The effect of mercury on the usability of sport fish is considered through the commercial, recreational and Aboriginal fisheries indicator for Aquatic Biology.

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				1) Traditional food sources and country foods, including fish and other species that consume fish and are subsequently consumed by Aboriginal peoples. 2) Consumption patterns and access to traditional fishing resources by Aboriginal peoples.f) Indicate what arrangements the proponent is considering for mitigating impacts to Aboriginal peoples should methyl mercury levels increase g) Provide a fish monitoring program that includes methyl mercury and considers the fish species, size, type of tissue and sample preparation method that is representative of how (Aboriginal) people are most likely to consume the fish (e.g. fillet including skin vs. skinned fillet, raw vs. cooked, etc.) as per Health Canada guidance1. h) As applicable, note any changes to conclusions in the EIS in relation to work done in relation to the requests immediately above. i) Discuss whether these considerations change the conclusions in regards to any indicators (valued components) in the EIS. 1 Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada. Supplemental Guidance on Human Health Risk Assessment for Country Foods (HHRA). Prepared by Contaminated Sites Division, Safe Environments Directorate. October.	

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538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) AP1-6 Appendix P – Traditional Land and Resource Use; Appendix W – HHRA TSD – Section 2.1.2 (Study Area and Potential Exposure Pathways); Appendix K According to Appendix P, the project area is used for traditional activities, including blueberry picking and hunting. As there are uncertainties with the predicted future soil and surface water contaminant concentrations (which could contaminate future terrestrial and aquatic flora and fauna), the ingestion of contaminated country foods may have the potential to impact Aboriginal peoples. The list of exposure pathways identified in Appendix W (HHRA TSD) includes both the ingestion of fish and wild game and the ingestion of plants. These pathways are not discussed further in the HHRA. The EIS and supporting documents do not identify any baseline monitoring of country foods or recommend monitoring of country foods during operations. In order to evaluate pre-project country foods contaminant levels, it would be useful to collect baseline samples of specific country foods typically harvested in the area (including plants, berries, fish and game/waterfowl) and analyze them for the relevant COPCs, refer to Health Canada's Guidance on Human Health Risk Assessment for Country Foods, which can be found at the following link, http://www.hc-sc.gc.ca/ewh-	Indirect soil contact pathways inclusive of country foods were assessed through an evaluation of changes in soil quality that might result from the Project. As no changes in soil quality were predicted to occur over the lifetime of the Project when assessed against the MOECC Table 1 SCS, it can be concluded that unacceptable risks associated with exposure to contaminants that partition to country foods are not expected.a) The approach taken to assessing changes in ambient concentrations of trace elements in soil, and by extension vegetation and wildlife, was based on an evaluation of changes in soil chemistry resulting from wet and dry deposition over the lifetime of the Project. As a conservative measure, the quantities of trace metals deposited were assumed to mix in the top one centimeter of soil only. Information on local background concentrations of different elements in soil indicated that concentrations are within the range considered background for Ontario soils. As such, for the purpose of the HEHRA, results of depositional modelling were compared to the Table 1 SCS developed by the Ontario MOECC. These are based on an extensive sampling program of undisturbed urban and rural parkland across Ontario. The Table 1 SCS are based on the 98th percentile of the sampling dataset to account for natural variability. As the depositional modelling did not predict an increase in soil concentrations for any parameters evaluated approaching the Table 1 SCS, it can be concluded that there would be no acceptable risk via direct and indirect soil contact pathways inclusive of uptake by plants and grazing animals. Considering the depositional

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				semt/pubs/eval/environ_assess-eval/index-eng.php. The response to this information request will assist the Agency in determining potential environmental effects and/or impacts to Aboriginal peoples as a result of the Project. Identify the country foods important to Aboriginal peoples on a community by community basis and make reference to the source of this information. In addition: a) Provide baseline information on country foods and discuss how country foods will be monitored during the Project phases to evaluate any changes to contaminant levels in country foods and confirm predictions of effects. Refer to Health Canada's guidance on human health risk assessment for country foods1. b) Evaluate and discuss the exposure pathways that result from ingestion of contaminated country foods in the HHRA and determine any potential environmental effects and/or impacts to Aboriginal peoples and non-Aboriginal peoples. c) If an exposure pathway is not evaluated in the HHRA, provide a rationale. d) Provide appropriate mitigation measures and identify residual effects. e) Outline if arrangements have been made to mitigate impacts to Aboriginal peoples as a result of effects from	modelling results and the modest increase in soil concentrations of trace elements, a monitoring program for assessing trace element uptake in soils and vegetation is not considered necessary.b) Exposure pathways associated with ingestion of country foods have been discussed in Section 2.2.3.2 of Appendix W (HEHRA). c) Where exposure pathways have not been evaluated, a rationale has been provided. The one exception is ground water where additional discussion has been addedto Appendix W in response to Comment #510.d) As unacceptable risks have not been identified mitigation measures are not required and therefore have not been recommended.e) With the exception of fish consumption advisories, which are already in effect in the Study area, mitigation measures for country foods for Aboriginal populations are not anticipated and therefore have not been recommended.f) There are no changes to conclusions regarding indicators in the EA.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				contaminants in soil and surface water that may affect country foods and vegetation species used in traditional activities. f) Discuss whether these considerations change the conclusions in regards to any indicators in the EIS. 1 Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada. Supplemental Guidance on Human Health Risk Assessment for Country Foods (HHRA). Prepared by Contaminated Sites Division, Safe Environments Directorate. October.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-09 EIS Appendix N, page 7 The list of activities with potential to impair CRA fisheries within the LSA does not include decreased water availability to watercourses during operations or closure, due to realignments or refilling the lake, which can have impacts on fish habitat. This impact is discussed later in the report (i.e. EIS Appendix N, page 23) and therefore should be included in the discussion of activities with potential to cause serious harm to fish.	The filling of the watercourse realignments and open pit are not expected to affect commercial recreational or Aboriginal fisheries for the following reasons: the watercourse realignments will be filled with rainwater, runoff and snow melt and not with water pumped from other watercourses; and the open pit will be filled with water re-directed from the storm water ponds around the mine rock pile, direct precipitation, runoff and snow melt, groundwater inflow and possibly the redirection of a portion of peak flow from the Mollie River, however, the use of Mollie River water would only be conducted under approval from MOECC and would focus on the redirection of excess water. Therefore, the watercourse realignment and open pit filling were not listed as activities that have the potential to impair commercial, recreational or Aboriginal fisheries.
538	Email	08/01/2014	1) Sherry Boodram (Canadian	1) DFO-01	The fish communities within stream and lake habitats in the study area are generally dominated by northern

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			Environmental Assessment Agency)	EIS Appendix N, Section 2.4.2 page 6 EIS Report Section 9, Description of Project Effects, subsection 9.9, page 9-49. The assessment of effects on commercial, recreational and Aboriginal (CRA) fisheries has been based on five fish species: northern pike, yellow perch, walleye, whitefish and smallmouth bass. Per DFOs Fisheries Protection Policy Statement (October 2013), a fish is part of a CRA fishery if federal or provincial fisheries regulations apply to it, as well as those fish that can be fished by Aboriginal organizations or their members. In Ontario, a licence is required to fish, for any species. Species other than the five identified are fished for. A licence is also required to collect baitfish. Therefore, all species in the Côté Lake study area are part of a CRA fishery and the potential effects of the proposed project on all species needs to be understood. If using a few species as a surrogate for evaluating the impacts on all fish that are part of or support a CRA fishery, the fish chosen must be representative of all the fish species found in the Côté Lake study area, i.e. they represent the same habitat requirements, food requirements, life histories, etc. Provide a rationale as to how the chosen fish species are representative of all fish species in the Côté Lake study area. If those five species are not representative of all species, add other species for the effects assessment.	pike (Esox lucius) and yellow perch (Perca flavenscens). Walleye (Sander vitreus), white sucker (Catostomus commersonii) and lake whitefish (Coregonus clupeaformis) were also common and varied in abundance depending on lake habitat. Smallmouth bass (Micropterus dolomieu) and burbot (Lota lota) were only present in a few lakes, but were found in both watersheds that will be affected. In addition to these species, fifteen small-bodied species were also identified. Based on this information, it is proposed that northern pike, yellow perch, lake whitefish, walleye and smallmouth bass be evaluated as key species as it is assumed that these species requirements will cover the gamut of habitat required for the remaining fish community (both large and small bodied fish) within the affected area (see habitat offsetting assessment methods in the Addendum to Appendix N; Aquatic Biology TSD).In addition, the habitat requirements of forage fish is described together with a description of the existing habitat for these species in each water body assessed (see Aquatic Baseline Report; Appendix N, Appendix C). In the impact assessment, the protection of forage fish is also indirectly addressed through the assessment of water quality to a standard that meets the protection of fish and aquatic life; and the assessment of loss of habitat which incorporates habitat for both sport and forage fish.

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538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-02 EIS Appendix N, Table 2.1, and page 19 Section 4 (Prediction of Effects) of Appendix N (Aquatic Technical Support Document) indicates that "project activities with the potential to affect sport fish within the LSA were considered relative to the assessment indicators". The assessment should not be limited to sport fish. As in comment DFO-01 above, the assessment should be on fish that are part of, or support, a commercial, recreational or Aboriginal fishery. The basis for a recreational fishery is described above in comment DFO-01. Section 6 of the EIS (Description of the Environment), pages 6-124 and 6-125, indicate species that are harvested by or considered important to First Nations and Métis. These species are found in the Côté Lake study area. None – this should be covered by the Information Requested under comment DFO-01.	It is noted that the sentence in Section 4 (Prediction of Effects) in Appendix N (Aquatic Biology TSD) should state that Project activities with the potential to affect a commercial, recreational or Aboriginal fishery within the LSA..." and not "Project activities with the potential to affect sport fish within the LSA..." The sentence has been changed in Appendix N (Aquatic Biology TSD).
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-05 EIS Report Section 9.9.2.1, page 9-53, EIS Report Section 10 Table 10-2 page 10-18, EIS Report Section 11 Table 11-6, EIS Appendix N Table 3.1 Impacts from blasting in the open pit may affect fish habitat and spawning in the adjacent Clam Lake (south basin) during construction and the early years of operation. In the report, the area is described as deep	Table 11-6 summarized the impact in the post-closure phase. No blasting is planned during this phase therefore the effects of blasting were not assessed within this table. When blasting does occur, effects for spawning have been predicted at 238.5 m from the pit during construction and at 349 m during operations. This overlaps Clam Lake in the south eastern portion of the lake (see Figure 4.1 from Appendix N; Aquatic Biology TSD). The dominant species found in this lake are smallmouth bass which typically spawn within the

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				(profundal) and as providing limited spawning habitat for resident fish, with the dominant fish identified as smallmouth bass with an abundance of spawning habitat for that species available. The report indicates effects are determined to be likely limited to individuals and not result in a community or population level effect. This effect is not included in the Impact Assessment Matrix, Table 11-6. However it is included in the "Mitigation Measures – Biological Environment Table 10-2" where it is indicated that the effects to spawning habitat within 238.5 m of the open pit will be included in the fish habitat offsetting (compensation) plan. This impact should be in the Impact Assessment Matrix, Table 11-6 if it has been identified as an effect requiring mitigation. Burbot are present in Clam Lake, as indicated in Table 3.1: Summary of fish species presence/absence in Côté Gold area lentic (lake) habitat. Burbot are sensitive to noise, as they use vocalizations during spawning. As indicated in comment DFO-01, above, Burbot are a fish that are part of, and support, a CRA fishery. Should blasting impact their spawning over a period of several years there is the potential for impacts to productivity.	first meter of water over and around cobble, gravel and sandy bottoms. All the other species found within Clam will typically use the first two meters for spawning substrate. Of all the species found in Clam, only smallmouth bass, burbot and johnny darter use sandy, rock substrate for spawning. All other species spawning substrate are associated with the presence of vegetation. Minimal vegetation is present within the area affected by the blasting. The habitat present is largely cobble, rock, sand and silt substrate which is abundantly present in Clam Lake. During construction, the shoreline perimeter affected by the blasting will be approximately 240 m and 892 m during operations. The predominant area affected during operations falls in water depths greater than two meters of water, therefore it is anticipated that the area affected for spawning will be minimal when taking the entire area of the lake into consideration and the habitat present. Since the effects of blasting are expected to be minimal, no monitoring was proposed. The area affected will be included in the habitat loss for the Fisheries Act Authorization. Furthermore, it has been proposed that fish health monitoring should be conducted every three years in accordance with EEM guidance and that the newly created habitat be monitored to ensure it is functioning as designed. These programs will assess endpoints for population dynamics (e.g., catch-per-unit-effort, growth and reproduction endpoints).
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) DFO-06 EIS Appendix N, page 22 and Table 4.8	It is proposed that the transplanting of vegetation, benthic invertebrates and forage fish be carried out to expedite the establishing of compensatory habitat.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Assessment Agency)	It is indicated that implementing the offsetting measures, being the watercourse realignments as well as other associated changes to existing water bodies, will result in only a minimal loss of habitat within the LSA. It is noted that this should not affect fish productivity. Per DFO's "Fisheries Productivity Investment Policy", benefits from offsetting measures must balance project impacts. It is not clear in the EIS if impacts are being fully counterbalanced by offsetting measures. It is recognized that impacts may be fully offset by the proposed channel realignments if a different approach is taken in calculating the losses and gains, such as the use of Habitat Units or some measure of productivity, however as it is currently portrayed in the EIS, a loss of habitat has been identified with no supporting information to demonstrate that the impacts of fisheries productivity is in fact fully offset by gains to productivity. Provide an offsetting plan that demonstrates, at a conceptual level at minimum, that losses of fisheries productivity will be fully offset by gains in productivity.	Minnow has previously implemented this approach at another site (Agrium Kapuskasing Phosphate Operations 2006) and results were quite effective (e.g., no loss in year class of any of the fish species relocated to the newly constructed lake). In areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted providing cover for juvenile fish and decreasing erosion from construction and wind. Transplanting activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas to the newly constructed channels and therefore reduce lag times. Transplanting activities will likely include the transplantation of macrophytes (aquatic plants), benthic invertebrates, and the relocation of small-bodied fish (forage fish) and of large-bodied fish. The sequence of transfers will take into account spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish. The objectives of these transplants will be to accelerate the establishment of the ecosystem and food chain within the newly constructed areas prior to the placement of the key fish species, thus reducing lag times. Furthermore, the realignments will be constructed using natural channel design and will incorporate habitat structure to support successful utilization of the constructed habitats by resident fish. Therefore, it is expected that the lag time within the created habitat will be minimal. The decreased functioning of the constructed habitat in the first year will be factored into the offsetting plan. It is anticipated

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					that lag times will be greatly reduced through the transplanting of vegetation, benthic invertebrates and forage fish, which will expedite the establishing of compensatory habitat.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-07 Appendix N, page 19 and Table 4.1 It is anticipated that watercourse realignments and habitats that are constructed prior to mine operations may not be fully functional by the time the serious harm to fish occurs. It is anticipated that watercourse realignments and habitats that are constructed prior to mine operations may not be fully functional by the time the serious harm to fish occurs. When evaluating whether proposed offsetting measures fully offset serious harm to fish, the lag time in the functioning of the offsetting measures should be factored in to the offsetting plan. This may require creation or enhancement of additional habitat to offset the potential loss of productivity until the constructed habitats are fully functioning. As part of the request in comment DFO-07, ensure that the decreased functioning of the constructed habitat in the first year been factored into the offsetting plan.	See response to Comment #487c). The decreased functioning of the constructed habitat in the first year will be factored into the offsetting plan. It is anticipated that lag times will be greatly reduced through the transplanting of vegetation, benthic invertebrates and forage fish, which will expedite the establishing of compensatory habitat.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) DFO-08 EIS Appendix N pages 7,9, & 19	Fish will be required to be relocated from habitats lost during the development of the mine (i.e., the construction of the open pit and the TMF). It is

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Assessment Agency)	Fish are to be collected and relocated from habitats that will be lost due to development of the mine. Fish are to be relocated to newly constructed habitats which connect various existing waterbodies. It is anticipated that some fish will be lost and not relocated. More information is required to assess the impacts of the relocation and loss of fish. Why is it anticipated that some fish will not be able to be relocated; is there a specific species or size of fish that is expected to be difficult to capture or relocate? How many fish are estimated to be lost? What are the impacts of the fish relocations on existing fish populations in the waterbodies connected to the constructed habitats?	anticipated that fish will be relocated at ideal timing windows to minimize fish and egg stranding during the watercourse realignments. Timing of spawning for all fish found within the local study area indicated that the optimal window for all species will be late summer, early fall. By August all species young-of-the-year should be large enough to catch and transfer. Only golden shiner potentially spawn into August. Since their spawning window is quite large, it is not anticipated that the entire year class would be lost or that the species could not spawn in the new area they are transferred to. To concentrate fish, it is anticipated that a series of progressive water drawdowns will be conducted (taking into consideration ideal timing for fish removal) to catch and relocate fish from areas being lost to newly constructed habitat. A variety of fish gear will be employed to capture fish to ensure all sizes and species are caught. Fish will be relocated within the same watershed. As the fish being relocated will be moved to newly constructed areas, minimal effects on existing populations are anticipated. The only location where fish may be relocated to another water body is for Côté Lake. Fish from Côté Lake will likely be relocated to Upper Three Duck Lake. Côté Lake and Upper Three Duck Lake are currently only separated by culverts and fish can move freely between the two water bodies. As many fish as practically possible will be moved during the relocation, however it is anticipated that some fish will not be able to be relocated either through stranding during drawdowns or not being able to catch the fish. It is not possible to estimate the number of fish that will be lost in all areas. Minnow has previously

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					conducted a complete fish removal at Agrium Kapuskasing Phosphate Operations, where the estimated population of northern pike was successfully relocated (population estimate [95% confidence limits] = 525 [232-1054] and 575 northern pike were relocated).
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-10 EIS Appendix N page 23, EIS Section 10 Table 10-2 page 10-19 Reductions in flows to Bagsverd Creek are anticipated to begin during operations and remain in perpetuity. Fish habitat may be impacted. It is proposed to survey the stream morphology prior to construction to assess the potential for exposure of habitat and barriers to fish passage. Then, if required, the mitigation proposed is to modify the stream bed to ensure an adequate depth of water for fish to utilize habitat and allow for fish passage. Without defining the impact, it is unknown whether the proposed mitigation will be effective and whether it will completely offset the serious harm to fish. Provide a detailed analysis of the impacts to Bagsverd Creek as well as downstream (for example what will be the impacts to Neville Lake). Provide an analysis of the feasibility of the proposed mitigation, indicating whether the mitigation will fully offset the impacts. When considering hydrology and impacts to fish habitat, use seasonal flows (as, for example, impacts to fish passage	Additional investigations were completed in 2014 to address concerns with respect to potential changes in water levels within Bagsverd Creek. The outcome of these investigations are provided in the Addendum to Appendix N (Aquatic Biology TSD).

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				and habitat may be exaggerated at low flows), rather than the current approach which uses the average annual flow. Also, ensure that this is discussed in the offsetting plan (as in comment DFO-07).	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-13 EIS Appendix I Section 1.1.7 Page 4 Channel realignments are to be constructed to provide fish habitat as offsetting for serious harm to fish. Upon mine closure, some channel realignments are to be changed to restore surface water flow paths similar to pre-development conditions. Indicate whether the watercourse realignments to be decommissioned upon mine closure are those that are to be constructed with fish habitat features as part of the Offsetting Plan. If habitat created as offsetting is to be destroyed or permanently altered upon mine closure, then include how this subsequent loss of fish habitat will be offset in the Offsetting Plan (referenced in comment DFO-06).	The watercourse realignments will be constructed to accommodate the development of the open pit and the TMF. The Mollie River will flow into Clam Lake which will flow north through the South Arm of Bagsverd Lake and then be redirected south into Weeduck Lake and on to Upper Three Duck Lake where it will resume its original watershed configuration (see Figure 1.2 of Appendix N; Aquatic Biology TSD). Furthermore, the outlet of Bagsverd Lake (Bagsverd Creek) will be realigned to the west of Bagsverd Lake where it will flow north around the TMF and enter Unnamed Lake #2 and rejoin the original Bagsverd Creek. The Mollie River (from Chester Lake to Clam Lake) and Bagsverd Creek realignment will remain in perpetuity. Once the pit is filled (anticipated to take approximately 50 yrs.) some of the realignments will be decommissioned as follows: the Mollie River water realignments (Clam Lake to West Beaver Pond) will be removed; and south arm of Bagsverd Lake to Bagsverd Pond to Weedubck Lake and the watershed will be returned to its original configuration (see Figure 1.3 of the Aquatic Biology TSD). All habitat altered or destroyed upon mine closure will be mitigated through the newly constructed or enhanced fish habitat provided by the pit lake and restoring the channels that will connect Clam Lake to the pit lake and the pit lake to Upper Three Duck Lake. It is expected that the any loss of habitat associated with the decommissioning of

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					watercourse realignments will be off set with the establishment of former watercourse connections. Specifically: the reconnection of Clam Lake to the pit lake through the re-establishment of Clam Creek; the development of the pit lake; and the establishment of an outlet channel from the pit lake to Upper Three Ducks Lake. These changes will not be considered in the off-setting plan being developed but will need to be approved under a separate Fisheries Act Authorization following the closure phase and confirmation of pit filling plans and timelines.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-14 EIS Appendix I Table 4.2 Table 4.3 Table 4.4 Table 4.5, EIS Appendix N page 10 Some watercourses will experience an increase in flows greater than 100% of the pre-development flow. These watercourses are not all identified as the constructed watercourse realignments. It is noted the constructed alignments will be designed for the expected flow, however the impacts of increased flows to the existing watercourses (for example, Un-named Lake #2 Outflow) is not evaluated, and mitigation is not proposed. The Aquatic Biology section of the EIS indicates that predicted changes in water flow have been considered in the assessment of potential effects to fish habitat, however the only water flow changes assessed in Table 4.1 are the changes to Bagsverd Creek (as above in comment DFO-10).	Additional investigations were completed in 2014 to address concerns with respect to potential changes in water levels within Bagsverd Creek. The outcome of these investigations are provided in the Addendum to Appendix N (Aquatic Biology TSD).

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				Evaluate the impacts to fish and fish habitat arising from increased flows from mine activities, including impacts related to increased erosion and sedimentation, high flows as a barrier to fish migration, and direct changes to habitat. Propose mitigation for potential impacts to fish and fish habitat, and if offsetting is required, include this in the Offsetting Plan.	
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) DFO-03 EIS Appendix N, Table 3.1. Walleye is not indicated as present in Cote Lake. Walleye should be indicated as present in Cote Lake, as it was found in surveys in 2010 by AMEC, as indicated in EIS Appendix N (Aquatic Technical Support Document), Appendix A, Section A.8.2. Other species which were found by AMEC in 2010 are included in the table with a footnote indicating "AMEC 2011".	Walleye were found in Côté Lake in 2010 (AMEC 2011). IAMGOLD agrees that Table 3.1 should have walleye included in Côté Lake. The table has been updated (see revised Appendix N; Aquatic Biology TSD).
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental Assessment Agency)	1) PD1-4 EIS Report, Section 5.7 The EIS states that with respect to overburden that "Prior to development of the TMF dams, topsoil as needed, will be stripped from the TMF area. This topsoil may be used in construction of the channel realignments or be stockpiled around the TMF footprint where appropriate in	Overburden will be stockpiled in the MRA, and only the small quantity that may be stripped from the proposed TMF area may be stockpiled close to it's perimeter at an appropriate location. Overburden cleared from the construction of the proposed watercourse realignments will be used in their construction or stockpiled in the MRA. a) No additional overburden stockpiles are planned for the TMF or the water course realignments.b) All expected effects associated with the

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				low height, small stockpiles, to be used for future closure activities." There is no information in the EIS on the exact locations or how the drainage from these stockpiles will be managed and monitored during the time that the overburden is stockpiled and before the material is utilized in rehabilitation of the site. Furthermore, it is unclear whether the creation of new watercourse realignments may result in the clearing of overburden and result in additional stockpiles being necessary for overburden gathered during construction of the engineered watercourse channels. The response to this information request will assist the Agency to determine the project's potential effects to the terrestrial landscape, migratory birds, and water a) Provide in a map or figure the location(s) of the overburden stockpiles associated with the TMF and the new watercourse realignments (if applicable) b) Provide a description of the predicted environmental effects of the construction and operation of overburden stockpiles during all phases of the project c) Provide a description of how drainage from these stockpiles will be managed and monitored.	construction and operations phases are included in the EA report. No additional effects prediction required.c) Runoff for topsoil stockpiles around the TMF would be managed similarly as in the MRA, directing flow towards the TMF seepage collection ponds or returned to the TMF. The final design will be optimized for water collection and recycling through ongoing engineering studies.
538	Email	08/01/2014	1) Sherry Boodram (Canadian Environmental	1) TC-07 EIS Report, pg 9-85, Section 9.16.3	Section 9.16.3 of the Amended EIS / Final EA Report has been revised to be inclusive of any interference to navigation. IAMGOLD is aware of the 'opt-in' clause and

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			Assessment Agency)	This paragraph mentions 2 proposed works (watercourse realignments and retention dams) that could affect the common law right of navigation (in non-scheduled waters). However, there are more proposed works that could affect navigation in non-scheduled waters than just these two that are mentioned. A better list to address this comment is, for example, the list found under Section 9.16.1. So what's missing from Section 9.16.3 is: draining of Cote Lake; access road creek crossings; intake water pipes; and outflow water pipes. Also missing are works involving the depositing or throwing of materials that risk impacting navigation in navigable waterways or in any waters that flow into navigable waterways (NPA, section 22). Lastly, it seems that that any potential revisions to Section 9.16.3 could affect what is said (and perhaps assessed) in Section 9.17.2. This section needs to be expanded upon to include all proposed works that could or will affect the common law right of navigation (in non- scheduled waters). The proponent needs to be made aware of the opt-in clause under the NPA and they are to decide if will opt-in or not (see Tania's comments above for NPA and opt-in explanations, etc). If opting-in AND the Minister approves the opt-in request, then all non-scheduled waters affected need to be assessed for navigability by the proponent, and all info is then to be provided to Transport Canada for review and acceptance, and if accepted as navigable then	intends to use the 'opt-in' process to have all effects on interference to navigation assessed under the Navigation Protection Act.

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				an NPA approval/permit is required. So perhaps the proponent can add to this Section an explanation and their decision to 'opt-in' or not to the NPA. Some proposed works (the depositing/throwing/dewatering of materials in navigable waterways or in any waters that flow into navigable waterways) is subject to the NPA regardless if the proponent opts-in or not, and regardless that such waters are non-scheduled.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; General Comments about the pre-screening of the Candidate Alternatives EC's Guidelines for Mine Waste Disposal has not been followed by the proponent. The first step is to identify candidate alternatives by developing a list of all possible candidate mine waste disposal alternatives for the site. The second step, the pre-screening assessment, is to optimize the alternatives to be analyzed in more detail by eliminating alternatives that have obvious deficiencies or 'fatal flaws'. Unfortunately, these steps have not been met since the proponent has identified six alternatives for which a pre-screening assessment has not been done. In section 2 (Background), the proponent indicates that a pre-screening assessment has been completed whereby a total of 14 candidate tailings management sites were identified and investigated as part of an initial pre-screening assessment (KPL, 2012) but has failed to provide	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

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				and include the information as part of this alternatives assessment analysis. The proponent should note that the alternatives assessment document must be a standalone document that should be complete and include all the necessary information, description, justification and rationale that were considered in evaluating the alternatives. As water bodies frequented by fish will be needed for tailings disposal, the alternatives assessment analysis should provide all information that was used to justify such an approach. In addition, the alternatives assessment study as well as the fish habitat compensation plan to offset the loss of fish habitat resulting from the deposit of tailings in waters frequented by fish are key documents that will be needed to proceed with the MMER amendments which require public consultations. In order to adequately complete these steps, the proponent should provide a map indicating the boundaries of the mine property, which has not been included in the report. Then the proponent is requested to identify all possible alternatives for which fatal flaws assessment will be conducted to eliminate alternatives that could not be considered because of obvious deficiencies.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants, March 5, 2013; Appendix U3 Tailings Management Facility Alternatives Assessment, March 5, 2013 In general, in developing the alternative assessments for the Mine Rock Area and the Tailings Management Facility,	IAMGOLD is confident that it has thoroughly consulted on the deposition of mine rock and tailings for the Cote Gold Project. In response to stakeholder comments, IAMGOLD revised the MRA in order to reduce the Project footprint and the potential for noise and visual impacts on the nearby Mesomikenda Lake cottagers.As discussed with the CEA Agency and Environment

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				the Proponent has partly followed the Multiple Accounts Analysis approach outlined in the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (EC 2011), however there are a number of areas where the requirements of the guidelines have not been met. The document needs to be updated as a whole. The proponent is reminded that the alternatives assessment is needed to support a potential amendment to the Fisheries Act and as such it is important that the document includes, among other things, a thorough evaluation of the impacts to water bodies, aquatic life and socio economic factors. This evaluation needs to take into account the views of the communities impacted by the project. The alternatives assessment report as well as the fish habitat compensation plan to offset the loss of fish habitat resulting from the deposit of mine waste in waters frequented by fish will also be key documents used during the public consultations that are required for Metal Mine Effluent Regulations amendments. Therefore, it should be a standalone document that must be complete and include all the necessary information, description, justification and rationale that were considered in evaluating the alternatives. This document ultimately needs to justify that the use of the fish frequented water bodies is the option that makes the most sense. Please note as well that the comments provided below are organized separately for Appendices U1 (Waste Rock Areas) and U3 (Tailings Management Facilities) of the report. Please note that the comments for these two sections are similar	Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments.It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schelude II process will remain a viable approval option.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				EC requests that the proponent provide a standalone document for the alternatives assessment for the mine rock and tailings management facilities that addresses the following comments related to this aspect.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1and Appendix U3 It is not clear whether any fish-frequented natural water bodies would be affected by the polishing pond and the mine water pond. If that is the case, the two ponds will be subject to Schedule 2 of the MMER. EC requests that the proponent: 1. Provide information on whether there are fish-frequented natural water bodies that would be affected by the polishing pond and the mine water pond. 2. Add the locations of the Polishing Pond and the Mine Water Pond to Figure 1.2 Overall Site Layout.	This subject has been discussed with Environment Canada and will be considered as part of the MMER Schedule II regulatory amendment.
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Figure 1-2 In various sections of the EIS, the proponent indicates low-grade ore will be stockpiled northeast of the open pit for processing later in the mine life. On Figure 1-2 of the EIS, a portion of area envisaged by the proponent to stockpile the low-grade ore will impact a portion of the upper section of the Three Duck Lakes. (Also see comment	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

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				EC-1 above.) If this area of Three Duck Lake is fish frequented, the Metal Mining Effluent Regulations (MMER) will need to be amended in order to add this portion of the lake to Schedule 2 of the MMER. Assuming that the portion of the Upper section of the Three Duck Lakes is frequented by fish, the proponent will need to provide an alternative assessment for the disposal of the low-grade ore since it is going to impact waters that are frequented by fish in order to support a regulatory amendment to MMER Schedule 2.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Section 2.2 Summary of MRA Options The description of each candidate MRA is weak and too general in describing each option. EC requests that the proponent describe in more detail the specifics of each option taking into account presence of water bodies, water courses, fish communities, fisheries values, hydrology, hydrogeology, water quality, aquatic habitat, vegetation and wildlife, terrestrial habitat, wetlands, etc. Maps indicating detailed characteristics that were considered in the analysis should be provided for each alternative. For each candidate option, please also provide the following additional details: subsurface conditions	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments.It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schelude II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				including lithological units underlying the candidate options; overburden thickness and depth to bedrock; competency of bedrock and presence/absence of structural weaknesses such as faults, joints, etc; ability to control and manage seepage; number of dams required for each candidate option and their dimensions (length, width, height).	update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Table 2.1 Summary of Mine Rock Area Options Details The proponent indicates that MRA 1, 2, 3 and 4 potentially contain water bodies and/or a watercourse (Criteria 'Site Contains a Waterbody and /or a Watercourse'). The proponent needs to better characterize each of these alternatives and indicate if water bodies and/or streams are present as well as if they are fish frequented. For those that are fish frequented, assessment of fisheries resources is required.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Table 3.1 Account, Sub-Account and Indicator Rationale	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses

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				The rationale provided in this table is weak and too general. As it stands, these descriptions are too general and not specific to the project. Since the description of each MRA option is weak in providing detailed information (section 2.2) based on site specificity, it is impossible for an external reviewer to have a good understanding of how the selected indicators are reflecting and taking into account site specificity. Detailed comments on the description of each indicator provided in Appendix A are provided below. EC requests that the proponent provide more in-depth description of the indicators that are considered in the analysis. The proponent should consider other indicators in the Assessment of alternatives that would contribute to assessing the project impacts, such as: Environmental: dam failure potential, dam failure consequences, MRA footprint, total catchment area, total watershed area, existing streams and water bodies frequented by fish, value of fish habitat, loss of rare and endangered wildlife species, quantity and quality of terrestrial habitat disturbed, wildlife, terrestrial and aquatic flora, water quality, potential for contamination, etc.; Socio-economic: impact on existing communities, recreational use, importance for Aboriginal land use and resource activities (hunting/trapping/fishing/plant gathering), public acceptability, community consultation, community engagement, etc; Technical: number of containment dams required, total containment dam volume, embankment	Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				construction, water management, diversion dams required, etc.; Economic: post closure cost, fish habitat compensation cost, water treatment cost, etc.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Table 3.3 Summary of Indicator Values Several indicators considered in the analysis do not have any bearing on the analysis since they have the same values. This is the case for the following indicators: Adjacent Fish Ecology, Total Moose Winter Habitat Altered/Lost, Total Moose Aquatic Feeding Habitat Altered/Lost, Post-Closure Chemical Stability, Human Health (Indirect Exposure), Aboriginal Peoples Interests and Current Land Use, Presence of Archaeological Sites, Recreational Access, Geotechnical Conditions, and Consequence of Operational Error. Indicators that do not provide any differentiation between options should not be included in the ledger analysis as indicated in the EC Guidelines (section 2.5). For those, the proponent should provide a list of all indicators that were considered but not included in the analysis on that basis and provide the rationale explaining why they were excluded.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U1, Mine Rock Area (MRA) Alternatives Assessment Report – Knight Piesold Consultants; Table 3.4 Summary of Indicators value Scales	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				The value scales established for several indicators are inappropriate to reflect the project scenario. The following are some examples that are given to illustrate the issue. - Number of Watersheds: according to Table 3.3, the number of watersheds impacted by the various MRA options range from 0 to 2 but the value scale provided in Table 3.4 range from 0 up to greater than 6. Furthermore, the value of 6 (best) has been given when one watershed is impacted. The proposed scale would be more appropriate since it better reflects the range of values provided in Table 3.3 and provides a better differentiation between MRA options. Based on the suggested scale, the indicator values would then be 4, 4, 2, 4, 2 and 2 instead of 6, 6, 5, 6, 5 and 5. Value Proposed by Proponent Suggested by EC 6(best) 1 watershed 0 watershed 5 2 - 4 3 1 watershed 3 4 - 2 5 2 watershed 1(worst) > 6 > 2 - Stream Length Removed: according to Table 3.3, the stream length removed ranges from 0 m to 530 m but the	response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				value scale for this indicator ranges from 0 to 6 km in Table 3.4. The suggested following scale would be more appropriate and would provide a better differentiation between options. Based on the suggested scale, the indicator values would then be 3, 1, 2, 6, 6 and 6 instead of 5, 5, 5, 6, 6 and 6. Value Proposed by Proponent Suggested by EC 6(best) None none 5 0.0 - 1.5 km 1-125 m 4 1.6 and 3.0 km 126 - 250 m 3 3.1 and 4.5 km 251- 375 m 2 4.6 and 6.0 km 376 - 500 m 1(worst) > 6.0 km > 500 m - Loss of waterbodies: according to Table 3.3, the area of waterbodies lost ranges from 0 ha to 8.6 ha but the scale value ranges from 0 to greater than 250 ha using different increments. The proponent should explain why different increments are used. The proposed scale by the proponent is inadequate and is not reflecting the indicator values determined for each MRA options. Also, this indicator should not include wetlands which should be considered separately. It is important to differentiate water bodies that are frequented by fish and wetlands. The suggested following scale would be more appropriate	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				and would provide a better differentiation between options. Based on the suggested scale, the indicator values would then be 6, 6, 2, 5, 6 and 5 instead of 6, 6, 5, 6, 5 and 5. Value Proposed by Proponent Suggested by EC 6(best) None None 5 0 - 15 ha 0 – 2,25 ha 4 15 - 50 ha 2.26 – 5.50 ha 3 50 - 125 ha 5.51 – 7.75 ha 2 125 - 250 ha 7.76 - 10 ha 1(worst) > 250 ha >10.0 ha - Flow Change: For the indicators that are evaluated qualitatively, scales should be explained, described and justified.	
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Economic Indicators: The economic account includes several indicators that are not evaluated based on costs but rather on indirect components of the MRA options. The proponent needs to provide a detailed cost assessment for each MRA option as well as the cost for the fish habitat compensation plan to offset the loss of fish habitat resulting from the deposit of waste rock in waters frequented by fish. For all the indicators, EC requests that the proponent provide justification of the scoring for each indicator, as described in the previous column.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
539	Email	08/06/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Maps As presented, the maps included in the report do not provide sufficient details on each alternative considered especially with respect to lakes and streams frequented by fish that will be impacted. The analysis should include more detailed maps. For better clarity and in order to provide a better understanding, the proponent is requested to provide maps that include detailed and specific information that are considered in the analysis.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 (As discussed with the CEA Agency and Environment Canada, IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, the Assessment of Alternatives for Mine Waste Disposal will be provided in a standalone document and updated to address Environment Canada's comments. It is noted that this document and the requested edits are part of the process to potentially amend the Fisheries Act, and as such, is not required to advance the EA process. It is the intent of IAMGOLD to provide the updated version in a timely manner, such that the streamlined MMER Schedule II process will remain a viable approval option.) It is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Maps As presented, the maps included in the report do not provide sufficient details on each alternative considered especially with respect to lakes and streams frequented by fish that will be impacted. The analysis should include more detailed maps. For better clarity and in order to provide a better understanding, the proponent is requested to provide maps that include detailed and specific information that are considered in the analysis.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Section 3.2 Summary of TMF Options The Summary of TMF Options section of Appendix U3 is vague and too general in describing each option. EC requests that the proponent describe in more detail the specifics of each option taking into account presence of water bodies, water courses, fish communities, fisheries values, hydrology, hydrogeology, water quality, aquatic habitat, vegetation and wildlife, terrestrial habitat, wetlands, etc. Maps providing detailed characteristics are requested for each alternative.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Section 3.2 Summary of TMF Options The proponent indicates that all TMF options contain water bodies and/or watercourses (Criteria 'Site Contains a Waterbody and /or a Watercourse'). As presented, this criterion also includes the presence of wetlands. The proponent needs to better characterize each of these alternatives and indicate if water bodies and/or streams are present as well as if they are fish frequented. For those that are fish frequented, assessment of fisheries resources is required. Wetlands should be assessed separately from waterbodies/ watercourses.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Table 4.1 Account, Sub-Account and Indicator Rationale The rationale provided in this table is weak and too general. As it stands, these descriptions are too vague and not specific to the project. Since the description of each TMF option is weak in providing detailed information (section 3.2) based on site specificity, it is impossible for an external reviewer to have a good understanding of how most of the selected indicators are reflecting and	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				taking into account site specificity. Detailed comments on the description of each indicator provided in Appendix A are provided below. EC requests that the proponent provide more in-depth description of the indicators that are considered in the analysis. The following indicators are typically considered: Environmental: dam failure potential, dam failure consequences, TMF footprint, total catchment area, total watershed area, existing streams and water bodies frequented by fish, value of fish habitat, loss of rare and endangered wildlife species, quantity and quality of terrestrial habitat disturbed, wildlife, terrestrial and aquatic flora, water quality, potential for contamination, etc. ; Socio-economic: impact on existing communities, recreational use, Importance for Aboriginal land and resource use activities (hunting/trapping/ fishing/ plant gathering), public acceptability, community consultation, community engagement, etc. ; Technical: number of containment dams required, total containment dam volume, embankment construction, water management, diversion dams required, etc.	
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Table 4.4 Summary of Indicator Value Scale The value scales established for several indicators are inappropriate and do not reflect the range of values determined for the indicators associated with each TMF	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				option. In some other cases, the scales are not defined with the view of maximizing the differentiation between options. The following are some examples that are given to illustrate the issue. - Total Catchment Area: Based on the proponent scale, the indicator values for the TMF options are 2, 4, 4, 4, 4 and 5. Based on the suggested scale, the indicator values would be 2, 3, 3, 4, 3 and 5. Value Proposed by Proponent Suggested by EC 6(best) < 600 < 600 5 600-700 601-675 4 700-800 676-750 3 800-900 751-825 2 900-1000 826-900 1(worst) > 1000 > 900 - Number of Watersheds: According to Table 4.3, the number of watersheds impacted by the various TMF options is the same for all options, i.e., 1. As previously indicated, this indicator should not be included in the analysis since it does not provide any differentiation between options as indicated in EC's Guidelines (section 2.5).	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				- Stream Length Removed: According to Table 4.3, the stream length removed ranges from 0 m to 9.2 km. The following suggested scale would be more appropriate in reflecting the values indicated in Table 4.3 in order to provide a better differentiation between options. Based on the suggested scale, the indicator values would then be 1, 2, 2, 4, 5 and 6 instead of 2, 3, 3, 4, 4 and 6. Value Proposed by Proponent Suggested by EC 6(best) None < 2 km 5 0 – 3 km 2 - 3.5 km 4 3 – 6 km 3.5 – 5 km 3 6 – 9 km 5 – 6.5 km 2 9 – 12 km 6.5 – 8 km 1(worst) > 12 km > 8 km - Loss of waterbodies: According to Table 4.3, the area of waterbodies lost ranges from 73.3 ha to 148.2 ha but the scale values range from 0 to greater than 500 ha using different increments. The proponent should explain why different increments are used. The proposed scale by the proponent is inadequate and is not reflecting the indicator values determined for each TMF option. Also, this indicator should not include wetlands which should be considered separately. It is important to differentiate water bodies that are frequented by fish and wetlands.	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				The suggested following scale would be more appropriate and would provide a better differentiation between options. Based on the suggested scale, the indicator values would then be 3, 2, 2, 5, 4, and 5 instead of 4, 3, 3, 4, 4 and 4. Value Proposed by Proponent Suggested by EC 6(best) None < 70 ha 5 0 - 50 ha 70 – 90 ha 4 50 - 125 ha 90 – 110 ha 3 125 - 250 ha 110 – 130 ha 2 250 - 500 ha 130 - 150 ha 1(worst) > 500 ha >150 ha - Flow Change: For the indicators that are evaluated qualitatively, scales should be explained, described and justified. For instance, the scale defined for this indicator is based on a % change in the flow. The proponent should explain and describe how the flow change was calculated. As it is, there is no means for an external evaluator to assess the adequacy of the information provided. The proponent is requested to revisit all scales and re-evaluate the scores for each alternative accordingly. The conclusion should be updated based on the new scores.	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Appendix U3, Tailings Management Facility (TMF) Alternatives Assessment Report – Knight Piesold Consultants; Section 3.2 Summary of TMF Options, Table 4.3; Appendix A – Description of Indicators The proponent should provide more in depth description of the indicators that are considered in the analysis. As it stands, these descriptions are too general and not specific to the project. Since the description of each TMF options is weak in providing detailed information (section 2.2) based on site specificity, it is impossible for an external reviewer to have a good understanding of how these indicators are reflected and take into account site specificity. The proponent needs to provide in the document a thorough description of the justification for all the values in Table 4.3. Here are some weaknesses that should be addressed for the following indicators: Environmental Indicators: - Number of Watersheds: Maps should be provided showing boundaries of the watersheds impacted by each option. Table should also be included comparing each option in terms of number of watersheds and area impacted. - Stream Length Removed: Maps should be provided showing streams impacted. A table listing each stream and their respective length should also be provided.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada's comments. As noted in the response to Comment #703 it is IAMGOLD's intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				- Loss of Waterbodies: Maps should be provided showing each waterbody impacted. A table listing each waterbody and their respective area impacted should also be provided for each option. - Requires Surface Water Realignment: Maps should be provided showing what the surface water realignment needs are. These water realignments should be described in more detail for each option. - Flow Change: Maps should be included showing the area affected by the flow change. Detailed information should also be provided on how these flow changes were calculated in evaluating this indicator. - Change in Receiving Water Quality: This indicator needs to be better described. The proponent should also explain how this indicator was evaluated for each option. - Potential for Seepage: This indicator needs to be better described. The proponent should also explain how this indicator was evaluated for each option. - Potential for Negative Influence on Surface Water Quality from Groundwater Seepage: This indicator needs to be better described. The proponent should also explain how this indicator was evaluated for each option. - Loss of Fish Bearing Water: The proponent indicates that "The expected quality and quantity of fish habitat potentially lost under the TMF options was used to assign	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				relative scores as a measure of the impact of each option for this indicator". The quantity and quality of fish habitat must be described and assessed for each option and not be assessed based on expectation. The proponent must conduct field studies and characterize the site accordingly. - Adjacent Fish Ecology: Same comment as for the previous indicator. In addition, this indicator should not be included in the analysis since it does not provide a differentiation between options as indicated in EC's Guidelines (section 2.5). This indicator should be redefined to better consider the specifics of the site for each option. - Habitat of Species of Special Concern Altered/Lost: The proponent must better assess and describe the population associated for each of the identified species. The results of the study conducted by Golder (2012) must be summarized as part of the alternative assessment report and included in the analysis. Assessing this indicator based only on habitat lost is insufficient. - Total Moose Winter Habitat Altered/Lost and Total Moose Aquatic Feeding Habitat Altered/Lost: These two indicators are described and taken into account in the analysis but do not have any bearing since there is no habitat associated. The analysis should not include indicators that do not provide differentiation between options as indicated in EC's Guidelines (section 2.5). - Total Vegetative Habitat Altered/Lost: The proponent should identify, assess and describe the plant communities that are across the mine site and justify why	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				this indicator is important and relevant. As presented, there is no indication that this indicator is justified for inclusion in the analysis. - Total Wetland Area Removed: The proponent must provide a better description of the wetlands impacted in terms of quality and better justify its importance. Assessing the impacts on wetlands based on area removed is not adequate. The proponent should describe the wildlife diversity that is referred to in the description of this indicator. - Post-Closure Chemical Stability: This indicator needs better assessment since a certain amount of PAG material will be generated. It is difficult to envisage that water quality will not be impacted. As it stands, the same indicator values have been assigned to each TMF. So, if after reconsideration the indicator values remain the same for all TMF options, the analysis should exclude this indicator since it does not provide differentiation between options as indicated in EC's Guidelines (section 2.5). - Post-Closure Flow Change: Maps should be included showing the area affected by the flow change. Detailed information should also be provided on how these flow changes were calculated in evaluating this indicator. Socio-economic Indicators: The socio-economic account includes seven indicators and among them, six indicators have the same values for all 6 TMF options considered. As already mentioned,	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				indicators that do not differentiate alternatives should not be included in the analysis as per EC's Guidelines (section 2.5). Furthermore, the assessment of this account is weak since it does not take into consideration any impacts that the project may have on the Aboriginal communities and other land users. The only remaining indicator i.e., "Proximity to Existing Permanent or Temporary Residences" is not providing an adequate assessment of the project impacts on the residents. The proponent will need to revisit this assessment and the choice of indicators in order to take into account the impacts of the project on the communities impacted. Furthermore, the proponent will need to take into account the comments provided by these communities and reflect them in the analysis. - Proximity to Existing Permanent or Temporary Residences: The justification for including this indicator is weak and needs to be described in more detail. As presently described, it is difficult to assess and understand the importance of the impacts that the project may have on approximately 5 residences located 3 km away from the site considering that some of them are trapper cabins, temporary camp sites, and seasonal residences. The proponent should indicate the numbers of trapper cabins, camps sites, seasonal and permanent residences which were assessed for this indicator. Maps should be provided indicating the location of the residences that were considered in the assessment. Technical Indicators:	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				- Maximum Embankment Height and Average Embankment Height: The proponent needs to better describe and justify the use of these two indicators which seem to take into account the same reality. Perhaps the use of one indicator taking into account both would be more appropriate. - Expansion Capacity: The expansion capacity storage indicator should assess the achievable maximum capacity to store additional tailings beyond the proposed amount for the project. The values of the indicators given for each TMF option should be in terms of additional tonnage or volume. As presented, the assessment of the expansion capacity of each TMF options is subjective and does not provide an adequate assessment. - Site Preparation: The description and justification for the inclusion of this indicator are weak and need to be better described. What does site preparation mean and include? The proponent should describe the level of complexity that is referred to. Is the complexity only related to construction of haul roads and runoff collection systems? These particular works (roads and ditches) are usually not complex. What is the basis upon which the qualitative measures were assigned to each TMF option? - Pumping Requirements: The description of this indicator is too vague. This indicator should also describe the number of pumps needed and other characteristics related to the pumping system that will be required for each TMF option.	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				- Ease of Operation during Start-up: The description of this indicator is weak and vague. Details on how this indicator was evaluated for each of the TMF options need to be provided. - Final Embankment Volume: The description of this indicator is weak and vague. Details on how this indicator was evaluated for each of the TMF options need to be provided. - Geotechnical Conditions: The assessment of the geotechnical conditions is weak, vague and too general. Descriptions should be more specific and provide more details for each of the TMF options. For instance, description of competent and non-competent bedrock should be provided with their respective importance in term of length or percentage. - Land Area and Title Holders: The assessment of this indicator is the same for all six TMF options. As previously indicated, indicators that do not contribute to differentiate alternatives should not be included in the analysis as per EC's Guidelines (section 2.5). - TMF Catchment Area: The description of this indicator is weak and needs further consideration. Maps should be provided showing those areas. - Ease of Water Management Including Polishing Pond: The description of this indicator is weak and needs better description and justification on how the qualitative	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				measures were determined. - Ease of Seepage Management: The description of this indicator is weak and needs better description and justification on how the qualitative measures were determined. - Monitoring and Maintenance Requirements: The description of this indicator is weak and needs better description and justification on how the qualitative measures were determined. - Consequence of Operational Error: The description of this indicator is weak and needs better description and justification on how the qualitative measures were determined. In addition this indicator should not be included as technical but rather in the socio-economic account. - Ease of Decommissioning and Closure: The description of this indicator is weak and needs better description and justification on how the qualitative measures were determined. - Post Closure Landform Stability: The description of this indicator is weak and needs better description and justification on how the qualitative measures were determined. Economic Indicators: The economic account includes several indicators for	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				which no detailed costs have been provided. Details of cost estimates must be provided as well as the cost for the fish habitat compensation plan to offset the loss of fish habitat resulting from the deposit of tailings in waters frequented by fish. EC requests that the proponent provide justification for the scoring of each indicator considered in the analysis.	
541	Email	08/07/2014	1) Denise Fell (Environment Canada)	1) Table 4.3 Tailings Management Facility Alternatives Assessment Summary of Indicator Values in Appendix U3 In Table 4.3, brief descriptions are provided for: 1. "Requirement for Surface Water Realignment", Environmental account 2. "Loss of Fish Bearing Water", Environmental account 3. "Recreation Access", Socio-Economic account 4. “Expansion Capacity”, Technical account 5. “Geotechnical Conditions”, Technical account However, the information provided is not sufficient to score the impacts following the Indicator Value Scales listed in Table 4.4. EC requests that the proponent provide additional qualitative information for each of the six alternatives with respect to the five indicators mentioned to the left.	IAMGOLD understands that as part of the MMER Schedule II regulatory amendment process, a standalone document is requested that addresses Environment Canada’s comments. As noted in the response to Comment #703 it is IAMGOLD’s intention to fully address and update the Assessment of Alternatives for Mine Waste disposal in a timely manner.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
542	Email	08/07/2014	1) Cindy Batista (Ministry of the Environment)	1) EAS-42 Section 7: Description of and Rationale for Alternatives, Section 7.3.9: Watercourse Realignments p. 7-26 This section states that watercourse realignments are under investigation and, in discussions with regulators, will be reviewed as engineering studies advance. Assessment of alternatives for the proposed Project components needs to be finalized in the EA document in order to adequately assess potential impacts and mitigation. Complete assessment of alternatives for watercourse re-alignment in-order to identify potential effects and mitigation, prior to submitting final EA document to the MOECC. Consult as appropriate with stakeholders, members of the public, Aboriginal communities and government agencies.	The Section 7.3.9 text has been revised to verify the assessment of alternatives is complete. The design may be optimized as engineering progresses. This optimization will not include any additional watercourse realignments, or changes to locations of those proposed. As a result, there is no change to significance of any of the alternatives. The Amended EIS / Final EA Report has been revised to include this information.
545	Email	08/11/2014	1) Ed Snucins (Ministry of the Environment)	1) MOE-SW04 Appendix J Water Quality, Water Quality Modeling Report 2.4 Modeled Parameters Modeled parameters did not include mercury. Watercourse re-alignments will result in flooding of land. There is high potential for existing elemental mercury to be converted to its bio-available form, methyl-mercury, leading to increases in the concentration of methyl-	Section 2.4 Modelled Parameters in Appendix J, Attachment II did not indicate that mercury was not modelled; rather, the text indicates that mercury was not included in the presentation of the results of the water quality predictions because concentrations, including mine site components, were below or very near the MDL. Given that the concentrations were below or very near the MDLs, the drainage from the mine site is not a tangible source of mercury and presenting simulated concentrations of mercury would not provide any value to the water quality effects

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				mercury in rivers, lakes and residing fish. The proponent should (1) define baseline conditions for water chemistry and fish tissue using advanced sampling and analytical protocols for low level total and methyl mercury according to guidance from MOECC Northern Region; and (2) model the potential impact of flooding on mercury levels in fish tissue (e.g. Johnson et al. 1991. Can. J. Fish Aquat. Sci. 48: 1468-1475) Also include evaluation of the potential for increased sulphate levels to influence mercury methylation.	assessment in this context. Inorganic mercury can be bound in terrestrial vegetation and organic-rich soils and can become mobilized in terrestrial areas that become flooded where reducing conditions develop sufficiently to result in the methylation of the mercury. However, as noted in the aquatic impact assessment with respect to the Côté Gold Project, potential effects associated with methyl mercury production due to flooding are expected to be very limited because currently the areas that will be flooded (i.e., Chester Lake and parts of the south arm of Bagsverd Lake) are small (i.e., less than 80 ha) and are inundated on a seasonal basis. Generally, any methyl mercury production associated with flooding of shallow areas, such as those proposed for the Côté Gold Project, is realized within 2 to 3 years of flooding and does not represent a long-term issue as observed at large reservoirs (Bodaly et. al, 1997; Canada-Manitoba Governments, 1987). Furthermore, the areas predicted to be flooded will form littoral shallow habitat that is expected to remain oxic and will thereby not create the anoxic conditions required for methyl mercury production. Therefore, the seasonal flooding of the areas of concern are not expected to significantly contribute to methyl mercury production upon development of the Project.The key issue with methyl mercury is the potential increase in mercury tissue concentrations of fish that reside in the lakes where flooding of terrestrial areas is expected causing restrictions in fish consumption rather than effects to the fish themselves. It is important to note that fish within the local area are currently restricted for

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					consumption due to regionally elevated mercury levels. Thus, if any small increases in methyl mercury occurred in fish tissues, these increases will not likely change the consumption restriction on the fish. More information on fish tissue concentrations are discussed in Appendix W (HEHRA) as they relate to the possible impacts associated with human consumption of fish.Although methyl mercury production is not expected to be a concern, IAMGOLD is committing to remove terrestrial vegetation within the small areas that are predicted to experience flooding prior to the construction of watercourse realignments (Section 10, Table 10-2); this commitment has been expanded to include the removal of shallow organic-rich soils in these small areas. The removal of the terrestrial vegetation and organic-rich soils in these areas will further reduce the potential for methyl mercury production (Windham-Meyers, 2009). Furthermore, low-level total mercury and methyl mercury have been added as parameters to the baseline water quality sampling and fish tissue monitoring as part of the overall monitoring commitments for the Côté Gold Project.Methyl mercury that is generated from inorganic mercury that is sequestered by terrestrial vegetation from the atmosphere typically occurs at very low total concentrations (i.e., nanograms per litre). The generation of methyl mercury depends upon the development of favourable geochemical conditions (i.e., sulphate reducing) to allow for sulphate reducing bacteria to transform the inorganic mercury to organic mercury. The rate of the microbial-induced methylation of the mercury depends on a number of factors

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					including: distribution and concentrations of inorganic mercury in biodegradable organic matter, geochemical conditions (pH, redox, temperature), presence of compounds that can complex with inorganic mercury (e.g., dissolved organic carbon and sulphide), and presence and activity of sulphate-reducing bacteria (Benoit et al., 2003). Uncertainties associated with the source term, geochemical conditions and microbial communities, compounded with uncertainties associated with modelling exposure pathways and bioaccumulation in fish, makes modelling the overall effect of potential methyl mercury production very challenging and carries a range of uncertainty that is likely to be significantly greater than the range of the predicted magnitudes. Therefore, modelling methyl mercury does not provide value in the context of an EA, and would not remove the need to follow through with the proposed mitigation and monitoring commitments that are discussed above.Additional information regarding methyl mercury production has been added in the Addendum to Appendix N (Aquatic Biology TSD).
545	Email	08/11/2014	1) Ed Snucins (Ministry of the Environment)	1) MOE-SW11 Chapter 5 – Project Description, 5.10.7 Watercourse Realignments, Chapter 9 – Description of Project Effects, 9.4.2.2 Operations Phase Hydrogeology, 9.5.2.2 Operations Phase Hydrology and Climate This section (5.10.7) discusses fish habitat compensation plan in support of federal regulations and authorizations.	It is acknowledged that a Permit to Take Water and supporting studies will be required for realignments and/or open pit dewatering. As per the hydrogeological baseline study report (Appendix H; Hydrogeology TSD), Attachment 1, groundwater inflow to the pit is anticipated to be a minor part of the total water balance of local lakes. Further, realignment channels will be designed with fish habitat and passage as a priority. Contingency and monitoring plans are described within the Amended EIS / Final EA Report, and further

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				These sections (9.4.2.2, 9.5.2.2) note: (a) 1m groundwater drawdown contour extends 1.4 km southwest of the open pit; and (b) Along a portion of Bagsverd Creek, average annual flow is predicted to decrease by 20% due to loss of watershed area from watercourse re-alignment and development of Tailings Management Facility. Watercourse re-alignments and other water-taking (e.g. open pit dewatering) will require provincial Permit to Take Water (PTTW). Considerations include minimum flow and water level requirements to protect natural function of aquatic ecosystems and other uses of affected watercourses. Quantify minimum water level and flow required to maintain natural function and avoid interference with other uses of lakes, streams and wetlands potentially affected by diversion and water-taking (e.g. open pit dewatering). A monitoring and contingency plan may be needed to ensure maintenance of water level and flow.	monitoring plans will be developed if identified during permitting.
545	Email	08/11/2014	1) Ed Snucins (Ministry of the Environment)	1) MOE-SW17 Appendix J – Water Quality, Water Quality Baseline Report 4.3.2 Water Column Profiles Lake profiles were sampled at 1 m intervals except lakes deeper than 40 m were profiled at 3 m intervals. Profile data collected at 3 m intervals provides coarser resolution of thermocline depths than profile data collected at 1 m intervals. This could influence the	Lake stations where profile measurements are collected every 3 m were located in Dividing Lake and Mesomikenda Lake. The basin in Dividing Lake that was profiled is about 40 m in depth. The basins in Mesomikenda Lake that were profiled are about 40 to 70 m in depth. Profile measurements collected every 3 m across 40 to 70 m of water column depth provides sufficient data to develop trends to derive the thermocline depths. Furthermore, the development of the Côté Gold Project is not expected to effect lake trout habitat through alterations to dissolved oxygen

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				calculation of the lake trout habitat criterion of Mean Volume Weighted Hypolimnetic Dissolved Oxygen. Sampling at 3 m intervals in lakes deeper than 40 m may be acceptable if the coarser sampling begins more than 5 m below the top of the hypolimnion (Quinlan et al. 2005).	levels in Mesomikenda Lake or Dividing Lake. Therefore, the profile data collected is considered to be sufficient to characterize the water column profile for the purposes of the EA. Nonetheless, the concern is noted and future baseline sampling campaigns will collect measurements at key lake stations at 1 m intervals in Mesomikenda Lake and Dividing Lake from surface to the depth of 5 m below the top of the hypolimnion to support future permitting, as required.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-13, 2nd Bullet Please be more specific, what percentage of water will be recycled? This is important because when cyanide is released into the environment, it negatively impacts fish populations.	IAMGOLD has developed a closed-loop process water use plan to maximize recycling of water on-site and minimize the amount of freshwater required for operations, as well as minimizing the amount of water pumped to the TMF.In Section 5.10.2, it is indicated that the majority of process water will be derived from the open pit, runoff, seepage collection to the mine water pond and supernatant from the TMF pond as required.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-13, List of activities carried out during operations phase During ore processing, how will the effects of cyanidation be mitigated? What are the detailed precautionary plans? Questions include: cyanide is extremely toxic to birds and mammals that are drawn to cyanide solution collection ponds as a source of water. How will this be mitigated?; Ponds can leak or overflow, posing threats to underground drinking water supplies and wildlife in lakes and streams, (area is known to have groundwater infiltration) - How will this be	Water quality mitigation measures are shown in Table 10-1 of the EA report. In summary, the vast majority of cyanide will be destroyed prior to the discharge to the TMF.

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				mitigated?; Fish and benthic macroinvertebrate are extremely sensitive to low cyanide concentrations - how will this be mitigated?	
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-39, 5th Paragraph Please provide more specific information regarding offsetting measures for fish habitat.	This information is contained in the body of the EA report, Section 9.9, and in Appendix N (Aquatic Biology TSD). In summary, IAMGOLD will offset the loss of lotic and lentic habitat to maintain the existing commercial, recreation and aboriginal fisheries.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Cumulative impacts to fisheries downstream in Dividing Lake and the Mollie River do not seem to be discussed. Please address.	No adverse effects on fisheries are expected in Dividing Lake and the downstream reaches of the Mollie River system (see Section 9.9 and Chapter 11).
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) It is not clear how fisheries and data population (fish/ha) was derived. Was captured tag recapture program utilized? It is known that the North East region average walleye population is 4 fish/ha, not the 6 to 14 fish indicated in the report.	A mark-recapture program was utilized to determine fish/ha (see Appendix N, Aquatic Biology TSD, Sections 2.4.3 and 6.2.2).
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Throughout the report, compensation plans are discussed for fish and wildlife, forestry, loss of lands and species at risk. Unfortunately, nowhere in the plan are there any detail plans to review, nor are there any timelines of when these plans will be implemented. Please address.	Compensation plans are only proposed to offset the loss of aquatic habitat (see Chapters 9, 10 and 11). Compensation plans are not foreseen for terrestrial wildlife and vegetation.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-2, 2nd Paragraph With the flow changes to the Mollie River, how will the Dividing Lake Walleye that utilize this flow be addressed?	Changes in flow in Dividing lake will be of a very low magnitude (conservatively calculated to be max. 4%, see Table 4-3 in the Hydrology TSD - Appendix I), such that no effects on Walleye are expected.

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537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-19, 1st Paragraph Walleye are found within the water body complexes stated in the executive summary and are also found by your studies. Additionally, Walleye are known to spawn in this area and these lakes are made up of Walleye complexes. What were your survey methods and timing of year? What is the experience of the crew surveying? Which ponds were surveyed?	The baseline study findings are summarized in Section 6.4.8 of the EA report. Full baseline results including methods, dates and locations are described in Appendix N (Aquatic Biology TSD), Appendix C. All data collection was carried out by well-experienced and qualified staff.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Mollie River watershed has a very good Walleye population, yet it is not shown on your tables. Please clarify.	Walleye were collected in the Mollie River Watershed and were captured in Côté Lake, Upper, Middle and Lower Three Duck lakes but not in the Mollie River itself. Tables 3.1 and 6.1 in Appendix N (Aquatic Biology TSD) shows walleye collected in Upper, Middle and Lower Three Ducks lakes but erroneously does not show that they have also been collected in Côté Lake. The tables have been corrected (see Table 6.1 in the Aquatic Addendum and Table 3.1 in the revised Aquatic Biology TSD). Walleye are shown as present in Côté Lake, Upper, Middle and Lower Three Duck lakes within the Mollie River watershed in Figure 6.6 of Appendix N.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-3, 2nd Paragraph The construction of the TMF will affect the flows of two streams that flow into Mesomikenda Lake and have the potential to affect potential Northern Pike spawning habitat. What studies, if any, were done in these potential areas to identify habitat? MNRF staff has noted spawning behaviour in these areas.	Baseline data for hydrology is summarized in Section 6.3.6, water quality in Section 6.3.7, aquatic biology in Section 6.4.8. The effects are described in Chapter 9 and the impacts assessed in Chapter 11. Appendix I (Hydrology TSD), Appendix J (Water Quality TSD) and Appendix N (Aquatic Biology TSD) fully describe the studies carried out on hydrology, water quality and aquatic biology respectively.

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537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page ES-16, 1st Paragraph With the changing of groundwater flow, what studies have been completed to see the impact of upwelling in Mesomikenda Lake? These upwelling's are very important for Lake Trout spawning within the lake.	As described in Section 9.4 of the EA report the potential drawdown around the open pit has a very limited extent (see Figure 9-29). The 1 m drawdown contour is predicted to extend farthest at the southwest of the open pit (approximately 1.4 km). No effects are expected beyond the drawdown cone. Therefore it is not foreseen that upwelling in Mesomikenda Lake will be affected by the Project. Full details with regards to the hydrogeological modelling are provided in Appendix H.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Table ES-2, Water Supply Section There is no discussion of impacts to hydro-electric generation. Mesomikenda Lake is a Hydro Reservoir and is utilized in winter for Hydro production. Additionally, what are the effects on Lake Trout?	IAMGOLD understands the requirement to operate the Project such that is does not interfere with existing uses (see Section 9.5.3 of the EA report). Effects on aquatic species are described in Section 9.9 and Appendix N (Water Quality TSD).
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Table ES-2, Water Discharge Section There is no mention of source water protection and its impacts by discharging into Mesomikenda Lake. Also, the effects on Lake Trout are not explored. Please clarify.	As described in Section 9.10 no adverse effects on the Timmins drinking water supply are expected. Effects on aquatic species are described in Section 9.9 and Appendix N (Water Quality TSD).
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Bathymetric work presented to MNRF in the past had process errors, have these errors been corrected? This area is flat and there are no dramatic drop-offs in these lakes with the exception of Mesomikenda Lake, a cold water lake with known Lake Trout species.	The comment has been noted. IAMGOLD has confidence that the bathymetric data used is of high quality and suitable to support the EA report.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Figure 5-1 Conditions regarding fording and in water work:	The comment has been noted. No in water works will be carried out for the proposed transmission line, and IAMGOLD will contact the MNRF prior to in water work

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				1) Before any work is conducted around the Mattagami River tributaries (i.e. Grassy and Mountjoy Rivers) which contain Lake Sturgeon, please contact a Timmins District Management Biologist. For this watershed, no in water work until after July 15. 2) Additionally, no in water work or fording will be conducted (for the entire project area) until further consultation with a Timmins District Management Biologist. For all other water courses outside of the Mattagami River watershed - no in water work would be conducted until after June 20.	at the Project site, or for work around the Mattagami river tributaries which contain Lake Sturgeon. Timing windows established by the MNRF will be respected for all in water work. If timing windows cannot be met, IAMGOLD will contact the MNRF and DFO for advice.
537	Email	09/01/2014	1) Korey Walker (Ministry of Natural Resources)	1) Page 9-48, Sec 9.9.1 If the sub watersheds are planned to be restored to pre-mining conditions, will the proposed compensatory aquatic habitat be destroyed? Will the original channels be able to sustain the original biodiversity as before with little or no maintenance?	The two main watercourse realignments will remain in place post-closure and the previously established habitat will mainly remain functional. Once the open pit, which overprints a large amount of lotic habitat, is fully flooded the original subwatersheds will be re-established and the new lake will become productive aquatic habitat.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AP(2)-3, Ecosystem Topic: Socio-economic Environment Current Use of Lands and Resources for Traditional Purposes ES-55, ES-75, Appendix Z; Appendix Z Comment #499 On page ES-55 of the Amended EIS Executive Summary (Table ES-3) IAMGOLD states the Project may have "Potential effects on fishing during the construction phase of the Project include loss of traditional fishing areas,	a) Tables ES-3 to ES-6 in the Executive Summary contain impact assessment matrices for construction, operations, closure and post-closure phases of the Project. The information contained in the full body of the report, including Comment Responses (Appendix Z), indicate that there were no identified commercial or Aboriginal fisheries within the Project area. There are bait harvest areas which would overlap with the Project area, however, these are not considered to be commercial fisheries. b) Potential effects on baitfish

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				changes to access to fishing areas and changes to the abundance and distribution of fish due to construction activities." On page ES-75 of the Amended EIS Executive Summary (Table ES-3) IAMGOLD identifies that the Project may have a negative effect on commercial fisheries income (baitfish harvesters). The response provided in Appendix Z (c) of the Amended EIS indicates that IAMGOLD does not anticipate any effects to fisheries as there are no commercial or Aboriginal fisheries in the area. Section 9.1.1 of the EIS Guidelines requires an examination of changes to the distribution, populations, behaviour, and availability of fish including current use by Aboriginal peoples. a) Explain the apparent discrepancy between Appendix Z of the Amended EIS and the Amended EIS Executive Summary. b) Identify the impacts on known baitfish harvesting areas that will be impacted by the Project. Clarify whether the baitfish harvesting is being undertaken by Aboriginal and/or non-Aboriginal groups. c) Describe methods used to identify and validate Aboriginal fisheries activities in the Regional Study Area and identify the areas where impacts may occur.	harvesting areas are identified in Section 11, Impact Assessment, Table 11-3. No specific mitigation measures related to effects on bait harvesting areas were identified, nor are they required, since there are no expected significant impacts on this indicator. As noted in Section 3.1.6.2 of the Land and Resource Use TSD (Appendix O), other bait harvest blocks could be allocated to interested bait fishers and potential effects are limited due to the mitigation measures incorporated in the water quality and aquatic biology disciplines. Baitfish harvesting and/or commercial fisheries were not identified in the Traditional Knowledge / Traditional Land Use Study undertaken by Wabun Tribal Council. c) Information on fisheries, including Aboriginal fisheries, was determined through consultation with outfitters, the public and Aboriginal groups as well as discussions with the Ministry of Natural Resources and Forestry. As noted above, the Traditional Knowledge / Traditional Land Use Study undertaken by Wabun Tribal Council did not identify any commercial Aboriginal fisheries.

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657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AP(2)-7, (New), Ecosystem Topic: Current Use of Lands and Resources for Traditional Purposes Chapter 4; Appendix P The assessment of effects on the current use of lands and resources for traditional purposes in the Amended EIS appears to focus on effects related to the project footprint and is specific to Mattagami First Nation and Flying Post First Nation. The assessment does not clearly articulate steps taken to determine potential effects of the Project on Mattagami First Nation and Flying Post First Nation's current use of lands and resources for traditional purposes or cultural and historic sites outside of the project footprint. The assessment does not clearly articulate potential effects of the Project on the current use of lands and resources for traditional purposes or cultural and historic sites of other Aboriginal groups including the Métis Nation of Ontario and Brunswick House First Nation. It is also unclear if the secondary information described in relation to Métis peoples was assessed to determine potential impacts of the Project on their current use of lands and resources for traditional purposes or if efforts were made to substantiate this information with the Métis Nation of Ontario. The Amended EIS identifies other Aboriginal groups that expressed an interest in the Project (Serpent River First Nation, M'Chigeeng First Nation and Abitibiwinni First Nation). It is unclear if these interests have been determined or factored into the assessment of potential	a) The Traditional Land and Resource Use TSD (Appendix P) contains the results of the Traditional Knowledge / Traditional Land Use study undertaken by Wabun Tribal Council on behalf of their communities, which include Mattagami First Nation, Flying Post First Nation and Brunswick House First Nation. There were no potential effects identified of the Project on the current use of lands and resources for traditional purposes and potential cultural and historic sites for Brunswick House First Nation. Information about the potential for the Project to affect Metis Nation of Ontario's current use of lands and resources for traditional purposes, as well as potential effects on any cultural and historic sites, was not available for inclusion in the Amended EIS / Final EA Report. IAMGOLD provided funding support to the Métis Nation of Ontario (MNO) for the completion of a TK / TLU study and provided a deadline of September 1, 2014 for submission to ensure that the study could be incorporated into the EA. IAMGOLD is committed to building and maintaining a strong relationship with potentially affected Aboriginal groups. As part of that commitment, IAMGOLD is negotiating impact benefit agreements with potentially affected First Nations (Mattagami First Nation and Flying Post First Nation) and the Metis Nation of Ontario - Region 3. This document is not meant to be prejudicial to those negotiations. Should additional information become available regarding Aboriginal land and resource use for traditional purposes, IAMGOLD will consider this in consultation with Aboriginal groups. b) IAMGOLD has shared Project information with Serpent River First

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				effects associated with the Project. Sections 3.3, 3.4.2, 7.1, 9.2 and 10.1.1 of the EIS Guidelines require IAMGOLD to apply traditional knowledge and input from Aboriginal groups that may be affected by the Project. Section 10.2 requires the EIS to include a full description of the potential adverse impacts of the Project on the ability of Aboriginal peoples to exercise these potential or established Aboriginal and Treaty rights and related interests. Section 11 requires mitigation measures specific to each environmental effect to be identified and an assessment of the effectiveness of the proposed mitigation measures to be completed. Provide additional information for the assessment of effects on the current use of lands and resources for traditional purposes as well as potential effects on cultural or historic sites, including: a) A revised baseline characterization and assessment of the potential effects of the Project on the current use of lands and resources for traditional purposes and potential cultural and historic sites for Mattagami First Nation, Flying Post First Nation, Brunswick House First Nation and the Métis Nation of Ontario. b) Incorporate into the effects assessment potential interests or concerns of Serpent River First Nation, M’Cigeeng First Nation and Abitibiwinni First Nation to the extent that these are available. c) Describe how the current use of lands and resources for	Nation, M'Chigeeng First Nation and Abitibiwinni First Nation. In 2013, it was noted that several members of M'Chigeeng First Nation use the territory close the proposed Project location and believe that a Project of the size of the proposed Project could affect hunting and fishing rights as per the Robinson Huron Treaty. No potential significant adverse environmental effects were identified that would impact the rights of these communities. As such, no additional mitigations or management of effects are required beyond what has already been included in the Amended EIS / Final EA Report. c) The traditional study area contained within the TK / TLU study conducted by a consultant selected by the Wabun Tribal Council extends beyond the Project footprint and was developed by the Tribal Council's consultant. No rationale was provided for the study area selection and it is IAMGOLD's understanding that this study area was accepted by Wabun Tribal Council and is reflective of the First Nations' land use. d) Please see response to Comment #F2.

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				traditional purposes, and cultural and historic sites, may be affected outside the project footprint. Describe efforts made to substantiate this assessment with potentially impacted Aboriginal Groups. d) As applicable, propose any mitigation and follow-up measures in relation to s5(1)(c) of CEAA 2012 that reflect the potential interests of the seven potentially affected Aboriginal groups identified in the EIS Guidelines. As applicable, update the mitigation and/or monitoring aspects of the follow-up program to the Commitment Summary Table. In revising the assessment in consideration of s5(1)(c) of CEAA 2012, consider: - Use of lands and resource for traditional purposes during decommissioning, site restoration and abandonment; - the current use of lands and resources for traditional purposes and potential cultural and historic sites for Brunswick House First Nation; - potential impacts on key plant and wildlife species important to Métis people as referenced in the Métis reports referenced in the Amended EIS; - effects on the current use of lands and resources for traditional purposes (hunting, fishing, gathering and trapping) and cultural and historic sites for Mattagami and Flying Post First Nations within the Sensitive Areas	

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				labelled A through F; - effects on the Biscostasing Lake, Mattagami First Nation and 4M canoe portage trails; - effects associated with the transmission line alignments; and - changes to the environment at the local and regional study area scale including access restrictions, sensory disturbances such as noise, changes to air quality, changes to water quality and quantity or changes to wildlife, plant, fish or other biophysical resources that Aboriginal groups value.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AM(2) –1, (New), Ecosystem Topic: Accidents and Malfunctions 13.0; Appendix X Chapter 13 and Appendix X of the Amended EIS does not include a detailed description of the geographic extent to which Aboriginal peoples' current use of lands and resources for traditional purposes, cultural and heritage sites, fish habitat, migratory bird habitat or the critical habitat for species at risk could be impacted by a potential accident or malfunction. Section 7.1.2 of the EIS Guidelines requires an identification of the potential consequences of accidents and malfunctions including the environmental effects. This includes identifying the geographical and temporal	It should be noted that the accidents and malfunctions described in Chapter 13 are not anticipated to occur and the effects of these accidents and malfunctions are therefore not assessed in the same fashion as the effects of 'regular' Project activities.a) In Sections 13.2._.1 the potential environmental concerns are described including the geographic extent. It is assumed that all lands surrounding the Project site are used by First Nations, therefore all described environmental concerns associated with an accident or a malfunction would consequently affect First Nations.b) Potential environmental concerns are described in the following Sections:•13.2.7.1 - TMF Dam Failure•13.2.13.1 - Mine Water Pond•13.2.1.1 - Open Pit Slope Failure•13.2.15.1 - Retention Dam Failure•13.2.14.1 - Watercourse Realignment Failure•13.2.2.1 - MRA / Low-Grade Ore Stockpile FailuresAs discussed with the CEA

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				boundaries. a) Provide additional information on potential environmental effects (geographic extent) of an accident or malfunction on Aboriginal people's current use of lands and resources for traditional purposes, cultural and heritage sites, fish habitat, migratory bird habitat or the critical habitat for species at risk. b) In revising the assessment, consider impacts and pathways associated with failure of a(n): - TMF dam - mine water pond - open pit slope - retention dam - watercourse realignment - rock stockpile slope	Agency on March 31, 2015, Table to Comment #F17 (see attached) has been prepared showing the linkage between the environmental assessment indicators and potential worst case scenario accidents / malfunctions of the aforementioned facilities.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AM(2) -2, (New), Ecosystem Topic: Accidents and Malfunctions 13.0; Appendix X Chapter 13 and Appendix X of the Amended EIS does not identify specific mitigation measures or design features that will be implemented to lower the likelihood of a	In line with Section 7.1.2 of the EIS Guidelines 'Safeguards' for each accident and malfunction described in Chapter 13 are provided.a) As described in Section 13.2.10.2 the design and operations safeguards included in the design and operation of the tailing pipelines includes pressure sensors on the automatic shutdown system along the pipeline and the flow transmitters at the ore processing plant and the Tailings

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				tailings pipeline spill impacting fish habitat in areas where the tailings pipeline crosses the creeks that feed into Bagsverd Lake Section 11.1.1 of the EIS Guidelines requires a description of mitigation measures that are specific to each environmental effect identified in section 10.1. a) Provide additional information on any mitigation measures that will be implemented to protect fish habitat from effluent discharge in areas where the tailings pipeline crosses creeks. If no additional mitigation measures are required, provide a detailed justification.	Management Facility (TMF) tailings receiving point. The tailings pipeline will also be visually inspected at least once or twice per working shift, to detect any cracks or smaller leaks that may not be picked up by the sensors. Leaks can be prevented or minimized through early detection. Incidental observations during operations will immediately notify any observed damage if detected. In addition, several spill collections ponds will be established in low areas along the tailings pipeline.With these safeguards in place is it considered highly unlikely that tailings will be released to the environment. It is therefore not clear on what grounds the CEA Agency is requesting additional information on mitigation measures.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-4, Ecosystem Topic: Water Quality EIS Report, Section 11.2.1, Table 11-3 Water Quality Technical Support Document; Appendix Z Comment #449 The response to comment #449 (SW1-4) does not address concerns associated with the potential release of ammonia and nitrate from the use of ammonium nitrate/fuel oil (ANFO) explosives during the construction phase. Section 10.1.2 of the EIS Guidelines requires any changes that may be caused by the Project on the environment (including water) to be described in the EIS. a) Revise the predictions of changes to water quality to reflect the release of ammonia and nitrate from the use of	a) It should be noted that Comment #449 does not mention any request to provide additional information on the potential water quality effects due to the release of ammonia and nitrate from use of ammonium nitrate / fuel oil explosives; rather, the comment specifically mentions potential water quality effects due to erosion during the construction phase. As such, the response to Comment #449 was intended to address the actual comment provided and not specifically the potential effects due to dissolution of residual explosives.The water quality effects during the construction phase were evaluated qualitatively, while the effects of the operations and post-closure phases were evaluated based on the results of predictive water quality modeling. For the operations phase, the water quality predictions conservatively assume the ultimate extent of on-site facilities and account for contact water (that

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				ANFO explosives during the construction phase, or provide a rationale for how the release of ammonia and nitrate from the use of ANFO explosives during the construction phase will not affect water quality. b) Provide any revised or additional mitigation measures which may be put into place, to account for changes to water quality from the release of ammonia and nitrate from the use of ANFO explosives during the construction phase. Indicate which mitigation measures are 'key' to avoiding significant adverse environmental s5 effects under CEAA 2012. c) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to water quality that are described in (a), after applying the mitigation measures described in (b). d) As required, identify follow-up and monitoring measures. e) As required, update the relevant aspects of the Commitment Summary Table.	contains ammonia and nitrate from the dissolution of residual explosives) from the fully-developed mine rock area (MRA), low-grade ore stockpile and open pit. Under this conservative scenario, no significant effects to surface water quality are predicted. During the construction phase, Project components such as the open pit, low-grade ore stockpile and mine rock area (MRA) are not fully developed and are in the preliminary stages of development. Blasting activities during the construction phase will be needed to cut a channel through bedrock as part of the development of the watercourse realignments; this is the only blasting activity that will not occur during the operations phase. Five watercourse realignments are planned during the construction phase, but the quantity of rock that will require blasting is small relative to the operation phase. Because no significant effects with respect to residual explosives are predicted during the operations phase for the ultimate extent of the MRA, low-grade ore stockpile and open pit, no significant effects due to dissolution of residual explosives are predicted for the construction phase.b) As listed in Chapter 10, Table 10-1, mitigation measures were identified for potential influence of explosives residuals on the receiving environment water quality during operations; these mitigation measures are also applicable to the construction phase. Best management practices will be implemented to reduce the blast waste rate and residual explosives available for contact with water. In addition, the best management practices referred to in Table 10-1 include the collection and treatment of contact water during the construction of the

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					watercourse realignments (i.e., pumping of water that collects in the realignment into a management area on site), as required; this will be possible, as water will not be flowing through the realignments until construction is complete and any ponded water can be managed prior to the ends of the realignments (inflows and outflows) being opened. c) No significant effects with respect to residual explosives are predicted, based on the response to (a).d) Monitoring commitments are unchanged, based on the responses to (a) through (c). For reference, monitoring commitments are provided in Appendix Y and will include analysis of nitrate, total ammonia, and parameters to calculate un-ionized ammonia.e) Commitments are unchanged, based on the responses to (a) through (c). For reference, commitments are provided in Appendix Y.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-6, Ecosystem Topic: Water Quality Water Quality Technical Support Document (TSD), Attachment II Water Quality Modelling Report The response to comment #451c (SW1-6c) identifies that the first 20 weeks of humidity cell testing must be incorporated in order to model short-term loading rates and this has not been completed. The response to comment #451d (SW1-6d) identifies that that aluminum and manganese exhibited increased release rates in some humidity cells and no explanation was provided. It is important to understand the sources of these metals, in order to predict the effects of the project	a) The response to Comment #451c (SW1-6c) did not state that the data from the first 20 weeks of humidity cell testing was needed to model the short-term loading rates; rather the response stated that the use of the data collected during the first 20 weeks would perhaps be better applied to simulate the mass release rates from the mine rock during the early stages of operations, when the mine rock pile is smaller and the water-rock interactions with freshly oxidized materials would be proportionally greater. This being said, the loading rates from humidity cells associated with Weeks 0 to 20 can be influenced by pre-existing oxidation products that have built-up over time during storage of the rock core, which would inevitably get incorporated into the sample as part of the sample preparation

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				on water quality, and subsequently on fish and fish habitat. Section 9.1.2 of the EIS Guidelines requires ARD/ML prediction information to predict ARD/ML effects on water quality and to determine effective mitigation measures. a) Incorporate the first 20 weeks of the humidity cell tests into predicted loadings, with weighting based on portion of period of time being assessed, or clearly explain the uncertainty associated with the environmental effects predictions if these first 20 weeks are not incorporated. b) Clearly explain, with supporting evidence as necessary, the sources of aluminium, manganese, and any other metals that are found to have exhibited increased release rates in humidity cells c) Incorporate any new information that is obtained from the detailed review of mine rock humidity cell data in early 2015, as committed to in the response to comment #451d (SW1-6d). d) Revise the predictions of changes to water quality by incorporating new results obtained in (a), (b) and (c), or provide a justification for how these new results would not lead to changes to the predictions of water quality. e) Provide any revised or additional mitigation measures which may be put into place to account for revised predictions to water quality obtained in (d). Indicate which mitigation measures are 'key' to avoiding significant	process. Since the rock core collected for the Côté Gold Project was in storage for a long period of time prior to sample collection for the humidity cell test work, the flushing of the oxidation products that were pre-existing versus the oxidation products that are generated by the humidity cell test itself cannot be distinguished during the early stages of the test work. Because there is a high potential for some pre-existing oxidation products to be present in the rock core, there is a risk that using the early time humidity cell data would result in overestimating the mass loading rates since the rate of mass release would include the flushing of the oxidation products built-up prior to the test work. Therefore, by not incorporating the early time humidity cell data, the uncertainty associated with pre-existing oxidation products is removed from the water quality modelling. This is an additional reason for the selected approach for the water quality modelling, which was to conservatively account for the ultimate mine rock tonnages and ultimate open pit area at the site, and to incorporate humidity cell data that simulates the longer term, steady state conditions.b) Currently, release rates data for the humidity cells includes 110 weeks of monitoring results. With regards to aluminum, similar patterns of release have been observed for the tonalite, diorite breccia and magma mixing breccia rock samples (HC-1, 2, 3, 4, 5, 6, 7, 8, 11, 12). Original calculated release rates for aluminum were based upon data for weeks 20 to 34, which corresponded to a period of decreasing aluminum loading beginning at cell start up for these rock types. At approximately week 40, the rates began to increase

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				adverse environmental s5 effects under CEAA 2012. f) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to water quality that are described in (d), after applying the mitigation measures described in (e). g) As required, identify follow-up and monitoring measures. h) As required, update the relevant aspects of the Commitment Summary Table.	slightly until approximately week 60. Since week 60 (~50 weeks), the rates have been relatively constant, suggesting that long term steady state loading rates have been achieved. These patterns are due to initial flushing of accumulated weathering products, followed by the onset of natural weathering and slow dissolution of minerals such as feldspars within the sample. Manganese loading rates have decreased notably since week 90 in the two cells (HC-6 and 12) described previously. Rates are lower than those observed during weeks 20 to 34 and used for the water quality predictions. These decreases likely reflect the oxidation and dissolution of a minor manganese bearing phase within the rock.c) A detailed review of the humidity cell monitoring program (115 weeks of monitoring) was completed in February 2015. In comparison to the previous rates (used for source term calculations in the water quality model, July 2014), the updated rates for the cells were either constant and had decreased. The overall pattern for the cells is one of slowly decreasing release rates. Based on these observations, no update to the water quality model is warranted, as the results would be identical or better than those predicted previously.d) As described in (b) and (c), the humidity cell test results from early 2015 are consistent with results used in the water quality model. The loading rates used in the model are reasonable and conservative and re-modeling with new results would not change the effects prediction. e) No additional mitigation measures are applicable (i.e., outside of those presented in Appendix Y), based on the responses to (a), (b) and (c).f) Comment not relevant, based on the

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					responses to (a), (b) and (c). g) No additional follow-up and monitoring measures are necessary (i.e., outside of those presented in Appendix Y), based on the responses to (a), (b) and (c).h) No update to the commitment summary table is necessary, based on the responses to (a), (b) and (c).
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-7, Ecosystem Topic: Water Quality Water Quality Technical Support Document (TSD), Attachment II Water Quality Modelling Report; Appendix Z Comment #452 Additional information is needed to the response to comment #452c (SW1-7c), in order to verify that the composition of the humidity cell samples is representative of the range of the mine rock composition, including the 7% of the mine rock that is classified as "other lithologies". This is needed to assess ARD/ML potential of other lithologies, as per section 9.1.2 of the EIS Guidelines. Humidity cells with the upper 30% percentile of zinc concentrations are not provided. It is noted that if zinc loadings are underestimated, the effects assessment as required by Section 10.1.2 of the EIS Guidelines will be inaccurate. a) Provide similar plots to graphic 7-20 of Appendix E, showing cumulative distribution and humidity cell composition, for AP, MPA, Mod-NP, CO3-NP and copper for samples as a whole.	a) The requested plots are shown on Figures to Comment #F22-1 to #F22-5.b) The humidity cells in operation represent samples with a wide range of copper concentrations, including the highest copper concentration in the dataset (2800 mg/kg). Six of the 14 humidity cells represent samples with copper concentration in the upper 10% (>90th percentile, or approximately 200 mg/kg Cu) of the database. We consider this to be representative of the higher copper concentrations, and a conservative representation of the copper distribution within the Project mine rock.c) No revisions are required, based on the response to (b).d) Zinc concentrations are less than the average crustal value for approximately 90% of the samples tested. Only 19 of the 236 samples tested reported zinc values above 70 mg/kg (the average content of zinc in the crust). None of these 19 samples exceeded the 10X threshold used to screen for potentially elevated metal concentrations. Median and average zinc concentrations were approximately 1/3 and 1/2, respectively, of the average crustal zinc concentrations. Therefore, the zinc content of the Côté rock was considered to be low in zinc and not a concern. Humidity cells targeting zinc concentrations that were below or near the average crustal concentration were

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				b) Demonstrate that copper concentrations and copper loadings found in humidity cell samples, are representative of the range of the composition including the poorer quality material with higher copper concentrations. c) If copper concentrations are found to be underestimated by the humidity cell samples, update the estimates of concentrations and loadings using the most recent humidity cell data. d) Provide a discussion of the changes to water quality that would occur if zinc loadings are higher (for example, by 50%) than the estimates in the Amended EIS. e) Revise the predictions of changes to water quality by incorporating new results obtained in (c) and (d), or provide a justification for how these new results would not lead to changes to the predictions of water quality. f) Provide any revised or additional mitigation measures which may be put into place to account for revised predictions to water quality obtained in (e). Indicate which mitigation measures are 'key' to avoiding significant adverse environmental s5 effects under CEAA 2012. g) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to water quality that are described in (e), after applying the mitigation measures described in (f). h) As required, identify follow-up and monitoring	not considered to be of practical value. Humidity cell results have consistently reported loadings trending at or below the detection limit. e) As the source terms are unchanged or lower in the updated dataset, and no significant effects were predicted using the original dataset, modeling with the updated dataset results would not change the water quality effects prediction.f) No additional mitigation measures are required (i.e., outside of those provided in the EA Commitments Table; Appendix Y), based on the responses to (a) through (e).g) Comment not relevant, based on the responses to (a) through (e).h) No additional monitoring measures are needed (i.e., outside of those in Appendix Y), based on the responses to (a) through (e).i) No update to the commitment summary table is necessary, based on the responses to (a) through (e).

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				measures. i) As required, update the relevant aspects of the Commitment Summary Table.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-11, Ecosystem Topic: Water Quality Appendix J Attachment 2 - Water Quality Modelling Report January 31, 2014; Appendix Z Comment #456 The response to comment #456 (SW1-11) raises further questions about whether the concentrations of some contaminants, such as aluminium, will be controlled by mineral solubility limits. Further to the response to comment #451d (SW1-6d), it is particularly important to consider all sources of elevated aluminum. Section 9.1.2 of the EIS Guidelines indicates that ARD/ML prediction information will be used to predict water quality for effects assessment and to determine mitigation requirements for the Project. a) Evaluate the likelihood that metal and trace element concentrations in infiltration drainage will reach solubility limits, and identify the precipitating chemical species. b) Provide the solubility limits under predicted drainage chemistry conditions. c) Explain how these solubility limits will impact predicted	a) Solubility controls for metal and trace elements were not applied, as the mass is assumed to be conservatively transported from throughout the modelled system. The exception is aluminum for which the use of a conservative correction factor was applied to in part account for solubility controls in order to avoid considerably over-predicting aluminum concentrations. Because no form of solubility controls were applied in the water quality model for parameters other than aluminum, which is a conservative approach, an evaluation of the likelihood of concentrations of each metal and trace element reaching solubility limits does not provide any value to the EA. Aluminum solubility is largely controlled by pH and sulphate. An aluminum solubility limit that corresponds to amorphous aluminum hydroxide and hydroxysulphates is reached under conditions with pH values between 5 and 7.5 (Nordstrom and Ball 1986; Gunsinger et. al. 2006; Nordstrom 2011). Given the non-acid generating nature of the mine rock and tailings for the Project, it is highly likely that aluminum will reach solubility limits under the near-neutral site drainage conditions. b) To evaluate the solubility limits of aluminum under the predicted drainage chemistry conditions, the equilibrium geochemical speciation/mass transfer model PHREEQC was used to equilibrate the aluminum concentrations (predicted using Goldsim) for the Project

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				loadings. d) Provide a discussion of predicted changes to water quality, accounting for the impacts to predicted loadings described in (c). e) Provide a discussion of any additional mitigation measures which may be put into place, after accounting for the predicted loadings described in (c) and water quality changes described in (d). Indicate which mitigation measures are 'key' to avoiding significant adverse environmental s5 effects under CEAA 2012. f) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to water quality that are described in (d), after applying the mitigation measures described in (e). g) As required, identify follow-up and monitoring measures. h) As required, update the relevant aspects of the Commitment Summary Table.	site facilities. The solubility limits for aluminum as predicted using PHREEQC modelling are presented in the Table to Comment #F25. c) If the solubility limits were fully accounted for in the predictions for aluminum, then the aluminum loadings from the Project site facilities to the surface water receivers would be lower or equal to those currently predicted. d) If the solubility limits were fully accounted for in the predictions for aluminum, then the aluminum concentrations in the surface water receivers would be lower or equal to those currently predicted. Therefore, the predicted concentrations of aluminum are conservative and reasonable for the purposes of the EA.e) No additional mitigation measures are required (i.e., outside of those provided in the EA Commitments Table; Appendix Y), based on the responses to (a) through (d).f) None, based on the responses to (a) through (d).g) No additional monitoring measures are needed (i.e., outside of those in Appendix Y), based on the responses to (a) through (d).h) No update to the commitment summary table is necessary, based on the responses to (a) through (d).
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-14, Ecosystem Topic: Water Quality Appendix J – Water Quality Baseline; Appendix Z Comment #459 The response to comment #459a (SW1-14a) does not include the mean and median values. These values are needed to provide an indication of the spread or	a) The values presented in the Water Quality TSD (Appendix J), Tables 4-1 through 4-8, are suitable for comparison to water quality benchmarks for the purposes of the water quality effects assessment, as the maximum concentrations ultimately determine the magnitude level for impact assessment, not the average nor the median. For this reason, the median and mean values were not provided. b) As described in Section

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				fluctuation of those values. The response to comment #459b (SW1-14b) conflicts with the statement made in Table 9-6 of the Amended EIS. Paragraph two of the response to comment #459b states the polishing pond will not contain cyanide. In Table 9-6 of the Amended EIS it identifies that some cyanide, in very low concentrations will be present in surface water in the immediate vicinity of the site. Section 10.1.2 of the EIS Guidelines requires there to be a complete understanding of the changes the project will cause to the environment. a) Provide, where possible, median and mean values for the parameters in Tables 4-1 – 4-8 of the water quality TSD in Appendix J, inclusive. b) Provide an explanation for the discrepancy between the statement in comment #459b (SW1-14b) that the polishing pond will not contain cyanide, and the statement in Table 9-6 of the Amended EIS that some cyanide in very low concentrations will be present in the surface water in the immediate vicinity of the site. c) If there will be cyanide present in the surface water in the immediate vicinity of the site, provide predicted cyanide concentrations for the 2 receiver sites in Table 4-2 of the water quality TSD in Appendix J. d) Provide a discussion of any additional mitigation measures which may be put into place, after accounting	4.3.1 Conceptual Model of Appendix J, a water management strategy has been designed to maintain a closed-loop between the processing plant and the reclaim pond. As a result, water from the reclaim pond does not report to the polishing pond. Rather, water from the mine water pond reports to the polishing pond. As such, the water quality model assumes that there is no cyanide in the effluent discharged to the environment through the polishing pond because cyanide-bearing water does not enter the polishing pond. Estimates of seepage that bypass the collection system and discharges into the surface water environment were accounted for in the water quality effects predictions included in the Water Quality TSD (Appendix J). The water quality model assumes a loading rate into surface water features due to seepage from the TMF, which contains residual cyanide. Seepage from the TMF is assumed to report to Bagsverd Lake, Un-named Lake #1, Un-named Lake #2 and Bagsverd Creek; as such, low concentrations of cyanide will be present in these receivers due to seepage discharge from the TMF, as listed in Table 9-6. A further discussion of seepage from the TMF is provided in the Addendum to the Hydrogeology TSD (Appendix H) and the Addendum to the Water Quality TSD (Appendix J).c) Table 4-2 presents the monthly average concentrations for Neville Lake and Mesomikenda Lake, which are the two lakes that were being evaluated as the receiver for treated effluent discharge from the polishing pond. The purpose of Table 4-2 is a comparison table to assist with the assessment of the potential water quality effects of discharging treated effluent from the

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				for the predicted cyanide concentrations described in (c). Indicate which mitigation measures are 'key' to avoiding significant adverse environmental s5 effects under CEAA 2012. e) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to water quality that are described in (c) after applying the mitigation measures proposed in (d). f) As required, identify follow-up and monitoring measures. g) As required, update the relevant aspects of the Commitment Summary Table.	polishing pond into these two lakes, and therefore assist with the selection of the preferred discharge point. As described in the response to (b), the treated effluent from the polishing will not contain cyanide and therefore there is no value in including cyanide in Table 4-2.d) No additional mitigation measures are required (i.e., outside of those in Appendix Y), based on the responses to (a) through (c).e) Comment not relevant, based on the responses to (a) through (c).f) No additional monitoring measures are needed (i.e., outside of those in Appendix Y), based on the responses to (a) through (c).g) No updates to the Commitment Summary Table (Appendix Y) required.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-15, Ecosystem Topic: Sediment Quality Appendix N - Aquatic Biology Technical Support Document – Pg. 6; Appendix Z Comment #460 The response to comment #460 (SW1-15) does not provide predictions of potential effects on sediment quality due to the Project. Section 9.1.2 of the EIS Guidelines requires there to be a description of sediment quality within the area of influence of the Project. a) Provide a completed prediction of environmental effects due to changes to sediment quality caused by project activities. b) Provide a discussion of any additional mitigation	a) See response to Comment #460 (SW1-15) in Appendix Z. A description of the potential for considerable changes to sediment quality is provided in Section 2.4 of the Water Quality TSD (Appendix J).b) No additional mitigation measures are applicable (i.e., outside of those presented in Appendix Y), based on the response to (a).c) Comment not relevant, based on the responses to (a) and (b).d) No additional follow-up and monitoring measures are necessary (i.e., outside of those presented in Appendix Y), based on the response to (a).e) No update to the EA Commitments Table (Appendix Y) is necessary, based on the responses to (a) through (d).

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				measures which may be put into place, after accounting for the predicted changes to sediment quality. Indicate which mitigation measures are 'key' to avoiding significant adverse environmental effects due to changes in sediment quality. c) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) that would result from the changes to sediment quality that are described in (a) after applying the mitigation measures described in (b). d) As required, identify follow-up and monitoring measures. e) As required, update the relevant aspects of the Commitment Summary Table.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) SW(2)-17, Ecosystem Topic: Water Quality Chapter 5; Appendix Z Comment #462 The response to comment #462a-iv (SW1-17a-iv) does not provide supporting evidence to back the statement that "no differences in the physical characteristics of the PAG and non- PAG materials were noted". Section 3.4.3 of the EIS Guidelines indicates that when relying on existing information, the proponent will either include the information directly in the EIS or clearly direct the reader to where it may obtain the information. Regarding the response to comment #462a-vi (SW1-17a-vi), it is noted that mixing PAG and non-PAG waste rock	a) The response to Comment #462 v) states that "Based on the random distribution of PAG samples in the deposit, adequate mixing of the PAG materials to prevent formation of discrete PAG masses can be achieved by the normal mining procedure of dumping mine rock within the waste rock piles. The mixing of the isolated PAG materials with the significantly greater (~20 times) volume of acid consuming non-PAG rock will result in mine rock with an overall acid consuming character."The statement that "no differences in the physical characteristics of the PAG and non- PAG materials were noted" was with respect to physical appearance when visually inspecting the core material. b) As stated in our previous response (Comment #462) and the accompanying Addendum to the Geochemical

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				will only be a reliable mitigation option if a well-informed, systematic approach to mixing is implemented; otherwise, there is potential for the deposition of sizable discrete masses of PAG waste rock which could result in acid rock drainage. Section 9.1.2 of the EIS Guidelines indicates that information about waste rock segregation/disposal method mitigation/management plans are to be provided. Section 11.1 of the EIS Guidelines requires ARD/ML prediction information to be used to predict water quality effects to determine mitigation requirements for the Project. a) Provide supporting evidence for the statement that "No differences in the physical characteristics of the PAG and non-PAG materials were noted". b) Provide a discussion of any additional mitigation measures which may be put into place, if required, to ensure mixing and to prevent the occurrence of sizable discrete masses of PAG waste rock. Indicate which mitigation measures are 'key' to avoiding significant adverse environmental s5 effects under CEAA 2012. c) Discuss any potential residual s5 effects (e.g., to fish and fish habitat) after applying the mitigation measures described in (b). d) As required, identify follow-up and monitoring measures.	Characterization Report (Appendix E), evidence from the ML/ARD characterization study shows that the small percentage of potentially acid generating (PAG) rock is well distributed throughout the volume of the Côté Gold Project waste rock volume, which is composed predominantly of high neutralization potential (NP) non-PAG rock. The waste rock with its high overall NP and correspondingly high neutralization potential ratio (NPR) values will be non-acid generating. Relocation of this rock from the pit to the waste dump will not alter these proportions. No additional mitigation is required. c) to e) n/a

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				e) As required, update the relevant aspects of the Commitment Summary Table.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) FH(2)-1 (FH(2)-2), Ecosystem Topic: Fish and Fish Habitat EIS Appendix N, Section 2.4.2 page 6 ; Table 2.1, and page 19; Section 4 EIS Report Section 9, Description of Project Effects, subsection 9.9, page 9-49; Appendix Z Comment #485 Based on the response to comment #485 (FH1-1), an assessment of the impacts to habitat for forage fish species is not provided. All potential effects to fish and fish habitat need to be assessed and quantified in order to determine how impacts to fish supporting the CRA fisheries will impact the CRA fisheries, as described in Section 9.1.2 of the EIS Guidelines. In addition, there are identified commercial bait fisheries within the LSA, and impacts to forage fish could impact these commercial fisheries. A representative forage fish species that shares common habitat requirements between all other species can be used as the key forage fish species. Therefore, an assessment of the effects to fish present in areas impacted by the project is required. a) Due to the differences in habitat utilization by the various forage fish species present within the LSA, provide an assessment of the impacts to forage fish in impacted lotic and lentic habitats. Forage fish species will need to be modeled in the HSI exercise, as there will be a transfer of habitat between lentic habitats to lotic habitats to	a) IAMGOLD has developed an agreement with Fisheries and Oceans Canada (DFO) on the five species used in the fish habitat assessment. Based existing fish community composition, the habitat assessment was conducted for five key sport fish; northern pike, yellow perch, lake whitefish, walleye, and smallmouth bass. The habitat requirements of these five species represent the range of conditions required to support all fish species found within the affected areas, including habitat used by forage fish. b) This information is provided in Chapter 10 and the Addendum to the Aquatic Biology TSD (Appendix N). The details of the mitigation measures will be developed in cooperation with DFO.

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				accomplish the required offsetting. b) Indicate which mitigation measures are key to reducing significant adverse environmental effects; and if required, provide information on follow-up and update the Commitment Summary Table.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) FH(2)-4, Ecosystem Topic: Fish and Fish Habitat EIS Appendix N; Appendix Z Comment #488 Based on the response to comment #488 (FH1-4), it is mentioned that fish will be moved to newly constructed areas. However, there is no indication of where the newly constructed fish habitat areas will be located, the extent and size of the fish habitat to be created, as well as the intended function of the fish habitat to be created. As per section 9.1.2 of the EIS Guidelines, the EIS will identify any potential waterbodies and fish habitat sites that could be rehabilitated, restored or created for possible habitat gains to offset losses from the Project. This information is needed to fully understand the potential environmental effects to fish and fish habitat caused by the Project. a) Provide information about any newly constructed fish habitat areas under consideration as a mitigation measure to compensate or offset effects to fish habitat, including potential locations, extent, size, and function	The principal mitigation measures are provided in Chapter 10. To provide the CEA Agency further clarity on the assessment of effects to fish habitat and fisheries, IAMGOLD is providing additional information that has already been shared and discussed with DFO.A document entitled "Cote Gold Fisheries Act Support Document" details the habitat evaluation methodology and results. The methodology and plan is consistent with the EIS / EA and was agreed upon with DFO in order to demonstrate that the Project will not result in Serious Harm to Commercial, Recreational and Aboriginal Fisheries. It should be noted that this level of detail was completed in support of the future regulatory phase of the Project. The document entitled "Review of waterbodies affected by Côté Gold Project relative to the requirement for a Section 35 FAA versus MMER Schedule 2" provides a detailed breakdown of IAMGOLD's assessment of the alteration to waterways and the applicable Fisheries Act section or regulation which may require approval.
657	Letter	04/17/2015	1) Christine Greenaway (Canadian	1) FH(2)-5, Ecosystem Topic: Fish and Fish Habitat Hydrology	IAMGOLD is of the opinion that a full prediction of effects on aquatic species and habitat is provided in detail in the Aquatic Biology TSD (Appendix N) and in

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			Environmental Assessment Agency)	EIS Appendix N page 23, page 10, Table 4.1; EIS Section 10 Table 10-2 page 10-19 EIS Appendix I Table 4.2 Table 4.3 Table 4.4 Table 4.5; Appendix Z Comment #489 The additional information provided in response to comment #489 (FH1-5) addressed the predicted effects to Bagsverd Creek in relation to reduced flows and the predicted environmental effects on fish as a result of potential changes to fish passage through stream reaches with the shallowest flows. It is accepted that the predicted water level reductions as a result of reduced flows in Bagsverd Creek will not likely result in a barrier to fish migration in the simulated 1:25 summer low flow case. In addition, impacts of flow reductions on available in-stream habitat were not presented in the assessment of effects in response to comment #489 (FH(2)-5). As indicated in Section 11.1 of the EIS Guidelines, this information is needed to determine appropriate mitigation. As per Section 10 an assessment of effects to fish and fish habitat arising from increased flows from mine development and activities were not provided. a) Provide information on follow-up activities to ensure that the effects predicted to fish migration are accurate. b) Provide an assessment of effects, any key mitigation, residual effects, and information on follow-up if required, to in-stream fish habitats in lentic and lotic systems resulting from potential reductions and increases in flows	summary in Chapter 9. Mitigation measures are listed in Chapter 10, the impacts assessment is provided in Chapter 11 and associated monitoring measures are detailed in Chapter 16. IAMGOLD offers to hold further discussions with the CEA Agency in order to provide additional clarity and assistance if required to support the CEA Agency's review of the Project and preparation of a draft EA Report.

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				from mine development; and characterize the effects on fish utilization of habitat that is no longer accessible (e.g. inaccessible flooded vegetation or online wetlands due to reduced water levels). Provide a rationale if no residual environmental effects to fish and fish habitat are anticipated.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) FH(2)-8, Ecosystem Topic: Fish and Fish Habitat Country Foods EIS Report, Section 6.4.8.2, page 6-92 to 6- 113; Section 6.4.8.3, page 6- 113 to 6-114; Appendix N. Section 2.4.2; Section 3.0; Appendix Z Comment #492 From the response to comment #492 (FH1-8), details in relation to monitoring of fish tissues are limited to waterbodies and watercourses that experienced increased water levels due to realignments. However, information on monitoring of fish tissues should be provided on all receiving environments. This information is required in order to capture any effects of mining activities on fish health within the LSA, as per Section 9.1.2 of the EIS Guidelines. This monitoring should be conducted under Environmental Effects Monitoring (EEM) or the follow up program. As indicated in Section 16 of the EIS Guidelines, monitoring is required in order to decrease the potential for environmental degradation during all phases of project development. Section 11.4 of the EIS Guidelines describes follow-up program requirements. a) Provide information on follow-up and monitoring of fish tissues on all receiving waterbodies and watercourses	a) Fish tissue information is provided in the Addendum to the Aquatic Biology TSD (Appendix N; see Tables F46 and F47). A commitment to monitor fish tissue in included in Chapter 16.b) n/aIAMGOLD offers to hold further discussions with the CEA Agency in order to provide additional clarity and assistance if required to support the CEA Agency’s review of the Project and preparation of a draft EA Report.

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				that may be affected by the Project. b) As required, update the relevant aspects of the Commitment Summary Table.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) NW(2)-1, (new), Related IRs: AP1-1, TC-1a, TC-1b, TC-04, TC-07 and TC-08; Navigation Executive Summary, pg 36; EIS Report, Table 2-1, pg 2-2, Section 4.3, page 4-11, 4.3.2.8, pg 4-23; Section 9.16.3, pg 9-85; Section 9.17.2, pg 9-85; Appendix O, Land and Resource Use; Appendix P, Traditional Land and Resource Use Appendix Z Comment #s 497, 543, 544, 545, 546, 547, 548 The Amended EIS does not contain sufficient detail to allow for an assessment of the Project effects related to navigation. Section 9.1.3 of the EIS Guidelines requires the identification of Project components and activities that may affect waterways and waterbodies and/or limit access to those waterbodies. It also requires a description of any recreational uses and information on current and/or historic uses that will be directly affected by the Project, including current Aboriginal users, where available. The Amended EIS includes conflicting and incomplete information on effects of the Project and proposed mitigation related to navigation. For example, Table 11-5 suggests that mitigation during decommissioning and	a) See attached table (Table to Comment #F60).b) All effects to navigation are assessed in the Land and Resource Use TSD (Appendix O). Except for waterbody / watercourses that will be overprinted or removed as part of the Project, as identified in Table to Comment #F60, for the purposes of navigation for hunting and fishing, swimming, camping, or visiting areas of historical, archaeological, paleontological or architectural significance, no significant impacts are anticipated.With respect to the Section 5 of CEAA 2012, please refer to the response to Comment #F2.c) See attached table (Table to Comment #F60).d) Regular operations of the Côté Gold Project may result in occasional excursions of the ambient air quality guidelines for nitrogen oxides and particulate along several waterbodies adjacent to the Project. These contaminants originate principally from materials handling and haulage. Excursions above the ambient air quality guidelines are expected to be infrequent and transient in nature and are not expected to pose an unacceptable risk to people who travel through these areas. However, with prolonged exposure, those with pre-existing respiratory conditions may experience enhanced symptoms. As a precaution, it is recommended that travel through this area be restricted limiting the duration of stay to 24 hours or less.Controlled-access lakes are expected to include

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				abandonment is 'not applicable', despite also stating that canoe routes may continue to be disturbed. Appendix O suggests there are no residual effects on canoeing and navigable waters during these phases. In Table 9-9, 1st row, 2nd column of the Amended EIS it states "… the Project will have effects on fishing, hunting and canoeing, but with mitigation in place, these effects are not expected to prevent people from enjoying these activities in the areas." Sections 2.1 (Table 2-1) and 9.16.3 of the Amended EIS indicate that IAMGOLD plans on requesting the 'opt-in' provision under Section 4 of the Navigation Protection Act (NPA) to have any potential interference with navigation reviewed and sanctioned. Please be advised that an approval under Section 24 of the NPA may also be required. Sections 10.1.2 and 10.1.3 of the EIS Guidelines require a description of changes to the environment that are related to federal decisions, and the effects of those changes on health and socio-economic conditions, physical and cultural heritage, or any structure, site or thing that is of significance, other than as they pertain to Aboriginal peoples. Section 9.16.3 of the Amended EIS is not clear on which watercourse changes may be subject to federal decisions under the NPA. Section 9.17.2 of the Amended EIS indicates that there are no effects related to federal decisions, but does not provide a rationale for this statement in relation to navigation, which seems to conflict with other descriptions of navigation-related effects throughout the EIS.	Chester Lake, Clam Lake, East Clam Lake, Little Clam Lake, West Beaver Pond, Bagsverd Lake, Bagsverd Pond, Weeduck Lake and Three Duck Lakes. Controlled access lakes will remain fully open to navigation, including use as part of the 4M Canoe Route. Land access including camp sites will be controlled. Camp sites will be removed if overprinted by mine infrastructure, and as a precaution to prevent prolonged exposure to air with potential excursions above the ambient air quality guidelines. e) IAMGOLD will work to mitigate any effects to portage routes. This could include working with potential canoe route users to identify suitable conditions for crossing the controlled-access lakes, such as identifying preferred portage locations that do not interfere with Project construction and operations. This could also include placing markers to ensure canoes do not approach active construction sites, such as the diversion dams in Three Duck Lakes and Bagsverd Lake. f) As described in Chapter 10, IAMGOLD will continue to consult with any potential canoe route users to facilitate navigation during the construction and operations phases. No additional specific mitigation is proposed at this time. g) IAMGOLD does not anticipate the requirement for Section 24 Navigation Protection Act approvals and no updates to Table 2-1 are applicable at this time.

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				a) Provide a description of all non-scheduled navigable waters for which navigation may be affected by project components and activities, including, but not limited to: i. Dewatering ii. Deposition or throwing of material iii. Watercourse realignments and retention dams iv. Changes in flows and levels caused by the Project v. Bridges and aerial cables crossing waterways vi. Temporary works b) Identify how the project components and activities identified in (a) would affect navigation. Include in your assessment effects for all phases of the Project to canoe routes as well as effects to navigation for the purposes of hunting and fishing, swimming, camping, or visiting areas of historical, archaeological, paleontological or architectural significance, and any other effects to be taken into account under Section 5 of CEAA 2012. c) From (a) and (b), identify those non-scheduled navigable waters for which a federal decision may be pursued by IAMGOLD under the NPA (e.g., a Section 24 approval or through the Section 4 opt-in provisions). d) Explain what is meant by "controlled-access lakes" and	

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				methods that will be used to identify, contact and consult potentially affected users. e) Explain what is meant by "suitable conditions for crossing". f) Provide a discussion of any additional mitigation measures which may be put in place after accounting for any revised predictions to effects related to navigation. Indicate which mitigation measures are 'key' to avoiding significant adverse environmental effects; and if required, provide information on follow-up and update the Commitment Summary Table. g) Update Section 2.1 (Table 2-1), as deemed applicable, to reflect that Section 24 NPA approvals may be required for the Project.	
657	Letter	04/17/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) TL(2)-1, Ecosystem Topic: Surficial Geology, Terrain and Soils, Water Quality Chapter 16, Table 16-1, Table 16-2; Chapter 9 – p. 9- 50, 9-53; Chapter 10 – p. 10-17; Chapter 11 – p.11-24, 11-44 Figure 5-3 Figure 6-2 Figure 6-6 Appendix E – Geochemical Report p. 3-1 Table 6-2 p. 7-1-7-3 Table 7-2 7-3 Table 7-2 Chapter 5 Chapter 9 of the EIS- Section 9.9.2.1 (Construction Phase) Tables 16-1 and 16-2 in the Amended EIS indicate that total mercury and methyl mercury will be monitored in sediment. Section 16.2 of the Amended EIS indicates that	a) As described in the Addendum to the Aquatic Biology TSD (Appendix N), soils that could potentially release methyl mercury will be removed prior to flooding of these areas. Therefore there is no requirement to collected mercury and/or methyl mercury baseline information. b) These effects are addressed in Chapter 11 and Section 5.0 of the Addendum to the Aquatic Biology TSD (Appendix N). Any mercury in the soil was caused by natural processes. The potential for naturally occurring mercury to methylate or to be flushed out is mitigated by removing organic soils.c) See response to a) above - soil is being removed.

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				monitoring programs apply to the construction, operation, decommissioning, and abandonment phases of the Project. Section 11.4 of the EIS Guidelines describes follow-up program requirements. For monitoring to be feasible during phases of the Project, baseline information preconstruction would be needed for comparison of results. However, baseline information on mercury and methyl mercury levels in the project area, particularly the soils and terrain where the flooding will occur was not provided as requested in comment #482 (TL1-1). This information is required as described in Sections 9.1, 9.1.2 and 10.1 of the EIS Guidelines. a) Provide baseline information (pre-construction) on mercury and methyl mercury levels in the soils/terrain for the areas that will be flooded by the Project. b) Provide information on the potential environmental effects caused by mercy and methyl mercury in soil/terrain. c) Provide soil characterization/profile information for the above-mentioned soil and terrain areas.	
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Draft EA Comment #110 & 679 (1) Defining baseline concentrations with the 95th percentile instead of the 75th percentile could change the Impact Magnitude Level in situation where predicted concentration is greater than water quality guideline but less than 95th percentile. (2) For some locations a site-specific background concentration can differ from the site-wide average value. This difference could potentially change the Impact	1) The parameters identified as having a 95th percentile baseline concentration greater than the water quality guideline are aluminum and iron. The concentrations that are predicted to be greater than the water quality guideline but less than the 95th percentile baseline concentration are as follows: the maximum monthly average concentration of aluminum in Delaney Lake (0.10 mg/L), Unnamed Lake #1 (0.11 mg/L) and

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				Magnitude Level. (3) Use of the cyanide water quality guideline for non-salmonid waters as presented in WERF document is not accepted. The guiding principle behind the development of Ontario's PWQO differs from the US EPA's AWQC. Ontario takes a more protective approach (protect all species, at all life stages, for indefinite exposure periods) whereas the US EPA is less protective (protection of 95% of all species, allowing for some occasional upset). There are data that show invertebrates can be as sensitive to cyanide as cold water fish. (1) Include the 75th percentile to define background water quality. (2) Characterize baseline water quality according to individual sampling locations, not site-wide average. (3) Use the PWQO and CWQG for cyanide.	Bagsverd Creek (0.082 mg/L); and, the maximum monthly average concentration of iron in Delaney Lake (0.37 mg/L) and Unnamed Lake #1 (0.38 mg/L). The predicted concentrations of aluminum do not account for attenuation (or mass loss) in the surface water system and incorporates the total mass that reports to the receivers. As a result, the concentrations that are calculated by the water quality model include mass in addition to the 'dissolved' mass. As such, comparing the predicted concentrations to the Provincial Water Quality Objectives (PWQO) and Canadian Water Quality Guidelines (CWQGs), which are applicable on the clay-free fractions, is conservative. In addition, it is important to note that the baseline concentrations of aluminum in Delaney Lake, Unnamed Lake #1 and Bagsverd Creek are up to 0.12 mg/L, 0.19 mg/L, and 0.13 mg/L, respectively; the maximum baseline concentrations that were measured are greater than the predicted maximum monthly average concentrations in all three cases. Therefore, because the predicted aluminum concentrations are within the range of baseline levels for those lakes, the conclusions of the effects assessment do not change despite the fact that the conservative comparisons show that the predictions are greater than the PWQO / CWQG for aluminum. The predicted maximum monthly iron concentrations are only greater than both the 75th percentile baseline concentration (0.21 mg/L) and the PWQO (0.3 mg/L) at Delaney Lake and Unnamed Lake #1 (same as for the 95th percentile concentrations); however, these predicted concentrations (0.37 and 0.38 mg/L, respectively) are only slightly greater than the PWQO.

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					Additionally, the water quality model does not account for solubility controls on iron in the receiving environment and, as such, the predicted concentrations are considered to be conservative. In summary, the predicted iron concentrations are below the toxicity thresholds and protective of aquatic life (as described in the Aquatic Biology TSD; Appendix N) and no significant effects are predicted. While the 95th percentile baseline concentrations were used as comparators for predicted concentrations during the effects assessment for the EA, the 75th percentile concentrations will be used as an input to calculations for studies associated with the permitting process. When the time comes to apply for an ECA, following completion of the EA process, the requirements for deriving effluent criteria will follow Ontario MOECC guidance, including application of the 75th percentile to background receiving water quality. (Response continued below)
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Draft EA Comment #112 and 681 Not clear if baseline data for mercury in water and fish are or will be collected according to MOECC Northern Region guidance (draft document Nov. 2010). For example, include method detection limits for low-level mercury and fish tissue sample sizes. The potential for increased sulphate levels from mine effluent to influence mercury methylation was not addressed. Describe how baseline mercury data is being collected with reference to MOECC Northern Region guidance for baseline monitoring of mercury in water and fish tissue. Address whether or not increased	MOECC Northern Region guidance for baseline monitoring of mercury in water and fish tissue was reviewed, and baseline monitoring for fish tissue is confirmed to be consistent with the methodology provided in the document. Northern pike were used as the large-bodied fish in most waterbodies, or walleye (fish sampled greater than 40 cm - see Table F.47 in the Addendum to the Aquatic Biology TSD; Appendix N). Juvenile yellow perch and forage fish were used as the small-bodied fish (typically between 50 and 70 mm with multiple composite samples collected per lake). Samples were collected above the lateral line for the

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				sulphate levels from mine effluent could potentially influence mercury methylation.	large bodied fish. The small bodied fish were analyzed whole. Samples were placed in whirl pac bags - frozen and shipped to the laboratory on dry ice. Mercury was detected in all fish tissue samples analyzed with a MDL of 0.05 ug/g so there is no concern that concentrations were underestimated due to poor detection limits. The analysis was conducted by the Saskatchewan Research Council Laboratory in both 2012 and 2013. Saskatchewan Research Council Laboratory is a Canadian Association for Laboratory Accreditation certified lab. The mercury analysis was conducted by cold vapour atomic absorption method. If samples are below detection in the future, then alternative low-level mercury analysis can be conducted. Mercury in water was also analyzed via cold vapour atomic absorption to a detection limit of 0.01 µg/L in samples collected during August 2013 and beyond. Mine discharge will be at the outflow of Bagsverd Creek and not the areas to be flooded (therefore no pathway from flooded vegetation to methyl mercury production). The predicted maximum sulphate concentrations downstream will occur in the mixing zone and are less than 7 mg/L and only marginally above background. The receiving environment is expected to be well oxygenated during discharge and as such sulphate will remain in an oxidized state. Baseline fish tissue mercury was collected from all lakes assessed in the aquatic baseline studies. The methods and fish collected are described in Appendix N. As noted above, sulphate concentrations are predicted to be extremely low and the slight increase over background will occur in Bagsverd Creek where water level increases (i.e.,

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					flooding) are not planned, therefore, the potential for methyl mercury production is limited. Furthermore, receiving environments will remain oxic preventing the establishment of reducing conditions for sulphate.
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Comment #352; Chapter 10 and 11 We feel that more details are needed as per your planned fisheries compensation requirements for these lakes to ensure no loss of productive habitat related to commercial, aboriginal, or recreational fisheries, as per the Fisheries Act Section 35. A more detailed description of planned fisheries compensation measures that will ensure fisheries compensation requirements.	A detailed Fish Habitat Offsetting Plan has been provided to the Department of Fisheries and Oceans (DFO) and a copy is available for review.
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Comment #383; Appendix K, Section 4.2, page 45 There is need to address the compensation for other non-fisheries species that depend on the wetland features that will be adversely affected. Will IAMGOLD not be compensating for the loss of amphibians, reptiles and birds (ie. non-fish species) destroyed during operations?	As noted in the EA, IAMGOLD is committed to developing an offsetting program using a natural channel design approach. This method considers a range of factors in planning the configuration and characteristics of the channel realignment works. IAMGOLD expects the new channel corridors and wetted areas to provide high quality habitat for fish and non-fish species.
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Appendix P, Section 3.1 The document states "The construction of Project components is predicted to overlap with some traditional hunting areas, as described above. It is not expected that this will impeded the ability to carry out traditional hunting activities in the area (p.3-3). No lakes overprinted by the Project have been identified as popular fishing lakes. Therefore, no traditional fishing area losses will be incurred due to Protect construction (p;3-4), The Project footprint does not overlap any sensitive area lakes identified in the TEK	The detailed analysis of effects provided in Appendix P, demonstrates that there will be none to very limited effects on traditional hunting and fishing in the local study area, and therefore the EA assigns a level II magnitude for this effect, i.e., the project overlaps with portions of traditional hunting areas, but does not limit the ability to carry out hunting activities. In combination with the other impact assessment criteria and applying the impact assessment methodology described in Chapter 11, particularly Graphic 11-1, the impact is

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				study (P3-4)" Wabun Tribal council has indicated that this oversimplifies the interrelationships between project components, the biophysical environment and Aboriginal traditional land use. "The footprint area is not an accurate reflection of the area that will no longer be available for traditional uses, considering additional areas around and between the actual project footprint that will be unusable or unused due to issues of safety, air quality, noise and other ongoing impacts of the proposed project. This "effective" footprint will be larger than the physical footprint of the infrastructure." Figure 1 -2 Chapter 5, Section 5.1 pg. 5-1. In response, the Proponent indicated " the project will not limit the ability to carry out traditional activities in the area. Studies conducted as per EA process have shown no traditional land and resource use within the Project footprint…" (however does not reference Aboriginal and/or Treaty rights) However, on Table ES-4 Impact Assessment Matrix for the operational phases, Page ES-77, Final EA Report traditional hunting and fishing is identified as having the potential to be effected during the operations phase including changes in access to and from the area, changes in abundance and distribution. The suggested mitigations is to limit fishing by project personal and acknowledges the project may affect a small number of water bodies but does not limit the ability to fish. It does not mitigate how these changes in access and abundance/distribution impact Aboriginal and Treaty rights and how these impacts could be impacted. The Proponent references Chapter 11 in response, no additional areas outside the project footprint would likely be rendered unavailable for traditional uses. However, some areas around the Project footprint may	considered to be not significant. A clearer understanding of this methodology should assist the reviewer in clarifying how IAMGOLD is able to recognize that there will be some effect, and has conservatively assigned the effect a Level II magnitude, but it still able to determine that the overall impact on the ability to carry out traditional activities in the area is not significant.

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				require controlled access and traditional uses may continue depend on project activities in the area. Were these restriction included in the analysis of potential impacts to Aboriginal and Treaty rights? This information seems to conflict. Provide clarification on how this project does not limit the ability or impact the Aboriginal or treaty right to fish (e.g Cote Lake) and on additional potential impacts to fishing and hunting rights associated with this project? Reconcile other sections of the documentation to reflect consistent messaging on impacts to Aboriginal and treaty rights in addition to traditional use. Provide documentation on how treaty rights were incorporated into your analysis of "no traditional fishing area loses or other resource use within the project footprint" therefore no impact on Aboriginal and Treaty rights. The response should also include if the project area is put to visible and incompatible use including for example current existing access restrictions, project footprint area is already fenced off etc.	
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Appendix D9-b The document states "The construction of Project components is predicted to overlap with some traditional hunting areas, as described above. It is not expected that this will impeded the ability to carry out traditional hunting activities in the area (p.3-3). No lakes overprinted by the Project have been identified as popular fishing lakes. Therefore, no traditional fishing area losses will be incurred due to Protect construction (p;3-4), The Project footprint does not overlap any sensitive area lakes identified in the TEK study (P3-4)" On Table ES-4 Impact Assessment Matrix for the operational phases, Page ES-77, Final EA Report traditional hunting and fishing is identified	A detailed analysis of effects on traditional land use is provided in the Traditional Land and Resource Use TSD (Appendix P). This analysis combines information provided in the TK / TLU study, experience of IAMGOLD's EA Team, and comments received through the stakeholder and Aboriginal consultation process (documented in Appendix Z). The impact matrices use this information to determine whether these effects have the potential to be significant. To be conservative, a Level II magnitude for effects on hunting and fishing, which assumes a small amount of disturbance, has been selected. The impact assessment concludes that even

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				as having the potential to be effected during the operations phase including changes in access to and from the area, changes in abundance and distribution. The suggested mitigations is to limit fishing by project personal and acknowledges the project may affect a small number of water bodies but does not limit the ability to fish. This information seem to conflict. Can you provide clarification on how this does not limit the ability or impact the treaty right to fish (e.g Cote Lake) and on additional potential impacts to fishing and hunting treaty rights associated with this project? Please reconcile other sections of the documentation to reflect consistent messaging on impacts to Aboriginal and treaty rights in addition to traditional use. Wabun TC – "The footprint area is not an accurate reflection of the area that will no longer be available for traditional uses, considering additional areas around and between the actual project footprint that will be unusable or unused due to issues of safety, air quality, noise and other ongoing impacts of the proposed project. This "effective" footprint will be larger than the physical footprint of the infrastructure." Figure 1 -2 Chapter 5, Section 5.1 pg. 5-1. Also, Wabun TC email Sept 6, 2013" The Chiefs and Councils, as well as the membership have maintained that the impacts from this Project will be felt well beyond the immediate project area and will be cumulative. " (Page 4 -28, Amended EIS, FEA report 4.5.2) Also in the responses to comments from Aboriginal Groups on the EIS/Draft EA Report, page 69 in reference to issue description 320 - "During a recent information session in MFN members raised concerns about the extent of existing development in the territory and that there are limits to the amount of development	with conservatively assigned Level II for of magnitude and extent, no significant impact on traditional hunting and fishing are anticipated. Please see Section 9-1 for a detailed description of the methodology used for the prediction of effects and Section 11-1 for the detailed methodology used for the impact assessment. See also response to Comment #F452. In addition, effects on other disciplines (e.g., air quality), were used to predict effects in the study area specifically identified for the Traditional Land and Resource Use TSD (Appendix P). See also response to Comment #F453.

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				that can be tolerated before cumulative effects become too extreme. "The Proponent reference Chapter 11 in response, no additional areas outside the project footprint would likely be rendered unavailable for traditional uses. However, some areas around the Project footprint may require controlled access and traditional uses may continue depend on project activities in the area. This comment relates to cumulative impact, the size and identification of the study areas and to comments above where the documentation references "No impact to traditional use." Re-evaluation of potential impacts on traditional use and Aboriginal and treaty rights is required to confirm that there are no impacts to the Aboriginal community's rights and traditional use as a result of the proposed project including impacts to areas outside of the Project footprint however linked with project impacts.	
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Summary of Recommendations: AAB recommends that the proponent: 1. Update Table 4-7 in Final EA Report Chapter 4 to better reflect a summary of key issues and concerns identified by the Aboriginal communities as documented in Appendix D-9 Including any proposed mitigation and rationale. For example : Mattagami FN raised issues on realignment and success rates of realignments. Mattagami also identified seepage on 06/26/14 and the challenges using the TEK/TLU study focusing only on the project area. Brunswick House First Nation had identified concerns with the Bagsverd Creek realignment in meetings on June 5, 2014 with water flow, how it may hurt, harm or enhance aquatic species in the area. Flying Post also identified cyanide leaching and seeping of water and ground water issues in a meeting on	1) IAMGOLD exercised professional judgement in determining what the summary of key Aboriginal concerns were. For the sake of efficiency, IAMGOLD summarized issue specific concerns (e.g. realignments) and classified them as water and hydrology concerns. A list of all issues raised through Aboriginal consultation can be found in the RoC (Appendix D). 2) IAMGOLD has shared with the MOECC the status of Aboriginal agreement negotiations. Both negotiations with Flying Post First Nation and Mattagami First Nation, and the MNO, respectively are ongoing. Details of the negotiations are considered confidential, as agreed upon by all parties involved. IAMGOLD received a Draft TEK/TLU study from the MNO in March of 2015. 3) IAMGOLD is confident that it has adequately considered

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				Feb. 13, 2013. Cumulative effects on wildlife considering other projects in the area (10/09/13) and ammonia as an issue at all mines sites on the same date. The Metis Nation of Ontario identified several additional concerns that have not been documented in table 4-7 but are identified in Appendix D, Table D-9c. including for example, cyanide and greenhouse gas. 2. Ensure that the MOECC is provided with timely updates on the status of agreement discussions with First Nation Communities and with the Metis Nation of Ontario. Please include an update on the status of the TEK/TLU study with the Metis Nation. 3. Provide further documentation to support assumptions that TEK/TLU studies prepared by the Aboriginal Communities will be similar to those studies conducted by Metis. Documentation should also respond to the Metis Nation of Ontario comment (06/27/14): "Currently your Environmental Impact Study is void of descriptions of any impact to the Metis and suggest there are not residual effects, but IAMGOLD does not know the impacts to the Metis until we can identify impacts (TEK/TLU), we need to assume that these impacts are significant." 4. Provide documentation and/or copies of any technical reviews of the Final Environmental Report completed by or submitted by, the First Nations or Aboriginal Communities and/or their representatives including if appropriate the Proponents response to any issues or concerns raised. In addition, was any further consultation planned with the Aboriginal communities including but not limited to a review on the Proponent response to Aboriginal technical review comments submitted on the draft EA report in late July and presentations of the Final EA documentation or project updates since July 2014. 5. Provide further	Aboriginal land use in the EA Report. IAMGOLD will continue to work the MNO to identify how best to consider information provided vis-à-vis the Draft TEK/TLU, however, IAMGOLD opinion remains that the information provided in the MNO's Draft TEK/TLU does not change the effects assessment and impact assessment presented in the EA Report. 4) Details of engagement with Aboriginal communities up to September 30, 2014 can be found in the RoC (Appendix D). The MOECC has received the requested comments from Aboriginal technical reviewers since the submission of these comments. 5) Please see response to Comment #F456. 6) Please see response to Comment #F452.

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				clarification and documentation on the differences in understanding between the First Nation Communities and the Proponent as to the intent and use of information collected in the TEK/TLU studies, the identification of the regional study areas and analysis of the differences in geography from that of the study areas used by the Proponent and the area identified in the TEK report. Provide clarification on, was the TEK/TLU used as the only measure of use by Aboriginal communities and potential impact on that use in the project footprint. 6. Provide clarification on how Aboriginal and/or Treaty rights associated with this geography were incorporated in the impact analysis both within the context of the TEK/TLU study and on the geography in general. Specifically how they were used to identify potential impacts to fishing and hunting rights in the area (water, access), how these were considered in impact assessments and any mitigative measures specific to the potential impact on the rights.	
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Comment #350; Appendix N, Section 4 and 6; Section 6.4.8 We are concerned that negative effects to the aquatic habitat where these two streams discharge into Mesomikenda Lake are not adequately accounted. The EA report states that the initial effluent mixing zone within the Neville-Mesomikenda Lake watershed are expected to have higher levels of several substances (aluminum, arsenic, calcium, cadmium, copper, iron, magnesium, total phosphorus, strontium, uranium, vanadium and zinc) which will exceed water quality benchmarks. These substances will flow into Mesomikenda Lake shortly thereafter. What are the anticipated effects to the Northern Pike spawning beds that will be receive mining	The only tributary of Mesomikenda Lake that is downstream of mine discharge is the outlet of Neville Lake where concentrations are predicted to be less than benchmarks (guidelines or background). No substances are predicted to exceed background or water quality guidelines in Mesomikenda Lake see Tables 4.3 to 4.5 in the Aquatic Biology TSD (Appendix N). Under average and dry year flow scenarios, maximum concentrations of some substances (aluminum, arsenic, calcium, cadmium, copper, iron, magnesium, total phosphorus, strontium, uranium, vanadium, zinc) are expected to exceed water quality benchmarks (background or guidelines) within the initial mixing zone in Bagsverd

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				effluent? Our concerns about the aquatic organisms in the stream are also not yet addressed. An analysis or accounting for the potential deleterious effects of the mining effluent on the pike spawning habitat should be provided, as well as accounting for other aquatic organisms in these inlet areas of Mesomikenda Lake.	Creek (Table 4.3 and Appendix Tables A.4 and A.5). These conditions are expected to be short in duration (i.e., typically less than 4 days; Appendix Table B.2) and as such it is appropriate to consider short-term guidelines or acute toxicity thresholds (Table 4.7b; Appendix Table B.1). The predicted cadmium and uranium concentrations are below the short-term Canadian Water Quality Guidelines (CWQG) and as such no effects to aquatic life are expected (Table 4.7b). Calcium, magnesium and strontium which do not have water quality guidelines, are predicted to be less than established TRV's (Table 4.7b). Aluminum, arsenic and vanadium are predicted to be above water quality guidelines but below TRVs (Table 4.7b). Biotic ligand modelling using copper and site specific water quality indicated that the predicted concentrations will be below toxicity thresholds (see Biotic Ligand Modelling report). Iron concentrations will be lower than predicted due to precipitation within the polishing pond which was not incorporated into the modelling (assumed all in dissolved form). Zinc concentrations were likely overstated in baseline and as such the associated predicted values which incorporate baseline concentrations may be elevated as well. IAMGOLD has committed that if site specific water quality objectives cannot be developed that will allow for the protection of fish and aquatic life and meet regulatory requirements, then additional effluent treatment will be provided. In addition, the implications of predicted phosphorus concentrations were modelled by the water quality team using the Lakeshore Capacity Model to predict future total phosphorus concentrations in

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					Neville Lake (total phosphorus loading from the polishing pond; see Addendum to the Water Quality TSD; Appendix J). The results of the Lakeshore Capacity Model support the conclusion that average total phosphorous concentrations in the mixing zone (lower basin of Neville Lake) are expected to be less than the lake-specific water quality guideline value for total phosphorous (as calculated using the Lakeshore Capacity Model). The mixing zone in Neville Lake will incorporate the lower end of Neville Lake which provides spawning habitat for Northern Pike. Median concentrations will achieve benchmarks (background or guidelines) under all stages of mine development and all flow conditions. Only maximum concentrations which will be short in duration will exceed background or guidelines but these, as noted above, will be below short-term guidelines for the protection of aquatic life. Thus impact to pike spawning and egg incubation is not expected.
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Comment #379; Chapter 11, pages 11-17 and 11-22 We are concerned about the use of the decision tree on page 11-17 to determine residual effects/impact of significance for the loss of aquatic habitat and loss of wetlands. For instance, a level I magnitude for loss of aquatic habitat seems low considering the Mollie River and Bagsverd Creek realignments, and the loss of Cote Lake, Beaver Pond, Unnamed pond, Clam Creek, and parts of Clam Lake an Upper Three Duck Lake, as well as changes in flow to many of the other surrounding water bodies. The reversibility was categorized as “effect is partially reversible”, which then resulted in a residual	IAMGOLD agrees with the statement, that even if an effect is considered reversible this does not necessarily mean an impact is not significant. The decision tree has been developed, in part, to clearly demonstrate that only the combination of all factors allows the determination of impact significance. The decision tree also includes scenarios where, although the impact is considered reversible, the impact is still considered significant. Note that specific to the loss of aquatic habitat the impact is considered insignificant with mitigation, i.e., compensation, in place.

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				impact significance of "Not Significant" for the loss of aquatic habitat and loss of wetland areas. Please note that assigning the reversibility to "Effect is partially reversible" should not necessarily mean the residual impact is not significant.	
660	Letter	06/12/2015	1) Cindy Batista (Ministry of the Environment)	1) Comment #405; Chapter 10, Page 10-18, 10-19 When and how frequent will the proposed aquatic habitat compensation plan be reviewed to ensure the predicted effects to the lotic and lentic habitat are realized?	This is the mandate of DFO and pursuant to the Fisheries Act amendments of 2012, conditions are enforceable requirements of the Fisheries Act Authorization. A monitoring program framework was included in the offsetting plan that included monitoring every year for the first three years following commissioning and then every three year thereafter for three monitoring events. It is recognized that a more detailed monitoring program will be required when the FAA application is submitted.
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) GW(3)-1, Appendix H Section 5.0 of the TMF seepage analysis technical memo, Figure 2-3, Section 5.2; IR#1-444, IR#2-F59, GW(1)-1, GW(2)-1 Summary: Further to questions posed in IR#1 and IR#2, the Agency remains uncertain about: a) the potential for seepage through the base of the tailings management facility (TMF), b) the magnitude and geographic extent (direction and distance) of any seepage that may potentially pass through the base of the TMF to surface water receptors,	south, and a figure showing the extent of bedrock outcrop at the TMF. The extent of bedrock outcrops has been inferred from LiDAR imagery obtained for the Project. These comprise Figures F507-1 to F507-3 (attached).Inspection of these figures is consistent with the interpretation evident in the previously provided cross-sections (Addendum to Hydrogeology TSD; Appendix H); specifically that bedrock outcrops extensively around the perimeter of the TMF with some overburden (silt/sand, till covered by organics) and less bedrock outcrops in the central low lying area. The extent of higher elevation bedrock around much of the perimeter of the TMF is to be noted. Investigations conducted indicate the localized presence of overburden materials in bedrock troughs and the

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				and c) the key mitigation measures necessary to avoid a significant adverse environmental effect on fish and fish habitat and the health of Aboriginal peoples, and follow-up requirements to verify the accuracy of EA predictions related to seepage (including the appropriate locations for certain mitigation and monitoring). Background: 1. Potential for seepage through the base of the TMF To better understand the potential for seepage through the base of the TMF, a more thorough characterization of the permeability beneath the TMF footprint is required. In comment GW(2)-1c, the Agency requested figures "showing cross-sections through the location of the proposed TMF depicting the hydro-stratigraphic units and groundwater flow directions." In its response IR#2-F59c, IAMGOLD provided two cross-sections in Figures F59-1 and F59-2, oriented east-west along the northern and southern margins of the TMF. The Agency notes that to address the concern about the base of the TMF, it would be more useful to have cross-sections that are perpendicular to one another, and that cross through the central part of the proposed TMF. We note that the limited number of wells and boreholes reported likely limits the ability to present these cross-sections. In comment GW(2)-1e, the Agency requested "an isopach	dominance of bedrock outcrops around the perimeter of the TMF. Tailings dams to be constructed at the perimeter of the TMF will be founded on bedrock and to a lesser extent on overburden materials with higher elevation bedrock providing containment along much of the east side. Crystalline bedrock underlies the full extent of the TMF. This crystalline bedrock has a decreasing occurrence of fracturing with depth. The overburden materials comprise the primary seepage pathway from the proposed TMF. The direction of groundwater flow in the overburden reflects the local topography. The bulk of groundwater in the overburden is derived from precipitation with a minor component of lateral flow from the immediately adjacent bedrock highs that bound the overburden occurrences. In areas where overburden is continuous from the TMF to local surface water features, seepage collection facilities will be constructed on the down gradient side to capture tailings seepage from each overburden pathway.The upper fractured bedrock comprises a secondary seepage pathway at the TMF and is less permeable than the overburden materials. Flow in the moderately permeable upper fractured rock is controlled by the local topography with seepage reporting to the immediately adjacent low lying overburden materials. The collection facilities to be constructed downgradient from the low points at the perimeter of the TMF are expected to capture seepage migrating in the overburden and upper fractured rock. The upper fractured rock is considered to comprise the upper 5 to 10 m of the bedrock with the underlying rock essentially unfractured and much less permeable.

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				map of sand thickness with the location of the TMF and groundwater flow directions superimposed to assess if there may be conduits for enhanced groundwater flow beneath the TMF". IAMGOLD provided this map as Figure F59-4, in its response IR#2-F59e. The Agency notes that only 2 monitoring wells and 1 geotechnical borehole were reported within the footprint of the TMF, according to Figure 2-3 of the Hydrogeology TSD (Appendix H). It is unclear whether these samples are characteristic of the entire 8.4-square kilometre TMF footprint. Of particular interest to the Agency is that one of the monitoring wells (DH12 TMF-29) shows silt and sand with a thickness of 9.68 m, which could provide a conduit for enhanced groundwater flow from the base of the TMF. This contributes to the Agency's uncertainty of the permeability beneath the base of the TMF. Information, likely from additional boreholes within the TMF footprint, is considered necessary to ensure that the composition and depth of the overburden under the TMF footprint is adequately characterized, and that the potential for seepage through the base of the TMF is sufficiently understood. a) Keeping in mind question (b) below, provide information from additional boreholes and monitoring wells to further characterize the hydro-stratigraphy and groundwater flow beneath the TMF footprint, or provide a clear rationale (for Agency and federal expert review and consideration) for how the three boreholes taken within the TMF footprint are sufficient, characteristic, and representative of the composition and depth of the	Based on the investigations conducted and the extensive presence of bedrock outcrops around the perimeter of the TMF, the proposed seepage collection facilities to be located downgradient of the tailings dams in low lying areas, and that the water quality in the TMF is predicted to meet metal mining effluent regulations (MMER), and the investigations conducted within the TMF (three boreholes) is considered appropriate. The seepage pathways are sufficiently well characterized to support the water quality modelling for this EA.The hydraulic conductivity of the underlying bedrock decreases by more than two orders of magnitude with depth below the upper fractured rock. As such, seepage from the overlying tailings will move laterally in the overburden and upper fractured rock horizon (the primary and secondary seepage pathways) rather than vertically. Given this, it is IAMGOLD's and the lead hydrogeological consultant (Golder Associates) opinion that this investigation and analysis based on the 2 D modelling is adequate to describe the key seepage pathways and quantify the mass flux potentially migrating to the environment.It should be further noted that monitoring in the overburden and bedrock (including below the upper fractured bedrock) at the perimeter of the TMF is to be conducted to assess groundwater quality during operations and closure. Details of this monitoring program including location and depth of overburden and bedrock monitoring wells will be developed at the detailed design stage of the Project. Should this monitoring indicate that mitigation measures may be required, IAMGOLD will consider deepening of the seepage

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				overburden underneath the entire 8.4-square kilometre TMF footprint. If this rationale is provided, ensure it describes how data and information previously provided have been supplemented with new information and/or extrapolated, with supporting figures and charts, and appropriate literature to support any assumptions made). b) Provide intersecting cross-sections that cross through the central part of the proposed TMF, designed to provide a fulsome representation of the base of the TMF. Ensure that these cross-sections contain the hydro-stratigraphic model layer units, water levels for monitoring wells, and groundwater flow directions. Provide a rationale for the amount of data used to inform each cross-section, and its sufficiency. c) Provide an updated isopach, similar to figure F59-4 provided in the response 2. Magnitude, direction and extent of seepage passing through the base of the TMF From Section 5.0 of the technical memo for TMF seepage analysis in the addendum to Appendix H, it is unclear how the rate of seepage passing through the base of the TMF was modelled and calculated. It is also unclear how seepage through the base of the TMF was incorporated into models for surface water quality. This is necessary to assess with confidence the magnitude and geographic extent of effects on surface water quality, and then on fish and fish habitat and human health. In comment GW(2)-1f, the Agency recommended that 3-D modelling and particle tracking be used to characterize	collection ponds or interception wells downgradient of the TMF. However, it should be noted that the effects assessment does not indicate a warranted need for the application of these measures, and therefore further details regarding these proposed adaptive mitigation measures is not justified at this time. Reviewer comments included a request for more clarity regarding how seepage from the TMF was calculated and incorporated into the water quality model. The total seepage rate that was predicted to bypass the seepage collection system is estimated to be 35,000 m3/year. This was determined by multiplying the groundwater flux rate that by-passes the seepage collection system (m2/year), as simulated by the 2-D modelling, by the perimeter dam ditch length (m). The total seepage rate was then split such that 60% of this total seepage rate reported to Bagsverd Lake and 40% of the total seepage rate reports to the Unnamed Lakes and Bagsverd Creek; this split was based on the relative perimeter dam ditch length along the north and south perimeters. However, because the water quality model does not account for mass attenuation in the surface water system, the model set-up is such that the entire mass associated with the total seepage (35,000 m3/year) ultimately reports to Bagsverd Creek through drainage from Bagsverd Lake and the Unnamed Lakes. What this means is that the proportioning of the seepage from the TMF into the receiving environment has no effect on the predictions for Bagsverd Creek and further downstream; that is, 100% of the mass load associated with the TMF seepage is being accounted for in Bagsverd Creek and further downstream. This

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				the groundwater system around the TMF. The proponent responded that "a 3-D model is not considered to be useful in providing additional information that is not currently incorporated in the 2-D modelling." The Agency understands that the 3-D model is the best way to understand the seepage through the base of the TMF, and to understand the magnitude and geographic extent (directions and distances) of groundwater flow underneath the TMF. Additionally, the current 2-D model does not have particle tracking capability, which shows the predicted pathways of particles leaving a potentially contaminated source area to their ultimate destination. It is noted that the TMF seepage monitoring plan described in section 5.2 of Appendix H describes monitoring around the perimeter of the TMF. The locations of the monitoring wells would also ideally take into consideration seepage from the base of the TMF, and that the groundwater flow regime may change once the Côté Gold Mine Project (the Project) has begun, such that baseline flow directions may no longer apply. A 3-D groundwater model based on a fully characterized TMF would be useful to 1) clearly show flow pathways from source to receptor in the baseline case and the project case, which is crucial in the magnitude and extent of predicted effects on surface water quality, and on fish and fish habitat and human health; 2) optimize the locations and pumping rates of the proposed seepage pumping wells, and provide information on the effectiveness of the seepage reduction and seepage collection measures including, but not limited, to the TMF	approach to assigning seepage in the water quality model is conservative because of the following:•The total seepage rate is based on the maximum (ultimate) dam height, maximum reclaim pond operating water levels, and therefore the maximum hydraulic head differences between the reclaim pond and the water table downgradient of the seepage collection system;•The total seepage rate of 35,000 m3/year was applied for all climate conditions, including the 1:25-dry year condition; and,•As stated above, the water quality model assumes that the mass transport in the surface water system is conservative (i.e. attenuation/degradation in the surface water receivers is not accounted for in water quality model) and that the entire mass load associated with the seepage reports to Bagsverd Creek and further downstream. In reality, some of that mass will be sequestered in the system and not all the mass load would report downstream.

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				liner, seepage pumping wells, and ditching; and 3) optimize the layout of monitoring wells by taking into account the groundwater flow regime. d) Provide, with a detailed rationale, the calculated seepage rate through the base of the TMF, not including seepage beneath the TMF dams, and indicate this as a percentage of the total seepage. Provide the percentage of the seepage beneath the base of the TMF (not beneath TMF dams) that will be captured and the geographic fate (direction and distance) of that seepage not captured. If necessary, use a 3-D groundwater model of the area around the proposed TMF to obtain this information. Use particle tracking to show the extent of the contaminant plume predicted to emanate from the TMF with and without the proposed mitigation measures (i.e., collection system). If a 2-D groundwater model is used to provide the information requested in this question, provide details of how that 2-D model is used to calculate the magnitude, and geographic extent (directions and distances) of groundwater flow underneath the TMF. e) To understand the magnitude and extent of impacts on surface water quality, and then impacts on fish and fish habitat and human health, provide updated surface water quality predictions which incorporate the new information from questions (a) to (d). 3. Key mitigation measures and follow-up requirements The Agency acknowledges commitments by IAMGOLD to install a geomembrane lining around the perimeter of	

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				starter TMF dams, and to collect seepage and runoff at collection ponds around the perimeter of the TMF to pump back into the TMF. The Agency also acknowledges commitments by IAMGOLD to monitor groundwater quality and levels at locations around the perimeter of the TMF, and to monitor surface water quality before and after the final effluent discharge point, and in some water bodies near the TMF (e.g., Bagsverd Lake, Unnamed Lake #1, Neville Lake, Mesomikenda Lake). As part of its recommendation to the Minister on the significance of adverse environmental effects, the Agency will include potential conditions including key mitigation measures necessary to avoid significant adverse environmental effects caused by seepage, and follow-up requirements to verify the accuracy of EA predictions related to seepage (including the appropriate locations for certain mitigation measures and monitoring program.) The outcome of this information request will increase the Agency's confidence with IAMGOLD's proposed mitigation measures and monitoring program, and help determine any additional specific key mitigation and follow-up requirements, which will help to refine the Agency's recommendation to the Minister. Rationale: The Agency has determined it requires more certainty on the potential for seepage through the base of the TMF, the magnitude and geographic extent (direction and distance) of any seepage that may potentially pass through the base of the TMF to surface water receptors,	

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				prior to completing its recommendation to the federal Minister of the Environment regarding 1) key mitigation measures necessary to avoid significant adverse environmental effects on fish and fish habitat, and the health of Aboriginal peoples, and 2) follow-up program requirements, including the location of monitoring systems, to verify the accuracy of EA predictions related to seepage. This information is needed to characterize the hydrogeology at the site, as requested in Section 9.1.2 of the EIS Guidelines, and to determine changes to surface water quality (Section 10.1.2 of the EIS Guidelines). It will also help determine the sufficiency of the proposed mitigation measures and monitoring programs, or any additional key mitigation measures and follow-up program requirements, as required in Section 11.1 an 11.4 of the EIS Guidelines. f) Based on the updated surface water quality predictions in (e), provide additional seepage control measures (e.g., enhanced TMF liner, seepage pumping wells, other), if necessary, to ensure that surface water quality meets provincial and federal guidelines and regulations. g) Provide details on how seepage through the base of the TMF will be monitored throughout the Project to verify the accuracy of EA predictions, as part of a follow-up program.	
658	Letter	09/11/2015	1) Christine Greenaway	1) SW(3)-42, Surface water & Water quality, Response to province (June 12, 2015)	a) Appendix J, Section 4.3.3 Treated Effluent Discharge Alternatives Analysis, clearly states that the proposed

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			(Canadian Environmental Assessment Agency)	Summary: The Agency would like to clarify the location of the treated effluent discharge point. Background: In Figure 1 of the technical memo "Preliminary Hydrodynamic Analysis of the Proposed Treated Effluent Mixing Zone, Côté Gold Project", included in the proponent's June 12, 2015 responses to the Province of Ontario comments, the proposed treated effluent discharge location is shown as being in the mouth of Neville Lake. In Figure 2-4 of the Water Quality TSD (Appendix J), the treated effluent discharge location is shown as the downstream end of Bagsverd Creek. Rationale: The location of discharge can affect predictions of changes to surface water quality and quantity, and potential adverse environmental effects on fish and fish habitat and human health in the area of Neville Lake. Further, the Agency's draft EA Report currently includes a chapter on the alternatives considered for the Project, and specifically mentions the alternatives discussed in the Amended EIS for the final effluent discharge points (comparing the selected option, Bagsverd Creek to the alternative, Mesomikenda Lake). We would like to make sure this section of the EA Report is accurate before	option is to discharge treated effluent at the downstream end of Bagsverd Creek using the lower basin of Neville Lake as a mixing zone; noting that there is no mention of using any stretch of Bagsverd Creek as part of the mixing zone.b) IAMGOLD is of the opinion that 'Figure 1-2 Preliminary Site Plan' as it is currently designed adequately reflects the proposed option to discharge treated effluent. c) There is no change in the proposed locations of the final treated effluent discharge point, and therefore there is no change to the prediction of effects about surface water flows and levels and surface water quality. d) There is no change in the proposed locations of the final treated effluent discharge point and therefore there are no new / modified potential adverse effects on fish and fish habitat and human health. e) There is no change in the proposed locations of the final treated effluent discharge point and therefore no additional mitigation or accommodation, or monitoring and follow-up programs are required.

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				posting online for consultation. Reviewers may have particular interests at the new location (e.g., fish spawning habitat, other). We are also seeking to confirm that the federal and provincial governments are working from the same information. Section 10.1.2 of the EIS Guidelines requires that the EIS describe any change that may be caused by the Project, including "water, [.], living organisms, [.], and the interacting natural systems that include the components described above." Effluent discharge location: a) Confirm the location of the final proposed treated effluent discharge location, in a figure similar to Figure 2-4 of Appendix J. b) If the change is observable at the site plan scale, please provide an updated 'Figure 1-2 Preliminary Site Plan', for use in the draft EA Report for the next round of public participation. c) If the proposed location of the final treated effluent discharge point has changed from what is shown in Figure 2-4 of Appendix J, provide details on how this new location will change any predictions about surface water flows and levels, and surface water quality. d) Discuss any new, or modifications to, potential adverse environmental effects on fish and fish habitat and human health that may result from moving the effluent discharge	

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				point to this new location. e) Provide details on additional mitigation or accommodation measures, or monitoring and follow-up programs, which may be put into place if required, or may no longer be required, to avoid significant adverse environmental effects under section 5 of CEAA 2012.	
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AP(3)-11, Human environment, EA(2)-2 Summary: The Agency requests a summary map (or maps) illustrating the full geographic extent of predicted physical and chemical changes to the environment (as specified in next column), overlaid with Aboriginal land uses and sites or areas of importance for exercising Aboriginal or Treaty rights, to help communicate relationships between these changes and potential adverse environmental effects on Aboriginal peoples, and to ensure appropriate mitigation measures and follow-up program requirements can be specified. Background: Aboriginal groups have commented that the project footprint is not an accurate reflection of the area that will no longer be available for the exercise of rights, considering additional areas adjacent to the actual project footprint that will be unusable or unused due to issues of safety, air quality, noise and other ongoing effects of the proposed Project. Aboriginal groups have indicated that	a) As discussed with the CEA Agency during the meeting of July 23, 2015, the traditional land use effects prediction considers and integrates effects on other disciplines. The effects on traditional land use described in Section 9.11 and shown in Chapter 11, Tables 11-3 to 11-6, therefore reflect the extent of all combined effects on traditional land use. IAMGOLD therefore is of the opinion that the relationship between potential effects on the physical and biological environment and potential effects on Aboriginal peoples are already clearly and unequivocally presented and discussed in the EA and that appropriate mitigation measures and follow-up programs are specified such that significant impacts on Aboriginal people are not expected. The significance of an impact is derived using a series of assessment criteria (i.e., magnitude, extent, frequency, duration, and reversibility), in consideration through the decision tree (Graphic 11 1). Creating a figure that only illustrates one assessment criterion would be misleading to reviewers and stakeholders as it would not fully explain the complete methodology implemented to determine levels of significance. Additionally, illustrating this for a single criterion would not be consistent with the CEA Agency's reference guide for the determination

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				area experiencing environmental changes as a result of the Project will be larger than the physical footprint of the infrastructure. IAMGOLD has described current use of lands and resources, and sites or areas of importance for exercising Aboriginal or Treaty rights, within and around the project footprint, including: navigational routes (e.g., the 4M Canoe Route, traditional canoe route); known sites (e.g., waterfowl hunting site, waterfowl hunting route, Sensitive Area C as described by Mattagami First Nation/Flying Post First Nation, and campsites along the canoe routes); and other activities such as traditional hunting, trapping, fishing and harvesting. Other land uses may have been identified through recent engagement with Aboriginal groups and IAMGOLD's responses to requests AP(3)-9 and AP(3)-10. Rationale: Based on all information reviewed (e.g., Amended EIS, information request responses, Aboriginal comments), the Agency does not yet have certainty in its recommendation to the Minister about the geographic extent (and related significance) of adverse environmental effects on Aboriginal peoples, and the specific key mitigation measures and follow-up requirements required to address the specific effects. Section 12.1.1 of the EIS Guidelines requires the proponent to present any residual environmental effects of the Project on the biophysical and human	of significance (CEA Agency, 1994). Also note that the Project has been designed, and mitigation is included, such that significant impacts are not predicted on the environment.

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				environments after mitigation measures have been taken into account. The Agency requests the physical and chemical changes to the environment (as specified in next column) be presented on a map to clearly identify the predicted geographic extent of these changes for communication and analysis purposes, to help inform discussion on the effects of these changes and the appropriate mitigation measures and follow-up requirements to address these effects. Note: The map(s) requested will form the basis for additional information requested through AP(3)-12, AP(3)-13, and AP(3)-14, below.) In order to clearly characterize and communicate effects of the Project on Aboriginal peoples, the Agency requests a map (or maps) that show known areas and sites used for the exercise of rights including, but not limited to, any sites and areas of importance identified by Wabun Tribal Council, Brunswick House First Nation, and the Métis Nation of Ontario, overlaid with all areas where the following changes to the physical and chemical environment are anticipated: i. Areas where water bodies are expected to be lost at any time in the Project, overlaid with areas where surface water flows are expected to change by more than 10% at any time during the Project; ii. Areas where exceedances of Ontario Drinking Water Standards are expected for any compound at any time during the Project;	

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				iii. Areas where exceedances of a 24-hour air quality guideline are expected for any compound at any time during the Project, overlaid with areas where exceedances of an annual air quality guideline are predicted for any compound at any time during the Project; iv. Areas where maximum predicted daytime noise levels at any time during the Project will be above 45 dB, overlaid with areas where maximum predicted nighttime noise levels at any time during the Project will be above 40 dB; v. Areas where terrestrial vegetation or habitat is removed at any time during the Project, overlaid with areas where terrestrial vegetation or habitat is altered at any time during the Project; vi. Any proposed access road corridors or general areas where access roads are under consideration (e.g., to the tailings management facility, transmission line, or other project components). The map(s) should be at a scale and contain a level of detail that allows for clear communication with Aboriginal communities. The map(s) should take into account existing information described in the Amended EIS, IAMGOLD's responses to AP(3)-9 and AP(3)-10 regarding the Métis Nation of Ontario and Brunswick House First Nation, and any new information acquired through recent engagement with	

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				Wabun Tribal Council, Brunswick House First Nation, the Métis Nation of Ontario, and any other Aboriginal groups.	
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AP(3)-12, Current use of lands and resources for traditional purposes, Aboriginal and treaty rights, Appendix P (3.1.2.1) Appendix Z (#'s 308, 312, 313, 314, 315, 316, 500 and 543), AP1-1, AP(2)-7 Summary: The Agency requires a more precise understanding of the magnitude and full extent of the impacts of the combined environmental effects of the Project to lands, waters and resources used and valued by Aboriginal groups for traditional purposes (such as hunting, trapping, plant harvesting, fishing, and navigational routes) including areas where access will be restricted, areas where access will be controlled, and areas where the quality of the land uses will be altered. The Agency also requires a clearer understanding of the key mitigation and follow-up requirements proposed to address specific effects. Background: Aboriginal groups have expressed concerns in relation to a lack of clear understanding of the geographic extent of the predicted effects of the Project and a perceived underestimation of the potential for the environmental effects of the Project to impact the exercise of rights. In addition, Aboriginal groups have described specific species (captured in a in the column to the right) and land uses of importance to them.	a) Upon thorough review and discussion within IAMGOLD's EA team, IAMGOLD is confident that the effects requested in this IR have been fully considered and assessed through the integrated methodology applied which uses indicators to predict effects on all areas of the environment, including Aboriginal communities.This methodology has been developed and consulted on with, amongst others, local Aboriginal communities and their technical reviewers.An example of how the integrated methodology includes effects and mitigation from all disciplines, as it pertains to the traditional land, water and resource uses proposed by the CEA Agency, was demonstrated to the CEA Agency on July 23, 2015.The IR is requesting IAMGOLD to apply a new and different methodology for preparing the EIS. While, IAMGOLD is cognisant of the fact that there is a multitude of methodologies that can be applied for an EA, IAMGOLD feels that the methodology that has been applied in this EA is both respectful of all areas of the physical, biological and human environment, but also provides a thorough level of detail with respect to effects on Aboriginal communities.In other words, IAMGOLD believes the EA methodology allows IAMGOLD as well as the federal reviewers to appropriately understand the interaction of all potential effects on the physical, biological and human environment. Using this method, IAMGOLD is able to assess with confidence how, to what extent and duration changes in the physical environment will affect

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				In response to a Wabun Tribal Council Information Request (Appendix Z, #313), IAMGOLD identified that displacement of wildlife species from the project site will occur; however, that the Project will not limit the ability to carry out traditional hunting. It is also the Agency's understanding that traditional activities such as hunting, fishing/netting, trapping and gathering may occur within areas between the footprint of specific project components (e.g., the 4M Canoe Route), and around the project footprint (e.g., the Mattagami First Nation/Flying Post First Nation Sensitive Area C), where other physical and chemical changes to the environment may occur. In some cases, constraints on land use are proposed in response to predicted 24 hour air quality exceedances, but the extent of these constraints are not clear to the Agency. Rationale: Based on all information reviewed (e.g., Amended EIS, information request responses, Aboriginal comments), the Agency does not yet have certainty in its recommendation to the Minister about the significance of adverse environmental effects on the current use of lands and resources for traditional purposes by Aboriginal peoples, the specific key mitigation measures and follow-up requirements required to address the specific effects. Section 10.1.3 of the EIS Guidelines requires the proponent to describe the effects of any changes the	local Aboriginal communities' traditional use of the land. IAMGOLD also notes that this meets Section 5 requirements of CEAA 2012. The IRs request IAMGOLD to apply a methodology where Aboriginal land and resource uses form the basis of the impact assessment. IAMGOLD alternatively applies a methodology that considers all components of the environment equally thereby allowing indicators to be developed that are most relevant to each environmental discipline. IAMGOLD is confident that the chosen indicators, which have been consulted upon as documented in Appendix D, are reflective of all potential effects on land, water and resource uses listed in these IRs.In summary, IAMGOLD is confident that the assessment provided in the EIS fully compliant with CEAA, 2012, Section 5, and the EIS guidelines, specifically Section 10.1. IAMGOLD considers it unreasonable for the CEA Agency to request IAMGOLD to carry out an effects assessment applying a new EA methodology and approach. b) As described in the response to a) above, IAMGOLD has considered the linkage between effects, such as noise, on wildlife and how those effects impact Aboriginal traditional land and resource uses. For an example related to noise, please see Appendix Z, Comment 493.c) The cumulative effects assessment fully considers all Project effects, including effects on traditional land and resource uses.d) See a) above.On July 23, 2015, IAMGOLD presented a table for discussion purposes to demonstrate how multiple mitigation measures for effects to a number of physical environment and biological environment disciplines, are inherently applied throughout the effects prediction process on

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				Project may cause to the environment, with respect to Aboriginal peoples, on the current use of lands and resources for traditional purposes. Section 12.2 of the EIS Guidelines requires a description, from the perspective of the proponent, of the potential adverse impacts on potential or established Aboriginal and Treaty rights and related interests that have not been fully mitigated to inform the Crown's assessment of adequacy of consultation and accommodation measures. Note: The response to this request should take into account existing information described in the Amended EIS, IAMGOLD's responses to AP(3)-9 and AP(3)-10 regarding the Métis Nation of Ontario and Brunswick House First Nation, and any new information acquired through recent engagement with Wabun Tribal Council, Brunswick House First Nation, the Métis Nation of Ontario, and any other Aboriginal groups. Taking into account the magnitude and full extent of the combined environmental changes requested in AP(3)-11, and recognizing Aboriginal land uses may occur throughout areas affected by the Project: a) Provide additional details on the predicted effects and residual effects to traditional hunting, trapping, plant harvesting, fishing, and navigation of land and water routes within the project footprint (mine site and transmission line), and in areas between and around the specific project components. This information must include clear descriptions of how and where access to	effects that pertain to traditional land and resource uses.e) See d) above.Any residual effects to traditional land and resource uses that are not sufficiently mitigated through mitigations from the other discipline indicators, have additional mitigations specific to the Project effect. IAMGOLD is of the opinion that mitigation provided in the EA is sufficient such that there are no significant impacts on traditional land and resource uses.IAMGOLD has consulted with Aboriginal groups throughout the EA process on proposed mitigations. For example, based on feedback from Aboriginal communities, IAMGOLD committed to manually clearing vegetation along the transmission line. IAMGOLD has reviewed all information provided by Aboriginal groups, and has come to the conclusion that with the mitigation measures included in the EIS, there will be no significant impacts on Aboriginal groups and therefore no additional mitigation is required. f) See d) above.Upon review of Chapter 16, IAMGOLD is confident that the proposed monitoring program is best suited for monitoring the effectiveness of proposed mitigation measures. For example, monitoring of water quality is linked to traditional land and resource uses (Traditional Land Use – Fishing). IAMGOLD has consulted with Aboriginal groups throughout the EA process on proposed monitoring. For example, based on feedback from Aboriginal communities, IAMGOLD committed to developing a Socio-economic / Community Management Plan to monitor and respond to Project effects on Aboriginal communities. IAMGOLD has reviewed all information provided by Aboriginal groups, and has come to the

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				lands or waters will be restricted, access to lands or waters will be controlled, and the quality of the land or water uses and land and water use experience will be altered (e.g., will changes to air or water quality, noise or other sensory disturbances require restriction of access to areas identified by Aboriginal groups, decrease local resource availability, or decrease the quality of the experience?). This description must take into consideration the following values important for the exercise of traditional land, water and resource uses: i. large game (including, but not limited to, ungulates and black bear); ii. small game (including but not limited to rabbit); iii. furbearing species (including but not limited to American marten and wolves); iv. birds (including but not limited to grouse and duck); v. fish (including but not limited to walleye, northern pike, perch, bass, burbot/ling cod, trout, sturgeon) vi. medicinal and edible plants (including but not limited to blueberries, Labrador tea, raspberries, strawberries, birch, spruce, yellow birch, chaga (a large brown growth found on some birch trees), sweet grass, cattails, choke cherries, fiddleheads, cranberries, nuts, mushrooms, pin cherries, Saskatoon berries); vii. navigational routes (including but not limited to the	conclusion that with the currently included mitigation measures in the EIS, there will be no significant impacts on Aboriginal groups and therefore no additional mitigation is required. Accordingly, no additional monitoring is required.

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				4M canoe route, traditional canoe route, Biscotasing Lake to Mattagami First Nation travel route and other sites identified in the Métis Nation of Ontario Traditional Knowledge and Land Use Study); and viii. sites (waterfowl hunting site, waterfowl hunting route and the proposed removal of campsites along the 4M canoe route and traditional canoe route). b) Describe impacts on wildlife species in the combined environmental changes analysis, such as displacement due to noise in areas likely used by Aboriginal peoples (e.g., Sensitive Area C). c) Taking into consideration the combined predicted effects of the Project, describe any changes this may have on cumulative effects predictions as it relates to current use of lands and resources for traditional purposes. d) In a table, link (from section 16 of the Amended EIS) any mitigation measures that are applicable and sufficient to address effects on the current use of lands and resources for traditional purposes by Aboriginal peoples. Take into account the magnitude and full extent of the combined environmental changes described on the maps provided in response to AP(3)-11, and taking into account additional analysis undertaken in response to (a), (b) and (c) above. e) In the same table, if there are effects for which insufficient mitigation measures are identified, provide a list of additional mitigation measures, as required. Take	

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				into account any measures proposed by Aboriginal groups throughout the environmental assessment to-date. If mitigation is not required, provide a rationale. f) In the same table, identify any follow-up monitoring that may be required given responses to (a), (b), (c), (d) and (e). Clearly link to existing proposed monitoring plans in the Amended EIS. Identify additional follow-up program commitments as required, taking into consideration any continued monitoring or engagement proposed by Aboriginal groups throughout the environmental assessment to-date. If follow-up is not required, provide a rationale.	
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) AP(3)-13, Socio-economic conditions, Appendix T, Appendix O, Appendix Z (#'s 173, 275, 498, 499, 501), AP1-2, AP1-3, AP1-5 Summary: The Agency requires a clearer description of the effects of the Project on the socio-economic conditions of Aboriginal peoples that are directly linked to environmental changes, as well as the specific key mitigation measures and follow-up commitments proposed to address these effects. The Amended EIS does not clearly describe the magnitude and full extent of potential impacts of the combined environmental effects of the Project on Aboriginal socio-economic conditions. Background:	) Please see response to IR AP(3)-12 (Comment F515), part a).b) The cumulative effects assessment considers all Project effects, including effects on Aboriginal socio-economic conditions.c) See response to IR AP(3)-12, parts a) and d).d) Any residual effects to Aboriginal socio-economic conditions that are not mitigated through mitigations from the other disciplines, have additional mitigation specific to the project effect. IAMGOLD is of the opinion that mitigation provided in the EA is sufficient such that there are no significant impacts on Aboriginal socio-economic conditions.IAMGOLD has consulted with Aboriginal groups throughout the EA process on proposed mitigation. IAMGOLD has reviewed all information provided by Aboriginal groups, and has come to the conclusion that with the currently included mitigation measures in the EIS, there will be no significant impacts on Aboriginal groups and therefore no additional

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				Aboriginal groups have expressed concern that the socio-economic information described was limited and/or was not reflective of the socio-economic conditions of Aboriginal peoples. Aboriginal groups also expressed that the assessment of the impact of the environmental effects of the Project on Aboriginal socio-economic conditions should include consideration of impacts on the harvesting of plants for economic purposes, as well as Aboriginal baitfish harvesters, outfitters, trappers, cabins and campgrounds. As defined in section 5 of CEAA 2012, socio-economic assessment must be completed on matters directly related to a change in the environment. The Socio-economic TSD (Appendix T) of the Amended EIS described general socio-economic conditions that are not necessarily directly linked to environmental changes caused by the Project, including labour markets, business opportunities, government finances, population and demographics, community health conditions, housing and temporary accommodations, public utilities, education, emergency services, other community services and infrastructure, and transportation. The Land and Resource Use TSD (Appendix O) of the Amended EIS identifies predicted effects land uses related to socio-economic conditions such as trapping, recreational and commercial fishing, cottagers and outfitters, navigable waters and other recreational uses, but the assessment is scoped to non-traditional land users. The Traditional Land Use TSD (Appendix P) does not assess socio-economic effects related to Aboriginal	mitigation is required.e) See c) above.Upon review of Chapter 16, IAMGOLD is confident that the proposed monitoring program is best suited for monitoring the effectiveness of proposed mitigation measures. IAMGOLD has consulted with Aboriginal groups throughout the EA process on proposed monitoring. For example, based on feedback from Aboriginal communities, IAMGOLD committed to developing a Socio-economic / Community Management Plan to monitor and respond to Project effects on Aboriginal communities.

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				peoples. The Agency acknowledges that Appendix Z (499) of the Amended EIS identifies that IAMGOLD is not aware of commercial fisheries in the area and do not predict effects on commercial or Aboriginal fisheries. Therefore, the Agency concluded that the Amended EIS does not clearly describe the magnitude and full extent of the predicted impacts on Aboriginal socio-economic conditions specifically caused by environmental changes of the Project. The Agency is also concerned that if additional information about Aboriginal socio-economic conditions is acquired by IAMGOLD, a simple reassessment of conclusions from Appendix T of the Amended EIS may not capture the socio-economic effects to be taken into account under CEAA 2012. Rationale: Based on all information reviewed (e.g., Amended EIS, information request responses, Aboriginal comments), the Agency does not yet have certainty in its recommendation to the Minister about the significance of adverse environmental effects on the socio-economic conditions of Aboriginal peoples that are linked to changes in the environment, or the specific key mitigation measures and follow-up requirements required to address the specific effects. Section 10.1.3 of the EIS Guidelines requires the proponent to describe the effects of any changes the Project may cause to the environment, with respect to Aboriginal peoples, on health and socio-economic	

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				conditions. Note: The response to this request should take into account existing information described in the Amended EIS, IAMGOLD's responses to AP(3)-9 and AP(3)-10 regarding the Métis Nation of Ontario and Brunswick House First Nation, and any new information acquired through recent engagement with Wabun Tribal Council, Brunswick House First Nation, the Métis Nation of Ontario, and any other Aboriginal groups Taking into account the magnitude and full extent of the combined environmental changes described on the maps provided in response to AP(3)-11, and taking into consideration any population-level changes that may occur beyond those boundaries, and the potential for effects to Aboriginal socio-economic conditions to occur throughout all areas affected by the Project: a) Similar to the analysis completed in appendix O of the Amended EIS which identifies predicted effects on non-traditional land uses, provide an analysis of effects on Aboriginal socio-economic conditions from predicted environmental changes including, but not limited to, impacts on: a. harvesting of plants for economic purposes; b. baitfish harvesters; c. outfitters and cottages;	

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				d. trappers and cabins; e. campgrounds; and f. other businesses. b) Taking into consideration the combined predicted effects, describe any changes to cumulative effects predictions as it relates to Aboriginal socio-economic conditions. c) In a table, link (from section 16 of the Amended EIS) any mitigation measures that are applicable and sufficient to address effects on the socio-economic conditions of Aboriginal people. Taking into account the magnitude and full extent of the combined environmental changes described on the maps provided in response to AP(3)-11, and taking into account additional analysis undertaken in response to (a) and (b) above. d) In the same table, if there are effects for which insufficient mitigation measures are identified, provide a list of additional mitigation measures as required. Take into account any measures proposed by Aboriginal groups throughout the environmental assessment to-date. If mitigation is not required, provide a rationale. e) In the same table, identify any follow-up monitoring that maybe required given responses to (a), (b), (c), and (d). Clearly link to existing proposed monitoring plans in the Amended EIS. Identify additional follow-up program commitments as required, taking into consideration any	

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				continued monitoring or engagement proposed by Aboriginal groups throughout the environmental assessment to-date. If follow-up is not required, provide a rationale.	
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) WH(3)-1, Ecological changes linked to federal authorizations including wildlife and wildlife habitat, Sections 6, 9, 10, 11 Appendix K, L Summary: The Agency requires clarification and information about predicted effects to wildlife populations, habitat use, and ecological conditions that are linked to the proposed loss and alterations of water bodies and associated channel realignments, as well as any mitigation measures or follow-up program commitments proposed to address these effects. Background: Under subsection 5(2) of the Canadian Environmental Assessment Act, 2012(CEAA 2012), the Agency's environmental assessment must consider any changes to the environment that are directly linked or necessarily incidental to federal authorizations, and the effects of those changes. This can include effects to wildlife species other than fish, migratory birds, and wildlife resources for Aboriginal people that are already considered under subsection 5(1) of CEAA 2012. The scope of the Agency's analysis under subsection 5(2)	a) Confirmed, all water bodies for which a federal regulatory decision may be pursued (e.g., under the Fisheries Act, Metal Mining Effluent Regulations, and Navigation Protection Act), have been identified during the response to comments dated April 17, 2015 through "Table to Comment #F60 1: Proposed Rationale for NPA Approvals by Waterbody and the document "Review of waterbodies affected by Côté Gold Project relative to the requirement for a Section 35 FAA versus MMER Schedule 2" submitted in response to Comment F39. Please note that a revised version of this document is included as an attachment to this response package which includes a figure that has been updated to reflect the results of discussions with Environment Canada and DFO.b) IAMGOLD confirms the realignment locations presented in Figure 3.1 and Figure 3.2 in the Addendum to the Aquatic Biology TSD (Appendix N) are correct. The reviewer is correct that text in Section 7.3.9 relates to minor optimization of realignment design, and not general location.c) The land cover information was updated following submission of the EA. Land cover information provided in the response to IAMGOLDs response to IR#2 included the updated values, hence the discrepancy between the values in the EA and in the IR#2 response. These revised values are presented in Table 1. Table 1: Revised Baseline Wetland Habitat Area and Predicted Wetland Loss for the Local Study Area

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				of CEAA 2012, for the Côté Gold Mine Project, includes any changes to water bodies, wetlands, and riparian areas that will be linked to the anticipated Fisheries Act authorization, Metal Mining Effluent Regulations Schedule 2 water body listing, and Navigation Protection Act approvals. This geographic scoping is based on the water bodies identified in IAMGOLD's response to IR#2, including #F39 (and Table 3.1 within associated support document in the errata) and response #F60 (and associated table in the errata). It includes the terrestrial areas that will be replaced by new water bodies. To be more specific, the scope of the Agency's analysis includes the water bodies listed in 'Appendix A' of this information request, pasted at the bottom of the right hand column. As a result, other species, both flora and fauna, that reside, forage, breed, travel through, hibernate or nest within these areas must be clearly identified and assessed. This information is relevant to determining the significance of effects on species ecological change considered under subsection 5(2) of CEAA 2012, as well as any key mitigation required to avoid significant effects, and any follow-up requirements to verify the accuracy of EA predictions or effectiveness of mitigation. The Agency has used information available in the Amended EIS (Section 6, 9, 10, 11, Appendices K and L) to conduct the analysis. Through this review, specific questions about wetlands, turtles and amphibians. The information will help to verify and substantiate our	and Regional Study AreaStudy AreaValues Presented in TSDRevised ValuesTotal Wetland Area (ha) at BaselineWetland Area Loss from Project (ha)Wetland Loss from Project (%)Total Wetland Area (ha) at BaselineWetland Area Loss from Project(ha)Wetland Loss from Project (%)Local Study Area615.2170.427.7633.3177.128.0Regional Study Area1664.4183.811.01664.4177.110.6The total amount of wetland habitat lost as a result of the Project is predicted to be 177.1 ha. This represents an approximate loss of 11% of the available wetland habitat in the RSA (i.e. approximately 90% of the available wetland habitat in the RSA will remain unaffected by the Project).A conservative approach was taken in assessing the wetland loss from the Project:•The GIS database utilized in the interpretation of land cover included more wetland habitat than what was provided in the available land cover databases.•The predicted loss areas do not consider compensation through re-alignment of water channels until after closure.Using this conservative interpretation of different land cover data systems, habitat loss calculations suggest that the Project will affect approximately 11% of the wetlands in the RSA. As a precautionary approach, this value was carried through the effects assessment process over the life of the Project. For all phases of the Project, an 11% loss of wetlands in the RSA is expected to be within the adaptive capability of existing wetland ecosystems and no significant effects of the Project are predicted on wetland habitat. Wetland systems are expected to retain their ability to fulfill important ecosystem

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				potential recommendation to the Minister. Rationale: The Agency requires this information to satisfy subsection 5(2) of CEAA 2012 in its recommendation to the Minister of the Environment and Draft EA Report. Geographic scoping of effects assessment linked to potential federal authorizations: a) To confirm the Agency's geographic scoping of its effects assessment under subsection 5(2) of CEAA 2012, please verify that all water bodies for which a federal regulatory decision may be pursued (e.g., under the Fisheries Act, MMER, and Navigation Protection Act), have been identified through information request #2 responses (Appendix A, below). b) The Agency notes that Section 7.3.9 (project alternatives) of the Amended EIS mentions the realignments are under investigation and, in discussions with regulators, will be reviewed as engineering studies advance. The Agency understands this to be about optimizing channel design, and not general location. Pease confirm that the locations of the watercourse realignments are correct and finalized as presented in Figure 3.1 and Figure 3.2 in the Addendum to Appendix N, Minnow Environmental Inc. Report.Wetlands It is not clear how much wetland habitat will be lost in the construction phase relative to the available amount of	functions and be self-sustaining. d) The assessment provided in Appendix K: Vegetation Technical Support Document was based on the most current evaluation of landcover and there is no anticipated change in the assessment of magnitude of the effects of the Project on wetlands. The anticipated loss of wetland area represents 0.4% of the total available habitat in the regional study area, and 11% of the available wetland habitat in the regional study area. Because of the small proportion of area to be effected, no further offsets are proposed. e) A qualitative assessment of the effects to wetlands at the abandonment (post-closure) phase has been provided in Section 3.1.2 of Appendix K: Vegetation Technical Support Document. Since the proportion of wetlands affected by the Project is predicted to be low and the site hydrology will be maintained, no measureable residual effects to wetlands are predicted provided that habitat compensation for the water realignments includes features and functions of the present watercourse. Changes are anticipated to be measurable at the local scale but are expected to have no detectable effect on wetland abundance and distribution in the regional study area relative to natural fluctuations that occur from wet and dry cycles, and no further offsets are proposed.f) Conducting an assessment for every plant and wildlife species potentially affected by the Project is not feasible. Accordingly, the terrestrial criteria that were selected for the Project represent vegetation ecosystems and a subset of wildlife species that are of greatest concern with respect to Project effects. The terrestrial Effects Indicators "are considered by the proponent, public,

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				wetland habitat in the LSA and RSA, and to what extent the channel realignments and offsetting plan for serious harm to fish will also offset local effects associated with the local loss of wetlands (and wildlife that use the wetlands). It is acknowledged that IAMGOLD's goal of the channel realignments (section 5.10.7 of the Amended EIS) is to compensate for loss of fish habitat on a "like for like" basis to maintain the functionality of existing fish habitat, with application of natural channel design techniques to mimic natural flow and flooding patterns, and incorporate shoreline and riparian vegetation. The Agency is trying to reconcile various reports of wetland area to be lost. For example: • IAMGOLD's response to IR#2 (Table F16-1) indicates that the project site footprint will remove 170 ha of wetland habitat (not including bog and fen), which is equivalent to 27.7% of the total available wetland habitat in the terrestrial biology local study area (around the mine site), and 17.3% of the total available wetland habitat in the terrestrial biology regional study area. • This is inconsistent with section 9.7.2.1 which states that project construction is anticipated to remove 1.5% of the habitat that supports wetlands in the regional study area, and then separately states that approximately 90% of the wetlands existing in the regional study area will remain unaffected by the Project.	First Nations groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical, or other importance" (BC EAO 2013). Beavers were chosen as the Effects Indicator representing wildlife dependent on aquatic and wetland habitats. Beavers are ecological engineers that contribute substantially to ecosystem function and structure (i.e., highly interactive species). Beavers are considered an umbrella species for amphibians and reptiles, whereby maintaining self-sustaining and ecologically effective Beaver populations will also protect amphibians and reptiles. Section 3.1.2.4 of the Wildlife TSD (Appendix L) discusses the effects assessment of the Project on Beavers. In this section, it is calculated that less than 1% of the habitat suitable for supporting Beavers is predicted to be lost as a result of the Project. This habitat is defined as dense mixed forest, dense deciduous forest and regenerating habitats within 200 m of water and wetlands. Direct mortality from actively removing habitat is expected to be within the variation of natural mortality rates because animals can move away from construction equipment and the Project is not anticipated to have a measurable effect on the abundance and distribution of the Beaver population in the regional study area. Similarly, the Project is predicted to have no measurable ecological effect on the abundance and distribution of the Painted Turtle and amphibian populations in the regional study area. g) The Timmins Naturalists have maintained records of turtle observations in the area for the last 15 years (Timmins Naturalists 2015). The

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				• Appendix K then states that 10% loss is an overestimate and by using digitally derived ground cover only, the Project is predicted to affect 0.3% of the wetlands available in the RSA. • Appendix K also states that dewatering of water bodies and realignment of watercourses in the LSA may affect the quantity of wetlands by changing the quality of the habitat available, but that habitat compensation in the new realignments is expected to result in a recovery of approximately 80% of the total watercourse length lost. In addition, the Agency is trying to reconcile various statements about the magnitude of the residual effects to wetlands at construction, in relation to the fish offsetting plan as mitigation. For example: • Appendix K states that since the proportion of wetlands affected by the Project is predicted to be low (0.3%) and the site hydrology will be maintained, no measurable residual effects to wetlands are expected, “provided that habitat compensation for the water realignments includes features and functions of the present watercourses”. It is not clear if this sentence applies to known losses in the project site footprint, or to potential effects on wetlands outside of the project site footprint that might otherwise be affected by hydrology. • Appendix K (pg. 9-10) notes that the dewatering of water bodies and realignment of watercourses in the LSA may affect the quantity of wetlands by changing the quality of habitat available, and that the realignments will	Timmins Naturalists website shows records of Painted Turtles observations at Gillies Lake in the Mattagami River Watershed and at Harry Lake, located approximately 60 km northwest of the local study area. Observations of Painted Turtles at Gillies Lake were reported in 2014, while records of turtles at Harry Lake are reported for 2003, 2004, and 2008. The Mattagami Region Conservation Authority (2015) also reports sightings of Painted Turtle at Gillies Lake in 2015. The MNRF occasionally receives reports of Painted Turtles in the Timmins and Gogama areas. Both have been observed by MNRF staff in the Grassy River watershed, which is a tributary to the Mattagami River (MNR 2010).h) Mitigation to reduce effects to Painted Turtles and amphibians is not currently proposed. It is predicted that 0.8% of potential Painted Turtle and amphibian habitat will be removed by the Project (see response to Request f). Mitigation to offset effects is not proposed because the small magnitude of potential habitat changes from the Project is anticipated to have negligible effects on turtle and amphibian populations. Additionally, the amount of habitat loss will be less after the removal of some dams during Project closure, which will return wetland habitat to the landscape. The removal of dams is anticipated to return wetland habitat to areas where wetland habitat was previously located as the water is expected to flow through the existing channels that will be dammed for Project operation. Changes to total streamflow through the Mollie River and Mesomikenda Lake watersheds are anticipated to be less than 5% from baseline to post-closure (Hydrology TSD). Any changes to vital rates from

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				recover 80% of the total watercourse length lost. • Appendix K also states that effects from the Project on the abundance and distribution of wetlands are not expected to be measurable, despite acknowledging losses in the project footprint. • Section 9.7.2.1 of the Amended EIS states that effects from the Project on the abundance and distribution of wetlands are expected to be measurable, but are not predicted to influence the ability of wetlands to be self-sustaining (with sufficient undisturbed habitat in the regional study area for the continued persistence of wetlands). • Section 11 of the amended EIS quantifies the loss of wetlands in the project footprint, provides no reference to mitigation via the offsetting plan or realignments, and states that the effect will not be measureable (thus assigning Level I to magnitude, instead of Level II). The Agency is also seeking to confirm IAMGOLD's prediction of effects to new wetlands that become established during the life of the Project, should the landscape be further altered at abandonment (post-closure stage II) phase. For example: • Section 5.16.4.2 of the Amended EIS describes how some dams will be removed and a few channel realignments will be decommissioned at the abandonment (post-closure) stage II phase.	offsetting would likely be non-detectable relative to natural variation in factors driving fluctuations in the abundance and distribution of Painted Turtle and amphibian populations. i) The Project is predicted to remove 0.8% of potential turtle and amphibian habitat. There is predicted to be a less than 5% change in total streamflow through the Mollie River and Mesomikenda Lake watersheds from baseline to post-closure. Mitigation to offset effects is not proposed because the small magnitude of potential habitat changes from the Project is anticipated to have negligible effects on turtle and amphibian populations relative to natural factors influencing survival and reproduction (more detail is provided in the response to Request h).

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				• Table 11-6 states (in relation to wetlands) that during the post-closure phase, vegetation will be allowed to re-establish itself at the project site, and no activities will further disrupt vegetation. • Section 9.7.2.3 of the Amended EIS notes that effects on the abundance and distribution of wetlands in closure and post-closure phases are expected to be measurable, but wetlands will be self-sustaining, and there should be sufficient undisturbed habitat in the regional study area for the continued persistence of wetlands. c) Please confirm the Agency should refer to the wetland percentages provided in Table F16-1 in IAMGOLD's response to IR#2, in its consideration of the assessment of effects related to wetland loss at the construction phase. If not, please clarify what percent of the total amount of available wetland habitat will be lost within the terrestrial biology local and regional study areas (around the mine site), as a result of the Project. This should exclude the transmission line, and the Agency will use the values for the project site (mine site) footprint as a surrogate for the values associated with environmental changes linked to federal authorizations. Provide a rationale if numbers vary from your response to IR#2. d) Please provide an updated assessment of the magnitude of the effects on wetland taking into account the quantifiable loss or redistribution of wetland habitat in the project site footprint at the construction phase, with a clear link to any measures that reduce or offset effects within or beyond the project site footprint.	

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				e) Please also provide a separate, qualitative, assessment of effects to wetlands at the abandonment (post-closure) phase, when some dams are proposed to be dismantled and additional channel realignments may occur. Provide a clear link to any measures that will reduce or offset effects. Turtles and Amphibians Painted turtles were observed along Bagsverd Creek (in or near the proposed TMF footprint), Clam Lake (1 observation) and an Unnamed Lake (several observations over several visits). The Agency understands that while Painted turtles are not listed as species at risk, they are not as ubiquitous in the James Bay watershed as they are in southern flowing watersheds. Within Appendix L, Sub-Appendix O reports that the gray treefrog, American toad and spring peeper were heard within the LSA, and the bullfrog was heard in one sample location just outside of the LSA. Sub-Appendix N reports observations of Eastern Newt in 4 water bodies, wood frog in 6 water bodies, and the common green frog in 16 water bodies, all within or near the LSA. Painted turtles and amphibians are not identified as effects assessment indicators selected by IAMGOLD. The Agency acknowledges indirect linkages to the wetland and aquatic habitat indicators; however, the Agency has little information to pull from to report predicted effects, or proposed mitigation or follow-up monitoring that IAMGOLD may be considering in relation to these effects.	

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				Turtles and Amphibians: f) Please describe any predicted effects to painted turtles and amphibians that may occur through the loss or alteration of existing water bodies during construction. Consider both the activity of removing the habitat and the loss of habitat itself. g) To provide regional context for the assessment of effects, please provide any readily available information about the existing distribution and abundance of Painted Turtles in the Mattagami River watershed, or another regional boundary deemed ecologically-meaningful, while keeping in mind the local division between primary watersheds. h) Please describe any mitigation or follow-up monitoring that IAMGOLD is considering in relation to these effects to Painted turtles and amphibians. Describe to what extent, if any, the aquatic habitat created through the proposed channel realignments may offset effects to Painted turtles and amphibians, and what site-specific measures may be taken to enhance the new created habitat to further offset effects. i) Please also provide a separate, qualitative, assessment of effects to turtles and amphibians at the abandonment (post-closure) phase, when some dams are proposed to be dismantled and additional channel realignments may occur. Provide a clear link to any measures that will reduce or offset effects.	

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				Unnamed Pond b) East Clam Lake c) Côte Lake d) North Beaver Pond e) Clam Lake f) Upper Three Duck Lake g) Mollie River h) Chester Lake i) Little Clam Lake j) Intermittent Stream between Unnamed Pond and Beaver Pond k) Bagsverd Lake South Arm l) Stream where Beaver Pond was located m) Unnamed Inlet stream to Chester n) Intermittent stream between Beaver Pond and Mollie River o) West Beaver Pond stream to Bagsverd South Arm	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				p) East Beaver Pond q) Bagsverd Pond outlet to Bagsverd South Arm r) Upper Inlet Unnamed Lake #3 s) Bagsverd Pond t) Bagsverd Creek from Bagsverd Lake to Unnamed Lake #1 u) Unnamed Lake #2 v) Unnamed inlet to Bagsverd Creek w) Permanent Pond x) Channel Realignment between Bagsverd Lake and Unnamed Lake #2 y) Channel realignment between Bagsverd Lake South Arm and Weeduck Lake z) Channel realignment between Little Clam Lake and Bagsverd Lake South Arm aa) Channel realignment between Chester Lake and Clam Lake bb) Channel realignment between Clam Lake and Little Clam Lake	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				cc) Channel realignment between Little Clam Lake and West Beaver Pond dd) Channel realignment between Weeduck Lake and Upper Three Duck Lake	
658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) EA(3)-8 Summary: The Agency acknowledges there may be a temporal delay between EA decision and project construction. The Agency requests information on IAMGOLD's plans to validate and update baseline information through time, to support the verification of the accuracy of EA predictions regarding the significance of any residual or cumulative adverse environmental effects (as outlined in the Amended EIS, supplementary information provided by IAMGOLD, and the federal Environmental Assessment Report and conditions), should the Project be approved by the Minister of the Environment, but not proceed in the timeframes originally proposed. Background / Rationale: Baseline information provides the basis for the assessment of potential effects. In the Final Environmental Impact Statement Guidelines IAMGOLD was required to gather baseline data and to predict effects accordingly. The Amended EIS reflects baseline data gathered up to 2014, and is used to inform the Agency's EA Report.	IAMGOLD would like to thank the CEA Agency Ontario for their ongoing efforts in ensuring projects are considered in a precautionary manner to support the Government of Canada's objectives of ensuring responsible resource development. With respect to the CEA Agency's request for IAMGOLD to provide a follow-up program for changing baseline conditions, IAMGOLD is of the opinion that the request is not consistent with the purpose of CEAA 2012, and similarly that it is not consistent with the definition or goals of a follow-up program under CEAA 2012.To explain further, IAMGOLD, notes that the definition of a follow-up program per Section 2(1) is to verify the accuracy of the environmental assessment of a designated project; and (b) to determine the effectiveness of any mitigation measures. IAMGOLD does note that, monitoring results of Project effects and effectiveness of mitigation measures, assuming the Project went ahead, would certainly be relevant to the Agencies responsibility in fulfilling the primary purpose of CEAA 2012, which is to protect certain components of the environment (CEAA 2012, S.4(1)(a)). In other words, it is IAMGOLD's opinion that it is not within the CEA Agency's jurisdiction to request a proponent to verify the results of an EA prior to the development of the Project where actual

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				Section 5.15 (Project Phases and Schedule) of the Amended EIS received in February, 2015, suggests project construction may commence in the first quarter of 2015, and gold production may commence in the first quarter of 2017. The Executive Summary states that construction will commence after a feasibility study scheduled for 2016, and that the decision to proceed with construction will depend on the project economics, which is based on the projected gold price. It is therefore not clear when the Project will proceed relative to the timing of the EA decision. Baseline conditions may change through time, which can result in changes to the conclusions on predicted and actual residual and cumulative environmental effects caused by the Project at the time the Project is finally constructed. This is a source of uncertainty in EA predictions, which may warrant an enhanced follow-up program to verify the accuracy of EA predictions from the time an environmental assessment decision is made, through project commencement and implementation. Out of date baseline conditions can also reduce the scientific rigor within any follow-up program making it difficult to confirm cause-effect relationships. In a meeting on March 27, 2015, IAMGOLD indicated it was taking into consideration what baseline information will be monitored during the period between the environmental assessment decision and project construction.	potential adverse effects and their associated mitigations could indeed be verified. Information pertaining to continued baseline monitoring of the Project prior to the commencement of the work, therefore does not appear relevant to the Minister's decision on the Project as impacts to the environment, as a result of the Project, cannot occur until the Project actually progresses. IAMGOLD has already documented numerous monitoring programs within the EA that would be consistent with the definition and goals of a follow-up program. Additionally, upon the Agencies Information Request #2, IAMGOLD has provided an analysis of "key mitigation" measures, information that was not identified in the EIS guideline and was requested to support the Agency's ongoing development of CEAA 2012. IAMGOLD is open to assisting the Agency in improving the CEAA 2012 process, but requests that the Agency limit IRs to areas of its legislative responsibility and authority as determined by CEAA 2012. IAMGOLD would also like to note that in addition to the primary purposes of the Act mentioned above, the Act is intended to support sustainable development and complete environmental assessments in a timely manner.IAMGOLD will continue to monitor various aspects of the environment for the Côté Gold Project although changes to the environment are unlikely in the absence of any mining activity, IAMGOLD will use all additional information obtained between the completion of the EA and commencement of the Project in support of permitting processes and development of the environmental management plans.

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				Given that the Agency is also considering what baseline information will need to be monitored by IAMGOLD to verify the accuracy of the EA predictions through time, to support the Agency's recommendation to the Minister of the Environment about the Project, the Agency requests information from IAMGOLD on its monitoring plan. Follow-up program for changing baseline conditions a) Provide the monitoring plan that IAMGOLD will implement to validate baseline conditions presented in the Amended EIS, prior to construction. The plan should be designed to confirm (or update) the existing environmental conditions used to predict effects in the Amended EIS, in relation to the physical, biological and human environments, including Aboriginal peoples, as outlined in (b)-(d) below. b) The monitoring plan could consider parameters of the environment (e.g., surface and ground water quality and quantity; atmospheric environment, including air, noise and light; and flora, fauna and terrestrial habitat) that could change within the timeframe between EA decision and project construction, thus potentially altering the predictions of effects taken into account by the Agency under section 5 of CEAA 2012, as follows: i. Fish and Fish Habitat (ss5(1) of CEAA 2012) ii. Migratory Birds (ss5(1) of CEAA 2012) iii. Health and socio-economic conditions of Aboriginal	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				peoples iv. Physical and cultural heritage, and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance for Aboriginal people (ss5(1) of CEAA 2012) v. Current use of lands and resources for traditional purposes by Aboriginal peoples (ss5(1) of CEAA 2012) vi. Other environmental components for which changes may be linked to federal authorizations (e.g., wildlife and ecological conditions) (ss5(2) of CEAA 2012) vii. Human health and socio-economic conditions, including cultural heritage and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance (ss5(2) of CEAA 2012) viii. Species at Risk (ss5(1) and 5(2) of CEAA 2012) c) As part of the plan in (a) and (b), specifically be sure to consider shifting patterns of human use as communities change in the area (as per iii, iv, v and vii above. Describe who will be engaged in monitoring human use through time. d) Include a schedule of baseline information validation activities that takes into account: 1) project timelines; and 2) the timelines over which various environmental parameters and human uses may reasonably be expected to shift.	

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				e) Discuss what IAMGOLD may do to verify the accuracy of previous effects predictions if changes in baseline conditions are observed. f) Discuss what IAMGOLD may do to address any effects predictions which may no longer be accurate upon considering updated baseline information (e.g., contingency plans). g) Describe how IAMGOLD intends to keep the Agency informed of: 1) any changes in baseline conditions; and 2) modifications to mitigation measures or project design (contingency plans) required to address new effects.	
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) 1/ The EA references MOECC Northern Region guidance for mercury monitoring, leaving readers to access the specifics of that guidance in some other manner. The baseline data for mercury in water and fish tissue presented in the EA is less than recommended by MOECC Northern Region guidance. For example, the recommended minimum pre-development sample sizes of 20 individuals for large-bodied species and minimum 5 composite samples (5-10 individuals each) for small-bodied species have not been achieved for most waters. In addition, the method detection limit for mercury in water (0.01 ug/L since August 2013) exceeds the MOECC-recommended method detection limits of 0.1 ng/L total mercury and 0.02ng/L methyl mercury. 1/ Compare mercury sampling in water and fish tissue done to date with MOECC-recommendations, including sample size, locations (specify exposure and reference) and analytical	1) IAMGOLD is of the opinion that the reviewers request to compare mercury water and fish tissue baseline sampling with MOECC-recommendations seems, at this point in the EA process, more administrative and not material with respect to assisting with a deeper understanding of the effects assessment. IAMGOLD is committed to following MOECC recommendations for mercury sampling and analysis in water and fish tissue as part of the monitoring commitments. No further response with respect to sampling methodology is warranted at this time. 2) See response to 1) above. 3) Neville Lake will be included as part of operational monitoring program, including analysis of low-level total and methyl mercury.

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				detection limits. 2/ Mercury data are listed in the baseline summary (App. J Addendum), but the low-level analyses done since August 2013 seem to be combined with earlier sampling results. 2/ Amend Table 1a of App. J Addendum to list sample sizes and statistics separately for the low-level mercury and methyl mercury results. 3/ The response provides opinion that effluent concentrations of sulphate will be low and produce a slight increase above background in the receiver, thus limiting the potential for methyl mercury production. However, some studies (e.g. Corrales et al. 2011) suggest that sulfate stimulation of the methylation process is optimized at intermediate levels of sulfate, similar to what exists at this project. 3/ Include the receiver of sulphate-bearing effluent discharge (Neville Lake) as a location that could potentially be exposed to enhanced mercury methylation, as part of the monitoring plan for mercury in water and fish tissue.	
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) It is during the EA, the MNRF has the opportunity to assess effects on fish and wildlife, and other provincial interests. Further, during the EA review, the MNRF is able to review the location of mine related infrastructure for the purposes of fish and wildlife concerns. Ideally, MNRF's role in the Closure Plan phase of any project is to confirm the location of values and infrastructure already reviewed during the EA, as well as the issuance of permits. A proper review of the pipeline alignment should be provided to MNRF during the EA to fully address concerns for this reason. Figure ES-2 does not show where the pipeline connection and alignment will be from the TMF to the discharge location (approximately 3 to 4 km). These	IAMGOLD understands MNRF's request to see this information, however, the design of the Project has not been advanced to a level that would allow IAMGOLD to provide this information at this point in time. IAMGOLD is of the opinion that this level of detail is not required as part of the EA process. In addition, it should be noted that environmental effects due to a discharge pipeline alignment does not have the potential to cause significant impacts and as such further detail is not warranted during the EA phase.

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				details are required in order to understand what the potential effects are too fish and wildlife and how to mitigate those effects. The pipeline alignment from the TMF to the processing plant is provided in the EA, at minimum this level of detail should also be provided for the pipeline alignment from the TMF to the effluent discharge, including water crossing information. The environmental impacts of the discharge pipeline alignment are not known until there is an understanding of where and how the pipeline will be constructed. What information is available that confirms IAMGOLD's statement that effects due to the pipeline alignment does not have the potential to cause significant impacts? MNRF is requesting that a description of the pipeline alignment from the TMF to the effluent discharge location be provided at the EA stage for review so potential effects on fish, vegetation and wildlife are understood and mitigation. A location map showing where the pipeline will be routed from the TMF to the effluent discharge location should be provided.	
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) It still remains unclear what is meant by "controlled access." Additionally, how will travel time through the area (recommended to be 24 hours or less) be enforced and/or controlled? Does this not mean the fish and wildlife in the area will be impacted to a significant level? Please provide further clarification on what IAMGOLD's mean by controlled access to lakes and limiting travel time. What are the potential impacts and proposed mitigation to avoid risk to travellers, workers, fish and wildlife habitat due to potential respiratory exposure.	a) Controlled access means that for reasons of health and safety, areas that people can frequent and the duration that they can remain in those areas will be managed. This proposed approach for mitigating effects is consistent with the Minister's approved EA for the Rainy River Project. b) The area will be posted with signage indicating that access is limited to a period of 24-hours. If the need arises the area can be monitored. c) No. The air quality standards used for assessing the potential for adverse effects are based driven by human health considerations often incorporating large safety

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					factors. Effects on wildlife through direct inhalation are not expected. Similarly, depositional modelling was undertaken understand changes in soil quality resulting from the deposition of those contaminants that partition to particulate (e.g. metals). Considering the small incremental changes to soil quality representative of background conditions in the province resulting from aerial deposition at the maximum point of impingement, we would not expect impacts to wildlife and fish within this area through the depositional pathway. The results of the depositional modelling are discussed in the Human and Ecological Health Risk Assessment TSD (Appendix W). d) Please refer to the response for part a) e) Unacceptable risk to wildlife, fish and wildlife habitat is not expected and therefore mitigation is not required. Considering excursions of air quality guidelines are predicted to be infrequent and transitory the potential for unacceptable risk to human health is considered minor. However, with prolonged exposure, those with pre-existing respiratory conditions may experience enhanced symptoms. Accordingly, the proposed mitigation strategy is restricting access to periods of less than 24-hours, which can readily be accommodated considering the limited length of the portage route. Workers will be protected through occupational health and safety programs, and compliant with Ministry of Labour requirements.
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) MNRF understands that minor adjustments to project design may take place during operations and post-closure, but MNRF is not satisfied with the information provided to date regarding post closure activities. Stating	Please note a Closure Plan compliant with Ontario regulations will be submitted for approval prior to the commencement of Project construction. Effects during the post-closure phase are fully described in Sections

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				that the open pit will fill with water post-operation does not provide enough information about how pre-mining conditions will be achieved. Fish, wildlife and vegetation concerns should be more accurately addressed during the EA stage. Please provide a more detailed description of post-closure activities and how fish, wildlife and vegetation concerns are to be mitigated to pre-mining conditions as stated in the EA. More planning is requested.	9._.2.4, and occasionally in Sections 9._.2.3 for disciplines where the effects in the closure and post-closure phase are considered together. All mitigation required for effects during the post-closure phase are clearly identified in The Project Phase column in Tables 10-1, 10-2, and 10-3. Note that the technical appendices (i.e., TSDs) provide a more detailed description of effects and mitigations for each discipline. IAMGOLD is of the opinion that a sufficient level of detail is provided in the Project Description (Chapter 5) to adequately identify effects to the environment (Chapter 9), apply appropriate mitigation (Chapter 10), and determine significance (Chapter 11).
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) Please provide a statement to identify how Treaty and Aboriginal rights were considered with regards to the following statement in the EA " the project will not limit the ability to carry out traditional activities in the area. Studies conducted as per EA process have shown no traditional land and resource use within the Project footprint..." In addition please reconcile the different messaging contained in the following two paragraphs "The construction of Project components is predicted to overlap with some traditional hunting areas, as described above. It is not expected that this will impeded the ability to carry out traditional hunting activities in the area (p.3?3). No lakes overprinted by the Project have been identified as popular fishing lakes. Therefore, no traditional fishing area losses will be incurred due to Protect construction (p;3-4), The Project footprint does not overlap any sensitive area lakes identified in the TEK study (P3-4)" With Page ES-77, Final EA Report	a) For the Project, IAMGOLD considered Aboriginal and Treaty Rights through 5 key Effects Assessment Indicators: Plant Harvesting, Hunting, Fishing, Canoeing and Cultural, Spiritual or Ceremonial Sites. See Traditional Land and Resource Use TSD (Appendix P) for a detailed description of these indicators. These indicators were selected as they best represent activities that are reflective of local Aboriginal communities exercising their Treaty Rights. Subsequently, an understanding that the Project will not limit the ability for local Aboriginal communities to carry out traditional activities (represented by these indicators) inclusively considers their ability to exercise their Treaty Rights. b) The difference in the text reflects the change in potential effects over different phases of the Project. The text the reviewer is referring to from the main summary relates to potential Project effects during the construction phase, and the section of the Executive

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				traditional hunting and fishing is identified as having the potential to be effected during the operations phase including changes in access to and from the area, changes in abundance and distribution.	Summary the reviewer is referring to relates to potential Project effects during the operations phase. IAMGOLD respectfully asks that in the future the reviewer consider directly quoting the text, rather than paraphrasing identified effects as these inconsistencies may not be clear to other interested reviewers.
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) Provide additional supporting documentation to support the proponents position that the project does not limit the ability or impact the treaty right to fish (e.g. Cote Lake) and on additional potential impacts to fishing and hunting treaty rights associated with this project? Please note, traditional land use does not in entirety address Aboriginal and treaty rights. Reconcile other sections of the documentation to reflect consistent messaging on impacts to Aboriginal and treaty rights in addition to traditional use. Provide a detailed evaluation of potential impacts on traditional use and Aboriginal and treaty rights and provide documentation to support proponents claim there are no impacts to the Aboriginal community's treaty rights and traditional use as a result of the proposed project including impacts to areas outside of the Project footprint.	a) An understanding of the Project's potential to affect Aboriginal treaty rights is conceptualized most acutely in the Traditional Land and Resource Use TSD (Appendix P). Effects on other disciplines (e.g., air quality), were used to predict effects in the study area specifically identified for the Traditional Land and Resource Use TSD (Appendix P). Therefore, the prediction of all Project effects that have the potential to affect Aboriginal Treaty Rights have been considered inherently in the effects assessed in Appendix P. In other words, if there was an overall significant impact on aquatic biology, it would be noted that there is an overall significant impact on Aboriginal Treaty Rights to Fish, as this impact would have fed into the Traditional Land and Resource effects assessment. b) The difference in the text reflects the change in potential effects over different phases of the Project. The text the reviewer is referring to from the main summary relates to potential Project effects during the construction phase, and the section of the Executive Summary the reviewer is referring to relates to potential Project effects during the operations phase. c) A detailed evaluation of potential impacts on traditional land use and Aboriginal and Treaty rights has already been completed. This evaluation looks at all potential Project

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					effects, including any effects which extend into the Local Study Area's and Regional Study Areas. As previously noted, this analysis combines information provided in the TK / TLU study, experience of IAMGOLD's EA Team, and comments received through the stakeholder and Aboriginal consultation process (documented in Appendix Z).
661	Letter	09/11/2015	1) Cindy Batista (Ministry of the Environment)	1) Based on the mercury values for water in App. J Addendum Table 1a and for fish tissue in Table F.47 App. N Addendum, Chester Lake water exceeds CCME guideline for mercury and Chester Lake pike exceed the "do not eat" fish consumption guideline. By contrast, mercury levels are lower in Clam Lake, with water and fish tissue below guideline values. The mercury levels in Clam Lake may increase when the outlet stream of Chester Lake is re-directed to flow into Clam Lake, providing a new source of mercury-bearing water and perhaps a pathway for downstream movement of mercury-contaminated fish from Chester Lake. This effect may be enhanced by the proposed flooding of Chester lake during mine development which may further increase mercury levels in water and fish. Mitigation has been proposed for only Bagsverd Lake. Describe mitigation or contingency plan to compensate for potential adverse impacts to recreational, aboriginal, or wildlife consumers of fish if they might be affected by mercury increases in fish tissue as a consequence of new flooding or effluent sulphate stimulation.	Table F.47 provides fish tissue concentrations but does not provide water quality concentrations. Review of the surface water concentrations in Chester Lake, Cote Lake and Clam Lake (Table A.1 in Addendum to Water Quality TSD; Appendix J) indicates that mercury concentrations are almost an order of magnitude lower than the PWQO of 0.2 ug/L: Chester Lake Outlet – 0.036 ug/L Cote Lake Outlet -0.040 ug/L Clam Lake Outlet -0.037 ug/L Therefore, since mercury concentrations in Chester Lake are the same as in Clam Lake, no change in the surface water concentrations are expected in Clam Lake. The water level in Clam Lake will be reduced and as such no flooding of terrestrial lands will occur in Clam Lake. Further downstream, mitigation measures have been incorporated to remove organic soils and the source of mercury to the water column thus reducing / eliminating this pathway for methyl mercury production in South Bagsverd Lake which will have increased water levels. Fish tissue and water quality monitoring will be conducted in lakes where water level increases are projected. These values will be compared to baseline.

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658	Letter	09/11/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) a) The value used in the Water Quality TSD (Appendix J) was taken from the Canadian Drinking Water Guidelines, and is included as a guideline for reference only. The Human and Ecological Health Risk Assessment TSD (Appendix W) uses a benchmark of 0.025 mg/L, which is based on the interim Marginal Acceptable Concentration from the Ontario Drinking Water Standards. Regardless, the maximum modelled concentrations for arsenic are within both the human health benchmark and the guidelines. Soil removal for methyl mercury: a) Please confirm whether soil removal is proposed in the areas to be flooded around Chester Lake as a mitigation measure to prevent methyl mercury production. b) Please confirm that, aside from the south arm of Bagsverd Lake, soil removal is not proposed anywhere else. Or, clarify where it is proposed.	a) IAMGOLD has not proposed removal of organic soils around Chester Lake. The transfer from inorganic mercury to methyl mercury requires both a source of carbon, generally found in the top layers of sediment in newly flooded areas (i.e., top soil/overburden; Windham-Meyers 2008) and anaerobic conditions (Ullrich et. al., 2001). Generally, following the flooding of terrestrial vegetation, inorganic mercury bound in soils is converted to methyl mercury by anaerobic bacteria (Benoit et al. 2003; Jernelöv, 1972). The flooded vegetation and organic soils provide a carbon source for the bacteria and the decaying vegetation can create the anoxic conditions required for the presence of anaerobic bacteria.In Chester Lake, the area to be flooded is very small (14 % of the lake) and is within the range of seasonal and historical water levels (barriers at the outlet of the lake have increased lake levels by up to 1.5 m in the past). The depth of the flooded area will be very shallow (<40 cm) and thus will be expected to remain oxic. The vegetation in the area is aquatic or semi aquatic and thus will not decay and contribute to anaerobic decomposition. b) Correct. IAMGOLD has committed to removal of terrestrial vegetation and organic soils (terrestrial) prior to flooding which could potentially cause methyl mercury production and affect recreational use of sport fish through consumption limits. The South Arm of Bagsverd Lake is the only area that will be flooded due to watercourse realignment development that meets
584	Email	12/16/2015	1) Christine Greenaway	1) IAMGOLD Corporation provided general information that it would place access controls on Aboriginal people	Your comment has been noted. Detailed responses are provided for the specific comments below.

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			(Canadian Environmental Assessment Agency)	within the vicinity of its operations to address health and safety concerns, including restricting overnight stays due to air quality concerns. Furthermore, IAMGOLD Corporation has indicated that it would permit access with an understanding of appropriate uses (e.g. traversing the area by canoe, although no long term camps). However, the lack of information and lack of detail has left the Agency, in consideration of advice from Health Canada, with outstanding questions pertaining to: 1. Potential effects to the health of Aboriginal peoples from air quality contaminants and use of plants harvested in the vicinity of the project, and mitigation measures to manage these effects; and 2. Measures to mitigate effects on the current use of Lands and Resources for traditional purposes (e.g. plant gathering, hunting, trapping, fishing) resulting from any land Access controls and activity restrictions.	
584	Email	12/16/2015	1) Christine Greenaway (Canadian Environmental Assessment Agency)	1) What are the potential effects of proposed mitigation measures for human health and safety on current use of lands and resource for traditional purposes (e.g. hunting, fishing, trapping, plant harvesting)?	There are no additional effects anticipated as a result of proposed mitigation measures for human health and safety on current use of lands and resources for traditional purposes. No significant impacts are predicted on the current Aboriginal peoples uses of the lands and resources identified in the Amended EIS / Final EA Report.
662	Letter	12/16/2015	1) Cindy Batista (Ministry of the Environment)	1) Additional note to proponent: When applying for provincial permits, provide mercury baseline information as per MOECC guidance, to the satisfaction of MOECC. Include lakes with water level increases (e.g. Bagsverd	The comment has been noted and is appreciated. As requested, IAMGOLD will provide mercury baseline information as per MOECC guidance when applying for provincial permits.

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				Lake, Chester Lake), lakes downstream exposed to re-directed flow (e.g. Clam Lake) and lakes exposed to potential effluent sulphate stimulation (e.g. Neville Lake). Additional information requirements for permitting may include a contingency plan in the event that adverse effects of mine development on mercury levels affect consumers of fish. IAMGOLD notes that water-borne mercury concentrations at the outlets of Chester Lake and Clam Lake differ little and suggests no change in Clam Lake mercury is expected when the outlet of Chester Lake is re-directed. That prediction should be confirmed as part of the project's mercury monitoring plan which includes lakes with anticipated water level increases (e.g. Bagsverd Lake, Chester Lake) and lakes exposed to potential effluent sulphate stimulation (e.g. Neville Lake).	
662	Letter	12/16/2015	1) Cindy Batista (Ministry of the Environment)	1) Proposed EA Condition: IAMGOLD prepare a report, prior to obtaining approvals that will describe the pipeline alignment from the TMF to the effluent discharge location including water crossing information. Purpose: The report will allow the MNRF to review the location of mine related infrastructure for the purposes of understanding potential impacts to fish and wildlife and ensure that appropriate mitigation is in place.	IAMGOLD will engage the MNRF during the detailed planning of the discharge pipe alignment from the polishing pond to the final discharge point. It should be noted that the TMF is a part of a closed-loop system with the processing plant and as such, no discharge from the TMF is anticipated. IAMGOLD will also provide MNRF details on all water crossings, as required during the permitting phase of the Project.
662	Letter	12/16/2015	1) Cindy Batista (Ministry of the Environment)	1) Proposed EA Condition: IAMGOLD prepare a report, prior to obtaining approvals that will describe the pipeline alignment from the TMF to the effluent discharge location including water crossing information. Purpose: The report will allow the MNRF to review the location of mine related infrastructure for the purposes of purposes of	IAMGOLD will engage the MNRF during the detailed planning of the discharge pipe alignment from the polishing pond to the final discharge point. It should be noted that the TMF is a part of a closed-loop system with the processing plant and as such, no discharge from the TMF is anticipated. IAMGOLD will also

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				understanding potential impacts to fish and wildlife and ensure that appropriate mitigation is in place.	provide MNRF details on all water crossings, as required during the permitting phase of the Project.
662	Letter	12/16/2015	1) Cindy Batista (Ministry of the Environment)	1) Requirement for additional information in the EA: For Aboriginal communities to have meaningful input on the Project, the ministry requires a standalone document that describes IAMGOLD's analysis of how Aboriginal and/or Treaty Rights were considered in the EA in order to ensure that Aboriginal communities understand how the Project will impact their use and rights. The document should draw linkages from various supporting documentation (e.g. Appendix P, Aboriginal comments, and traditional knowledge studies), including how IAMGOLD proposes to avoid or mitigate potential impacts to Aboriginal peoples. The EA needs to document and analyze how Aboriginal rights were considered in the EA, including its supporting documentation and how IAMGOLD is willing to mitigate First Nations represented by WTC and the MNO for the Aboriginal rights that will be potentially impacted. The EA needs to analyze and document how the traditional knowledge studies prepared by WTC and MNO have been considered to determine use and potential impact the proposed Project will have on Aboriginal rights. In a standalone document, IAMGOLD will describe how the traditional knowledge studies were used to determine "use" and how the studies was used to determine impact. IAMGOLD will identify all information used to determine or measure known or potential use by the Aboriginal Communities on each of the study areas (footprint/polygons, local and regional.) Describe how Aboriginal rights were considered in the EA and, how they contributed to the analysis of impacts from the Project.	As requested, IAMGOLD has prepared a standalone document in response to Comments F452, F453, F456 and F457. The memorandum titled: Aboriginal Engagement in the IAMGOLD Côté Gold Project Environmental Assessment (Attachment 5) provides detailed information in response to the aforementioned comments from MOECC's Aboriginal Affairs Branch. Responses to Comment F453 are located in Section 6 Within the attached document (Attachment 5).

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				Purpose: As per the Appendix E: Proposed Aboriginal Consultation Plan of the Terms of Reference, July 2013 (ToR), IAMGOLD will seek to consult with Aboriginal people in a manner that advances their meaningful input on the Project (July 2013). This information is required as part of the duty to consult. Furthermore, the EA cannot say there is no impact. Taking up Crown land to build a mine is an impact on Aboriginal use and rights. Taking up the land will impede the ability to carry out traditional hunting activities in the area. Although the lakes in the area may not be identified now as popular fishing lakes, this may change overtime and it will no longer be available for fishing. Every phase of the project will have an impact on Aboriginal use and rights, until such time the site is completed restored. Although in your response you provide resources for how you considered impacts of the Project on Aboriginal people (Appendix P, D and Z), what is missing from the EA is documenting the analysis of the all pieces of information to determine use and potential impact use on Aboriginal rights and summary statements. This would include drawing linkages between the appendices and EA report. The proponent needs to provide clarification on whether the Appendix P report considered the Wabun Tribal Council traditional knowledge studies was used as the only measure of use by Aboriginal communities and determining potential impacts on that use? In addition, provide clarification on how treaty rights in general associated with the geography, were incorporated into the analysis? Recognizing that the TK is only a snap shot of how communities use the study. This information should be included and referenced in the analysis statements	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				requirement identified above in an errata to the MOECC. This information is necessary to understand the potential impacts to Aboriginal and/or Treaty Rights as a result of the proposed Project and have confidence in EAB's recommendation to the Minister that the EA clearly documents and analyzes the potential impacts of the proposed Project on Aboriginal use and rights.	
664	Letter	04/08/2016	1) Cindy Batista (Ministry of the Environment)	1) The response from IAMGOLD did not provide the requested receiving water-based effluent criteria for phosphorus and did not evaluate effluent discharge impact on cold water dissolved oxygen. IAMGOLD should address this issue within the EA by evaluating the potential for mine development to impact on dissolved oxygen levels and cold water fish species in Neville Lake. Mitigation measures should be described, including but not limited to receiving water-based effluent criteria for nutrients such as phosphorus in the mine effluent discharge. The response should consider the changes associated with mine development that could potentially alter the thermal structure and dissolved oxygen levels of Neville Lake, which include the following: (1) increased nutrient loading to Neville Lake from mine effluent discharge; (2) reduced water flow into Neville Lake from Bagsverd Creek because of watershed reconfiguration; and (3) changes in phosphorus and dissolved organic carbon inputs to the lake associated with watershed disturbance, changes in land use and altered hydrology.	As recommended by the MOECC, the Lakeshore Capacity Model (LCM) was used to evaluate the effects to Neville Lake and Mesomikenda Lake due to changes to the total phosphorous loading through treated effluent discharge. The LCM results were presented in the Addendum to the Water Quality TSD and the raw model file was provided to the MOECC for review upon their request. In an email dated October 15, 2015, the MOECC provided some comments based on their review of the raw model file about the LCM inputs. These comments were reviewed, changes have been made to the LCM to address the MOECC comments, and all data input have been re-checked. It is important to note that the changes made to the LCM in response to the MOECC comments were completed to demonstrate that these changes have little effect on the results and no change to the original conclusions presented in the addendum to the Water Quality TSD; that is, the original assumptions were valid and conservative, and therefore not considered to be errors. In the case of the mapping information included as input to the LCM (i.e., lake areas, % wetland, % cleared), the data were originally taken from the Ontario Land Cover Data Base, which is a credible source used by

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
					Golder's Geographic Information Systems (GIS) group. As part of making revisions to the LCM, we have included the use of Ontario Base Mapping (OBM) and Forest Resource Inventory (FRI) data to be consistent with MOECC comments regarding input parameters (e.g., % wetland for Schist Lake); these changes were completed to demonstrate that despite minor differences in some of the some assumptions (depending on the data base used to source the mapping information), the conclusions based on the LCM results remain unchanged. To provide further clarification on the source of the input data in the revised LCM, Figure 3 is attached that shows the number of residences, % wetland area, % cleared area, watershed area, and lake area; references to the source data are provided in the notes on Figure 3. For convenience, the revised LCM results compared to the original results are provided in Table 1. Based on the updated LCM results, the conclusions based on the original LCM results are unchanged; for convenience, the conclusions are reiterated as follows: Total phosphorous concentrations in Neville Lake and Mesomikenda Lake are predicted to be below the lake-specific PWQOs; Changes to total phosphorous are predicted to have no significant adverse effects on dissolved oxygen concentrations; and, the trophic status of Neville Lake and Mesomikenda Lake are predicted to remain unchanged. These conclusions suggest that total phosphorous is clearly not a contaminant of concern. Because total phosphorous is not a regulated effluent discharge parameter, and given that it is not a contaminant of concern, a maximum effluent criterion

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					for total phosphorous is considered to be not warranted.
1,018	Email	11/27/2018	1) Aisha Samuel (Ministry of Energy, Northern Development and Mines)	1) (Section 10.3) Biological Monitoring. Only monitoring of revegetation efforts is currently included in this section of the CP. In accordance with Schedule 2, item 10(iii) of O. Reg. 240/00 this section of the CP should provide: details of any biological monitoring programs and procedures to assess the effects of the project on any biological communities. These details shall include the locations, nature, methods and frequency of monitoring, the biological communities to be monitored and how the results of the monitoring will be recorded and reported to the Director. Aquatic surveys will be required during operation and post-closure to assess effects on aquatic biota and the success of rehabilitation efforts. These surveys should include water and sediment quality, benthic and fish community, and fish habitat. Presumably these assessments would also be required as part of the compensatory fish habitat and offset agreements associated with channel realignments. Commitments to undertake this work should be included in this Section of the closure plan with details regarding proposed monitoring programs.	

Comments and Responses Related to Fisheries Authorization – Public and Stakeholders – July 2012 to November 2018

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
82	Open House	02/27/2013	1) Ernest Turcotte (Individual - Gogama)	1) What will be done with fish in Côté Lake?	Fish in Côté Lake will be relocated to a new lake.
81	Open House	02/28/2013	1) Andre Simard (Unknown Individual)	1) Cottagers identified concerns about the quality of our water (closeness of the tailings reservoir and its overflow), noise pollution, impacts on fish, vandalism, increase in traffic (road and water).	Any water discharge to the environment will meet strict discharge and receiving water standards. Effects of the Project on water resources and fish will be assessed in the EA report.
129	Email	04/11/2013	1) Laurent Robichaud (Unknown Individual)	1) Individual stated that they have been involved with many mining and hydro energy project over the last 15 years and are a strong advocate for environmental protection (aquatic habitat and watershed protection). Individual is interested in the effluent discharges to the environment.	Thank you for contacting us. IAMGOLD has added you to the Project Mailing List.
209	Open House	05/21/2013	1) Unknown Unknown (Individual - Sudbury)	1) Lake Mesomikenda will have too much use: negative for fish & wildlife	Effects of the Project on water bodies including Mesomikenda Lake will be assessed in the EA Report.
198	Open House	05/22/2013	1) Ray Larocque (Unknown Individual)	1) The individual is concerned about waste piles - leeching in the water system. Also wants to know if the lakes are going to be closed to fishing. Ex: Three Ducks, Bagswerd, etc. Concerned about the fish habitat of the Molly River systems also surrounding lakes.	Effects of the Project on surface and ground water systems will be addressed in the EA Report.
270	Meeting	05/22/2013	1) Tracey Smith (Individual - Gogama)	1) Camp 303 on Dividing Lake by the 560, which operates as the "watershed's gas station". It has been the home of the junior ranger program for troubled kids, but understands that the project is being shut down. A larger canoe route, the 4M, along which people	All comments received were considered in preparation of the baseline study reports and the EIS / EA as appropriate.

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				stop at the lodge as they are circling it. Morin's All Season Resort on Minisinakwa Lake. Two camps on Pebonshewi Lake owned by Derry Air. Camp Kenda (now Mackenda Wilderness Lodge) is owned by Bob MacDonald, co-owner of Muskoka Breweries, who kept the camp's hunting tags but does not operate as an outfitter. Gogama Lodge takes visitors up to the Upper St. Louis for fishing and sets bear bait on the Berwick River. Whatsom Lake also has a private camp.	
199	Open House	05/23/2013	1) Gary Richards (Westburne); 2) Tanner Parcey (Individual - Timmins)	1) The individual is comforted by the in-depth nature of the assessment. His confidence that the project will cause zero-harm has been strenghtened. He fishes, hunts and camp in the area. He likes what he's read about IAMGOLD's culture of zero harm, he need reassurance that these are not hollow words-that there is a plan to measure the effects and a contingency to correct any problems. Please continue providing him with info by email as you have done in the past. 2) Overview of company profile, services offered, work completed in the past and certifications. The individual would like to be notified of project advancements via email - www.reliable-group.ca	All comments received were considered in preparation of the baseline study reports and the EIS / EA as appropriate.
199	Open House	05/23/2013	1) Gary Richards (Westburne)	1) If wildlife samples are collected (e.g., from fishing & hunting) for lab testing (e.g., toxin levels, size vs. age, etc.), the individual would be willing to donate portions of his catch.	IAMGOLD appreciates the offer and will pass this along to the consultants responsible for assessing impacts on wildlife or human populations.
199	Open House	05/23/2013	1) Tony Godin (Individual - Timmins)	1) How much area would be affected? How many lakes and streams will you change or re-route? Will you affect much if any of fish spawning area? Will water (overflow) being dumped into Mesomikenda being drinkable? The	IAMGOLD has provided preliminary information about stream channel alignments in the Project Description and these will be refined as the project progresses. A full assessment of the effect of the project (including

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				individual has many concerns which will be sent via e-mails.	channel re-alignments) on water bodies and fish will be included in the EA report.
266	Meeting	05/23/2013	1) Gerry Talbot (Gogama Local Services Board)	1) With regards to tourism, the existing campgrounds are at capacity with people who come back every year. If there is a large influx into the community and there may be pressure on fishing and recreation resources but this has to be confirmed by Ministry of Natural Resources.	All comments received were considered in preparation of the baseline study reports and the EIS / EA as appropriate.
217	Phone Call	06/05/2013		1) When and where will you be bait fishing? 2) Do bait fish in the same area every year? 3) How do access these areas?	1) Off and on from May to September in licensed townships 2) Yes 3) Drive, boat
323	Site Visit	06/05/2013	1) Raymond Roy (Gogama Area Citizens Committee)	1) What will happen to Côté Lake and the fish?	The lake will be drained in a staged down procedure, the fish will be captured and transferred to another location.
304	Interview	07/15/2013	1) Dick Neil (Tata Chika Pika Lodge)	1) We provide fishing and hunting; BMA CP-31-054 (along the cross-country transmission line. Clients hunt and fish around the lodge). They hunt for grouse, black bear and moose. We have not noticed any changes in the taste, quality or abundance of animals for hunting.	Thank you for your comment. The information collected will be used to support the Land and Resource Use Baseline Study.
314	Interview	07/15/2013	1) Brian Drysdale (Ritchie's End of Trail Lodge)	1) The individual identified that the Lodge provides hunting and fishing services around the lodge and lake area; their Bear Management Area is CP-38-005. Hunting is primarily for grouse, black bear, moose and duck. The individual identified that they had not noticed any changes in the abundance, taste or quality of meat from animals hunted.	Thank you for your comment. The information collected will be used to support the Land and Resource Use Baseline Study.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
315	Interview	07/15/2013	1) Mary Ann Dean (Morin's All Season Resort)	1) The Resort provides fishing and hunting; but is not a licensed Bear Management Area. Clients hunt and fish around the lodge and lake. Hunting primarily for black bear and moose. No identified changes in the taste or quality of meat from animals hunted, however there has been a noticeable decline in the number of moose in the area.	Thank you for your comment. The information collected will be used to support the Land and Resource Use Baseline Study.
316	Interview	07/15/2013	1) Collette Plouffee (Kenogaming Lake Lodge); 1) Pierre Plouffee (Kenogaming Lake Lodge)	1) The lodge provides hunting and fishing services; the Bear Management Area is number 33. Clients hunt and fish around the lake; primarily for partridge, black bear and moose. There have been no noticeable changes in the taste or quality of meat from hunting. There has been a decline in the abundance of moose for hunting (the Ministry of Natural Resources could provide more detail on that).	Thank you for your comment. The information collected will be used to support the Land and Resource Use Baseline Study.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) 5. Review of Fisheries Impacts Northwatch retained Mr. Muhammad Yamin Janjua to review the potential for fisheries impacts related to this project, particularly associated anticipated request to use a natural water body for the deposit of mining wastes and the anticipated loss of several water bodies inhabited by multiple fish species if this project were to proceed as currently proposed. The following section outlines Mr. Janjua's findings, beginning with a summary identification of key concerns which are outlined in more detail later in this section: The project activities have potential to affect fish, fish habitat and aquatic species that are covered by the Fisheries Act. Most of these activities and potential impacts are	This comment has been addressed through other responses to comments in Appendix Z of the Amended Environmental Impact Statement / Final Environmental Assessment Report.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				covered in the EIA report.; Fish baseline survey methodologies are not consistent, sample size is small, and fish & habitat analysis were conducted in summer season only.; Proper information on fish population dynamics, other value aquatic ecosystem components and productivity is lacking.; Compensation plan is not available and information provided is insufficient to exhibit success in realignment and restoring aquatic resources as required by the Fisheries Act.	
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) 5.1 Baseline Information The EIA document and additional information provided have indicated the possible effects of the development of a gold mine and related infrastructure components expected to affect fish communities and the habitat, and how those effects will be mitigated and compensated. The objective of habitat compensation measures associated with the project is to create habitat which achieves the biotic and abiotic habitat requirements of the resident fish species and minimizes the risk of adverse effects to the environment. It requires a detailed quantitative fish and fish habitat assessments of water bodies requiring compensation in order to assess the quality and extent of habitat that will potentially be lost. The Aquatic Biology Technical Support Documents (Appendix N), Aquatic Baseline Report (Appendix C) and Water Quality Technical Support Document (Appendix J) provides a database on which EIA for fish and fish habitat is based. The aquatic biology baseline survey methodology to study fish population dynamics is not standard and constant, and	Baseline water, sediment, benthos and fish data were collected during August through September 2010 (AMEC 2011), July 2012, and in June and September 2013 (Minnow 2014). In addition, routine water quality monitoring (monthly or quarterly) was initiated in 2011 and continues to be collected through 2014. Although no specific spawning surveys were conducted, the key resident fish species within the local study area are well documented in the literature and their spawning requirements are well known. Smallmouth bass were observed protecting their nests during the fishing survey of June 2013 in Clam Lake. Since the local fish species typically don't migrate far distances to spawn (will typically spawn with the lake or the tributaries to the lake / stream), the available habitat was summarized and compared to known life history stage requirements. Focused population dynamics were collected on lakes that were thought to be most impacted by development at the time of the survey. Population surveys were conducted on Côté Lake and Unnamed Lake #1. When the baseline work was initiated in 2012, the final location for the TMF was not

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				the sample size is very small. Most of the baseline data was collected during the summer months only and no studies were done during the spawning season. Important information on fish population dynamics are lacking. Much of the information on fish biology and ecology is literature based and enough field studies were not done on other important aspects of fish biology. Some valued aquatic ecosystem components are missing in baseline study. No clear information is provided about the productivity of these water bodies.	selected and there was a potential that Unnamed Lake #1 would be lost. General fish community composition was provided for the remaining lakes where general population dynamics could be characterized from catch-per-unit-data (e.g., dominant species found within the lake / stream section). Weight-length relationships as well as length-at-age relationships were explored for the local study area. It is not expected that the growth from lake to lake would vary significantly. Lastly productivity of the lakes were documented through Secchi depth readings, nutrients in water quality, in addition to chlorophyll a, total phosphorus and nitrogen measurements. The lakes within the local study area were categorized as being mesotrophic with an intermediate level of primary productivity.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue #1: Fish collection and estimation methods Reference: Aquatic baseline report Concern: Fishing equipment and techniques are provided in Table 2.2 (Appendix C, Appendix N). It appears that experimental gillnet used for survey were not of standard mesh sizes required for index gill netting. Maximum mesh size was 4”. No detail of mesh size except minimum and maximum size is provided. Not using standard walleye index gillnets may have created a bias towards less abundance of walleye and whitefish. Standard index gill netting recommends 8 sites in a water body < 200 however, experimental gill netting was done on 2-3 sites in each water body	Experimental gill net mesh size varied from 1” to 5” (see Appendix N; Aquatic Biology TSD, Appendix C, Appendix F, Table F.1 to F.12) for each individual net set and fish caught in each mesh size. All nets were set at a variety of depths and habitat within each lake to specifically avoid targeting a single species or size of fish. Gill net sets typically varied from 1 (in very small ponds) to 7, however a variety of fishing techniques were employed in each water body to ensure fish from the entire fish population in the lake were represented. Fishing was also conducted with minnow traps, hoop nets, seining and electrofishing (boat and backpack depending on the water body). The majority of the gill nets were set overnight, however the net sets within Côté Lake and Unnamed Lake #1 were kept very short

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				except for Côté Lake. The duration of gillnet setting was not sufficiently long enough to catch representative number, if their abundance was low. There is no information on depth of gillnets or other fishing gears used per water body. Electrofishing details are also lacking (current used, settings). This inconsistency and lack of details will make it difficult for stakeholders to compare results across the sites, as a benchmark from which change can be quantified, compare the different project phases and be assured that the aquatic resources are restored as required by the Fisheries Act. Were the standards for index gill netting, electrofishing, and trapping followed? A rationale behind the methods and techniques, sample size, and frequency is lacking.	as they were incorporated into the population survey and thus required that the fish remain alive. In addition, the weather during the summer survey in 2012 was very warm (daytime temperature in excess of 30° C) and efforts were focused on reducing fish mortality. Water depth and electrofishing settings were not summarized in the Appendix Tables, however all the data was collected, and all the data was reported in a standard catch-per-unit-effort so that water bodies could be directly compared across the local study area.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 2: Fish population dynamics Reference: Aquatic Baseline Report (Appendix N, 6.2) Concern: To monitor potential changes in fish populations resulting from physical, chemical, or biological stressors in the LSA, fish population attributes such as growth, reproduction, and survival need to be monitored. Fish baseline studies conducted to examine trends in abundance and population variables for key indicator fish species may be not enough. Length and age frequency data could be helpful in identifying the age or size classes potentially affected by stressors in the environment. However, no such data is available from the baseline study. Length was measured for selective subsamples only. Age studies were done for only 5 fish per water body (Appendix N, 2.2.4) and that	Fish population attributes such as growth, reproduction, and survival will be monitored as part of the Federally regulated EEM program. Length, weight and age data were reported for all fish measured during the 2012 and 2013 field surveys and can be found in Appendix N (Aquatic Biology TSD), Appendix C, Appendix F, Tables F.26 to F.45. Sample sizes do vary from lake to lake, however typically more than five fish were aged per water body to confirm length frequency. Typically five fish were aged per dominant species within a lake and depending on the number of fish caught, up to ten fish per species were measured. In many lakes sample sizes were much more than this. Appropriate aging structures were collected and used specific to each species being assessed (i.e., dorsal spines for walleye, cleithra for northern pike) for age determination. Fish mortality was kept to a minimum,

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				was not the standard otolith age. This data is insufficient and cannot provide adequate baseline information on fish growth. Experimental gillnetting was conducted on 2-3 few sites in each water body for short duration and may not provide true relative abundance (CPUE) for large bodied fish except for the Côté Lake. No proper data was collected on fish sex ratio, maturity and reproduction.	and sex was noted when it could be determined. Many fish were sampled during the spring (June) post spawning and therefore had insufficiently developed gonads to allow for measurement.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Reference: Fish and Fish Habitat/ Aquatic Baseline Report Concern: Base line survey and monitoring was not done every season and most of the sampling was conducted in July 2012, and June and September 2013. Therefore this baseline data may not represent the seasonal changes and conditions during fall, winter and spring. The document hasn't mentioned any survey conducted in spring or fall. One season information may not be enough to design proper compensation plan. Further field studies are required especially in the spawning season of large bodied fish.	Baseline water, sediment, benthos and fish data were collected during August through September 2010 (AMEC 2011), July 2012, and in June and September 2013 (Minnow 2014). In addition, routine water quality monitoring (monthly or quarterly) was initiated in 2011 and continues to be collected through 2014. Although no specific spawning surveys were conducted, the key resident fish species within the local study area are well documented in the literature and their spawning requirements are well known. Smallmouth bass were observed protecting their nests during the fishing survey of June 2013 in Clam Lake. Since the local fish species typically don't migrate far distances to spawn (will typically spawn with the lake or the tributaries to the lake / stream), the available habitat was summarized and compared to known life history stage requirements. Focused population dynamics were collected on lakes that were thought to be most impacted by development at the time of the survey. Population surveys were conducted on Côté Lake and Unnamed Lake #1. When the baseline work was initiated in 2012, the final location for the TMF was not selected and there was a potential that Unnamed Lake

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					#1 would be lost. General fish community composition was provided for the remaining lakes where general population dynamics could be characterized from catch-per-unit-data (e.g., dominant species found within the lake / stream section). Weight-length relationships as well as length-at-age relationships were explored for the local study area. It is not expected that the growth from lake to lake would vary significantly. Lastly productivity of the lakes were documented through Secchi depth readings, nutrients in water quality, in addition to chlorophyll a, total phosphorus and nitrogen measurements. The lakes within the local study area were categorized as being mesotrophic with an intermediate level of primary productivity. Benthic sampling was conducted in the fall as this is the best season to undertake a benthic survey as recognized by Environment Canada (2012). Fishing was conducted in the late spring (2013), summer (2010 and 2012) and fall (2013). Water sampling was collected monthly and continues to be monitored on a monthly or quarterly basis.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 5: Fish Spawning Survey Reference: Fish habitat Concern: The EIA and Appendix C (6, Table 2.4, Table A1) provide some information about the spawning habitat requirements and locations of some large body fish species. However, the supporting document doesn't mention any survey in spring or fall, i.e. the spawning season of many large body fish species. The identified	The identified spawning locations are based on documented preferences / requirements in the literature and survey observations of habitat conditions. Juvenile young-of-the-year northern pike were observed in June, along with smallmouth bass being observed guarding their nest providing evidence that spawning occurred within these areas. The use of habitat is more conservative as IAMGOLD assumes complete usage within a water body.

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				spawning locations are assumed on the basis of literature description. The document mentions that the created habitat will be designed to meet the spawning, rearing and overwintering requirements of the resident fish (Table 9.8). However it appears that no actual field observations on maturity and spawning were made. Therefore, there is uncertainty with the information provided, especially for lake whitefish and walleye, for whom spawning habitat is already limited and expected to be affected by the project activities. A special survey during spawning months may be useful in providing additional information.	
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 6: Impact of project activities on benthic invertebrates Reference: Fish Habitat Concern: Aquatic invertebrates are one of the most sensitive to environmental contaminants and are used as indicators of environmental degradation. Baseline study includes sampling and characterizing benthic invertebrates in all potentially impacted lakes and streams. Benthic invertebrate baseline data and indices are provided in Aquatic Baseline Report (Appendix C, 5.5). However, the assessment of potential impact of project activities on benthic invertebrates is missing in the EIA documents. Formulae for determining Simpson's evenness index is not provided. It may be useful to calculate Shannon-Weiner index as well, as it is generally more widely used in the literature and could be useful for comparisons.	Benthic invertebrate communities were not an assessment indicator but rather were addressed through habitat and water quality assessment indicators. As stated in the methods (Appendix N; Aquatic Biology TSD, Appendix C, Section 2.3.3) Simpson's Evenness was calculated as in Smith and Wilson 1996. Standard EEM endpoints were used as future environmental effects programs will enable direct comparison of the data. While the Shannon-Weiner Index can be a useful index, it is not an index recommended by Environment Canada for the assessment of mining effects (Environment Canada 2012). However, it may be used in future assessments. The raw data is available from the baseline so it could be calculated for comparison if deemed appropriate.

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544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 7: Other valued ecosystem components Reference: Fish habitat Concern: Other than macrophytes, fish, and benthic invertebrates, there is no information on the other valued aquatic ecosystem components. The EIA didn't not identify plankton as valued component of these aquatic ecosystems. Zooplankton are an important food chain component and environment change indicators. The presence of small-bodied fish in the study area indicates that zooplankton are available for young of year and juvenile fish. Inclusion of plankton in baseline study may be helpful in better evaluating lake productivity and comparisons.	Periphyton, phytoplankton and zooplankton monitoring was not conducted as part of the baseline studies. Secchi depth and nutrient concentrations were measured as an indicator of lake productivity. Periphyton, zooplankton and phytoplankton were assessed as potential monitoring tools for mining impact assessments as part of the AETE Program (St-Cyr et. al. 1997). The AETE program was used to assess and recommend the most appropriate monitoring tools for the Federal Environmental Effect Monitoring program for the mining sector in Canada. These measures (periphyton, zooplankton and phytoplankton) were not included in the EEM program due to their temporal variability and limited use in assessing conditions over time. Zooplankton, phytoplankton and periphyton communities can change due to numerous habitat factors (e.g., weather, water temperature, light). So that the ability to control for these factors and standardize monitoring results is extremely difficult (St-Cyr et al. 1997, APHA 1998, Lewis and McCutchan 2010, McIntire 1966, Jowett and Biggs 1997, Biggs et al. 1998, Bourassa and Cattaneo 1998, Barbour et al. 1999, Arnon et al. 2007, Wetzel 1983). Furthermore, standardization in laboratory identification of periphyton cannot be demonstrated and thus identified taxa can vary between laboratories. Thus, the sampling of the plankton and periphyton communities was not deemed appropriate as a long term measure of conditions in mine exposed water bodies.

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544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 8: Productive capacity of water bodies Reference: Fish Habitat Concern: Fish in Côté Lake will be relocated to other identified water bodies. The EIA document states that the productive capacity of the lakes and streams is sufficiently high and the addition of Côté Lake fish in other water bodies should not impact the condition of the existing fish (Table 9.8). As a part of compensation, habitat will be created in other areas of the watershed to offset the loss of Côté Lake. It is a requirement under the Fisheries Act to provide equivalent productive capacity. The EIA report states that the watercourse realignments will be designed to ensure productive capacity within the LSA is maintained (Appendix N, 4.3). However, the EIA report and baseline study do not properly address the existing productive capacity of the water bodies being impacted by project, adjacent lakes and proposed rearing channels. Lake productivity is governed by many abiotic and biotic factors, both internal and external to lake ecosystems. DFO definition of productive capacity acknowledges the importance of food and trophic interactions. Existing baseline information is not enough and additional studies are required to establish productivity level of these water bodies.	Habitat units for the resident fish (northern pike, walleye, yellow perch, lake whitefish and small mouth bass) for critical life stages will be used as a means of quantifying productive capacity before and after mine development.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 9: Lack of supporting data on food web and fish diet Reference: Fish Habitat	Fish diet composition is well established for the dominant fish species found within the local study area as well as the capacity of fish to shift their diet to available food items. Through the compensation plan,

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				Concern: EIA document states that the compensation/offsetting plans will consider not only the physical habitat requirements but also the biological requirements including food base (Appendix N, 4.2). However, no baseline information is provided on fish diet composition, their trophic interactions and important prey species and groups in the LSA. DFO definition of productive capacity acknowledges the importance of food and trophic interactions. This information is required to propose and evaluate proper habitat compensation plan.	it is proposed that the transplanting of vegetation, benthic invertebrates and forage fish be carried out to expedite the establishment of compensatory habitat. Minnow has previously implemented this approach at another site (Agrium Kapuskasing Phosphate Operations 2006) and results were quite effective (e.g., no loss in year class of any of the fish species relocated to the newly constructed lake). In areas where aquatic vegetation was transplanted, the coverage and expansion of colonization was much larger and quicker than in areas that were not transplanted providing cover for juvenile fish and decreasing erosion from construction and wind. Transplanting activities will be sequenced to allow for the best opportunity for the successful transfer of fish from lost areas to the newly constructed channels and will therefore provide the necessary food base in these new areas. Transplanting activities will likely include the transplantation of macrophytes (aquatic plants), benthic invertebrates and the relocation of small-bodied fish (forage fish) and of large-bodied fish. The sequence of transfers will take into account spawning and incubation periods of the dominant species found within the systems to ensure successful transfer of young-of-the-year fish. These transplants will be to accelerate the establishment of the ecosystem and food chain within the newly constructed areas prior to the placement of the key fish species.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 10: Lack of ecosystem approach Reference: Fish habitat	Fish will be required to be relocated from habitats lost during the development of the mine (i.e., the construction of the open and the TMF). It is anticipated

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				Concern: When fish will be relocated in other lakes it may cause impacts on existing fish and other species in the recipient lakes and may disturb these aquatic ecosystems. No information is available to evaluate trophic interactions in these ecosystems. Baseline studies haven't identified the keystone texa or species in these ecosystems. Lake and food web productivity is regulated by not only the limiting nutrients and light for autotrophic production, but also by the efficiency of trophic energy transfers which are governed by the abundance and species composition of prey items at each trophic level. More information is required on prey items, other components and trophic interaction.	that fish will be relocated during ideal timing windows to minimize fish and egg stranding during the watercourse realignments. Timing of spawning for all fish found within the local study area indicated that the optimal window for all species will be late summer, early fall. By August all species young-of-the-year should be large enough to catch and transfer. Only golden shiner spawn into August. Since their spawning window is quite large, it is not anticipated that the entire year class would be lost or that the species could not spawn in the new area they are transferred to. To concentrate fish, it is anticipated that a series of progressive water drawdowns will be conducted (taking into consideration ideal timing for fish removal) to catch and relocate fish from areas being lost to newly constructed habitat. A variety of fish gear will be employed to capture fish to ensure all sizes and species are caught. Fish will be relocated within the same watershed. As the fish being relocated will be to newly constructed areas, minimal effects on existing populations are anticipated. The only location where fish may be relocated to another water body where an established population is already in place is for Côté Lake where fish will likely be relocated to Upper Three Duck Lake. Côté Lake and Upper Three Duck Lake are currently only separated by large culverts and fish can move freely between the two water bodies.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 11: Compensating natural lotic habitat with artificial lentic habitat Reference: Fish Habitat	The lentic habitat from the pit is not considered in the current loss-to-gain ratio of habitat. All species of fish found in each of the areas to be lost will be relocated to newly constructed habitat. Walleye and lake

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				Concern: Based on the proposed watercourse realignments, it is anticipated that there will be a small reduction in the lotic habitat (1,900 m) and an increase in lentic habitat (29,000 m2) within the Local Study Area (LSA) during operations and the first stage of post-closure (9.9.2.1). It is unclear whether this includes lentic habitat assumed to be available after pit flooding in 50 years to 100 year time after mine closure. During construction of the mine, as many fish as possible will be collected from Côté Lake and relocated from all habitats that will be lost due to the development of the mine. The constructed fish habitat associated with the watercourse realignments is expected to provide spawning, rearing and adult foraging habitat for the resident fish, particularly northern pike and yellow perch. Walleye and lake whitefish are not included in the species listed in the relocation plan. Compensating natural lotic habitat with artificial lentic habitat will probably develop a different aquatic community from the one lost and does not constitute a equitable “trade”.	whitefish will be relocated to suitable habitat within the same watershed. It is anticipated that any walleye and lake whitefish captured in Côté Lake and the arm of Upper Three Duck Lake will be relocated to Upper Three Duck Lake as these areas are continuous. IAMGOLD is currently working with DFO to outline the analysis of how the in-kind habitat creation measures proposed will offset the serious harm to fish (see Addendum to Appendix N; Aquatic Biology TSD).
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 12: Unavailability of fisheries habitat compensation plan Reference: Fish Habitat Concern: The project requires habitat compensation/offsetting plans in support of a Fisheries Act Authorization. EIA document has mentioned that with the compensation, the overall effect on fish habitat is predicted to be negligible. This is based on	IAMGOLD is currently working with DFO to outline the analysis of how the in-kind habitat creation measures proposed will offset any serious harm to fish. As described in the policy entitled, Fisheries Productivity Investment Policy: A Proponent’s Guide to Offsetting (the Policy), dated November 2013, if there is likely to be serious harm to fish after the application of avoidance and mitigation measures, then the proponent must develop a plan to offset the residual serious harm. The avoidance and mitigation of effects

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				assumptions that compensation measures will be appropriate and fully effective. The water course realignment design will offset the loss of fish habitat within the adjacent lakes or streams, to maintain the existing fish communities and fisheries. The constructed fish habitat associated with the watercourse realignments is expected to provide spawning, rearing and adult foraging habitat for the resident fish, particularly northern pike and yellow perch. The proposal raises questions about whether adequate habitat will be available to support smaller populations of walleye, smallmouth bass and lake whitefish which are present in few selective lakes only. At present, evaluation of habitat, productive capacity, watercourse realignment design, fisheries habitat compensation plan, and future monitoring plan are not available. Only the design concepts have been developed and offsetting design are not finalised. Due to unavailability of compensation design and plan, the overall impact of the project activities on fish habitat cannot be assessed.	to the fishery has and will be an integral part of the design and engineering of the Project, but as noted, the Project is anticipated to permanently alter or destroy some existing fish habitat. The avoidance and mitigation of effects to the fishery will be addressed in two ways; first through reducing the number of fish harmed, and the duration and spatial extent of fish habitat being affected and second to develop and "in-kind" approach to offsetting that will be incorporated into the channel realignment plan, such that habitat that is destroyed or permanently altered is replaced by habitat of similar quantity and quality, with consideration of uncertainty and time lags. The approach will define a dimensionless habitat unit by multiplying the life stage-specific rating of habitat quality by the spatial area of the habitat type affected (e.g., m2). This will be calculated for all the habitat that will be lost as well as the habitat gained (created or enhanced) because of offsetting. These dimensionless units will be used to calculate the gain-to-loss ratio. A description of the methodology to be used in the assessment is provided in the Addendum to Appendix N (Aquatic Biology TSD).
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 13: Missing Information on methodology Reference: Fish and Fish Habitat Methodology Concern: In the "description of the environment" portion of the document, aquatic biology (6.4.8) methodology doesn't include survey conducted in 2013. The list of the lakes included in the 2013 survey is also	The Amended EIS / Final EA Report text has been revised accordingly.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				missing e.g.. Mesomikenda Lake (6.4.8.1). Mesomikenda Lake is an important component of this project from where water will be drawn and Tailing Management Facility (TMF) will discharge during the closure phase. This portion of the report should be updated.	
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 14: Inadequate number of samples Reference: Fish and Fish Habitat: Concern: Five large bodied fish and five forage fish were targeted in each water body for aging and fish tissue analysis (6.4.8.1, Appendix N 2.4.4). These tissues were analysed for total metals. Five samples for aging are not enough to show any trend, or for comparison among the lakes. The sample size should be increased in order to strengthen the rigour of analyses performed on individual parameters. Tissue sampling and analysis may be expensive. However, compromising it can put ecosystem health at risk for aquatic life and humans. Fish aging studies are also very important to study fish growth, age class structure and age at maturity. It appears that sample numbers were kept small to avoid fish mortality in these comparatively small water bodies. However 5 samples are not enough according to any standard. At least 15-20 samples are needed to be collected to achieve some statistical significance.	Fish length was recorded so that it can be considered in length distributions and then the length can be translated to age based on measured ages over a range of fish sizes. During sampling, IAMGOLD's consultants tried to limit fish mortality. Reliable aging structure generally requires the collection of bone / cartilage tissue which in turn requires sacrificing the fish. For the purpose of baseline monitoring IAMGOLD wanted to understand the size range and the relative proportion of adult and juvenile fish in various habitats. Collection of additional aging structures would not have assisted in achieving this objective.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 15: Long term non-lethal effects of toxins Reference: Fish / Aquatic toxicity	Chronic (sub-lethal) thresholds were considered in the assessment of water quality predictions. For each element where a concentration was predicted to exceed baseline or water quality guidelines, the most

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				Concern: Maximum copper, and zinc concentrations within the mixing zone are predicted to exceed water quality benchmarks and have the potential to effect fish and aquatic life at the predicted concentrations (9.9.2.2) Impacts on aquatic ecosystems occur at much lower concentrations of toxics than those that cause acute lethality. Endocrine disruption may result in sub-lethal effects which are not limited to fish fecundity, but can include effects on reproductive behaviour. Zinc and copper can affect aquatic biota by a variety of mechanisms, including both acute and chronic toxic effects. Increases in dissolved copper above normal background levels can reduce productivity of key links in aquatic food. Sub-lethal and toxic levels of copper and zinc can damage gills and other tissues of fish. Copper is known to depress the immune system, and is lethal for most of the invertebrates. Such sub-lethal effects may not be expressed in immediate generations. EIA does not consider other non-lethal end-points that may have intense effects on fish. The proponent argues their runoff will not lead to bioaccumulation of metals and tainting in the downstream. These conclusions are based on models and assumptions. Apparently, proposed monitoring studies are not sufficiently detailed enough to detect long run health changes in fishes.	appropriate chronic effect endpoint from the literature was selected and used as a toxicity reference value (Appendix N; Aquatic Biology TSD, Table 2.3) for both the aquatic biology impact assessment (Appendix N) and the HEHRA (Appendix W). Thus potential sub-lethal effects were considered. Monitoring will be conducted according to Federally regulated Environmental Effects Monitoring.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 16: Mesomikenda Lake Water Supply Reference: Fish Habitat Concern: Mesomikenda Lake is also expected to provide	Mesomikenda Lake is expected to provide a potential source of make-up water for use in the ore processing plant. Mesomikenda Lake is part of the Mattagami River watershed and the water levels within the lake are regulated by the dam. Prior to being able to take

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				a potential source of make-up water for use in the ore processing plant, as needed. It is expected that 7,200 m 3 /d of freshwater will be taken from the Mesomikenda Lake which will be less than 1% of annual average stream flow at the Mesomikenda lake outflow (5.10.2. and 7.3.7.4). However, the document doesn't state the approximate number of days per year for which water will be drawn. The EIA report has mentioned that the fish communities or populations within Mesomikenda Lake are not expected to have any adverse effect. However, such withdrawal could have its effects during key times of year when flow is low and peripheral habitats are stressed. This water withdrawal from Mesomikenda Lake will definitely have impacts on downstream aquatic biology and habitat.	water from Mesomikenda Lake, a Permit to Take Water will be required where further details will be established to ensure fish communities or populations within Mesomikenda Lake are not affected. Detailed mitigation measures are described in Appendix N (Aquatic Biology TSD), Section 4.2.
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 17: The potential effects of failure of water management facilities Reference: Fish and Fish Habitat/ Water quality Concern: Communities and stakeholders are concerned with potential seepage from the Tailing Management Facility (TMF) into the ground water and accidental spill into the water bodies. The EIA document states that additional test work is currently ongoing to better characterize the acid generating potential of the ore and the processed tailings to confirm the geochemical characteristics of the tailings (5.10.4). Initial test results do mention low potential of metal leaching but these analyses are based on many assumptions. EIA needs to accurately characterize the tailings that can be expected	Results from the tailings testwork indicate that the tailings leachates are circum-neutral with low metals concentrations. These results are consistent with the static testing results that indicate the vast bulk of the tailings are non-acid generating with a low content of sulphide and metals. This test monitoring program is ongoing and will be updated periodically.Note that cyanide concentrations will be below levels that are toxic to aquatic species, due to the operation of a cyanide destruction system prior to discharge of tailings to the tailings management facilities.The environmental concerns related to accidental releases from the TMF are described in detail in Section 13.2.7. The main concern would be the release of suspended solids.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				from the milling of the ore and should include detailed information regarding the selection process. Mitigation measures do mention the use of liner of early tailing dams and along the upstream face and areas where ponds are to be maintained within the TMF. But geo-membrane lining will not be done for all TMF. The EIA documents has mentioned that seepage through the tailing will occur and will be collected at collection ponds around the perimeter of TMF and pumped back into the TMF (5.7). But the document doesn't describe this risk empirically. A breach of the tailings dam is assessed in the EIA report (13.2.7). Although the chances of such an incident are very small, they are not insignificant. Water quality would deteriorate due to resulting slurry which may contain residual of cyanide, heavy metals and ammonia. TMF may contain large volume of water on closure which will not be pumped (Table 9.5). What would be the impacts of a TMF breach on downstream water quality and fish habitat?	
544	Email	08/08/2014	1) Brennain Lloyd (Northwatch)	1) Issue # 18: Open pit flooding upon closure Reference: Fish habitat/ Water quality Concern: As per plan, upon closure, the open pit will be flooded naturally or actively to form Côté Pit Lake. It will take 100 years to flood the lake naturally. Even enhanced flooding will take 50 years to fill the pit (7.4.4.1). Mine water is expected to contain suspended solids from general mining and earth moving activities, as well as ammonia and hydrocarbon residuals from ammonium-nitrate based explosives and heavy	IAMGOLD is committing to carry out the water quality monitoring program during all phases of the Project, including post-closure. However, as stated in Section 5.16 of Chapter 5 – Project Description, the closure of the Project site will be governed by the Ontario Mining Act and its associated Regulation and Code. The Ontario Mining Act requires that a Closure Plan be filed and that financial assurance be provided in advance of Project development and held in trust by the Ministry of Northern Development and Mines. The financial assurance guarantees that sufficient funds are in place to ensure the proper closure of a mine

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				equipment operation. Leaching of the exposed bedrock within the open pit may also potentially contribute solid and dissolved phase metals to the mine water (5.4). The pit lake will be incorporated into the main water system in 50-80 years from the project closure. Even at this phase, monthly average concentration of major ions and metals are predicted to be greater than the baseline concentrations in adjacent lakes. Total phosphorus concentration will be greater than water quality guidelines (4.6). It is unclear how monitoring of Côté Pit Lake water chemistry will be assured by the management for such an extended period of time (80-100years).	(including long-term monitoring of water quality) in the event that the proponent cannot meet its Closure Plan obligations due to financial insolvency.
575	Email	07/08/2015	1) Marc Rain (Unknown Individual)	1) Individual identified that they are an avid fisher-person that uses Chester Road to access local lakes (such as Wolf, Shou, Shisct) and read that the road may be closed. The individual asked if the road will be closed during the life of the mine and if so, how will people access the lakes?	IAMGOLD responded that Chester Road is owned and managed by EACOM Timber Corporation, and that the road is a Primary Road under the Forest Management Plan. IAMGOLD has a Memorandum of Understanding with EACOM to use the road. IAMGOLD identified that they intend to use Sultan Industrial Road for main access to the Project; however, Chester Road will likely be re-routed around the Project site during construction to accommodate Project infrastructure. A link to further information was provided.
762	Open House	02/14/2018	1) Unknown Unknown (Unknown Individual)	1) What will access look like for hunting and fishing through all phases of the Project?	Hunting and fishing will not be permitted within the Project boundary by employees or members of the public; however, access around the site will remain open.
810	Open House	06/13/2018	1) unknown unknown	1) What will happen to the fish in Cote Lake?	IAMGOLD will relocate fish to nearby lakes and New Lake. Also, IAMGOLD may share fish with nearby

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			(Individual - Gogama)		communities, pending discussions with the communities.

APPENDIX D-5

COMMENTS AND RESPONSES RELATED TO FISHERIES ACT AUTHORIZATION NOVEMBER 2018 TO FEBRUARY 2020

Comments and Responses Related to Fisheries Authorization – Indigenous – November 2018 to February 2020

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
1,071	Email	11/30/2018	1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.); 2) Rick Hendriks (Camerado Energy); 2) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 2) Brent Parsons (Hutchinson Environmental Services Ltd.); 3) Rick Hendriks (Camerado Energy); 3) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 3) Brent Parsons	1) Numerous Species at Risk have been identified on the project site. The Closure objectives for vegetation are focused on long-term physical stability of the site (e.g. erosion control) and improvement of site aesthetics (p. 108). p. 112 indicates areas of revegetation but these are not related to natural heritage features. We would like to see additional consideration of how the revegetation plans affect SAR habitat or that of other wildlife. For example, the fisheries component speaks to the need for considering individual species and habitat for specific life stages. Please explain how the proposed revegetation plans were designed to address species habitat restoration of specific SAR species and other wildlife species. 2) Partially resolved. It is not clear if IAMGold revegetation efforts are aimed at restoring the original forest and wetland compositions existing in the project area. Will the successional forest be planted to restore both mixed deciduous/mixed woods and coniferous forest types? Will the variety of wetlands described on site be recreated (i.e. hardwood swamp, fen, bog and marsh)? Will revegetation efforts aim to achieve similar proportions of different habitat types as are currently found in the project area? Please note that three of the five provincial special concern species confirmed during the 2013 surveys (Common Nighthawk, Canada Warbler and Olive-sided Flycatcher) are listed as threatened under the federal Species at Risk Act and thus their nests are protected on private land.	1) The EA and updated UTM confirm there are no residual adverse effects on species at risk (SAR). Therefore the primary objectives of rehabilitation/rehabilitation do not specifically focus SAR. However, it is generally anticipated that SAR may utilize some of the habitat types that are broadly identified in the Closure Plan. As discussed in Section 9.18 of the Closure Plan, The primary aim of the site revegetation / rehabilitation program is to control erosion and ensure physical stability, improve the aesthetics of the site, promote vegetation communities that support habitat for local species. Revegetation of disturbed areas will be accomplished through seeding and planting of seedlings of indigenous plant species, as appropriate, to initiate colonization and regeneration. The species mix / mixes for the site revegetation will be determined through onsite testwork programs during the Operations phase, and will be refined during progressive rehabilitation. The programs will assist with revegetation success at closure. Re-vegetation is anticipated to result in the following habitat types (Closure Stage II, Figure 9-2): Successional grassland = 325 ha; Successional forest = 280 ha; Wetland = 20 ha; Mixed exposed rock slope and successional forest = 200 ha; and the remainder will comprise of exposed rock slopes. A description of the types of habitats used by various SAR in the Project area, and the amount of habitat loss that will result from Project construction and operations, is described in the original EA. All of these habitat types are very abundant in the region, immediately outside the Project footprint. As noted in the terrestrial baseline report "Five of these [SAR] species, Bald Eagle,

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			(Hutchinson Environmental Services Ltd.)	Further, although Bald Eagle exhibit nest fidelity to a specific nest tree, most migratory bird species tend to return to the general area where they nested previously (e.g., the same forest patch). 3) Resolved.	Rusty Blackbird, Common Nighthawk, Canada Warbler and Olive-sided Flycatcher were confirmed within the Project Study area during the spring and summer 2013 surveys. The remaining species, Eastern Whip-poor-will, Chimney Swift, Black Tern and Barn Swallow were not observed during the surveys; these species may occur on the site and were undetected or use the site intermittently making detection very difficult." The five species confirmed during the 2013 surveys are provincially designated as Special Concern and are not afforded individual or habitat protection under the ESA. Of these species, only Bald Eagle have been known to exhibit nest fidelity. However, management of the Bald Eagle nest site will take place during the development of the mine, as such it is not addressed in the Closure Plan. It is therefore reasonable to expect all five SAR birds to relocate to suitable nearby available habitat, eventually recolonizing the footprint as progressive rehabilitation measures result in the return of suitable habitat.2) Successional forest rehabilitation will include deciduous/mixedwoods. Species composition will be further informed by ongoing monitoring. Proportions of habitats are provided in Section 11.5 of the Closure Plan. Wetland compositions will ultimately be informed by detailed engineering (which will determine final water elevations/invert elevations).
1,071	Email	11/30/2018	1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental	1) There is no evidence that the Draft Closure Plan reflects any consultation with, or input from, the Mattagami and Flying Post First Nations. This is important at the start to establish closure expectations and objectives, and the results of such consultation must be made clear in the Closure Plan.	1) a-b) IAMGOLD conducted extensive engagement throughout the EA process, including engagement on closure concepts. Information gathered through engagements during the EA process and following Project approvals provided the framework for the development of the Closure Plan. IAMGOLD has held four open houses in

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.); 2) Rick Hendriks (Camerado Energy); 2) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 2) Brent Parsons (Hutchinson Environmental Services Ltd.); 3) Rick Hendriks (Camerado Energy); 3) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 3) Brent Parsons (Hutchinson Environmental Services Ltd.)	Presenting a draft to the First Nations for comment does not constitute adequate consultation. Please document: a) the consultation activities undertaken to date by IAMGOLD in relation to mine closure and the Draft Closure Plan; and b) indicate how and where the Draft Closure Plan reflects input from the MFN and the FPFN. 2) a) Partially resolved. Please provide a copy of the report summarizing the consultation. b) Not resolved. IAMGOLD has provided a summary of consultation opportunities and presentations they have made. The key concern raised in the request was not the number of opportunities or presentations made but how the consultation influenced the Draft Closure Plan. Did IAMGOLD seek and receive input on closure expectations and objectives that would guide development of the Draft Closure Plan? 3) a) Resolved. Summary of Consultation to Support the Côté Gold Project Closure Plan was received; b) Partially resolved. IAMGOLD summarized how consultation undertaken to date has influenced the Final Closure Plan submission. However, a number of the key concerns and interests do not appear in the Summary of Consultation Report nor in the final Closure Plan including specific commitments to:	each of Mattagami First Nation and Flying Post First Nation during which information about the Project was shared, including the Project components subject to closure, and feedback was sought from open house attendees. In addition to these open houses, numerous meetings and discussions have occurred within the communities and information shared through Project newsletters, fact sheets and handouts. During the May 2018 community open houses, IAMGOLD presented additional information on mine closure including the mine closure process, legislated requirements, primary objectives of closure activities and key activities that will occur during closure. In addition to the information shared in the presentation, IAMGOLD shared the following information on poster boards: progressive rehabilitation measures and closure phases, and conceptual habitat types anticipated at stages one and two of post-closure. A video animation was also displayed showing the development of the site through to post-closure. A Report will be produced that provides a summary of how input from consultation was used to inform the closure plan. IAMGOLD received a number of comments from the Wabun Tribal Council (WTC), representing FPFN and MFN during the EA processes that have been used to inform the Draft Closure Plan (Section 9). IAMGOLD has provided additional clarification in the responses provided below.2) a) In order to incorporate the consultation activities of September 2018, a Summary of Consultation to Support the Côté Gold Project Closure Plan was included with the final closure plan submission and is provided to you as part of this package of responses. b) The Summary of Consultation to Support the Côté Gold Project Closure Plan contains a Section (Section 2.7) that

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				a. reviewing closure objectives every 5 years with the First Nations to ensure future generations' aspirations are understood and considered; b. establishing a First Nation Closure and Reclamation Committee to facilitate closure consultation over the life of mine and closure phases; c. Ongoing community-based monitoring of fish and water quality; d. Reporting results of closure monitoring to the First Nation communities in addition to government agencies; e. Establishing a reference area(s) to verify the efficacy of closure results; and f. Including the closure objectives of water quality suitable for contact recreation (i.e., swimming) and limiting any further disturbance to reestablished ecological conditions in post closure phases through the removal of dams. It would have been helpful to know how all concerns and interests expressed in the consultation meetings related to mine closure will be addressed – either in the Closure Plan or through other approval processes and if there were any concerns or interests that cannot be addressed, then an explanation given as to why not.	summarizes how consultation undertaken to date influenced the Final Closure Plan submission.
1,047	Email	12/06/2018	1) Caroline Burgess (Odonaterra)	1) CEAA Analysis Section 3.4.2. It should be noted that the project also creates real or perceived effects on fish and wildlife that are harvested for consumption in terms of abundance, distribution and	No response required.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				health conditions. The project will also irreversibly impact a Bald Eagles nest which is an important and iconic animal in Anishnawbe culture. It is unclear why the analysis excluded these potential effects. Please indicate why there is no linkage between the project and	
				effects on fish and wildlife that are important to the First Nation member's diets and / or culture and therefore health conditions. Please add the following approval condition related to health of indigenous peoples:	
				Monitor, in collaboration with the First Nations, the effects on plants, wildlife and fish from the effects of vegetation management practices along the transmission line right of way- in particular if there is a need to apply chemical sprays to manage vegetation.	
1,047	Email	12/06/2018	1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) The proponent has indicated key design considerations will include many of the same elements as the previous proposal and it would address the influence of blasting on fish habitat in both Clam Lake and New Lake. The Federal Ministry of Environment and Climate Change Condition	No response required.
				and Oceans Canada and Environment and Climate Change Canada, and in consultation with Indigenous groups, develop and implement any plan(s) required	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				to offset the loss of fish and fish habitat associated with the carrying out of all phases of the Designated It is not clear if the above-mentioned approach was developed in consultation with First Nations or if it was simply presented without alternative options for comment.	
1,047	Email	12/06/2018	1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) CEAA Analysis Section 3.4.1. IAMGOLD have committed to monitoring methylmercury concentrations in water and fish in accordance with CEAA EA	No response required.
				condition 6.4.3 in New Lake and in reference lakes but the potential for increased mercury concentrations are not restricted to New Lake. Table 3-3 (in the EER) Simulated Surface Water Elevation Changes indicates that increased water levels are anticipated in Three Duck (Upper), Three Duck (Lower), Chester Lake and Schist Lake. There is not, therefore, evidence to support the statement that the conditions would not be suitable for methylmercury production.	
				Please indicate how the Agency accepts the proponent's conclusions without updated predictive methylmercury modelling or consideration of lakes where water level increases have been predicted, as	

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				previous mercury modelling is no longer representative and CEAA EA condition 6.4.3 is reliant on these predictions.	
1,103	Email	01/22/2019	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) Environmental Study Report (Draft) Section 6.15 Traditional Land Use New Indigenous land use information provided to IAMGOLD in October 2018 identifies new information related to plant harvesting, trapping, hunting and fishing in the areas that will be impacted by the Shining Tree alignment. Please revise, in consultation with MFN, the traditional land use section to better reflect traditional land uses that will be impacted by the proposed transmission line and to identify appropriate mitigation measures.	IAMGOLD appreciates the additional information provided in the Mattagami First Nation Indigenous Land Use Interview Summary (Non-confidential / Public Copy) which will be incorporated in the Final ESR as applicable.
1,103	Email	01/22/2019	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson	1) Description of Potential Environmental Effects References: Environmental Study Report (Draft) Section 9.2.1 Surface and Ground Water IAMGOLD states that potential effects to surrounding surface waterbodies will be minimized or negated by applying a number of mitigation measures during the operations phase but construction timing windows to minimize impacts on fisheries are not discussed. Please propose in-water construction timing windows based on fish communities listed in Table 6-5 for the waterbodies that could be directly or indirectly impacted by construction, operation or removal of the transmission line.	Engineering and construction scheduling has progressed in the intervening period since the Draft ESR was issued. IAMGOLD has determined that construction of the transmission line will occur primarily* during the winter. During this period, watercourses are anticipated to fully or mainly frozen. In addition, no in-water work is proposed, including travel through unfrozen watercourses (which in any case would not be allowed by MNRF). Construction timing windows for fish will be included in the Final ESR for completeness. * Work within the project site as well as at locations where there is good access and the ground is not susceptible to damage may occur at other times of the year.

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			Environmental Services Ltd.)		
1,103	Email	01/22/2019	1) Caroline Burgess (Odonaterra); 1) Rick Hendriks (Camerado Energy); 1) Neil Hutchinson (Hutchinson Environmental Services Ltd.); 1) Brent Parsons (Hutchinson Environmental Services Ltd.)	1) Description of the Study Area. Environmental Study Report (Draft) Section 6.8.2 Fish Community. Issue / Concern. The description of the aquatic environment in the study area is based entirely on a projection of aquatic features that were recorded in the CGP as no site-specific information was collected. IAMGOLD states that, "there were no Endangered, Threatened or Special Concern fish species observed in any of the waterbodies within the CGP area." A background review should be included to aid in the determination of the presence or absence of Endangered, Threatened or Special Concern fish species. Please complete a search of the Natural Heritage Information Centre and other relevant information sources to aid in the determination of the presence or absence of fish Species at Risk in the SSA.	Additional information regarding fish Species at Risk will be provided in the Final ESR. Note that there is no planned in-water work, and no anticipated material effects to fisheries resources are expected, including to Species at Risk if present.
1,108	Email	03/11/2019	1) Jeff Berube (Flying Post First Nation); 1) Tim Harvey (Mattagami First Nation); 1) Stephanie LaBelle (Wabun Tribal Council)	1) Appendix E: Updated Impact Assessment Matrices "The Project may affect a small number of waterbodies used for traditional fishing but does not limit the ability to fish." Construction of the Project totally eliminates the ability and willingness of MFN members for many generations to fish in the Lakes and other waterbodies impacted by the Project. The Project perpetuates the impacts of historic and current mining and exploration in this area on traditional fishing as well as other indigenous land uses. Please consider revising the magnitude of effect	No response required. This comment was removed by Mattagami First Nation and Flying Post First Nation on 2019-02-25.

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				predictions for traditional fishing in the construction, operations and closure phase tables.	
1,108	Email	03/11/2019	1) Jeff Berube (Flying Post First Nation); 1) Tim Harvey (Mattagami First Nation); 1) Stephanie LaBelle (Wabun Tribal Council); 2) Stephanie LaBelle (Wabun Tribal Council)	1) Main Report, Sections 3.10.7 and 4.7. P. 3-27. As part of the proposed development of the Project, several water features will be fully or partially overprinted and flows redirected using dams and watercourse alignments. The two proposed watercourse realignments will total approximately 2.4 km. These water bodies include: a portion of the Mollie River, Côté Lake, portions of Clam Lake and Three Ducks Lake (Upper), Clam Creek, and approximately 15 small unnamed streams and ponds throughout or adjacent to the Project footprint. P. 5-12. There are two areas where fish habitat quality will potentially be affected during construction; Clam Lake and New Lake. The potential disruption in habitat will be addressed through the offsetting / compensation plan. It seems that fish habitat will be impacted in a number of waterbodies and watercourses yet only habitat alterations in Clam Lake and New Lake will be addressed through the offsetting/compensation plan. Please increase the number of waterbodies where fish habitat will be affected and addressed through the future offsetting/compensation plan or provide rationale for the inclusion of only Clam and New Lakes. 2) As of 2019-04-16, Wabun Tribal Council confirmed that all comments on the EER are considered resolved by Mattagami First Nation and Flying Post First Nation.	IAMGOLD is preparing a Fish and Fish Habitat Offsetting plan (offsetting plan) for submission to DFO and Environment and Climate Change Canada. The offsetting plan accounts for the losses of habitat and the habitat to be gained through offsetting measures in terms of quality and quantity of habitat. The net result is a plan that results in no net loss of productive habitat. Sport fish and forage fish were considered with the habitat requirements for four life history stages (spawning, adult foraging, juvenile rearing and over wintering). The offsetting measures include: The creation of New Lake; A natural channel connecting Clam Lake to Chester Lake; A natural channel connecting New Lake to Upper Three Duck Lake; Connecting channels between Weeduck and Upper Three Duck Lake; Connecting channels between East Clam Lake and Clam Lake; A pond to support forage fish within the Bagsverd Creek basin; A pond/bay and interconnecting channel to Middle Three Duck Lake; and A natural channel connecting Unnamed Pond to New Lake. The offsetting plan also incorporates measure to improve connectivity of habitat and to reduce lag times for the establishment of the constructed habitat.

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1,108	Email	03/11/2019	1) Jeff Berube (Flying Post First Nation); 1) Tim Harvey (Mattagami First Nation); 1) Stephanie LaBelle (Wabun Tribal Council); 2) Stephanie LaBelle (Wabun Tribal Council)	1) P. 7-7. This monitoring should be conducted in New Lake and in reference lakes as no other terrestrial habitats are proposed for flooding. CEAA EA condition 6.4.3 states, "monitoring methylmercury concentrations in water and fish of pike, walleye, whitefish or perch in all waterbodies where an increase in water level is predicted or waterbodies directly connected to realignment channels." Surface water elevations for the operations phase were simulated and presented in Table 3-3 within the Aquatic Biology UTM. It is clear that fish tissue monitoring needs to be completed in more than New Lake and reference lakes to meet CEAA condition 6.4.3. Please include all of the waterbodies where an increase in water level is predicted, are located downstream of a waterbody where an increased water level is predicted and waterbodies that are directly connected to realignment channels within the fish tissue monitoring program. 2) As of 2019-04-16, Wabun Tribal Council confirmed that all comments on the EER are considered resolved by Mattagami First Nation and Flying Post First Nation.	While the EIS resulted in the flooding of several water bodies in order to move flow to the north around the open pit, the revised Project description in the EER will maintain watersheds and results in fewer areas for flooding. These areas include: New Lake, and the polishing pond upstream of the South Arm of Bagsverd Lake. In order to assess for the potential issue of methyl mercury production and mercury uptake by fish, fish tissue monitoring will be conducted in the following locations: New Lake; Upper Three Ducks Lake (as New Lake discharges to this waterbody); The South Arm of Bagsverd Lake; and One to two reference lakes. Tissues will be sampled from fish species listed from CEAA (pike, walleye, whitefish or perch) for those species found in the waterbody assessed. Tissue sampling will be conducted prior to the Construction phase and then following flooding.
1,108	Email	03/11/2019	1) Jeff Berube (Flying Post First Nation); 1) Tim Harvey (Mattagami First Nation); 1) Stephanie LaBelle (Wabun Tribal Council)	1) Aquatic Biology UTM, Section 3.2. P. 19. Unlike the EA, which predicted a reduction in flow and water level in Bagsverd Creek that had the potential to effect fish habitat and passage, no reductions in water levels are predicted under the Project mine plan (Table 3-3). The only material change in water elevation will be a slight increase in the water level of Lower Three Duck Lakes (0.11 m) which is not expected to materially affect fish habitat. During	No response required. This comment was removed by Mattagami First Nation and Flying Post First Nation on 2019-02-25.

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				Closure, water levels and flow will be adjusted towards baseline conditions as channel realignments and the New Lake are removed. The above-mentioned simulated surface water elevation changes only reference average year modelling. Clam Lake (-0.15 m) and Upper Three Ducks Lake (0.49 m) exhibit substantial changes in water levels in dry years. Please update the assessment of simulated water level change on fish habitat to include wet and dry modelling as necessary.	
1,108	Email	03/11/2019	1) Jeff Berube (Flying Post First Nation); 1) Tim Harvey (Mattagami First Nation); 1) Stephanie LaBelle (Wabun Tribal Council)	1) Aquatic Environment – Fish Habitat Compensation. Main Report, Section 3.10.7. P.3-28. Design concepts for the compensation plans have been developed. The objective of habitat compensation measures associated with the Project will be to create habitat which achieves the biotic (e.g., food) and abiotic (e.g., flow, depth, fish passage, cover, and substrate) habitat requirements of the predominant resident fish species and minimized the risk of adverse effects to the environment. The goal will be to compensate the pre-construction productive capacity and lost habitat on a "like for like" basis to maintain the fish communities within, and the functionality of, the existing habitat. P.3-29. Compensation plans will be in consideration of regional fisheries management objectives and in consultation with the MNRF and Fisheries and Oceans Canada. The Federal Ministry of Environment and Climate Change Condition 3.7 states that, "The Proponent shall, to the satisfaction of Fisheries and Oceans Canada and Environment and Climate Change Canada, and in consultation with	No response required. This comment was removed by Mattagami First Nation and Flying Post First Nation on 2019-02-25.

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				Indigenous groups, develop and implement any plan(s) required to offset the loss of fish and fish habitat associated with the carrying out of all phases of the Designated Project." It is not clear if the above-mentioned approach was developed in consultation with First Nations. The scope of potential CG fish habitat compensation projects should be widened for consultation and include potential "out of kind" projects. Application of "in-kind" habitat offsetting designed to ensure that there is "no net loss" of habitat is a challenge as noted by Quigley and Harper (20063) who determined that the ability to replicate ecosystem function is clearly limited after reviewing the no net loss habitat principle at 16 sites across Canada. The Fisheries Act allows for offsetting that is removed from a project site and can target factors which limit fish productivity by means other than replacing what is lost, so long as the offset: Supports fisheries management objectives or local restoration Priorities:?Benefits balance project impacts;?Measures provide additional benefits to the fishery; and Generates self-sustaining benefits over the long term Also, DFO (20174) lists seven classes of equivalency metrics that should be used when predicting impacts and benefits and one includes "other value based metrics, focused on economic or societal values", so it is clear that more creative, "out-of-kind" offsetting projects with a focus on local restoration priorities and societal values should be developed by IAMGOLD and considered by First Nations. For example, a fish habitat compensation plan was developed based on input from Matachewan and	

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				Temagami First Nations as part of the Young Davidson mine expansion by Alamos Gold Inc. The compensation plan included the development of 3.72-hectare baitfish habitat, enhancement of 4 walleye spawning areas and funding for research on environmental DNA barcoding (https://www.macleans.ca/news/canada/how-to-destroy-a-lake/). Please: a) Describe how First Nations have been consulted on the development of the planned fish habitat compensation plan. b) Develop additional habitat compensation projects, including "out-of-kind" projects, so that First Nations can provide input on preferred projects.	
1,248	Community Meeting	05/29/2019	1) Unknown Individual (Mattagami First Nation)	1) Regarding the current hatchery and opportunities that may be presented as a result of the fisheries offsetting plan, the community expressed an interest in helping supply walleye if the fish salvage caught walleye during the spawning period and working with whomever is responsible for doing the fish salvage work. Community member expressed that it is important for ample notice of work to be provided so that interested individuals have enough time to prepare, such as organizing daycare as this is one of the largest barriers to employment in the community.	IAMGOLD has committed that Mattagami First Nation will have opportunities to be involved in the fish capture and relocation. Minnow has experience working with First Nation communities to train staff to hire for fisheries work which could include first aid training, WHMIS, electrofishing training and working safely around water training. Regarding the fish capture, there is a commitment to involve Mattagami and Flying Post in the fish salvage work. IAMGOLD is committed to supporting and hosting a water ceremony at Côté Lake when the arrangements can be made by Mattagami First Nation.
1,248	Community Meeting	05/29/2019	1) Unknown Individual (Mattagami First Nation)	1) How are the fish salvaged?	Planning will take place to allow for strategic transfer of fish and dewatering. The fish will be captured through electrofishing, hoop nets, seining and minnow traps. To minimize mortality, gill nets may not be used.

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1,248	Community Meeting	05/29/2019	1) Unknown Individual (Mattagami First Nation)	1) What do you do with the fish that die?	This depends on what is stated in the permits. They may be buried or disposed of in some other way, but the goal is to not have any dead fish at all if possible. Fish loss is usually young fish or small-bodied fish. There is the possibility that fish may be shared with the community. IAMGOLD is open to providing fish but there are critical considerations around timing and temperature that may prohibit such sharing.
1,248	Community Meeting	05/29/2019	1) Unknown Individual (Mattagami First Nation)	1) What is the success rate for the fisheries offsetting plan?	Mitigation measures are monitored to determine that measures are working. If they are found not to be working properly, IAMGOLD is responsible for ensuring this is corrected.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Section 3.4 - Overall imbalances in the offsetting plan may result in several changes in the local aquatic ecosystem. For example, there is a net loss of juvenile rearing and adult foraging habitat for all species considered. More specifically, walleye are expected to experience a net loss of habitat in all life stages considered. These changes may cause ecosystem-wide changes in community diversity and abundance that are not in line with the DFO offsetting policy. The health and well-being of the lands and waters, which includes fully functional ecosystems, are inextricably linked to the Métis Community's health and well-being. It is imperative that potential Project impacts are examined at the ecosystem-level, rather than focused on specific species, in order to adequately consider impacts to Métis rights, interests, and Way of Life. If ecosystem-wide imbalances perpetuate, the health and	a) While the Offsetting plan indicates a reduction in juvenile rearing and adult foraging habitat for walleye, this habitat is not limited in the local watersheds and has been incorporated in the Offsetting Plan (Appendix Tables B.3 and B.10) to the extent possible. The loss of juvenile rearing and adult foraging habitat is not expected to reduce walleye productivity as there are sufficient habitat remaining to support these life history functions. IAMGOLD has further promoted productivity through access to existing habitats by significantly improving the connectivity of the watershed and its habitats which will extend throughout and beyond the life of the mine. This is not necessarily accounted for within the HU assessment. With respect to the southern portion of Clam Lake, we agree it has excellent potential to provide juvenile rearing and adult forage habitat for the resident species and that is why a significant expansion of this area was included in the Offsetting Plan (see Appendix C – WRC1). This area will

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				sustainability of the Métis Community will be compromised. a) The Proponent must provide additional information on options for improving the production of juvenile rearing and adult foraging habitat for all species. For example, there may be opportunity for creating additional habitat at the southern portion of Clam Lake as part of WRC1; b) The Proponent must provide additional information on options for improving the amount and value of compensation habitat for walleye, an important fish species that local Métis rely upon (Métis Nation of Ontario, 2015). For example, there may be opportunity for creating additional walleye habitat in New Lake or by expanding and deepening the aggregate pits that will be flooded.	provide a shallow vegetative lotic area that connects to the stream channel of WRC1 to Chester Lake. However, since there is naturally limited access to spawning habitat for walleye in Clam Lake, this area was assigned a low score for walleye juvenile rearing but a much higher score for northern pike and yellow perch (Appendix Table B.8 to B.10). b) It is important to remember that walleye are not the most dominant species within the watershed, largely due to the natural topography, which limits spawning locations (see response to comment 7 below). While it is expected that walleye will use much of the created habitat, IAMGOLD has been conservative in our evaluation and have only counted walleye habitat value where it clearly achieves the HSI requirements for the various life history stages assessed; With respect to the aggregate pits, these are not locations that can realistically be developed into successful walleye habitat. These ponds are headwater ponds and could not be made to provide the conditions to support most life history stages for walleye. While they could provide some juvenile rearing habitat, they are not connected to spawning habitat so there is no potential for walleye to access and use these locations for juvenile rearing. Therefore, no habitat value was assigned to the aggregate pits for walleye. In addition, the connecting habitat channels to these waterbodies are small streams not necessarily conducive for adult walleye passage (limited water depth). Instead, the overall habitat compensation package has focused on improving connection among large waterbodies (to not only provide access to additional overwintering habitat, but additional habitat for all species and life stages) and providing increased spawning potential in WRC2 where gradients and stream habitat are more

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					suitable for potential walleye spawning. Focusing on these conditions, as well as using a conservative approach to the evaluation of habitat within the system, will safeguard and protect the balance to the local aquatic ecosystem.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Section 3.3.2 and 3.3.3 - The culverts under the Mollie River Road crossing and WRC1 are very long (27 m under WRC1 and 39 m under Chester Lake outlet) and likely to create barriers for fish passage. The Proponent has planned to separate culverts to allow light penetration and install natural materials to reduce flows and create backwater eddies (providing refuge). Despite the proposed mitigation measures, is unclear to the MNO how effective these culverts will be at facilitating fish passage. For example, it is likely that natural materials may be washed away during storm events or covered by incoming sediments, thus limiting the effectiveness of a natural bottom. Moreover, it is unclear how accessible a 39 m culvert will be for the majority of fish. Even if it is physiologically possible (i.e., below the mean critical swim speed), these culverts are likely to present behavioural barriers (Fullerton, 2010). The MNO requires that the Proponent install bridge crossings over WRC1 and Chester Lake outlet. The purpose is threefold: first, to increase channel width, allowing for some sinuosity and natural channel meandering; second, to increase light penetration, improving the likelihood that fish will choose to pass through, thus reducing the behavioural barrier; and third, to increase habitat diversity, providing rest areas, which	IAMGOLD identified culvert construction as a potential issue for fish passage and fish habitat and therefore, the size and design of the culverts were optimized to minimize their length and promote fish passage. For WRC1 the culvert crossings are at a 0% gradient and thus velocity will not impair passage. In the case of WRC2, an arched culvert with an open natural substrate was designed to promote fish passage and allow for a wildlife corridor. A hydrologist and a fluvial geomorphologist reviewed the design of these culverts and fisheries biologist to ensure flow events could be managed, the habitat will remain stable and will allow for fish passage. When developing an Offsetting Plan, the system as a whole is considered and a plan is developed which will offset expected losses and promote productivity. As a result, individual aspects such as road crossing should not be considered in isolation. While a bridge was considered as an alternative, the culvert design was optimized to provide fish passage for all species. The culvert was accounted for in this context (marginal habitat for adult and juvenile yellow perch only; see Appendix B of the Offsetting Plan). Given the objectives of the Offsetting Plan, the inclusion of a bridge was not found to provide sufficient habitat quality relative to other options and thus was not deemed economically justifiable based on habitat offsetting opportunities. IAMGOLD will commit to confirming that fish passage conditions are suitable through culverts post construction; additionally, post-

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				are particularly important during periods of high and low flow.	construction monitoring will include flow and velocity measurements.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Section 4 - The Proponent has stated that they will begin construction on the offsetting (and other Project activities) before a decision is made on the MDMER Schedule 2 amendment. Furthermore, the Proponent has committed to rehabilitating any disturbed habitat in the event that the approval for a Schedule 2 amendment is not granted. Despite this written commitment, the Proponent has not provided any assurances or details on how they will be held accountable. The MNO requires additional reassurance that the Proponent will rehabilitate any disturbed fish habitat in the event that a Schedule 2 amendment is not granted, by including this commitment as a condition in the Fisheries Act Authorization.	IAMGOLD believes that making such a commitment is important and this is why it was stated within the Offsetting Plan. However, since the Offsetting Plan has been developed, the construction of the Project has been deferred. It is expected that any disturbances to fish habitat subject to the Fisheries Act Authorization will not be undertaken prior to receipt of an Order in Council for the proposed Schedule 2 amendment.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) Côté Gold Project Offsetting Plan, Section 3.2. - Several of the proposed Project activities will alter flow pathways and catchment areas. For example, construction of the MRA and overprinting of an unnamed tributary to Unnamed Lake #3 may result in loss of inflows to downstream waterbodies, including Unnamed Lake #3. Likewise, overprinting of waterbodies for construction of the TMF (including Unnamed Waterbodies #1 to #6 and West Beaver Pond) will cause a reduction in flows to Bagsverd Lake and Bagsverd Creek. Drawdown from dewatering of the open pit may also reduce groundwater inputs to East Clam Lake, Unnamed Pond and New Lake. As a	a) Changes in hydrology and lake water levels were assessed in the EA and again in the EER to reflect the current mine plan. This assessment considered the loss of runoff to the watershed from mine development and infrastructure (See hydrology EER). This assessment found no decrease in average lake level in any of the adjacent lakes and no material change in flow or stream levels. The Offsetting Plan is based on average conditions both existing and planned. Therefore, there would be no changes in the predicted HSI. To confirm that there are no changes in the predicted HSI, long-term monitoring will incorporate adaptive management measures (see b) which will be established in conjunction with MECP and DFO,

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				result of these changes, the Proponent may redirect or otherwise manage precipitation, runoff and/or groundwater that would previously form part of the water balance for these waterbodies to the TMF, polishing pond, or seepage collection ponds. Despite these potential reductions of flows, the Proponent has not assessed the potential loss of habitat area or change to habitat suitability. This information is necessary, as it will be critical in the net-change to fish habitat as a result of the Project, and ultimately how the Project will affect Métis rights and land use in this area. a) The Proponent must provide additional information on how the Project may impact water balance to waterbodies potentially impacted by the Project. This should include an evaluation of how any potential changes may result in an alteration of the predicted HSI; b) The Proponent must describe additional mitigation and monitoring they will implement in relation to the potential impacts associated with altered flow regimes. This may include installing flow meters or level loggers to detect impacts of the Project on water quantity. The compensation plan should identify and include thresholds for adaptive management.	where contingency measures will be outlined to include additional mitigation, or additional offsetting; b) Extensive monitoring programs have been developed to monitor changes in flow and water quality and have been described in Table 4.1 of the Hydrology Updated Technical Memorandum (UTM) and in Table 4-1 of the Water Quality UTM.Ongoing baseline data is currently being collected and will continue to be monitored through the construction and during operation periods. The current program includes manual flow gauging, water level data loggers and staff gauges at key lake (e.g., Clam Lake, New Lake, Upper Three Duck Lake, Unnamed Pond, South Bagsverd Lake Arm), stream and connecting channel locations (e.g., WRC1, WRC2, Unnamed Pond outlet, Aggregate Pit#3 outlet, Upper Three Duck Lake outlet). The long-term monitoring program that will be finalized in conjunction with MECP and DFO will incorporate maps of groundwater and surface water monitoring locations, methodology, thresholds, limits to be achieved and will include adaptive management measures. The data collected will be used to determine any impacts from the Project. Once a decision to construct has been issued, an anticipated EMP schedule will be provided to MECP and DFO for review. It is anticipated that all EMPs will be completed within three months of the decision. The final designs of the monitoring programs which will include water levels and flow as well as other fisheries related measures will be incorporated into a single document for DFO's review.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis	1) FHCP, Section 3.3.6 - Unnamed Pond and the 409 m outlet channel from Unnamed Pond to New Lake	IAMGOLD has considered this issue and has conducted additional analysis of groundwater draw down and

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			Nation of Ontario)	are in close proximity to the open pit. Groundwater drawdown from the pit may result in a loss of water from these features, limiting their value as fish habitat and reducing the ability to act as compensation habitat. It is unclear how the Proponent will address potential leakage from channel realignment of Unnamed Pond to New Lake, and the resultant impacts that these water quantity reductions could have on Métis rights and land use. The Proponent must provide additional information on how pit dewatering is expected to reduce water quantity in Unnamed Pond and the outlet channel. If negative impacts on area of fish habitat or habitat suitability are expected, the Proponent must describe plans to avoid or mitigate such impacts and demonstrate how the resultant impacts to Métis rights and land use will be either mitigated or accommodated.	potential seepage implications on Unnamed Pond. Project hydrogeologists and hydrologists have indicated that there is a potential for water to seep to the Open Pit in the summer and winter months. It is now expected that Unnamed Pond will drain in the winter and have lower water levels in the summer and for the purpose of fish habitat it will function as ephemeral habitat at some point in the mine life (though not within the first year of operations). The accounting of habitat losses will be adjusted and updated in the FHCP to reflect this. Even with accounting Unnamed Pond as a total loss of habitat the overall Offsetting Plan is still expected to result in a net positive habitat development which is the main factor to consider when assessing mitigation of impacts on Métis rights and land value. To confirm the modelled conditions, a water level recorder will be installed in Unnamed Pond and winter dissolved oxygen profiles will be conducted to compare conditions to preconstruction relative to the requirements for the resident fish present. IAMGOLD will seek other opportunities for offsetting habitat if seepage from the pond results in impaired habitat quality beyond what was accounted for (complete loss) in the Offsetting Plan.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Appendix A - The Proponent assessed fish habitat for five sport-fish species considered to represent the range of habitat requirements for all species present, including northern pike, yellow perch, lake whitefish, walleye, and smallmouth bass. However, other species of importance, including burbot, have not been evaluated. Burbot are a valued species that MNO citizens fish within the Project area	Five key sport fish were considered to represent the range of habitat requirements for all the species present in the surrounding habitat. Lake whitefish and burbot have similar life history requirements and therefore by addressing lake whitefish in the assessment, burbot are inherently assessed. For example, both burbot and lake whitefish typically prefer to spawn in the shallow, littoral areas of lakes (i.e. < 8 m, although both species may also spawn in rivers) over gravel

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				(Métis Nation of Ontario, 2015) and the Proponent must avoid negative impacts on them or their habitat. The Proponent must include burbot in the accounting of fish habitat for the compensation plan. In the event that significant loss of burbot habitat occurs, the Proponent must include additional compensation habitat focused on creating habitat suitable for burbot.	or cobble substrate; both species sometimes also spawn over sand. Young burbot and lake whitefish continue to inhabit shallow lake waters but eventually move to deeper water during the summer to take advantage of cooler temperatures. Both burbot and lake whitefish likely prefer dissolved oxygen levels in the range of 6 mg/L for overwintering. A table will be added the FHCP to demonstrate and further clarify the similarity in life history requirements between lake whitefish and burbot. It is also important to note that only two individual burbot were collected in baseline studies, one each in Clam Lake and Cote Lake. Burbot are therefore not considered key species within the watershed.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) The Proponent has indicated that habitat within Côté Lake is poor for lake whitefish (HSI values of 0 or 0.25 for all life stages), yet this species is present in a moderately high abundance. It is also noteworthy that the largest whitefish observed during baseline data collection were found in Côté Lake (AMEC, 2014). This evidence suggests that the value of this lake is higher than what the Proponent evaluated. The Proponent must re-evaluate the HSI values used for Côté Lake for lake whitefish. Even if spawning and juvenile rearing habitat are low, it is likely that adult foraging habitat is of higher value. This change would have significant changes on the total habitat units requiring offset for this lake. The Proponent needs to ensure that appropriate evaluations are conducted so that adequate offsets are created for all fish species (such as whitefish), honoring the Métis Community	Despite preferring cool water habitat, lake whitefish were observed in Côté Lake. However, the lake whitefish catch per unit effort (CPUE; an indicator of abundance) in Côté Lake was lower than all the other large bodied fish species captured in the lake, with the exception of burbot which had the lowest CPUE (see comment 3). Habitat within Côté Lake is not optimal for lake whitefish, as they prefer cobble, gravel and sand substrate, all of which are extremely limited in Côté Lake. There is no spawning habitat (generally occurs in water less than 7.6 m over hard or stony bottom but sometimes over sand) present for this species within the lake. Therefore, the HSI was given a marginal score. If the HSI values were increased to 0.5 (moderate habitat) for lake whitefish in Côté Lake the FHCP would still have a net positive habitat development. The current HSI method was developed to be robust and conservative to ensure an adequate habitat development and account for losses in habitat due to the Project. A

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				value and importance of whole ecosystem functioning and species inter-dependence.	similarly conservative approach was used to value habitat gains. However, it is understood that models are not static; they are improved by refinement, which includes adding data and verifying predictions. Therefore, from the recommendations received by DFO, IAMGOLD will verify HSI variables that will be used to calculate losses for the FHCP during the dewatering / fish salvage program. These monitoring endpoints will be finalized in conjunction with DFO and will include measurements such as substrate, water depth, velocity, and vegetation present to match habitat suitability quality allocated for the key species in the FHCP.
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Appendix B - The Proponent has described very limited walleye spawning habitat that is included in offsetting activities. The only habitat available for spawning as part of the compensation plan is located within WRC2. The MNO recognizes that this is partly due to the habitat requirements of walleye and a preference for spawning in riffles below barriers such as waterfalls or dams, which are difficult to recreate. However, due to the cultural importance of this fish species to the Métis community, as a top predator and a traditionally harvested species (Métis Nation of Ontario, 2015), it is important that the Project not result in negative effects on their population. Inadequate compensation for walleye spawning habitat and the potential effects on their population would negatively impact Métis rights and land use in the area, and ultimately affect the Abitibi Inland Métis Community's Way of Life. The MNO requires that the Proponent explore additional options for creating	IAMGOLD appreciates that walleye are a valued species by MNO. IAMGOLD and the design team made every effort to incorporate walleye habitat in the habitat offsetting plan. However, the natural topography of the watershed does not lend itself to developing walleye spawning habitat in most areas. Walleye spawning habitat was developed in WRC2 where the gradient and water depth was sufficient to allow this habitat to be developed and is connected to the necessary downstream juvenile rearing habitat to promote productivity within the watershed. Gravel shoals are being constructed within the New Lake and will therefore be available as potential spawning habitat for walleye, however walleye are not known to spawn in lakes within the area (i.e., local populations primarily spawn in rivers), therefore IAMGOLD will not commit that walleye will use the constructed shoals for spawning and therefore will not account for them as habitat gains within the HU assessment.

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				walleye spawning habitat. For example, this may include creating cobble/gravel shoals or shorelines in some of the proposed lake features. The MNO further requires that the Proponent share this information in a format that is mutually acceptable (e.g., meeting, workshop, memo, etc.). If feasible options are identified, the Proponent must carry these forward in an updated compensation plan.	
1,706	Email	12/10/2019	1) Unknown Unknown (Métis Nation of Ontario)	1) FHCP, Section 3.3 and Appendix B - The Proponent has not considered the potential impacts of impaired water quality in the compensation plan. Due to the size and complexity of the Project, the Proponent is planning on constructing several key pieces of mine infrastructure in close proximity to fish habitat. This includes existing fish habitat in Upper Three Duck Lack (adjacent to Polishing Pond) and Bagsverd Creek and Bagsverd Lake (downstream of the TMF), and compensation habitat in New Lake (adjacent to MRA and collection ponds). Due to their proximity to this infrastructure, these habitats may suffer impairment of water quality from runoff and/or seepage. The MNO requires that the Proponent consider the potential impacts of impaired water quality in the compensation plan and habitat accounting. In situations where existing habitat is potentially impaired, the Proponent must consider these to be additional section 35 impacts and engage in offsetting. Where compensation habitats are impaired (e.g., New Lake), the Proponent must modify the value of those habitats as offsets accordingly. For example, low abundance/diversity of benthics and	The focus of the Offsetting Plan is on fish habitat. While water quality is a component of fish habitat, it is not considered in the evaluation of habitat for a Fisheries Act Authorization. Water quality was assessed in the EA and EER and the protection of water quality is addressed through permitting by the province under an ECA. Water quality modelling described in the EER indicates that downstream water quality will achieve conditions and criteria for the protection of aquatic life and discharge will achieve MDMER effluent standards. With regards to water quality, IAMGOLD reiterates its commitment to comply with all provincial and federal regulations and water quality will be incorporated in the EMPs. Once a decision to construct has been issued, an anticipated schedule for all EMPs review will be provided to DFO for review. It is anticipated that all EMPs will be completed within three months of the decision to construct. All issues regarding mine effluent, contact water, and seepage will be addressed under MDMER guidelines and through ECA applications. The monitoring plan included in the Offsetting Plan will evaluate benthic invertebrate endpoints and how they relate back to the fish health found in all of the newly constructed habitat (See Table 5.1).

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				related food-web impacts may impair adult foraging by lake whitefish in New Lake. Alternatively, the Proponent must provide assurances with detailed supporting information to MNO that they will divert all mine contact water and seepage from overflow or upwelling (via groundwater) into these waterbodies.	

Comments and Responses Related to Fisheries Authorization – Government - November 2018 to February 2020

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
1,012	Email	11/29/2018	1) Philip Seeto (Canadian Environmental Assessment Agency)	1) The Proponent shall design, construct and operate realignment channels and dams in a manner that will maintain fish habitat during all phases of the Designated Project and be consistent with any offsetting plan. In doing so, the Proponent shall maintain fish passage in the realigned channels and the natural channels impacted by the Designated Project, including between Bagsverd Lake and Neville Lake.	IAMGOLD is in agreement with the proposed change to the condition.
1,026	Email	11/09/2018	1) Korey Walker (Ministry of Natural Resources)	1) Pg. 4-3. Wetlands were considered as an indicator, but wildlife that depend on the wetlands such as amphibians, reptiles, etc.. are not accounted for. MNRF believes that there is a need to address the compensation for other non-fisheries species that depend on the wetland features that will be adversely impacted.	The following are discussed in the Terrestrial Biology Updated Technical Memorandum: moderate probability of turtle wintering areas, moderate probability of reptile hibernacula, low probability of turtle nesting habitat (one nest observed was in cracks on rock barren, moderate probability of wetland amphibian breeding habitat and confirmed presence of woodland amphibian breeding habitat. Salamander larvae observed in pond in a cultural fill area.
1,087	Email	12/20/2018	1) Andrew Persad (Ministry of Northern Development and Mines); 1) Aisha Samuel (Ministry of Energy, Northern	1) The CP document states "The dam between New Lake and the open pit lake will be removed or lowered to restore the Mollie River system and will be directed to the open pit with low flows maintained to the realignment channel to support fisheries. This will fully integrate the pit lake it into the Mollie River subwatershed." There are concerns with connecting the open pit lake to the Mollie River subwatershed. However, ECCC and the province will need to advise on water quality concerns. Please note that DFO will be involved with the determination of Schedule 2	Comment noted.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
			Development and Mines)	listing via MDMER as well as the Section 35 Fisheries Act authorization as identified in Table 5-9. Flagged: May be a point of discussion for the Fisheries Offset Plan.	
1,087	Email	12/20/2018	1) Andrew Persad (Ministry of Northern Development and Mines); 1) Aisha Samuel (Ministry of Energy, Northern Development and Mines)	1) The CP states that "The objective of habitat compensation / offsetting measures associated with the Project will be to create habitat which achieves the biotic and abiotic habitat requirements of the resident fish species (northern pike, yellow perch, walleye, smallmouth bass and whitefish) and minimizes the risk of adverse effects to the environment (i.e., flooding and sedimentation). The overarching goal will be to provide "like for like" habitat to maintain the fish communities within, and the functionality of, the affected watersheds." In agreement with the goal of the Fisheries offset plan. Please note that DFO will be involved with the determination of Schedule 2 listing via MDMER as well as the Section 35 Fisheries Act authorization as identified in Table 5-9.	Comment noted.
1,087	Email	12/20/2018	1) Andrew Persad (Ministry of Northern Development and Mines); 1) Aisha Samuel (Ministry of Energy, Northern Development	1) Only monitoring of revegetation efforts is currently included in this section of the CP. In accordance with Schedule 2, item 10(iii) of O. Reg. 240/00 this section of the CP should provide: details of any biological monitoring programs and procedures to assess the effects of the project on any biological communities. These details shall include the locations, nature, methods and frequency of monitoring, the biological communities to be monitored and how the results of the monitoring will be recorded and reported to the	1) The following information will be included in Section 10.3: A monitoring program was developed for the Aquatic Biology component of the EA based to the mine plan through construction, operations and the two phases of post-closure. The monitoring plan addressed the potential impacts to the aquatic environment identified within the Environmental Assessment. While the footprint of the optimized mine plan and the associated effects are less than those associated with the EA, monitoring of the aquatic environment will continue to be required to

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			and Mines); 2) Andrew Persad (Ministry of Northern Development and Mines); 2) Aisha Samuel (Ministry of Energy, Northern Development and Mines)	Director. Aquatic surveys will be required during operation and post-closure to assess effects on aquatic biota and the success of rehabilitation efforts. These surveys should include water and sediment quality, benthic and fish community, and fish habitat. Presumably these assessments would also be required as part of the compensatory fish habitat and offset agreements associated with channel realignments. Commitments to undertake this work should be included in this Section of the closure plan with details regarding proposed monitoring programs. 2) Lots of detail has been provided but it appears to be associated with operations. Clarification should be provided as to whether these biological monitoring programs are proposed to continue at closure and at what frequency.	demonstrate that conditions within the aquatic habitats are consistent with predictions. Monitoring will be required by DFO and Environment and Climate Change Canada (ECCC) as a conditions of the approved offsetting plan under Sections 35 and 36 (Schedule 2 amendment) of the Fisheries Act. However, this monitoring is not included in the recommended monitoring described herein. During operations the mine will be required to undertake monitoring for a number of permits and approvals as well as monitoring required under the Metal and Diamond Mining Effluent Regulations (MDMER). These monitoring requirements should be addressed through a single comprehensive monitoring program undertaken during operations. This program will be reviewed at regular intervals and will be modified to reflect conditions in the aquatic environment and/or changes in mine operations (i.e., a change in ore characteristics can cause changes in effluent chemistry). The operational monitoring program will include: A receiving water quality monitoring program will be implemented. The scope of this program will be reviewed to ensure: Sampling locations are representative of potential mine related sources; Reference locations are included that are representative of similar habitat conditions to mine-exposed locations (i.e., flow, depth, watershed area) but are upstream of potential mine influence. Monitoring frequencies are adequate to detect change; The analytes monitored represent expected mine related substances as well as total and methyl mercury and measures to support the interpretation (i.e., hardness, DOC, alkalinity, pH); Method detection limits should be well below applicable guidelines for fish and aquatic life and method detection limits for total phosphorus and zinc

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					should be reviewed. A sediment monitoring program should be implemented every three years, consistent with the national Environmental Effects Monitoring (EEM) program requirements under MMER. Sediment should be collected in all lakes and streams downstream of mine source loadings (including drainage, direct discharge and groundwater seepage). Sediment samples should be collected concurrent with benthic invertebrate samples to allow for assessment of the benthic community relative to sediment conditions. Sediment core samples (top 1 cm) should be collected in the deepest location in key lakes downstream of mine discharges (Chester Lake, Upper Three Duck Lake, Middle Three Duck Lake Lower Three Duck Lake and Bagsverd Lake). Sediment samples should be analyzed for TOC, grain size1, nutrients (TKN, total phosphorus), mercury (total and methyl) and metals (full ICP-MS scan). A benthic invertebrate monitoring program should be implemented every three years, consistent with EEM. The program should focus on lakes and streams receiving mine discharges, and should incorporate reference lakes and streams as well. Five stations should be located in each mine-exposed area and multiple reference locations should be sampled if comparable habitats can be found. Sampling stations should be located in depositional areas with care taken to locate stations above the thermocline and in areas of comparable habitat conditions (i.e., depth, substrate, flow, stream gradient). Fish monitoring should focus on the functioning of created fish habitat and on fish health downstream of mine sources (e.g., effluent discharge): The constructed habitat and habitat compensation/offsetting areas should be assessed annually for the first three years and then every three years until conditions can be

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					demonstrated to be stable; Fish tissue monitoring for mercury should also be conducted on all lakes where water levels are going to increase as a result of watercourse realignments. Fish health monitoring should be conducted every three years in accordance with the EEM, following standard EEM guidance (EC 2011). Routine inspection of fish screens on water intake structures. Table 1 (provided below – see supporting information for ENDM-46) provides the monitoring measures applicable to the EER and indicates if the scope of the monitoring requirements that have changed or stayed the same from the EA. Instances where monitoring is no longer applicable have been identified and similarly where additional monitoring is required has also been identified. 2) The Closure Plan has been updated. Additional information on closure monitoring has been included in Section 10.3.
1,087	Email	12/20/2018	1) Andrew Persad (Ministry of Northern Development and Mines); 1) Aisha Samuel (Ministry of Energy, Northern Development and Mines)	1) The CP document states that "The TMF pond, polishing pond and the reclaim pond will have emergency overflow spillways for discharge volumes exceeding design capacity. The TMF pond and reclaim pond would discharge to Bagsverd Lake and the polishing pond would discharge to Three Duck Lake (Upper)."The risk of contamination of Bagsverd Lake and Three Duck Lake (Upper) if overflow occurs is a concern. The holding ponds should be designed for extreme flooding events. Please note that DFO will be involved with the determination of Schedule 2 listing via MDMER as well as the Section 35 Fisheries Act authorization as identified in Table 5-9. Flagged: May be a point of discussion for the Fisheries Offset Plan.	Comment noted

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1,051	Email	01/09/2019	1) Korey Walker (Ministry of Natural Resources)	1) Table 5-1 (pg. 31): The Fisheries Act (1985) should be considered if work-in-water is required. The self-assessment criteria can be used to determine if the project needs to be reviewed by Fisheries and Oceans Canada.	No in-water work is proposed. If in-water work becomes required (due to unforeseen field conditions for example), IAMGOLD will follow-up with both MNRF and DFO to ensure any regulatory requirements are met, including submission of permit applications as appropriate.
1,051	Email	01/09/2019	1) Korey Walker (Ministry of Natural Resources)	1) Section 6.8.2 (pg. 36): Fish species and thermal regime data from Land Information Ontario and local stocking lists may provide additional information.	This information source will be reviewed and additional information will be provided in the Final Environmental Study Report (ESR) as pertinent.
1,091	Email	01/15/2019	1) Emmanuel Ogunjobi (Ministry of Natural Resources and Forestry)	1) In the initial EA report, compensation plans are mentioned for fish and wildlife, forestry, wetlands and its wildlife, loss of lands and Species at Risk. Unfortunately there is nowhere that the details regarding the compensation plans are submitted for review and there is no timelines of when the plans will be implemented. Please address.	IAMGOLD will consider the comments in the updated Biodiversity Management Plan.
1,261	Email	05/17/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Table 2.1 indicates that no fish were caught or observed in Waterbody #5. From the Minnow 2017 report, I see that 48.7 hrs of minnow trapping was conducted in the waterbody and no fish were captured. How many traps were set? Is there any water quality data on the pond? Has sampling been conducted in other years since?	Two minnow traps were set overnight July 5, 2016 during the reconnaissance survey. Unfortunately no water quality was taken. I have included a table that shows what the water quality was like at the other waterbodies during the reconnaissance work (see table in ROC attachment).A brief summary of Unnamed Waterbody #5 for your reference - Unnamed Waterbody #5 is a small triangle shaped pond (40 m by 19 m), likely created by road construction and beaver activity (Figure A.12.5). The littoral and shoreline substrates consists of organic material with an estimated maximum depth of one metre. Dense submergent vegetation is present throughout and consists of milfoil, coontail and pond weed. No defined inlet or outlet channels were noted. Riparian vegetation consists of black

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					spruce and speckled alder, with cattails, sedges, and burreed lining the shoreline.
1,456	Email	07/24/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks)	1) The list of lakes proposed for profile measurements and stratified sampling is missing some that support cold water fish species (i.e. missing Weeduck Lake, Attach Lake, Dividing Lake) and many of the lakes with hypoxia (missing Bagsverd Lake, Weeduck Lake, Clam Lake, Little Clam Lake, Unnamed Lake #1, Unnamed Lake #2, Unnamed Lake #3, Attach Lake, Three Duck Pond, SawPeter Lake).	Bagsverd lake, Clam Lake, Little Clam Lake and Unnamed Lake #3 are all included in the list of lakes proposed for profile sampling, as per page 2 of the May 10, 2019 letter to MECP. Weeduck Lake and Unnamed lake #2 are proposed as reference lakes as per the response to Item "r". Discuss Attach Lake, Three Duck Pond and SawPeter Lake. Inclusion of Unnamed Lake #1 is of questionable value.
1,456	Email	07/24/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks)	1) In response letter of May 10, 2019, IAMGOLD proposed a path forward for methyl mercury monitoring that is not acceptable because it is not in accordance with Ministry guidance provided to them during the EA in a document entitled "Ministry of the Environment and Climate Change, Northern Region Guidance for Conducting Baseline and Post-Development Monitoring of Water Quality and Fish Tissue" and dated July 2014. Proposed deviations include deferring fish tissue monitoring to the operations phase, instead of starting prior to dam construction, and surface water monitoring during the open water period three times per year, instead of monthly. Also, IAMGOLD proposes to coordinate mercury monitoring with federal EEM requirements, but that is not acceptable because it will delay sampling and provincial requirements differ from federal requirements.	Fish tissue monitoring will be carried out. We would suggest that sampling 3 times per year during the open water season is adequate to detect any trends. A trigger value could be developed to support monthly sampling if so indicated by monitoring data.

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1,456	Email	07/24/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks)	1) Ensure that the methyl mercury monitoring plan follows the ministry guidance "Ministry of the Environment and Climate Change, Northern Region Guidance for Conducting Baseline and Post-Development Monitoring of Water Quality and Fish Tissue", July 2014, which has been included for reference.	See response to Items "y" and "z" in preliminary response document.
1,559	Email	09/13/2019	1) Tuovi Haapakoski (Ministry of Natural Resources and Forestry)	1) 2.2.4 Natural Environment Level 1: determine whether any of the following features exist on and within 120 metres of the site: significant wetland, significant portions of the habitat of endangered or threatened species, fish habitat, significant woodlands (south and east of the Canadian Shield), significant valley lands (south and east of the Canadian Shield), significant wildlife habitat and significant areas of natural and scientific interest; Page 16 of the Natural Environment – Level 1 section of the report under 4.1 General Setting indicates that "No significant wetlands, significant portions of the habitat of endangered or threatened species, fish habitat, significant woodlands, significant valley lands, significant wildlife habitat, or areas of significant natural and scientific interest have been identified on or within the 120 m of the proposed site." Page 17 under 4.4 Aquatic Vegetation and Resources states "There are no aquatic habitats (wetlands or waterbodies) located within 120 m of the extraction limit of the proposed quarry. The nearest waterbody is the West Beaver Pond, which is located approximately 150 m south of the extraction limit of the proposed quarry at its closest point. West Beaver	The proposed TMF quarry will only be developed if additional construction material is needed on site beyond what is provided by the open pit. Furthermore, the proposed location of the TMF quarry is entirely within the footprint of the TMF, which will undergo construction prior to the potential development of the TMF Quarry. Construction of the TMF will require the removal of the West Beaver Pond and stream, for which permitting and fish habitat compensation plans are currently in progress with the DFO. In the event that the construction of the TMF does not move forward as planned, the quarry will not be developed. Therefore, development of the proposed TMF quarry will have no negative impacts on the natural features or ecological functions of the West Beaver Pond and its stream, as the pond and stream will be removed and compensated prior to quarry development.

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				Pond contains only small bodied fish aside from one species of large bodied fish, White Sucker, and the fisheries compensation plans for the pond are in progress as part of the planned TMF construction. Given the distance to aquatic habitats and the use of appropriate best management practices such as dust suppression, if necessary, there will be no anticipated effects to aquatic vegetation or wildlife species." Page 14 under 3.3 Surface Water Interactions indicates "Water from West Beaver Pond flows northeast towards Bagsverd Lake through the West Beaver Pond outflow." The Natural Environment Level 1 report indicates that the features on and within 120 m of the site (not the extraction limit) must be assessed. The report indicates the West Beaver Pond is not within the 120 m area, however, Drawing 4 of 5 indicates that the West Beaver Creek is located within the 120 m area and that it contains fish habitat. Please include a 2.2.5 Natural Environment Level 2 report to determine whether there will be any negative impacts on the natural features or ecological functions for which the area is identified and any proposed preventative, mitigative or remedial measures as the report identified that the West Beaver Pond and stream is located within 120 meters of the site in Drawing 4 of 5.	
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 2 Methods 2.1 Fish Species Considered in assessment page 8. The report indicates that all fish species and life stages being evaluated have equal weighting and therefore were not ranked. Did	Extensive consultation has been conducted by Côté Gold with Indigenous communities. Indigenous communities have not directly expressed a preference for any species in consideration of the Offsetting Plan. However, there has been more talk of walleye (pickerel) than other species

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				Indigenous communities express a preference for any species in consideration of offsetting?	present in the area. The full consultation record is appended to the Offsetting Plan. Additional consultation was conducted by ECCC on August 27 in Gogama and August 29th with MNO in Timmins in support of the Schedule 2 Amendment Application. Presentations on the Offsetting Plan were provided and no concerns or preference for a specific fish species were identified.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.2.5 Summary of Lost Fish Habitat Table 3.2. Is the proponent's intention that the lake HUs gained will offset for the loss of stream habitat? If so, provide a rationale for how the loss of stream habitat is fully offset by the gain in lake HUs considering the fish species and life stages impacted and benefited.	Yes, it is intended that the lake HU gained will offset the loss of stream habitat. The lentic habitat that will be constructed will be shallow lake habitat, the largest having the Mollie River flow through the lake (New Lake). Shallow lakes are known to be generally more productive than deeper lakes and can be as or in some cases more productive than stream habitats. For example, in low-order, canopied streams which describes many of the tributaries where habitat is being lost (some are intermittent and not suitable for CRA fish species), riparian vegetation can shade the channel and reduce periphyton and macrophyte productivity. Shallow lakes have a larger surface area, and also allow light penetration to the bottom sediments promoting macrophyte production such that the littoral zone can extend over a large proportion of the lake basin. Littoral areas are associated with diverse and productive periphyton, zoobenthos, and macrophyte communities. It is expected that shallow lake habitat will adequately compensate for the most productive stream habitat (e.g., the Mollie River and Clam Creek) being lost. These streams are described as low gradient with abundant instream vegetation. The New Lake habitat will be shallow with aquatic macrophytes and will therefore be suitable for northern pike and yellow perch spawning, rearing, and

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					adult foraging; nearly all other species captured within stream habitat in the Cote Gold Project Area (Table 2.1) were also found in numerous lakes and ponds within the Project area. The total stream habitat to be lost is 61,947 m2 (the majority of that being the Mollie River) and the total amount of comparable shallow lake habitat created in the New Lake is 265,182 m2 alone. In addition, the WRC1 and WRC2 realignment channels will provide an additional 21,531 m2 of stream habitat. What is important is that not only is the functional stream habitat being replaced by lake habitat that can achieve the same habitat functionality but that the plan provides for greater connectivity of habitat and access to critical habitat such as over wintering habitat. In addition, WRC2 design supply the much needed moderate and high gradient habitat to the watershed for potential walleye spawning which is limited within the watershed. The new updated plan for the Project greatly reduces the total lost habitat compared to the original EA.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.3.2 Realignment Channel from Clam to Chester (WRC1) page 32. Section 3.3.3 Mollie River Road Crossing Figure 3.6 pages 32 and 34. Culverts constructed as part of the WCR1 road crossing and the Mollie River road crossing are required to pass fish. The fish passage analysis should be based on high and low flow periods for spawning size adults of the weakest swimmer (northern pike and burbot). The low flow analysis should also ensure there is adequate depth for passage. Fish swimming performance curves (Katopodis and Gervais 2016) should be used to determine passage. Please see http://fishprotectiontools.ca Provide the fish passage	The WRC1 crossing locations have been designed as embedded culverts specifically upstream of the grade-controlling riffle that separates the “lake extension” and “high-gradient” morphology types. This design consideration was made specifically for fish passage. Since this culvert is embedded (minimum water depth of 0.8 m) and within the lake extension’s backwater (negligible water velocities), we do not anticipate fish passage issues at these culverts. A design and corresponding technical memo has been provided for the Chester Lake culvert outlining the design rationale and fish passage evaluation (see Appendix A).

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				analysis for the proposed WCR1 and Mollie River road crossings.	
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.3.4 New Lake page 34. "As flooding of vegetated areas can be associated with the formation of methyl mercury (Porvari and Verta 1995), IAMGOLD has committed to the removal of terrestrial vegetation and organic soils within the footprint of the New Lake to prevent the decay and release of associated mercury therefore limiting the possibility of methyl mercury production." The creation of the New Lake as offsetting has the potential to generate methylmercury in the system, potentially resulting in impacts to fish, the health of those consuming fish, and the effectiveness and functioning of the offsetting. Condition 6.4.3 of the environmental assessment decision statement re-issued by the Minister of Environment and Climate Change Canada on February 25, 2019 outlines methylmercury monitoring for surface water and fish tissue. Provide updated methylmercury modelling, if available, and the methylmercury monitoring plan.	The methylmercury modelling was not updated because under the revised mine plan fewer areas were proposed to be flooded. The area to be flooded in the previous EA was 454,820 m2 whereas the area to be flooded under the optimized mine plan is approximately 270,000 m2, which is primarily associated with the development of the New Lake and the extension on Clam Lake. This is approximately 40% smaller area to be flooded. Organic top soil is being removed prior to flooding to limited methylmercury production. The methylmercury monitoring plan is currently being prepared and will be provided when finalized.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.3.8 Connections of Little Clam, East Clam and Clam Lakes page 43. The road separating East Clam Lake and Clam Lake will be removed allowing free access for all fish species to both lakes. Comment on the history of the road including when it was built and ownership of the site at the time.	This road predates IAMGOLD's control of property and could have been constructed for forestry or other mining operations.

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.4 Predicted Net Change in Habitat/Productivity. page 50. "Other consideration not taken into account for the offsetting plan is that the Open Pit will be allowed to fill and will form a 450,000m2 lake, with the flow from the Mollie River being redirected into the pit, re-establishing the original configuration of the watershed. While the additional lake habitat to be created has not been included in the habitat offsetting evaluation, it does represent a substantial future gain in lentic habitat following mine closure." Some of the proposed offsetting will likely be lost at this point due to allowing the open pit to fill. This habitat will be fully functioning at this time. If IAMGOLD intends to proceed with this plan, they will be required to apply for a Fisheries Act authorization for the serious harm that will result. Acknowledge that IAMGOLD is aware of this requirement and incorporate it into future regulatory planning.	This requirement is stipulated in the Closure Plan and the EA. IAMGOLD acknowledges and is aware of the requirements in future regulatory planning.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 3.4 Predicted Net Change in Predicted Habitat/Productivity page 48; Table 3.4 page 49, Section 4.5 Reduction of Time Lags pages 62 to 63. The plan discusses time lags experienced between commissioning of new habitat and when the new habitat has developed its full productive potential, but detailed information on expected habitat development and use is not explicitly considered. The time lag is meant to offset lost productivity from the start of the fish rescue to the point when the offsetting habitat is returned to a fully functional ecosystem. It is also not clear that the time between	It is acknowledged that timing of impacts vs. offsetting's are not instantaneous and should be accounted for. However, there are no scientifically proven methods to determine the timing of habitat development to its full potential. As such, efforts to define scientifically supported measurements in the absence of a clear and comparable scientific knowledge base would not provide reliable monitoring endpoints/results. With that said, the updated Offsetting Plan will provide additional information on the construction schedule and timing of fish relocation and construction of new habitat. In the current plan, we expect to loose a portion of the Mollie River, Cote Lake, and Clam

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				impacts and commissioning of the offsetting has been considered and accounted for in the calculation of required offsetting. As per the Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting (2013), "time lags between the damage caused by the impact and the functioning of the habitat – ranging from months to even years – may contribute to fisheries productivity losses [...] When a time delay is unavoidable, the offset must include measures that account for the time delay to make up for the lost fisheries productivity." What timeframe does the proponent expect to have fully functional newly created habitat for each component of the offsetting plan? Provide a scientifically supported rationale for the timing of habitat development to its full potential. Include time lag considerations in the required amount of offsetting calculations. Additional offsetting may have to be proposed based on that assessment. Provide a timeline of impacts and offsets relative to area and HUs. Where there is a discrepancy in the timing of impacts vs. offsetting (i.e. they are not instantaneous or offsetting has not been built prior to the impact), this should be considered in the required amount of offsetting calculations. If sufficient justification cannot be provided, additional offsetting should be proposed. Note, if an area is fished out and the habitat is inaccessible prior to the impact (e.g. dewatering and overprinting), this should be considered as the starting point of the impact.	Creek within the first year of construction and that the New Lake, WRC1 and WRC2 would not be available until the following spring (at a minimum). While the new habitat will not be fully functional we do believe habitat within the New Lake will be available for fish to successfully reproduce and survive in the first year. We are also proposing that some of the offsetting habitat construction be moved up in the timeline to be constructed in advance or with the initiation of the fish salvage (e.g., the connection of Weeduck Lake to Upper Three Duck Lake) so that offsets can be accounted for immediately and to help reduce these initial impacts. This will provided for habitat construction and commissioning before losses. Furthermore, some losses such as the tributary from West Beaver Pond and the Unnamed Tributary to Lake 3 will not be lost until after operations have commenced and all habitat offsetting measures are in place. Thus, the early construction of some offsetting measures (connection to Weeduck Lake) and the delay of losses of habitats is expected to substantially reduce any impact of lag times. In addition to the offsetting schedule, IAMGOLD has provided a plan that considers the impact of time lags and has proposed measures to minimize these effects including installation of physical structures (e.g., boulder clusters, large woody debris) to increase habitat complexity and provide cover for fish, vegetation planting (aquatic and riparian), and invertebrate transplanting to establish a food base for fish. As an additional measure to mitigate time lags, IAMGOLD has committed $21,000 in direct funding as well as $3,000 in in-kind support over three years towards research on environmental DNA barcoding methods to increase the effectiveness of Environmental Effects Monitoring (See

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					Appendix B). IAMGOLD is of the opinion that in the efforts outlined to develop natural channels that mimic the existing system and a new lake, there are adequate offsets proposed to meet or exceed the needs of the fish community. Further, the offsetting plan indicates an overall net gain of 348,122 HU, and will promote enhanced connectivity within the watershed. Material impacts to the local recreational fishery are also unlikely as no population of any species will be removed from the watershed and therefore it is expected that they will be able to easily access and colonize the offsetting habitat. IAMGOLD is confident that the natural channel design will provide productive fish habitat upon commissioning with the application of the proposed mitigation measures.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 4.3 Fish Salvages/Relocation pages 59 to 61. Fish will be rescued in Phase 1 and timed to mitigate constructed impacts to fish. Once fish are salvaged from areas to be impacted e.g. West and East Beaver Ponds, how will fish be excluded from moving back into the area given there will be a lag between fish rescue and construction? Another example is the Clam Lake East Dam 2 and 3, where fish will be salvaged in fall of Phase 1 in order to prepare for dam construction in the spring of Phase 2.	IAMGOLD is committed to following BMPs during all phases of mine development to mitigate impacts to fish. This includes reducing serious harm/death to fish through fish salvages in areas prior to construction. Fish barriers will be put in place prior to fish salvage and remain in place upon completion of the salvage to ensure fish will not actively migrate back. These will largely be in water bladders with pump around systems if flow is required to be maintained. IAMGOLD is completing a Fish Salvage Environmental Monitoring Plan and it can be provided upon completion.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 6 Costs Table 6.1 page 78. The summary of costs in Table 6.1 looks reasonable, although it should be updated based on DFO's feedback in the attachment, where required. I will note that the line for the contingency to remediate fish habitat within	An updated Table 6.1 is provided wherein Section 35 and Schedule 2 costs have been divided into separate tables (see Appendix A). These tables will be updated if necessary with the final submission of the Offsetting Plan.

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				the TMF may need to be removed. DFO generally does not issue a Fisheries Act authorization associated with the construction of a TMF prior to the Governor in Council making a decision on the amendment of Schedule 2 of the MDMER.	
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) DFO has reviewed the Hydrogeology component of the ESR, and understands that due to the Project changes the predicted flow impacts to Bagsverd Creek have been reduced. However, other impacts were predicted including a reduction in lake levels in Little Clam and Clam Lakes. Provide an updated analysis of the groundwater and surface water loss predictions and the consequent impacts on all fish and fish habitat. The analysis should include an analysis of flow reductions annually as well as throughout the year, including low flow periods when impacts would exacerbate low flow conditions. Note the analysis is necessary only for habitat being maintained throughout the life of the mine.	No updated version is available concerning groundwater and surface water loss prediction. For clarity, there was no change in water level predicted for Little Clam Lake. The hydrological assessment that was conducted for the EER based on the reduced mine footprint (compared to the EA) demonstrated that predicted effects for the optimized Project are similar or reduced compared to the EA. Given that the footprint of the open pit has been reduced and is within the originally proposed extent for predictions of water level drawdowns, the estimates effects in the EA are anticipated to be similar and likely conservative. Mitigation measures and commitments for the groundwater monitoring program have not changed from the EA.
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) I understand that minnow traps were set overnight in July of 2016 on Unnamed Waterbody #5 and no fish were captured. There is also some general habitat information available. Based on the application, unnamed waterbody #5 was not proposed as part of the list of waterbodies to be added to Schedule 2 of the MDMER. As I'm sure you're aware, the scheduling of waterbodies is based on them being fish-frequented; even a single fish triggers the requirement. In order to be completely confident that a waterbody is not fish-bearing, extensive sampling	Additional sampling was conducted in July, and September 2019 to confirm the fish-bearing status of Unnamed Waterbody #5. Sampling carried out on July 16th and 17th, 2019 consisted of a total of 340 hours of minnow trapping, 5 seines and 1,963 electrofishing seconds resulting in no fish captured in Unnamed Waterbody #5. In September an additional 600 hours of minnow trapping was completed and 7 finescale dace were captured in one minnow trap. Waterbody #5 will be added to the FHCP and accounted for as a loss of fish habitat.

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				(multi-year, multi-season, multi-gear) must be undertaken as the burden of proof is high. As it currently stands, the baseline information collected is insufficient to make a non-fish bearing status for unnamed waterbody #5. Without additional sampling, DFO will assume it is fish-bearing and the impact will need to be included in the quantification of compensation requirements.	
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) The Proponent has proposed a complementary measure to offset a portion of the serious harm to fish. As complementary measures are considered an out-of-kind option for offsetting, additional justification and details are required in order to determine that the complementary measure is appropriate and that the methodology is scientifically rigorous. Please complete the attached proposal form.	The attached form is provided and will be updated if required in the final submission of the Offsetting Plan (see Appendix B).
1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) As per paragraph 13(f) of Schedule 1 of the Applications for Authorization under Paragraph 35(2)(b) of the Fisheries Act Regulations, a description of the contingency measures and associated monitoring measures that will be put into place if the measures referred to in paragraph (a) are not successful in offsetting the serious harm to fish is required with the application for authorization. Provide contingency measures in the event the offsetting is not successful.	IAMGOLD is committed to monitoring the constructed habitat and ensuring the developed habitat is functioning as intended. IAMGOLD is committed to monitoring the constructed habitat and ensuring the developed habitat is functioning as intended. In the event that the monitoring demonstrates the habitat is not functioning as intended, mitigation measures will be taken, and the habitat will be repaired/ adjusted/ augmented to function properly. Therefore, no additional contingency measures are being proposed. Furthermore, the plan provides for an excess of habitat units which accounts for the potential for under performance of habitat.

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1,275	Email	10/04/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) Section 4.3 Fish Salvages/Relocation page 60. Water drawdowns will occur in lentic habitat to aid in concentrating fish for capture, with periods of fishing occurring around the successive draw-downs. Approximately how long could a typical draw-down and fish rescue take to complete? Given that water quality (temperature and oxygen) may decline with successive draw-downs over an extended period, DFO recommends monitoring water quality and having contingency measures in place to mitigate mortality in the event water quality does decline.	IAMGOLD is committed to following BMPs and developing an EMP for the fish salvage program. The EMP will outline these BMPs and include regular water quality monitoring as well as contingency measures to mitigate mortality. Depending on the area to be salvaged, the time for draw-down and/or fish rescue will vary greatly. Draw-down can be expedited depending on water pump size, however, BMPs for fish entrainment, entrapment, and stranding will be followed to ensure minimal harm to fish.
1,688	Email	11/27/2019	1) Todd Kondrat (Ministry of the Environment); 2) Adam Leus (Ministry of Environment)	1) Please provide a detailed sequencing plan which clearly demonstrates the construction activities that will be taking place during the construction phase and if these activities will be occurring during baseline data collection. If construction activities will be occurring during baseline data collection, then please explain how that can occur so as not to impact baseline data collection. Submit documentation that addresses EA conditions 11.2, 11.3, 11.4 and 18.1. 2) The response to this item, provided in the Tables of Attachment D, was incomplete; missing from the tables are discussion of baseline mercury (water, fish tissue) and mid-lake sampling (top/bottom, temperature-dissolved oxygen profile). The tables should be updated with that additional information. Also, in Table D-3 the sampling start date should be provided for locations (Chester Lake tributary, Moore Lake tributary, Bagsverd Lake South Arm outlet) that do not have that information listed. In Table D-3 the entry for Chester Lake tributary had the comment	The sequencing plan schedule and related materials are provided as Attachment D. These materials include: A schedule of planned construction and operation of the Construction Phase ECA treatment works (Table D-1); Treatment Pond Construction Phase definitions and associated receiver baseline data collection status (Table D-2); Baseline surface water sampling in relation to potential construction activities effects (Table D-3); Consistency with EA Conditions 11.2, 11.3, 11.4 and 18.1 (Table D-4); Construction Phase material removal from the open pit quarries (Chart Series D1).

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				"purpose of sample not clear". To explain, the intent of gathering baseline data for this location which will in future support the overburden stockpile is to monitor for change in the chemistry of water leaving the catchment. That includes looking for effects other than TSS. For example, the overburden stockpile may be a source of additional nutrients (P, N, DOC) loading to downstream lakes and monitoring data will help support evaluation of mine- origin nutrient effects. Documentation to meet EA Conditions 11.2, 11.3, 11.4 and 18.1 are works in progress (See Items F, G, H, I)	
1,688	Email	11/27/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks); 2) Adam Leus (Ministry of Environment)	1) Missing the description of the sampling and analytical design of the surface water monitoring program for detection of project effects. This is important in ensuring that baseline sample sizes and locations are adequate for the monitoring program. 2) Attachment J provided a summary of the available baseline surface water monitoring program and proposed additional sampling. Items missing that should be included in a revision include the following: (1) number of samples by location for top/bottom lake chemistry and dissolved oxygen-temperature profiles; (2) mercury sampling (water, fish tissue); (3) benthos in lakes exposed to potential operations phase TMA seepage effects (i.e. missing Moore Lake to Chester Lake chain of lakes); and (4) water level and flow monitoring in lakes and streams adjacent to the open pit that may be affected by open pit dewatering during operations phase. Stations that are listed as having baseline water sampling at quarterly	Surface water quality sampling stations and sampling frequencies, including for associated lake top and bottom sampling are provided in Table J-1 [Attachment J] and shown in Figure D1 (Attachment D). Lake station benthos and sediment baseline sampling (historic and proposed) is provided in Table J-2 [Attachment J].

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				frequency should be revised to monthly frequency. The geographic coordinates show that three of the sampling locations classified as lake stations are in streams: the Moore Lake station is about 300 m downstream of the lake outlet; Delaney Lake station is about 1.5 km downstream; and Schist Lake station is about 1.1 km downstream. IAMGOLD/Wood should either demonstrate (e.g. annual cycle of monthly paired sampling) that the existing stations accurately represent lake outlet chemistry or provide plan for establishing sampling stations at the true lake outlets. AMGOLD/Wood should explain what mitigation is planned to minimize potential for the mine to affect Unnamed Pond (south side of the open pit) and Bagsverd Pond (beside the mine camp and ore stockpile) and what monitoring might be done to confirm effectiveness of mitigation. Design of monitoring depends in part on lake morphometry. Supporting documents submitted as part of the EA contained contour maps for many, but not all the monitoring lakes. Depth contour maps should be provided for the lakes that did not have those included as part of EA documentation.	
1,688	Email	11/27/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks); 2) Adam Leus	1) If proposing baseline data collection during construction phase, identify what construction activities are possible without affecting surface water quality. 2) The response provided by IAMGOLD/Wood is considered incomplete. It is missing discussion of potential construction impact on the completion of baseline data collection for lake temperature-oxygen profiles, lake top/bottom chemistry, and mercury	An extensive set of long-term, up to date surface water quality monitoring data has already been provided to the MECP, with sampling continuing as per Table J-1. The only additions would be the 5 new near-field sites suggested by MECP (i.e., Unnamed Lakes #5 and #6, Attach Lake, Unnamed Lake #2, Chester Lake Tributary, Moore Lake Tributary, and Unnamed Lake #3 Tributary. None of these sites would be affected by construction activities, as they

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			(Ministry of Environment)	(water, fish tissue) sampling. IAMGOLD/Wood questioned addition of three lake tributary locations. Reasons for collecting baseline data at those locations are as follows; (a) Tributary of Unnamed Lake #3. It will be overprinted in part by development of a south mine rock area runoff collection pond but, according to site plan, part of it will continue to exist. Thus, it is a location to monitor the future mine rock area effects on inflow to Unnamed Lake #3, (b) Tributary of Moore Lake. Its purpose is early detection of seepage from the adjacent Tailings Management Facility, (c) Tributary of Chester Lake. This location will serve to monitor the inputs to Chester Lake of drainage from the overburden stockpile.	are all upstream or isolated from Construction Phase drainages. Also refer to Attachment D for further details. In considering the addition of Unnamed Lake #3 Tributary (UL3T) as a monitoring station, as suggested by the MECP, we would question the validity of this station, as this small inflow tributary will be largely overprinted by development of one of the south Mine Rock Area runoff collection ponds and will therefore cease to exist. With respect to the additions of Moore Lake Tributary (MLT) and Chester Lake Tributary (CLT) monitoring stations, IAMGOLD is requesting clarification from the MECP on the intended purpose of these stations, as it would be inappropriate to consider these small ephemeral drainages as receivers.
1,688	Email	11/27/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks); 2) Adam Leus (Ministry of Environment)	1) Provide a mine-origin nutrient impact assessment and mitigation plan. 2) General comment - The response to this recommendation, presented in Appendix F, was missing important components and should be revised to include the following; (a) As indicated in Procedure B-1-5, phosphorus discharges to inland lakes are assessed using the Lakeshore Capacity Model. Guidance on total phosphorus (TP) sampling, analysis and modeling are provided in the document "Lakeshore Capacity Assessment Handbook Protecting Water Quality in Inland Lakes on Ontario's Precambrian Shield. May 2010" prepared by Ministry of Environment, Ministry of Natural Resources, and Ministry of Municipal Affairs and Housing. Assessment according to this guidance was part of the EA and needs to be updated for the changes in project design. The assessment must	N/A

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				include both construction and operation phases, (b) Field cell results provided during EA show some mine rock (Magma Mixing Brecchia) is source of phosphorus and lake capacity modelling during the EA quantified polishing pond effluent as a large source of phosphorus loading to lakes. Domestic sewage will be another effluent source of phosphorus. Conservative discharge limits for phosphorus are needed for all discharge locations, (c) The loading of nutrients (P, N, DOC) to lakes will change with watershed disturbance, changes in land use, and effluent discharges. These may affect the productivity, water clarity and thermal stratification of lakes, thereby altering the availability of dissolved oxygen habitat for cold water fish. Summarize the baseline data on availability of cold-water fish habitat in reference and exposure lakes and provide a plan for monitoring to detect potential changes in temperature-dissolved oxygen habitat of cold-water fish once construction begins, (d) Mitigation plan should include not only treatment of sewage but also best management practices, such as shoreline setbacks with buffer strips of natural vegetation, and engineering design to limit sediment and nutrient transport from areas of disturbance, (e) Appendix F proposed effluent limits for nitrate that exceed the CWQG Short-Term Exposure guideline, but that is contrary to provincial requirement that conditions in mixing zones be non-toxic.	
1,688	Email	11/27/2019	1) Steven McAvoy	1) The list of lakes proposed for profile measurements and stratified sampling is missing some that support	Bagsverd Lake, Clam Lake, Dividing Lake and Unnamed Lake #3 are all included in the list of lakes proposed for

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			(Ministry of the Environment, Conservation and Parks); 2) Adam Leus (Ministry of Environment)	cold water fish species (i.e. missing Weeduck Lake, Attach Lake, Dividing Lake) and many of the lakes with hypoxia (missing Bagsverd Lake, Weeduck Lake, Clam Lake, Little Clam Lake, Unnamed Lake #1, Unnamed Lake #2, Unnamed Lake #3, Attach Lake, Three Duck Pond, SawPeter Lake). 2) Sawpeter Lake, Lower Three Duck Pond and Unnamed Lake #1 were not included in temperature-dissolved oxygen profiling and top/bottom water chemistry sampling. The removal of Unnamed Lake #1 is understandable, but the other two lakes should not be excluded. Sawpeter Lake, despite being relatively shallow did exhibit anoxia according to the temperature-oxygen profile measured in July 2016. Three Duck Pond also showed anoxia in its profile from July 2016. The proposal for lakes upstream and downstream of Three Duck Pond to serve as surrogates is not supported because they have different morphometry and available profiles for those lakes do not show anoxia.	profile sampling, as per page 2 of the May 10, 2019 letter to MECP. Additional lakes for profile sampling have been included as per Table R-1. These include Attach Lake, Bagsverd Lake South Arm, Little Clam Lake, Moore Lake, Three Duck Lakes Middle and Lower, Weeduck Lake and Unnamed lake #2. SawPeter Lake, with a maximum depth of 3.5 m is too shallow to stratify and is being retained as a shallow lake reference lake. Unnamed Lake #1 is remote and is not considered. Lower Three Duck Pond is not proposed for stratified sampling in that Three Duck Lakes Upper, Middle and Lower, and Dividing Lake are all included.
1,688	Email	11/27/2019	1) Steven McAvoy (Ministry of the Environment, Conservation and Parks)	1) In response letter of May 10, 2019, IAMGOLD proposed a path forward for methyl mercury monitoring that is not acceptable because it is not in accordance with Ministry guidance provided to them during the EA in a document entitled “Ministry of the Environment and Climate Change, Northern Region Guidance for Conducting Baseline and Post-Development Monitoring of Water Quality and Fish Tissue” and dated July 2014. Proposed deviations include deferring fish tissue monitoring to the operations phase, instead of starting prior to dam	Fish tissue monitoring will be carried out as suggested. Relative to total and methyl mercury monitoring, IAMGOLD is proposing to collect samples from the outlets of the lakes listed below three times per year during the open water period (May, July and October). Based on experience with other mines, most notably the De Beers Victor Mine, Wood has found that July and October samples are particularly informative as these time periods capture that effects of mercury methylation which occurs mainly during the warmer period. Bagsverd Lake (South Arm) Outlet, Chester Lake Outlet, Clam Lake Outlet, Little Clam Lake

ROC	Event Type	Date	Stakeholder Commenting	Comments	Official Response
				construction, and surface water monitoring during the open water period three times per year, instead of monthly. Also, IAMGOLD proposes to coordinate mercury monitoring with federal EEM requirements, but that is not acceptable because it will delay sampling and provincial requirements differ from federal requirements.	Outlet, Moore Lake Outlet, New Lake Outlet (starting 1 yr after filling), Three Duck Lakes Upper Outlet, Three Duck Lakes Middle Outlet, Three Duck Lakes Lower Outlet, Unnamed Lake #3, Schist Lake Outlet (reference), Unnamed Lake #2 Outlet (reference), Weeduck Lake Outlet (reference). The lakes include all lakes surrounding the site area that could potentially be affected, together with three reference lakes. The analysis would be conducted on unfiltered samples for total and methyl mercury, as well as on filtered samples for methyl mercury. Method detection limits would be at 0.1 ng/L for total mercury and 0.02 ng/L for methyl mercury. Unfiltered data are required for comparison to CEQG of 26 ng/L for total mercury and 4 ng/L for methyl mercury, and the filtered methyl mercury data are required for comparison to the US EPA guideline of 0.05 ng/L for the protection of fish-eating birds and mammals such as Bald Eagles and River Otter.
1,692	Email	11/17/2019	1) Brandi Mogge (Fisheries and Oceans Canada)	1) DFO requested end point or success criteria to ensure the effectiveness of offsetting; these were not provided. Success criteria should be provided for each component and endpoint, similar to the performance targets for geomorphology. Data collected through monitoring is analysed and results interpreted in the context of the success criteria to provide a tangible measure of if the impacts of the project have been fully offset. Examples for riparian vegetation include 80% survival and cover. Fish presence/abundance/community can be in relation to an appropriate baseline (number of species, CPUE, etc. is equal to or greater than x baseline) or may be in relation to the target species in the HSI.	Comments were considered in the preparation of the final version of the Fisheries Offsetting Plan.

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1,746	Email	01/28/2020	1) Tania Havelka (Transport Canada)	1) Both Weeduck Lake and Three Ducks Lake are navigable waterways. I'm assuming that both crossings involve culverts and fill used to create a roadway through the waterway (as opposed to a bridge over a waterway). Given that the proposal is to remove these structures for the benefit of fish, I'm assuming that currently there is little flow/connection between Weeduck and Three Ducks and these structures pose a physical barrier. Based on these assumptions, I would consider these to be causeways. Causeways are considered Major Works and CNWA approval is required. The owner must submit an application to Transport Canada. The application/approval process includes a 30 day public comment period.	Comment noted.
1,747	Phone Call	01/31/2020	1) Brandi Mogge (Fisheries and Oceans Canada); 2) Brandi Mogge (Fisheries and Oceans Canada)	1) Fisheries and Oceans Canada (DFO) indicated that the verification of the Habitat Suitability Index and habitat variables needs to be further discussed. DFO also noted that models are not static; they are improved by refinement, which includes adding data and verifying predictions. DFO requested verification on the approach IAMGOLD used to calculate losses to ensure they are accurate. 2) DFO agreed that they would send conditions from previous Fisheries Act Authorizations from the oil sands as an example of what is expected, and the level of effort required. These expectations could then be identified within the Fish Habitat Compensation Plan and MNO comments.	1. DFO and Minnow agreed that this uncertainty should to be addressed and that the method could be as simple as verifying variables included in the Habitat Suitability Index (e.g., substrate, water depth, velocity, vegetation present to match habitat suitability quality allocated for the key species in the Fish Habitat Compensation Plan). The collection of this information would be completed during dewatering and through the fish salvage program.

APPENDIX E
COMPLIMENTARY MEASURES

COMPLEMENTARY MEASURES PROPOSAL

Project Title

The Collaborative R&D Consortium in Environmental Metagenomics

Rationale for Use of Complementary Measures

The Côté Gold Project Offsetting Plan[1] outlines a series of fish habitat offsets that are expected to result in an increase in fish productivity over existing conditions. Specifically, the offsetting plan indicates an overall net gain of 358,931 habitat units (HU) and will promote enhanced connectivity within the watershed. In addition to the in-kind habitat offsets, IAMGOLD is proposing one out-of-kind (complementary measures) offsetting project. Specifically, IAMGOLD has committed $21,000 in direct funding as well as $3,000 in in-kind support over three years towards research on environmental DNA (eDNA) barcoding methods for Environmental Effects Monitoring (EEM). The objective of this research is to advance the procedure for using eDNA barcoding to provide enhanced species specific information, specifically for benthic invertebrates, which will allow for better determination of effects. Benthic invertebrates are an important element of fish habitat and are sensitive indicators of environmental change; the ability to more accurately describe benthic communities will enable a more granular assessment of environmental conditions in monitoring programs with the potential to facilitate diagnosis of issues at an early stage, before they have a biologically meaningful impact on fish populations. This out-of-kind project is being proposed as an offset to account for lost productivity related to the lag time between initial impacts and commissioning of the offsetting habitat. Lag times, which represent the time between the initial impact and the ability of the habitat to be fully productive, have the potential to affect the productivity of the system through limiting the ability of fish to fully utilize constructed habitat for their various life stages. The complementary measures are being proposed in addition to other measures outlined in the plan to minimize lag times between commissioning and full habitat productivity (e.g., construction of physical habitat features to provide cover and spawning habitat and physical transfer of aquatic plants and benthic invertebrates to promote the establishment of created habitat and a food base for fish).

Calculation of Complementary Measures

The complementary measures proposed are intended to account for only a small proportion (<5%) of the total offset. IAMGOLD is confident that the remainder of the proposed offset will be sufficient to account for the fish habitat lost and will result in an increase in fish productivity over existing conditions. The created and alteration of habitats proposed in the plan includes: the relocation of Clam Creek, alteration of the Chester Lake outlet road crossing, the creation of a New Lake, the relocation of the Mollie River, the relocation of the outlet stream of Unnamed Pond, the connection of Weeduck Lake to Upper Three Duck Lake, the connection of Little Clam to Clam Lake, the remediation of the Aggregate Pit #3 and connection to Middle Three Duck Lake, and the remediation of the Aggregate Pit North (Bagsverd) and connection to the drainage to Bagsverd Creek[1]. The proposed offsetting will result in a net gain in lake habitat for Section 35 and Schedule 2 of 428,936 and 10,962 HU, respectively. Stream habitat has a net gain of 6,170 HU for Schedule 2, but a loss for Section 35 of -87,136 HU[1]. The stream offsets are less but are driven by stream length and not quality; the proposed offsetting stream habitat is expected to be of high quality, incorporating a diversity of habitat types that will be suitable for a wider variety of species and that will increase connectivity within the watershed[1]. Additionally, after mine closure the Open Pit will be allowed to fill and will form a 450,000 m^2 lake; this was not included in the habitat offsetting evaluation but does represent a substantial future gain in lentic habitat[1]. Lag times between habitat commissioning and full productivity will be minimized through pre-commissioning measures that will include installation of physical structures (e.g., shoals, woody debris), aquatic and riparian planting, and invertebrate transplanting as well as the sequencing of the construction of offsetting habitats versus the loss of habitat through project development.

Applicant Information

IAMGOLD Corporation and the Department of Integrative Biology, University of Guelph

Principal Investigator and Research Team

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Dr. Sarah Adamowicz has published widely on DNA barcoding, freshwater biodiversity, biogeography, and molecular evolution in a variety of high impact peer-reviewed journals. She has held $1.4M in grant funding and has supervised 18 graduate students, including students in both the Integrative Biology and Bioinformatics graduate programs. She has extensive experience in freshwater invertebrate sampling and DNA barcoding as well as a successful history of collaboration with industry. She will provide oversight for the research and serve as Advisor or co-Advisor to students and post-doctoral fellows involved in this research.

Dr. Robert Hanner (Co-Principle Investigator), Associate Professor
Department of Integrative Biology, University of Guelph, Guelph, ON, N1G 2W1
Phone: (519) 824-4120 ext. 53479; email: rhanner@uguelph.ca
Dr. Robert Hanner has an extensive publication history on DNA barcoding and its socio-economic applications, including for aquatic biomonitoring and food authentication. He has extensive experience in running a large molecular laboratory (including DNA barcoding, qPCR, and use of high-throughput sequencing technologies) and has supervised 16 graduate students and 8 postdoctoral fellows. Dr. Hanner has led multiple successful research collaborations with industry as well as the creation of two spin-off companies. He will serve as Advisor or co-Advisor to students involved in this research.

Dr. Karl Cottenie, Associate Professor
Department of Integrative Biology, University of Guelph, Guelph, ON, N1G 2W1
Phone: (519) 824-4120 ext. 53479; email: cottenie@uoguelph.ca
Dr. Karl Cottenie has deep expertise in meta-community ecology, multivariate biostatistics, and analytics in the R programming language. He will serve as a co-Advisor or Advisory Committee Member for the M.Sc. students involved in this project.

Dr. Mario Thomas, Co-founder and CEO, Precision Biomonitoring Inc.
5420 Highway 6 N., Orchard Park Suite 226, Guelph, ON, N1H 6J2
Phone: (647) 466-8008; email: Mario.thomas@precisionbiomonitoring.com
Dr. Mario Thomas has extensive experience in the biotechnology industry and in transforming scientific innovations into applications. He will contribute to a business-oriented report from this research, to ensure that technology adoption will proceed beyond the funding period.

Project Start Date: **Once Funding is Received** **End Date:** **Approximately 3 years**

Project Summary (maximum 500 words)

Canadian federal regulations mandate that industries producing effluents must undertake cyclical EEMs to monitor and mitigate potential harmful environmental effects; these regulations apply to several major natural resource industries, including all 80 active metal mines and 120 pulp-and-paper factories in Canada. EEM protocols require quantification of water quality, fish populations, fish reproductive health, and fish habitat quality (benthic invertebrate communities). An important element of fish habitat includes the benthic communities upon which fish feed, including larvae of insects (e.g., mayflies, stoneflies, caddisflies, true flies) as well as freshwater worms, snails, mussels, and other taxonomic groups. Currently, these invertebrates are identified using traditional, microscopy-based methods. Applying these methods is time consuming and requires considerable taxonomic expertise of a nature that is in decline in Canada and globally. Moreover, specimens may be damaged during collection, and early life stages can lack the important diagnostic features required to make a confident taxonomic assignment.

The research being proposed will test the contribution that DNA barcoding can make for benthic invertebrate surveys conducted for EEMs. DNA barcoding involves sequencing short, standardized gene regions for taxonomic identification through matching DNA sequences from unknown specimens to a reference database of sequences from identified specimens[2]. DNA barcoding also enables taxonomically broad biodiversity analysis and allows detection of novel species not yet present among the reference sequences[3,4,5]. Because of the digital signal inherent in DNA and the advances in high-throughput sequencing technology, DNA-based methods have the potential to revolutionize the speed, cost, objectivity, and quality of EEMs in Canada. Moreover, the methods can be adapted for other types of required biodiversity surveys (e.g. baseline surveys).

Academic researchers from the University of Guelph are partnering with four mining companies and three environmental consulting companies as part of an R&D consortium to conduct projects that will open new opportunities for using DNA-based technologies for biomonitoring. The initial project will represent a three-year collaborative effort wherein benthic invertebrate samples will be collected by environmental consultants as part of the recurring EEM cycles for the mines and subjected to full processing using two workflows: traditional specimen identification and DNA-based identification. Congruence will be assessed between workflows and a business cost model developed. Shortly following project completion, benefits to the participants will include improved speed, cost, and objectivity of data collected as part of their future EEM cycles. This research will also result in fundamental new biological knowledge about Canadian aquatic biodiversity, biogeography, cryptic species, and community ecology.

Detailed Project Description

Objectives

In Canada, the Metal Mining Effluent Regulations mandate that all metal mines must take prescribed steps to protect water resources, fish populations, and fish habitat (including benthic invertebrate communities) in the form of cyclical EEMs. The standard EEM approach of comparing benthic invertebrate communities from “exposed” sites (i.e. sites receiving industrial effluents) to “reference” sites are well established, yet they pose challenges. Firstly, specimen identification is time consuming and expensive and the availability of skilled taxonomists can be limiting. Secondly, specimens can become physically damaged during collection and immature, aquatic life phases often lack the necessary diagnostic features for identification. For these reasons, the outcomes of EEMs are incomplete despite substantial effort, as many specimens remain unidentified or are only identified to a high taxonomic level (e.g. family) which may be too coarse to detect community responses to environmental conditions[6,7,8]. Further, differences in taxonomic resolution among studies limit prospects for standardization and for drawing general conclusions about natural variability and responses to anthropogenic disturbance within and among sites.

Since all life stages of the same individual have the same DNA, and genetic differences are smaller between individuals within a species than between species within the same genus, DNA barcoding represents a promising method to overcome these challenges. This research will test the contribution that DNA barcoding can make for EEM benthic invertebrate surveys with an over arching project goal to develop and validate molecular methodology to identify benthic invertebrates that is more rapid, more accurate, and less costly than current morphological surveys. This will include identifying a fixative that supports both morphological and DNA-based identification, developing validated Standard Operating Procedures, developing cost models, expanding libraries of DNA barcode reference sequences from identified specimens, covering different freshwater macroinvertebrate communities across Canada, and commencing R&D to refine and improve the efficiency and output of metabarcoding in order to completely replace the mixed methods over the medium term. Additionally, this work will answer four key biological and methodological questions: 1) does the use of traditional taxonomic methods vs. DNA-based methods impact our conclusion regarding whether receiving and reference sites differ biologically? 2) Does the method used for specimen identification impact the biological variability among subsamples from the same site? 3) Do cryptic species display the same or different distribution patterns? 4) Does habitat type or geographic region influence our findings? Answering these questions will contribute new biological knowledge on the biodiversity, biogeography, and community ecology of Canadian freshwater invertebrates. Moreover, addressing these questions will enable industry partners to see the direct comparison and to consider moving towards DNA-based methods in the future. This direct comparison is expected to increase trust in the methods used by industry as well as government regulators. This work is also expected to be a steppingstone to using even higher-throughput sequencing methods in the future.

Methodology

This research will be performed at four metal mine sites located across central and western Canada: Snow Lake, Manitoba; Detour Mine, Ontario; Côté Gold Mine, Ontario; and Young-Davidson Mine, Ontario. Two mines will be sampled in the fall of year 1 and two in fall of year 2, with field sampling performed by subcontracted environmental consulting companies. For each mine site, five benthic invertebrate samples will be taken using a Ponar grab in the receiving environment and five in the paired reference site. Up to 300 benthic invertebrate individuals will be preserved per sample and identified using traditional methods, and then the same specimens will be used for molecular analysis. DNA barcoding will be performed using standard methods: specimen photography, tissue sampling, DNA extraction, PCR, bidirectional Sanger sequencing, combining forward and reverse sequences into a consensus sequence per specimen, sequence alignment, and analysis. After clustering the sequences into Molecular Operational Taxonomic Units (molecular proxy for species), the same four endpoints (density, taxon richness, Simpson Index, and Bray-Curtis Index) will be calculated for the molecular data as for the morphological data. The EEM standard ANOVA will be used to compare metrics endpoints between the receiving and reference sites but generalized linear mixed (GLM) models will also be used to compare the molecular data to the traditional taxonomic data across study sites. Models will also be adapted from meta-community ecology[9,10] to examine the relative influence of spatial (i.e. dispersal) and environmental (e.g. geological, water chemistry parameters) factors on taxon distributions; the conclusions will be further tested to determine if they vary between traditional taxonomic methods and DNA-based methods.

Work Plan and Summary Budget

Date/Period	Key Milestones and Annual Deliverables	Cost
July 1 - Dec. 31, Year 1	Recruitment of graduate students	$1000
Sept. 1 - Oct. 31, Year 1	Benthic invertebrate samples for Year 1 will be collected by consulting partners using EEM protocols	$3,200
Nov. 1, Year 1 - Mar. 31, Year 2	Consulting partners or sub-contractors will use current morphological methods to ID specimens	$8,000
Mar. 1 - June 30, Year 2	Generate DNA data from the same specimens identified using traditional morphological methods	$67,000
July 1 - Aug. 31, Year 2	Statistical analysis of endpoints from Year 1 data will be performed to compare results from morphological vs. DNA ID methods	$10,000
Sept. 1 - Oct. 31, Year 2	Benthic invertebrate samples for Year 2 will be collected by consulting partners using EEM protocols	$3,200
Nov. 1, Year 2 - Mar. 31, Year 3	Consulting partners or sub-contractors will use current morphological methods to ID specimens	$8,000
Mar. 1 - June 30, Year 2	Generate DNA data from the same specimens identified using traditional morphological methods	$62,700

July 1 - Aug. 31, Year 2	Statistical analysis of endpoints from Year 2 data will be performed to compare results from morphological vs. DNA ID methods	$10,000
Sept. 1, Year 2 - June 30, Year 3	Manuscript preparation for submission to peer-reviewed journal(s)	$11,400
Sept. 1, Year 3 - June 30, Year 4	Preparation of a conference presentation and report targeted to industry comparing methods	$3,800

Project Outcomes

Several benefits are anticipated from the proposed R&D program, including the potential to improve detection and advance our understanding of benthic communities in Ontario which are recognized as a key aspect of fish habitat under the *Fisheries Act*. With genomics technology, there is also the ability to acquire more objective data to support environmental management decisions. The development of these methods will allow the mining sector to comply with federal regulations more efficiently and cost effectively than in the past; this project could also open doors for future adoption of molecular methods for other biodiversity survey activities (e.g. baseline studies and reclamation activities). Although this collaboration currently involves four mining partners and three consulting companies there are 80 mines across Canada as well as 120 pulp-and-paper sites that must complete cyclical EEMs. Therefore, the potential market for DNA-based EEM service provision is large and as such, the impact of this research is expected to have broad implications for the Canadian economy and environment. In addition to the domestic market for biotechnology services, this research will enable Canada to stay at the cutting-edge of methods for biodiversity surveys, opening new opportunities for the provision of environmental services for international projects.

The expected outcomes within the first fiscal year of the project are: 1) the collection of benthic invertebrate samples from two different mine sites 2) the identification of specimens using traditional morphological methods (in-house or sub-contracted taxonomic specialist using microscopy and taxonomic keys), and 3) beginning DNA sequencing of specimens collected in the first fiscal year (anticipated completion June 30, of the second fiscal year).

Data Management and Sample Archive

All data will be managed with the Barcode of Life Data Systems (BOLD) and all partners will have access to the data pre-publication. Once the data sets are assembled, vetted against existing data, cleaned up and merged, they will be analyzed for publication and the sequences will be submitted to GenBank and will be made fully public. Separated and identified benthic invertebrate specimens collected in year 1 and year 2 of the project will be preserved in ethanol and stored in individual vials. Physical specimens will be housed within the Collections unit at the Centre for Biodiversity Genomics where they will be available for subsequent access by the scientific community under the established access protocols of the Centre.

Risks

Risk	Mitigation Measure
Lost or damaged benthic invertebrate samples	Clearly label all containers and complete a Chain-of-Custody (COC) form for each shipment.
Variability in quality of specimen identification	All samples shipped to the same sub-contractor/taxonomist to ensure consistency.
Failure to secure NSERC funding	IAMGOLD/ partners to cover cost of sequencing samples collected from site.

Literature References

1. Minnow Environmental. 2020. Côté Gold Offsetting Plan. Prepared for IAMGOLD Corporation, Toronto, Ontario. April 2020. Project 187202.0015.

2. Hebert PDN, Cywinska A, Ball SL, deWaard JR. 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London B*, 270: 313–321.

3. Hubert N, Hanner R. 2015. DNA Barcoding, species delineation and taxonomy: a historical perspective. *DNA Barcodes*, 3: 44–58.

4. Adamowicz SJ. 2015. International Barcode of Life: Evolution of a global research community. *Genome*, 58: 151–162.

5. Adamowicz SJ, Hollingsworth PM, Ratnasingham S, van der Bank M. 2017. International Barcode of Life: Focus on big biodiversity in South Africa. *Genome*, 60: 875–879.

6. Beermann AJ, Zizka VMA, Elbrecht V, Baranov V, Leese F. 2018. DNA metabarcoding reveals the complex and hidden responses of chironomids to multiple stressors. *Environmental Sciences Europe*, 30: 26.

7. Xiong W, Li J, Yang Y, Wang W, Shan B, Zhan A. 2018. Data collected in an integrated ecological survey of rotifer communities and corresponding environmental variables in the highly polluted Haihe River Basin, China. *Data in Brief* 17: 141–147.

8. Xiong W, Yang Y, Zhan A. 2019. Family-level surrogates are too coarse to assess environment community interactions: A response to Jiang et al. (2019). *Ecological Indicators*, 102: 466–468.

9. Shurin JB, Cottenie K, Hillebrand H. 2009. Spatial autocorrelation and dispersal limitation in freshwater organisms. *Oecologia*, 159: 151–159.

10. Siqueira T, Bini LM, Roque FO, Cottenie K. 2012. A Metacommunity Framework for Enhancing the Effectiveness of Biological Monitoring Strategies. *PLoS ONE*, 7(8): e43626.

Relevant Publications

Adamowicz, S.J., P.M. Hollingsworth, S. Ratnasingham, and M. van der Bank. 2017. International Barcode of Life: Focus on big biodiversity in South Africa. *Genome* 60: 875–879.

Adamowicz, S.J. 2015. International Barcode of Life: Evolution of a global research community. Genome 58: 151–162.

Adamowicz, S.J., and D. Steinke. 2015. Increasing global participation in genetics research through DNA barcoding. *Genome* 58: 519–526.

Adamowicz, S.J., Colbourne, J.K., Witt, J.D.S., and Hebert, P.D.N. 2009. The scale of divergence: a phylogenetic appraisal of intercontinental allopatric speciation in a passively dispersed zooplankton genus. Molecular Phylogenetics and Evolution 50: 423-436.

Adamowicz, S.J., Menu-Marque, S., Hebert, P.D.N., and Purvis, A. 2007. Molecular systematics and patterns of morphological evolution in the Centropagidae (Copepoda: Calanoida) of Argentina. Biological Journal of the Linnean Society 90: 279-292.

Dahruddin, H., A. Hutama, F. Busson, S. Sauri, **R. Hanner**, P. Keith, R. Hadiaty, and N. Hubert. 2017. Revisiting the ichthyodiversity of Java and Bali through DNA barcodes: taxonomic coverage, identification accuracy, cryptic diversity and identification of exotic species. Molecular Ecology Resources 17:288-299.

Hubert, N., **R. Hanner**, E. Holm, N.E. Mandrak, E. Taylor, M. Burridge, D. Watkinson, P. Dumont, A. Curry, P. Bentzen, and J. Zhang. 2008. Identifying Canadian freshwater fishes through DNA barcodes. PLoS one 3:e2490.

Overdyk, L.M., E. Holm, S.S. Crawford, and **R.H. Hanner.** 2016. Increased taxonomic resolution of Laurentian Great Lakes ichthyoplankton through DNA barcoding: a case study comparison against visual identification of larval fishes from Stokes Bay, Lake Huron. Journal of Great Lakes Research 42: 812-818.

Packer, L., J. Gibbs, C. Sheffield, and **R. Hanner.** 2009. DNA barcoding and the mediocrity of morphology. Molecular Ecology Resources 9: 42-50.

Shehata, H.R., A.M. Naaum, R.A. Garduño, and **R. Hanner.** 2018. DNA barcoding as a regulatory tool for seafood authentication in Canada. Food control 92: 147-153.

Supporting Information on Expertise

See Attached CVs.

Budget Tables

PROJECT YEARS (Year 1 to 3 after receiving funding): **DETAILED BUDGET SUMMARY (IN THOUSANDS OF DOLLARS)** Identify details of expenditure under each category and associated costs.		
Class of Expenditures		**Proponent support** (Funds and In-kind)
Year 1	**1. Salary:**	$7000 in direct funding to be primarily used for salaries and reagents for molecular analysis + $1000 In-kind (salaries for scientific and technical staff)[a]
	• Undergraduate Research Assistant ($9000)	
	• MSc student ($15,500)	
	2. Equipment and Facilities:	
	• Qubit 4™ Quantitation kit for DNA quantification ($4300)	
	• Ethanol, sample jars ($1,200)	
	3. Travel:	

	• Industry Conference (e.g. Congress of the Canadian Institute of Mining, Metallurgy, and Petroleum; $500) • Project-related travel (e.g. visiting mine sites and holding joint discussions between academic and industry partners; $1000) **4. Other Costs:** • DNA analysis at Canadian Centre for DNA Barcoding, University of Guelph ($52,500) **5. Administration Fee:** • Estimated $13,440	
	Total	$7000 cash + $1000 In-kind
Year 2	**1. Salary:** • Undergraduate Research Assistant ($9000) • MSc student ($15,500) • Work study student ($800) **2. Equipment and Facilities:** • Ethanol, sample jars ($1,200) **3. Travel:** • National Scientific and Industry Conferences ($2000) • Field work ($2000) • Project-related travel (e.g. visiting mine sites and holding joint discussions between academic and industry partners; $1000) **4. Other Costs:** • DNA analysis at Canadian Centre for DNA Barcoding, University of Guelph ($52,500) **5. Administration Fee:** • Estimated $13,440	$7000 in direct funding to be primarily used for salaries and reagents for molecular analysis + $1000 In-kind (salaries for scientific and technical staff)[a]
	Total	$7000 cash + $1000 In-kind
Year 3	**1. Salary:** • MSc student x 2 ($31,500) • Post-doctoral fellow ($45,000) **2. Equipment and Facilities:** • **3. Travel:** • National and International Conferences ($4000) • Project-related travel (e.g. visiting mine sites and holding joint discussions between academic and industry partners; $1000) **4. Other Costs:** • Publication costs ($3000)	$7000 in direct funding to be primarily used for salaries and reagents for molecular analysis + $1000 In-kind (salaries for scientific and technical staff)[a]

	5. Administration Fee: • Estimated $13,400	
	Total	$7000 cash + $1000 In-kind
	Total (3 yrs)	$21,000 cash +$3000 In-kind

[a] Additional funding will be provided by an NSERC Collaborative Research and Development Grant in addition to similar contributions from other industry and consulting partners.

IAMGOLD®
CORPORATION

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April 30, 2018

Dr. Sarah Adamowicz
& Dr. Robert Hanner
Department of Integrative Biology
University of Guelph
Guelph, ON, N1G 2W1, Canada

Re: NSERC-CRD Proposal of Adamowicz and Hanner

Dear Drs. Adamowicz and Hanner:

On behalf of IAMGOLD Corporation, I would like to express our strong support for the project entitled "The Collaborative R&D Consortium in Environmental Metagenomics", which you are submitting for consideration for funding under NSERC's Collaborative Research and Development (CRD) Grant program.

IAMGOLD is a mid-tier gold mining company headquartered in Canada with operating gold mines in Quebec, Burkina Faso, and Suriname and a development project near Gogama, Ontario. We are pleased to work in partnership on this project to explore our common interest in developing novel DNA-based approaches to environmental management within the mining industry. Many mine sites are in relatively remote locations, offering unparalleled opportunity to improve the scientific knowledge base in Canada and abroad. We find this collaborative research project capable of expediting the mining industry's ability to strengthen biodiversity monitoring within Canada by leveraging rapidly advancing genomics technology.

Currently, we undertake traditional approaches to species identification for mandatory environmental effects monitoring (EEM) studies. We intend to incorporate DNA-based methods into our future biomonitoring work within 3-5 years' time, after considering the results arising from this proposed research project. We anticipate that genetic methods will be useful for us in multiple contexts, including baseline biodiversity surveys for potential new mining sites, ongoing environmental effects monitoring programs in freshwaters, and site reclamation programs. By being among the early adopters of emerging, DNA-based methods, we plan to seek new opportunities for mining development and collaborative research projects over the medium term (5-10 years).

We anticipate several benefits from the proposed R&D program, including the ability to acquire more objective data to support environmental management decisions. With genomics technology, there is potential to improve detection and understanding of flora and fauna populations present in a given region over time. These methods also have potential to be less invasive, which may be of particular importance for any present species at risk. As costs for DNA sequencing are continue to decrease and sequencing capacity continues to increase, we anticipate that DNA-based methods for baseline surveys and ongoing biodiversity monitoring work will be more efficient and cost effective compared to conducting these programs using traditional approaches.

These methods will likely be adopted over a relatively short timeframe (3-5 years) by other mining companies seeking efficiencies and improved environmental outcomes. We foresee that the Canadian mining sector will be able to comply with federal environmental regulations more efficiently and cost effectively than in the past. This benefits Canada and Canadians at local, regional, and national levels. Additionally, as an international mining firm, we are of the opinion that these new methods will lead to improved environmental management approaches globally, and in the case of IAMGOLD, may be deployed to improve our base of knowledge in areas such as Suriname, which contains large tracts of tropical rainforest vastly understudied.

Recognizing the environmental, social and economic benefits, IAMGOLD is prepared to commit financial and in-kind resources equivalent to $24,000 to support this three-year R&D project. This includes a commitment of $7,000 cash per year, for a total cash contribution of $21,000 towards the proposed research. In addition to this, we anticipate ongoing dialogue with you to discuss and interpret the results from the proposed research and to discuss next steps for the adoption of the research results into our mining operations. We plan on contributing a minimum of 10 hours per year of senior IAMGOLD staff time ($100/hour salary valuation) towards such communications with the Principal Investigators (PIs) and trainees involved in this collaboration. This will likely include participating in a quarterly phone conference with you and the project trainees. The commitments of staff time towards the collaboration represent a total in-kind contribution of at least $3,000 over the three years of this proposed project.

IAMGOLD is one of five industry partners that supports the Research Institute on Mines and Environment (RIME) in Quebec, a joint research program between UQAT and Polytechnique Montreal. RIME relies on industrial financial support of $9,450,000 from mining partners. Over seven years (2013 to 2019), IAMGOLD's commitment includes access to our regional mining facilities for reclamation research and a total of $2,100,000 in financial support. This R&D project is complementary to our ongoing reclamation research with RIME as genomic technologies may be useful in effectively monitoring post-closure biodiversity recovery rates.

We greatly look forward to collaborating with you on this exciting project to achieve the proposed research goals. We hope that your submission to NSERC will be successful.

Yours sincerely,

Steven Woolfenden
Director, Environment
Steven_Woolfenden@iamgold.com

SW/lt
Enclosure: Form 183A

Natural Sciences and Engineering Research Council of Canada | Conseil de recherches en sciences naturelles et en génie du Canada

FORM 183A

Information Required from Organizations Participating in Research Partnerships Programs

Read the instructions before completing the Form.

GENERAL INFORMATION ON THE ORGANIZATION

Name of organization: IAMGOLD Corporation	Name and title of contact person at the organization: Steven Woolfenden, Director, Environment
Mailing address: 401 Bay Street, Suite 3200, PO Box 153 Toronto, Ontario, Canada M5H 2Y4	Mailing address for the contact person (only if different)
Telephone number: 416-360-4710 / Facsimile number: 416-360-4750	Telephone number: 416-360-4710, ext. 122884 / Facsimile number:
E-mail address:	E-mail address: Steven_Woolfenden@iamgold.com

Is your organization [X] Private sector? [ ] Government owned? [ ] Government agency/department?

Industry/Products and Services Code: 21222 (NAICS)

Is your organization [X] Profit-motivated? [ ] Not-for-profit?

Web site: www.iamgold.com

Canadian ownership (in percentage) (If Applicable): %

Date of incorporation in Canada (If Applicable): /

Total number of employees in Canada: 1042 (as at Dec. 31, 2017)

Types of products sold and/or services offered: gold mining and processing

Total annual sales for previous year (If Applicable): 871,000 ounces of gold in 2017

Net profit (loss) for previous year (If Applicable):

Is your organization [X] a parent company? [ ] a subsidiary of? (specify)

RESEARCH AND DEVELOPMENT ACTIVITIES

Does your organization have an R&D department? Yes [ ] No [X]

If not, does it undertake R&D within the organization's premises? Yes [ ] No [X]

Annual R&D expenditures * (previous/ current / next year)

*Does not include exploration or business development.

Number of R&D staff in Canada Scientists and technicians:

R&D staff with a PhD:

APPLICANT INFORMATION

Family name	Given names	Initial(s) of all given names

Title of proposal: The Collaborative R&D Consortium in Environmental Metagenomics

Personal identification no. (PIN):

Appl ID (for NSERC use only):

ORGANIZATION'S CONTRIBUTIONS

Contributions to the direct costs of research	Year 1	Year 2	Year 3	Year 4	Year 5
a) Cash contribution	7,000	7,000	7,000	n/a	n/a
b) In-kind contribution	1,000	1,000	1,000	n/a	n/a

Has your organization received publicly-funded support for R&D directly related to the proposed project? Yes [ ] No [X]

Are the applicant and co-applicant(s) at arm's length from your organization? Yes [X] No [ ]

Name, title and telephone number of authorized representative of the organization:
Steven Woolfenden 416-360-4710, ext. 122884
Director, Environment

Signature:

Date: April 30, 2018

Natural Sciences and Engineering Research Council of Canada | Conseil de recherches en sciences naturelles et en génie du Canada

For NSERC office use only

Form 101 - Application for a Grant

Send to NSERC with your attachments, if applicable

Reference Number: 401277330

Applicant: Sarah Adamowicz
Guelph

NSERC PIN: 236726

Program: Collaborative Research and Development Grant

Application Title: The Collaborative R&D Consortium in Environmental Metagenomics

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Sarah Adamowicz

Form 101 - Application for a Grant

Electronic Attachments:

Budget Justification - Budget Justification
Contributions from Supporting Organizations - Attachment - Contributions from Supporting Organizations
Relationship To Other Research Support - Relationship to Other Research Support
Proposal - Proposal
References - References
Other Documents - Collaborator CVs and Form 183A from two partners

Sarah Adamowicz

F100/Personal Data Form

Electronic Attachments:

Contributions - Contributions

Robert Hanner

F100/Personal Data Form

Electronic Attachments:

Contributions - Hanner Contributions

Rosamund Hyde

F183A/Org. Participating in RPP

Electronic Attachments:

Letter(s) of support - letter of support
Company Profile - Company profile

Kimberly Lyle

F183A/Org. Participating in RPP

Electronic Attachments:

Letter(s) of support - Detour Gold Corporation Guelph Letter of Support
Company Profile - Detour Gold Form 183A

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For NSERC office use only

Send to NSERC with your attachments, if applicable

Reference Number: 401277330

Applicant: Sarah Adamowicz
Guelph

NSERC PIN: 236726

Program: Collaborative Research and Development Grant

Application Title: The Collaborative R&D Consortium in Environmental Metagenomics

---

Pierre Stecko

F183A/Org. Participating in RPP

Electronic Attachments:

Letter(s) of support - Minnow Letter of Support

Company Profile - Minnow Profile

Lindsey Taylor

F183A/Org. Participating in RPP

Electronic Attachments:

Letter(s) of support - Letter_of_Support_IAMGOLD

Company Profile - Partner Company Profile - IAMGOLD Corporation

Leah Zapotochny

F183A/Org. Participating in RPP

Electronic Attachments:

Letter(s) of support - Letter of Support Alamos Gold

Company Profile - Alamos Gold Young Davidson Company Profile

Natural Sciences and Engineering Research Council of Canada
Conseil de recherches en sciences naturelles et en génie du Canada

FORM 101
Application for a Grant
PART I

Institutional Identifier	
System-ID (for NSERC use only)	401277330
Date	2019/03/29

Family name of applicant	Given name	Initial(s) of all given names	Personal identification no. (PIN)
Adamowicz	Sarah	SJ	**Valid** 236726

Department	Institution that will administer the grant
Integrative Biology	Guelph

Language of application [X] English [ ] French

Time (in hours per month) to be devoted to the proposed research / activity: 40

Type of grant applied for
Collaborative Research and Development Grant

For Strategic Projects, indicate the Target Area and the Research Topic; for Strategic Networks indicate the Target Area.

Title of proposal
The Collaborative R&D Consortium in Environmental Metagenomics

Provide a maximum of 10 key words that describe this proposal. Use commas to separate them.
mining industry, environmental effects monitoring, DNA barcoding, metabarcoding, metagenomics, benthic invertebrates, community structure, biogeography, environmental health, water quality

Research subject code(s) Primary	Secondary	Area of application code(s) Primary	Secondary
4700	4702	400	702

CERTIFICATION/REQUIREMENTS

If this proposal involves any of the following, check the box(es) and submit the protocol to the university or college's certification committee.
Research involving : Humans [ ] Human pluripotent stem cells [ ] Animals [ ] Biohazards [ ]

Indicate if the proposed research takes place outdoors and if you answered YES to a), b) or c) – Appendix A (Form 101) must be completed
[X] NO [ ] YES

TOTAL AMOUNT REQUESTED FROM NSERC

Year 1	Year 2	Year 3	Year 4	Year 5
56,000	56,000	56,000	0	0

SIGNATURES (Refer to instructions "What do signatures mean?")

It is agreed that the general conditions governing grants as outlined in the NSERC *Program Guide for Professors* apply to any grant made pursuant to this application and are hereby accepted by the applicant and the applicant's employing institution.

Applicant

Head of department

Dean of faculty

President of institution
(or representative)

Applicant's department, institution, tel. and fax nos., and e-mail
Integrative Biology
Guelph
Tel.: (519) 8244120 ext. 53055
FAX: (519) 8245703
sadamowi@uoguelph.ca

Personal identification no. (PIN)	Family name of applicant
Valid 236726	Adamowicz

CO-APPLICANTS

I have read the statement "What do signatures on the application mean?" in the accompanying instructions and agree to it.

PIN, family name and initial(s)	Research/ activity time (hours/month)	Organization	Signature
303944, Hanner, RH	16	Guelph	

Use additional page(s) if necessary.

Version française disponible

Canada

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Personal identification no. (PIN)	Family name of applicant
Valid 236726	Adamowicz

Before completing this section, read the instructions for the definition of collaborators in the Eligibility Criteria section of the Program Guide for Professors.

COLLABORATORS

PIN, family name and initial(s)	Research/ activity time (hours/month)	Organization / Department
Thomas, M	3	Precision Biomonitoring,
Cottenie, K	3	Guelph,

 Use additional page(s) if necessary.

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CO-APPLICANTS' ORGANIZATIONS AND/OR SUPPORTING ORGANIZATIONS (if organization different from page 1)

It is agreed that the general conditions governing grants as outlined in the NSERC *Program Guide for Professors,* as well as the statements "What do signatures on the application mean?" and "Summary of proposal for public release" in the accompanying instructions, apply to any grant made pursuant to this application and are hereby accepted by the organization.

Family name and given name of signing officer, title of position, and name of organization	**Signature**
Woolfenden, Steven, S Director, Environment IAMGOLD Corporation Wallen, Ruben, R VP, Environment Detour Gold Zapotochny, Leah, L Environmental Superintendent Alamos Gold Inc. Murdoch, Mary, M Senior Principal Stantec Consulting Ltd. Stecko, Pierre, P Aquatic Scientist/Principal Consultant Minnow Environmental Inc. Sonnenberg, Helga, H Principal and Founder Ecological and Regulatory Solutions Inc. Cooper, Jay, J Director of Environment Hudbay Minerals Inc.	

Use additional page(s) if necessary.

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SUMMARY OF PROPOSAL FOR PUBLIC RELEASE (Use plain language.)

This plain language summary will be available to the public if your proposal is funded. Although it is not mandatory, you may choose to include your business telephone number and/or your e-mail address to facilitate contact with the public and the media about your research.

Business telephone no. (optional): 1 (519) 8244120 Ext. 53055

E-mail address (optional): sadamowi@uoguelph.ca

In Canada, federal regulations mandate that industries producing effluents must undertake cyclical Environmental Effects Monitoring programs (EEMs) both to monitor and to mitigate potential harmful environmental effects. These regulations apply to several major natural resource industries that contribute to the Canadian economy, including the 80 operating mineral mines that span the country as well as 120 pulp-and-paper factories. EEM cycles include investigating potential impacts of effluents upon freshwater quality and on fish habitat, which includes the communities of bottom-dwelling invertebrates upon which fish feed, such as caddisfly and mayfly larvae and other invertebrates. In this project, we will undertake a collaborative research program to investigate the potential of new DNA-based methods to contribute to efficient and reliable surveys of benthic invertebrates. Involving a joint effort among academic researchers, environmental consultants, and environmental managers working in the mining sector, we will undertake the first large-scale direct comparison of currently-used methods for surveying biodiversity for EEMs (identification of invertebrate specimens using visual inspection under a microscope) vs. new DNA-based methods for specimen identification and biodiversity quantification. We will compare the outcomes from these methods across multiple dimensions, considering: total biodiversity and other metrics (e.g. taxon richness, evenness, Simpson index, etc.), efficiency in generating and analyzing the data, consistency of the results, and cost. This research will contribute fundamental new biological knowledge about freshwater species distribution patterns using DNA data. We also anticipate that this project will open doors for the further translation of DNA-based biodiversity research methods, originally developed in academia, to applied settings for the benefit of the Canadian economy, environment, and ecosystem services, including the protection of freshwater quality and commercial, recreational, and Indigenous fisheries.

Other Language Version of Summary (optional).

Personal identification no. (PIN)	Family name of applicant
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ACTIVITY SCHEDULE
(Refer to instructions to see if this section applies to your application. Use additional page(s) if necessary.)

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Recruit graduate students	Recruitment activities will include advertising on the university webpages, circulating announcements to discipline-specific listservs, and directly reaching out to strong fourth-year Honours students with suitable background.	2019-07-01	2019-12-31
Collect field samples (2019)	Aquatic benthic invertebrate samples will be collected in the fall using Environmental Effects Monitoring protocols.	2019-09-01	2019-10-31
Identify specimens with morphological methods (2019 samples)	Microscopy and taxonomic keys will be used to identify the collected specimens using current methods.	2019-11-01	2020-03-31
Generate DNA data (from 2019 samples)	Whenever possible, the same specimens will be used for DNA analysis, following the completion of microscopy-based identification. This activity involves tissue sampling from larger specimens, DNA extraction, PCR, and DNA sequencing.	2020-03-01	2020-06-30
Statistical analysis (2019 samples)	Statistical analysis will be performed to compare the results from traditional microscopy vs. DNA sequencing. Metrics to be compared include: taxon richness, evenness, Shannon Diversity Index.	2020-07-01	2020-08-31
Collect field samples (2020)	Aquatic benthic invertebrate samples will be collected in the fall using Environmental Effects Monitoring protocols.	2020-09-01	2020-10-31
Identify specimens with morphological methods (2020 samples)	Microscopy and taxonomic keys will be used to identify the collected specimens using current methods.	2020-11-01	2021-03-31

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ACTIVITY SCHEDULE
(Refer to instructions to see if this section applies to your application. Use additional page(s) if necessary.)

Milestone	Description of activities	Anticipated starting date	Anticipated completion date
Generate DNA data (from 2020 samples)	Whenever possible, the same specimens will be used for DNA analysis, following the completion of microscopy-based identification. This activity involves tissue sampling from larger specimens, DNA extraction, PCR, and DNA sequencing.	2021-03-01	2021-06-30
Statistical analysis (2020 samples)	Statistical analysis will be performed to compare the results from traditional microscopy vs. DNA sequencing. Metrics to be compared include: taxon richness, evenness, Shannon Diversity Index.	2021-07-01	2021-08-31
Publications	We will prepare scientific publications reporting the biological findings that arise from the two methods, including on diversity, abundance, geographic distribution, and niche breadth.	2021-09-01	2022-06-30
Report on comparison of procedures	We will prepare a conference presentation and report targeted to industry comparing methods: results, consistency, efficiency, and cost.	2021-09-01	2022-06-30

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See instructions for further details.

PROPOSED EXPENDITURES

	Year 1		Year 2		Year 3	
	Cash	In-kind	Cash	In-kind	Cash	In-kind
1) Salaries and benefits						
a) Students	24,500		24,500		31,000	
b) Postdoctoral fellows	0		0		45,000	
c) Technical/professional assistants	0	31,500	0	27,500	0	29,500
d) Work study student	0		800		0	
2) Equipment or facility						
a) Purchase or rental	4,300	0	0	0	0	0
b) Operation and maintenance costs	0		0		0	
c) User fees	0	0	0	0	0	0
d)	0		0		0	
3) Materials and supplies						
a) DNA analysis	52,500	0	52,500	0	0	0
b) Ethanol, sample jars	1,200		1,200		0	
c)	0	0	0	0	0	0
4) Travel						
a) Conferences	500		2,000		4,000	
b) Field work	0	0	2,000	0	0	0
c) Project-related travel	1,000		1,000		1,000	
d)	0		0		0	
5) Dissemination						
a) Publication costs	0		0		3,000	
b)	0		0		0	
6) Technology transfer activities						
a)	0		0		0	
b)	0		0		0	
c)	0		0		0	
TOTAL PROPOSED EXPENDITURES	84,000		84,000		84,000	
Total support from industry	28,000		28,000		28,000	
Total support from university						
Total support from other sources						
AMOUNT REQUESTED FROM NSERC	56,000		56,000		56,000	

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See instructions for further details.

PROPOSED EXPENDITURES

	Year 4		Year 5		
	Cash	In-kind	Cash	In-kind	
1) Salaries and benefits					
a) Students	0		0		
b) Postdoctoral fellows	0		0		
c) Technical/professional assistants	0	0	0	0	
d) Work study student	0		0		
2) Equipment or facility					
a) Purchase or rental	0	0	0	0	
b) Operation and maintenance costs	0		0		
c) User fees	0	0	0	0	
d)	0		0		
3) Materials and supplies					
a) DNA analysis	0	0	0	0	
b) Ethanol, sample jars	0		0		
c)	0	0	0	0	
4) Travel					
a) Conferences	0		0		
b) Field work	0	0	0	0	
c) Project-related travel	0		0		
d)	0		0		
5) Dissemination					
a) Publication costs	0		0		
b)	0		0		
6) Technology transfer activities					
a)	0		0		
b)	0		0		
c)	0		0		
TOTAL PROPOSED EXPENDITURES	0		0		
Total support from industry	0		0		
Total support from university					
Total support from other sources					
AMOUNT REQUESTED FROM NSERC	0		0		

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Canada

Sarah Adamowicz

Form 101 - Application for a Grant

Budget Justification

Budget Justification

BUDGET JUSTIFICATION

1. Salary and benefits

This project will involve the training of eight HQP over the proposed three-year timeframe of this project.

Year 1 – In year 1, an Undergraduate Summer Research Assistant (**USRA#1**) will be hired ($9,000 = $16.07/hour for 35 hours/week for 16 weeks) to assist with tissue sampling and photography of the benthic invertebrate samples collected in year 1. Samples will be collected by collaborating partners who are environmental consultants. Additionally, year 1 will include the Graduate Research Assistantship for an MSc student (**MSc#1**) in the Department of Integrative Biology, with the grant contribution being $15,500, a standard amount for the College of Biological Science, University of Guelph. The stipend will be augmented by one guaranteed Graduate Teaching Assistantship per year in the Department of Integrative Biology. In sum, the year 1 salaries are: $9,000 + $15,500 = $24,500.

Year 2 – **USRA #2** will be hired for 16 weeks to assist with preparing the specimens from the year 2 field collections ($9,000). Additionally, **MSc#1** will receive the second year of stipend funding ($15,500), as the MSc program is two years in duration. In year 2, we will also hire a **Work Study Student** at 10 hours/week for one semester from the course-based Master of Bioinformatics program to assist with data analysis. The work-study program is a co-funding program for students who have financial need and who also wish to gain work experience on campus. The PI (Sarah Adamowicz) has previously hired multiple Master of Bioinformatics students through this program. As a co-funding program, $800 would contribute towards the salary cost (total salary for the semester: $2800 = $20/hour for 10 hours/week for 14 weeks, with $800 from this proposed grant and the remainder from the university). In sum, the year 2 salaries are: $9,000 + $15,500 + $800 = $25,300.

Year 3 – **MSc#2** and **MSc#3** will each receive one year of stipend support associated with this project ($15,500 each). As the MSc program is two years long, their other year of support will come from other sources. For example, the PI has recruited multiple students from the course-based Master of Bioinformatics program, who enjoyed research and wished to transfer into the thesis-based MSc in Bioinformatics program for their second year of graduate studies. Therefore, one year of stipend support is provided for these students, during their second year once their courses are finished and they are focusing on research. For MSc#2 and #3, we will aim to recruit from the Master of Bioinformatics student pool (currently, there are 26 students in that program at the University of Guelph). Alternatively, students who prefer to register for the MSc program for their entire two years will receive their second year of stipend support from either a scholarship or from the NSERC Discovery Grant of the PI. In year 3, we will also recruit a postdoctoral fellow (**PDF#1**), who will assist with data analysis, writing a synthesis paper, writing a report for industry, and presenting at conferences. In sum, year 3 salaries are: $15,500 + $15,500 + $45,000 = $76,000.

2. Equipment or facility

Year 1 only - Most of the equipment required for this project is already available, including field sampling equipment, microscopes, freezers, pipettes, a liquid-handling robot for DNA extraction, thermocyclers, DNA sequencers, and computers. However, one item is lacking that is required for this project, an instrument for the sensitive quantification of DNA. We propose to purchase this item in year 1. This equipment is required to establish the appropriate protocols (e.g. tissue amount to be used for DNA extraction) for very small-bodied organisms and to assist with trouble shooting for taxonomic groups where sequencing success is lower than expected. In year 1, we therefore propose to purchase a QUBIT 4 QUANTITATION kit ($4300, quote obtained January 23, 2019 from Fisher Scientific).

3. Materials and supplies

Year 1 – In year 1, we budget $52,500 for molecular analysis. This project involves careful comparison of traditional, microscopy-based methods for specimen identification and results using DNA-based methods. Moreover, this project represents a unique opportunity to build a reference database of DNA sequences derived from expert-identified samples, opening further opportunity for molecular analysis in the future by using DNA-based matching to these sequences. As well, the aims of this project require us to generate individual DNA sequences from each individual benthic invertebrate specimen, in order to generate the abundance-based biodiversity metrics that are the current standard for Environmental Effects Monitoring programs, as currently federally mandated. Therefore, we propose that the most suitable sequencing method for this project is bidirectional Sanger sequencing in order to generate a high quality reference sequence from each specimen. (By contrast, we anticipate that some future spin-off projects would employ other methods, such as Illumina sequencing of mixed-species samples, in which the cost per sequence is lower.) We will be sequencing up to 300 specimens for each of 10 samples per mine site (specifically 5 from the potentially impacted site and 5 from the matched, less-impacted reference site that is paired with each mine). As many samples do not contain 300 invertebrate specimens, but rather fewer based upon prior field experience, we anticipate sequencing approximately 2000 invertebrate individuals per mine site. As we will conduct analysis for two mines in year 1, we will sequence approximately 4000 specimens in year 1. The cost at the Canadian Centre for DNA Barcoding, University of Guelph, is a standard price of $1250.00/plate of 95 specimens, for researchers contributing identified voucher specimens towards the International Barcode of Life project; this price includes DNA extraction, PCR, bidirectional DNA sequencing, reagents, consumables such as pipette tips, etc. Therefore, the molecular analysis cost for year 1 would be: 42 plates * $1250/plate = $52,500.

Additionally, in year 1 we budget $1000 for sample vials ($0.25 each * 4000 specimens to be DNA sequenced = $1000 for vials) and $200 for ethanol for preserving separated, identified specimens in a DNA-friendly fashion. By storing specimens in individual vials, we will preserve an exact linkage between specimen and DNA sequence, thus building up the reference library of voucher specimens and reference DNA sequences and creating a resource suitable for archiving in a registered biocollection and for future research. Year 1 materials and supplies costs: $52,500 + $1200 = $53,700.

Year 2 – In year 2, the costs for materials and supplies are the same as for year 1, as we will proceed with molecular analysis of the specimens collected from two additional mine sites plus reference sites. In total, 4 pairs of mines with their reference sites will be analyzed for this project, allowing us to examine the generality of our findings (traditional vs. DNA) across multiple ecoregions of Canada. Year 2 materials and supplies costs: $53,700.

4. Travel

Year 1 – We propose a budget of $500 to contribute towards one of the PIs participating in an industry conference (such as the Congress of the Canadian Institute of Mining, Metallurgy and Petroleum, CIM) in order to meet with partners and to present jointly our ideas about incorporating DNA tools into Environmental Effects Monitoring Programs. We previously presented a joint presentation (Sarah Adamowicz, University of Guelph & Mary Murdoch, Principal at Stantec Consulting Ltd.) at the 2018 Congress, which generated further interest in our project. Other resources would also contribute towards this travel, such as Professional Development Funds of the PIs from the University of Guelph. The $500 would contribute to travel and conference registration. We also budget $1000 in year 1 for project-specific travel, such as visiting mine sites and holding joint discussions between academic and industry partners. Year 1 travel: $500 + $1000 = $1500.

Year 2 – In year 2, we increase the travel budget to $2000 for conferences to allow MSc#1 to participate in a national conference ($1000) as well as make a contribution towards both PIs participating in relevant scientific and industry meetings nationally ($500 each), to be combined with other funding (e.g. Professional Development Funds). While field work in year 1 will be performed by the partner organizations, in year 2 $2000 is budgeted for field work-related travel to permit MSc#1 to participate in field work, alongside the partners. This will be a valuable training experience and also will inform data interpretation. An additional $1000 is budgeted for project-related travel, such as meetings between academic and industry partners. Year 2 travel summary: $2000 + $2000 + $1000 = $5000.

Year 3 – In year 3, the conference budget is set to $4000 to enable both MSc#2 and MSc#3 to participate in a national conference ($1000 each for travel and conference registration) and for PDF#1 to participate in an international conference ($2000). Additionally $1000 is budgeted for project-related travel, such as meetings between the academic and industry partners, which will be scheduled to coincide with a relevant industry-relevant meeting (such as CIM) and academic meeting, where possible. Year 3 travel: $4000 + $1000 = $5000.

5. Dissemination

Year 3 - $3000 is budgeted for open-access publishing fees for publications from this project. Open access publishing is mandated by NSERC, and moreover we aim for our results to be broadly available.

6. Technology transfer activities

No funds are requested specifically for this activity. However, technology transfer will take place through varied mechanisms, including meetings among the academic and private sector partners, preparation of a report that includes scientific results as well as efficiency and cost comparisons between methods, joint conference presentations and publications between academic and industry partners, and meetings to discuss further research and uptake of the technology beyond the requested funding period for this NSERC-CRD (3 years).

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Name of supporting organization

Stantec Consulting Ltd.

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	0	0	0	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	6,000	6,000	6,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	6,000	6,000	6,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	6,000	6,000	6,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

Ecological and Regulatory Solutions Inc.

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	0	0	0	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	8,000	4,000	6,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	8,000	4,000	6,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	8,000	4,000	6,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

Minnow Environmental Inc.

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	0	0	0	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	6,000	6,000	6,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	6,000	6,000	6,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	6,000	6,000	6,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

Hudbay Minerals Inc.

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	7,000	7,000	7,000	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	1,000	1,000	1,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	1,000	1,000	1,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	1,000	1,000	1,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

IAMGOLD Corporation

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	7,000	7,000	7,000	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	1,000	1,000	1,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	1,000	1,000	1,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	1,000	1,000	1,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

Detour Gold Corporation

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	7,000	7,000	7,000	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	7,000	7,000	7,000	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	7,000	7,000	7,000	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	7,000	7,000	7,000	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

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Name of supporting organization

Alamos Gold Inc.

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

	Year 1	Year 2	Year 3	Year 4	Year 5
Cash contributions to direct costs of research (Transfer amounts to page five (5); except those for the Ship Time program.)	7,000	7,000	7,000	0	0
In-kind contributions to direct costs of research					
1) Salaries for scientific and technical staff	2,500	2,500	2,500	0	0
2) Donation of equipment, software	0	0	0	0	0
3) Donation of material	0	0	0	0	0
4) Field work logistics	0	0	0	0	0
5) Provision of services	0	0	0	0	0
6)	0	0	0	0	0
Total of in-kind contributions to direct costs of research	2,500	2,500	2,500	0	0
In-kind contributions to indirect costs of research (not leveraged)					
1) Use of organization's facilities	0	0	0	0	0
2) Salaries of managerial and administrative staff	0	0	0	0	0
3)	0	0	0	0	0
Total of all in-kind contributions	2,500	2,500	2,500	0	0
Contribution to postsecondary institution overhead	0	0	0	0	0

Sarah Adamowicz

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Contributions from Supporting Organizations - Attachment

Contributions from Supporting Organizations

CONTRIBUTIONS FROM SUPPORTING ORGANIZATIONS

Overview

This proposal outlines a truly collaborative project, which includes academic partners, four mining companies, and three environmental consulting companies. The overall model for collaboration and co-funding is as follows, with the in-kind amounts representing minimum estimations.

The four mining companies have each committed to provide a cash contribution of $7K/year for three years ($21K total) to fund the direct costs of research. Direct cash costs are primarily comprised of HQP salaries and reagents for molecular analysis. Additionally, each mining company has committed an in-kind contribution of at least $1K/year for three years, reflecting a commitment of at least 10 hours per year ($100 valuation per hour) of senior scientific staff time for project planning, discussion, and interpretation of results. For two of the mining companies (Detour: $7K/year; and Alamos: $2.5K/year), the in-kind contribution is higher, as their scientific staff wish to be deeply involved, such as in participating in field work, data analysis, and interpretation.

For three of the four mines, there is a paired environmental consulting company, who will also be important partners in the collaboration. The consultants will participate in project planning, conduct the field work for this project, identify the benthic invertebrate samples using traditional methods, and will participate in comparative analysis (microscopy vs. DNA methods) and data interpretation. Per consulting company per mine, their in-kind contribution is valued as at least $6K/year for each of three years (i.e. at least 60 hours of time per year at a $100 valuation per hour), for a total in-kind contribution of at least $18K over the three years of the project. We will also prepare a collaborative, coauthored conference presentation and publication from this project, involving partners from academia, mining, and consulting.

The fourth mining company, Detour Gold Corporation, has not yet selected the environmental consulting company that they will hire to conduct their Environmental Effects Monitoring (EEM) cycle. Their mine site is due for field sampling in 2020, which falls in the second year of this project and thus fits well with the sampling schedule for this project. In the case of Detour, their environmental scientific staff members are deeply involved in exploring genetic and metagenomic methods for environmental assessment and have committed $7K/year ($21K total) in in-kind contribution towards this project, as outlined in detail in their letter of support.

Participating Scientific Staff from Industry

From the mining companies, the following individuals will participate in the project:

Alamos Gold Inc.: Leah Zapotochny, Environmental Superintendent

Detour Gold Corportion: Veronika Shirokova, Senior Advisor, Mine Closure Planning and Geochemistry & Kimberly Lyle, Environmental Specialist

Hudbay Minerals Inc.: Jay Cooper, Director of Environment

IAMGOLD Corporation: Steven Woolfenden, Director, Environment

The specific contributing individuals from the consulting companies are:

Ecological and Regulatory Solutions Inc.: Helga Sonnenberg, Principal and Founder

Minnow Environmental Inc.: Pierre Stecko, Aquatic Scientist/Principal Consultant

Stantec Consulting Ltd.: Mary Murdoch, Senior Principal

Additional staff members from the consulting industry partners will also contribute to the project, as field teams consist of at least two people. In summary, this collaborative project will rely upon both cash (25% of total budget) and in-kind (25% of total budget) contributions from industry, with 50% of the project cost requested from NSERC.

Sarah Adamowicz

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Relationship To Other Research Support

Relationship to Other Research Support

RELATIONSHIP TO OTHER RESEARCH SUPPORT

PI Dr. Sarah Adamowicz

PI Dr. Sarah Adamowicz currently holds two sources of grant funding as PI that are complementary to the present proposal. Her NSERC Discovery Grant ($28K/year 2016-21, totalling $140K) funds graduate student stipends and fundamental research in evolution and evolutionary ecology, with emphasis on understanding the evolutionary and geographic origins of Canadian Arctic biodiversity. As graduate student projects are underway, these funds are not available for the collaborative research proposed here in this NSERC-CRD application.

As lead PI, Dr. Adamowicz also holds a grant in Bioinformatics and Computational Biology from Genome Canada plus matching provincial funds from the Ministry of Economic Development, Job Creation and Trade (totalling $507K over three years, 2018-21). Those funds are directed towards the development of bioinformatics tools for large-scale biodiversity analysis using high-throughput sequencing data, including improved tools for sequence denoising, clustering, taxonomic/phylogenetic annotation, and geographic biodiversity analysis. In the short term, the research does not overlap with the present proposal. After project completion of the bioinformatics research as well as the proposed research from this NSERC-CRD, the projects are expected to be complementary in contributing to improved, high-throughput, DNA-based methods for biodiversity monitoring.

Dr. Adamowicz is also a collaborator in the Food from Thought project at the University of Guelph, funded through the Canada First Research Excellence Fund. She does not directly receive grant funds, but part of the stipend for one PhD in Bioinformatics student is funded through that program. The student is testing statistical imputation techniques (i.e. methods for estimating missing data) in biological datasets. The research does not overlap with the current proposal, but in the long term that research will contribute to improved methods for functional annotation of sequences from high-throughput DNA sequence datasets in biomonitoring applications.

Dr. Adamowicz is also the PI on one pending grant application, with Dr. Hanner and others serving in a co-applicant role. They have applied to NSERC's Research Tools and Instruments (RTI) program for computers and a small server configured to specialize in machine learning, mirroring the increase in bioinformatics research in her group. That proposal is complementary to the present proposal. While students would benefit from access to the requested infrastructure, the success of the research proposed here does not depend upon the outcome of that grant application. We currently have basic computers available for students to use as well as access to SHARCNET resources.

Co-PI Dr. Robert Hanner

Co-PI Dr. Robert Hanner currently holds several grants and research contracts (valued at >$1M/yr) that involve molecular methods for biomonitoring, some of which are complementary with the work here proposed. Specifically, Dr. Hanner is the lead PI on an NSERC Idea to

Innovation grant and matched Ontario Centres of Excellence (OCE) VIP2 grant that, together, aim to establish a point-of-need platform for environmental or eDNA detection for applied biomonitoring applications. These projects involve industry collaborations with Stantec Consulting Ltd. and Precision Biomonitoring Inc. to develop species-specific TaqMan Assays (based upon quantitative PCR, qPCR) for vertebrate species-at-risk (SAR) and valued ecosystem component (VEC) species. Both of these grants conclude in 2019, but the experience gained from them could be leveraged to develop assays for key benthic invertebrate species in the future, pending the completion of the DNA barcode reference sequences anticipated from the current proposal.

Dr. Hanner is also a team member on a Canada First Research Excellence Fund (CFREF) project at the University of Guelph, which involves characterization of the transport and fate of eDNA, both in a controlled mesocosm and in the field. Dr. Hanner is also the lead PI on research contracts with Detour Gold Corp. and Limnotech to conduct targeted eDNA surveys in 2019 for fishes of interest to these clients. Collectively, the aforementioned projects are complementary to the work here proposed in that they involve molecular aspects of aquatic biomonitoring, but none of them specifically cover the taxa targeted in the present application.

Dr. Hanner is also the PI on a Federal Assistance Partnership (FAP) project in collaboration with the Canadian Food Inspection Agency that aims to advance molecular diagnostic tools for plant and animal health applications. As a Co-PI, Dr Hanner also participates on an NSERC-CRD (together with Kari Dunfield, Steve Newmaster, and the Grain Farmers of Ontario) related to soil health. The latter two projects have no conceptual relation to the project proposed in this NSERC-CRD application.

Sarah Adamowicz

Form 101 - Application for a Grant

Proposal

Proposal

1. Synopsis

Canadian federal regulations mandate that industries producing effluents must undertake cyclical Environmental Effects Monitoring programs (EEMs) to monitor and mitigate potential harmful environmental effects. These regulations apply to several major natural resource industries, including all 80 active metal mines and 120 pulp-and-paper factors in Canada, which contribute to the Canadian economy and provide employment opportunities in remote regions. EEM protocols require quantification of water quality, fish populations, fish reproductive health, and fish habitat quality. An important element of fish habitat includes the communities of benthic (i.e. bottom-dwelling) invertebrates upon which fish feed, including the larvae of insects (e.g. EPTs: Ephemeroptera– mayflies, Plecoptera– stoneflies, Trichoptera– caddisflies; Diptera– true flies) as well as freshwater worms (Oligochaeta), snails and mussels (Mollusca), and other taxonomic groups (e.g. Arachnida, Nematoda, and others). Currently, these invertebrates are identified using traditional, microscopy-based methods. Applying these methods is time consuming and requires considerable taxonomic expertise of a nature that is in decline in Canada and globally. Moreover, specimens may be damaged during collection, and early life stages can lack the important diagnostic features required to make a confident taxonomic assignment.

We propose to test the contribution that DNA barcoding can make for benthic invertebrate surveys conducted for EEMs. DNA barcoding involves sequencing short, standardized gene regions for taxonomic identification through matching DNA sequences from unknown specimens to a reference database of sequences from identified specimens (Hebert et al. 2003). DNA barcoding also enables taxonomically broad biodiversity analysis and allows us to detect when novel species not yet present among the reference sequences are encountered (Hubert and Hanner 2015; Adamowicz 2015; Adamowicz et al. 2017). Because of the digital signal inherent in DNA (A, C, G, T) and the advances in high-throughput sequencing technology, we propose that **DNA-based methods have the potential to revolutionize the speed, cost, objectivity, and quality of EEMs in Canada**. Moreover, the methods can be adapted for other types of required biodiversity surveys, such as baseline surveys prior to commencing mine operations as well as surveys relating to mine closures and ecological reclamation efforts.

Academic researchers from the University of Guelph are partnering with four mining companies and three environmental consulting companies to conduct a collaborative project. In brief, benthic invertebrate samples will be collected by environmental consultants as part of the recurring EEM cycles for the mines and subjected to full processing using two workflows: traditional specimen identification and DNA-based identification. We will assess congruence between workflows and develop a business cost model. Shortly following project completion, benefits to the participants will include improved speed, cost, and objectivity of data collected as part of their future EEM cycles. Incorporating modern DNA-based methods into their workflows may also provide the consulting companies with a competitive advantage to win further biodiversity assessment contracts in Canada and internationally. This research will also result in fundamental new biological knowledge about Canadian aquatic biodiversity, biogeography, cryptic species, and community ecology.

2. Background

This research project is designed to address two complementary perspectives: to fill a need by Canadian industry for efficient biodiversity surveys, and to address unanswered biological questions in biodiversity science, ecology, and biogeography.

Industry background — In Canada, the Metal Mining Effluent Regulations mandate that all metal mines must take prescribed steps to protect water resources, fish populations, and fish habitat. Regular Environmental Effects Monitoring (EEMs) programs must be undertaken every three years for the ca. 80 active mines across Canada. EEMs are conducted according to the industry-specific technical guidance document (Environment and Climate Change Canada, Government of Canada, 2012). The overarching methodology for monitoring for impacts is termed the "reference condition approach". Benthic invertebrate communities from the environment receiving industrial effluents are compared with communities from one or more otherwise similar habitats, which are less impacted by anthropogenic activities. A reference site would typically be placed upstream of the industrial site, if available, or otherwise at one or more nearby sites that are geologically and hydrographically similar. Typically, five composite benthic invertebrate samples are taken from the receiving environment and five from each comparison site. From each of these ten benthic samples, up to 300 invertebrate specimens are individually identified to the lowest taxonomic level feasible using traditional methods (microscopy, taxonomic keys). Next, four biodiversity metrics, termed "effects endpoints", are calculated from the identified specimen data: total benthic invertebrate density, taxon richness (i.e. the number of unique forms of invertebrate life present in that sample), Simpson Index (a metric which considers both taxonomic richness and relative abundance), and the Bray-Curtis Index (a metric used to quantify the similarity in taxonomic composition among samples). With the exception of taxonomic richness, the three other metrics all rely upon specimen counts, i.e. abundance data. A statistical analysis (typically ANOVA) is performed to test whether the communities in the receiving environment are significantly different from the reference sites.

These methods are well established, yet they pose challenges. Firstly, specimen identification is time consuming, comprising a significant portion of the budget for the EEM in the form of person hours. Expertise may also be limiting, as identification of some taxonomic groups (e.g. larvae of non-biting midges of the fly family Chironomidae) can require the preparation of time-consuming slide mounts for examination under a microscope, and classical taxonomic expertise has been declining in Canada and globally. Secondly, even when expertise is available, identifications can be difficult. Specimens can become physically damaged during collection. Moreover, even when well preserved, immature life phases often lack the necessary diagnostic features for identification. For some taxonomic groups, reliable species-level identifications cannot be performed on the aquatic life stages that are captured during EEMs as the diagnostic features are only present in flighted, adult males (Ekrem et al. 2010). Therefore, the outcomes of EEMs are incomplete despite substantial effort, as many specimens remain unidentified or are only identified to a high taxonomic level (such as family or even order level, rather than species or genus). Recent literature has suggested that the family is too coarse a level of taxonomic resolution to detect community responses to environmental conditions (e.g. Beermann et al. 2018; Xiong et al. 2018, 2019), and differences in taxonomic resolution among studies limit prospects for standardization and for drawing general conclusions about natural variability and responses to anthropogenic disturbance within and among sites.

Biological background — As all life stages of the same individual have the same DNA, DNA barcoding represents a promising method to overcome the hurdles to specimen identification described above. Substantial prior research supports that freshwater invertebrates are generally well separated at their mitochondrial cytochrome c oxidase subunit I (COI) gene, which was the molecular region selected as the standard for animal DNA barcoding (Hebert et al. 2003). Typically, genetic diversity is constrained within species, with conspecific individuals typically differing by fewer than 2% of their nucleotide positions at the COI barcode marker. By contrast, divergences between species tend to be higher, often 8% or more even among species belonging to the same genus. While there are some cases of complexities in which exceptions to these trends are detected (e.g. hybridization events, recent speciation events), these general patterns have been widely observed across many freshwater invertebrates, including the EPTs (Zhou et al. 2009, 2010, 2011; Ruiter et al. 2013) as well as flies having aquatic larvae, including the non-biting midges (family Chironomidae: Ekrem et al. 2010; Lin et al. 2015), black flies (Simuliidae: Rivera and Currie 2009), and mosquitoes (Culicidae: Cywinska et al. 2006). Since DNA barcoding was first proposed as a general identification tool (Hebert et al. 2003), it has become well established, with widespread adoption across a large international research network for specimen identification, biodiversity discovery, wildlife forensics and conservation applications, authentication of foods and other marketplace products, the study of ecological interactions (e.g. dietary analysis, pollination, host-parasite associations), phylogeography and biogeography, community ecology, and food web analysis (see reviews by Adamowicz 2015, Adamowicz and Steinke 2015, Hubert and Hanner 2015, Adamowicz et al. 2017).

Because DNA barcoding is ideally suited to overcome the impediments to traditional taxonomic identification, it is increasingly being used in freshwater biomonitoring research. In particular, members of the academic research community, as well as some governmental scientists focused upon environmental health, have embraced the potential of DNA metabarcoding methodologies for biomonitoring applications. While DNA barcoding involves generating a sequence from each individual specimen, DNA metabarcoding is the simultaneous sequencing of many species at once from complex bulk samples using high-throughput sequencing technologies (e.g. Hajibabaei et al. 2011; Cristescu 2014; Porter and Hajibabei 2018; Elbrecht and Steinke 2019).

Despite substantial attention and regular methodological developments, **there remains a key gap between the state-of-the-art in academia and industry needs**: current metabarcoding methods do not yield reliable abundance estimates, as DNA read counts do not correlate reliably with specimen abundance (e.g. Elbrecht and Leese 2017). As described above, the Metal Mining Effluents Regulations in Canada use end points based upon specimen abundances. During our extensive consultations with members of industry, we learned that there is substantial interest in DNA-based methods but that it is vital to achieve their required end points for reporting to federal regulators. A second important gap is that reference sequences are missing for many aquatic taxa inhabiting Canadian waters, limiting prospects for annotating molecular data with taxonomic, functional, and ecotoxicology data. Therefore, this proposal represents a **crucial stepping stone between academia and industry**.

Here, we propose the <u>first</u> thorough comparison of aquatic biodiversity results obtained using traditional taxonomic identification methods vs. DNA-based identification in the context of real Environmental Effects Monitoring programs conducted by industry.

While several studies have compared morphological identifications with metabarcoding on modest scale (e.g. Hajibabaei et al 2011; Cahill et al. 2018), <u>no study</u> has performed a large-scale comparison of one-by-one specimen DNA barcoding against morphological methods in the context of large EEMs performed using the same protocols used by industry, as mandated by the Canadian government. This specimen-focused DNA barcoding approach will permit us to: perform a direct comparison of the results obtained using the contrasting identification methods; to assess error rates in morphological identifications of aquatic invertebrates, as prior research suggests the success rate was only 70% in the case of morphological identification of fish larvae (Overdyk et al. 2016); to build up a reference database of sequences for use in future high-throughput biomonitoring studies and applications; as well as to conduct fundamental scientific research. Specifically, we will answer four key biological and methodological questions:

1) *Does the use of traditional taxonomic methods vs. DNA-based methods impact our conclusion regarding whether receiving and reference sites differ biologically?* Because DNA-based methods can be used to identify immature or damaged specimens and can detect cryptic species (i.e. similar-looking species that are genetically distinct), we predict that taxon richness will generally be higher using DNA methods than using microscopy. Therefore, the more novel and interesting question is whether receiving environments and reference sites are more or less different, depending upon the specimen identification methods used. We hypothesize that, in some cases, species within genera or families will differ in their environmental tolerances (based upon prior research such as Beermann et al. 2018). Therefore, we predict that DNA-based methods will be more likely to yield differences among sites. Spatial analysis will also be performed to investigate the relative roles of dispersal limitation and environmental tolerances in structuring the aquatic communities (Shurin et al. 2009; Siqueira et al. 2012).

2) *Does the method used for specimen identification impact the biological variability among sub-samples from the same site?* Because DNA methods are expected to detect more species, including from damaged specimens and low-abundance species, we predict that overall variability among samples will be higher using DNA methods and considering all taxonomic groups, but that results will be similar between methods for common species.

3) *Do cryptic species display the same or different distribution patterns?* In other words, are cryptic species, and congeneric species more broadly, ecologically equivalent within the study systems? This question has yielded conflicting answers in the literature. For example, metacommunity patterns in freshwater insects—revealed by Martin et al. (2016) using DNA barcoding and a large sample size—suggest that species within genera are ecologically similar; variation in community composition at low taxonomic levels among samples (e.g. different species within genera) was less related to environmental factors in comparison with distributions of higher taxonomic groups (e.g. families). They suggested that close relatives are ecologically similar, in this temperate forest stream system and given the environmental variables measured. The presence of congenerics within a specific site was governed more by chance events (e.g.

flooding, recolonization events). By contrast, other researchers (including Pfenninger et al. 2007; Pfenninger and Nowak 2008; Beermann et al. 2018) have found evidence of structured communities among close relatives and subtly different environmental responses among related species of Chironomidae. Therefore, by addressing this question across multiple geographic sites and taxonomic groups, using consistent methods, we will contribute to eludicating the distribution patterns of cryptic species as well as congeneric and confamilial species.

4) *Does habitat type or geographic region influence our findings?* As our study will be conducted at four mine sites across Canada, we will have the opportunity to examine the generality of our findings.

Answering these questions will contribute new biological knowledge on the biodiversity, biogeography, and community ecology of Canadian freshwater invertebrates. Moreover, addressing these questions will enable industry partners to see the direct comparison and to consider moving towards DNA-based methods in the future. We have confirmed with Environment and Climate Change Canada representatives that, because we will achieve the same abundance-based endpoints as when using traditional identification methods, DNA-based identifications can be substituted for morphological identifications even now. This direct comparison is expected to increase trust in the methods by industry as well as government regulators. This work is also expected to be a stepping stone to using even higher-throughput sequencing methods in the future. Therefore, this study meets the NSERC-CRD guidelines in that new knowledge will be generated (i.e. biogeography, distributions of cryptic species, niche breadth), and existing knowledge (DNA barcoding technology) will be applied in an innovative manner for the benefit of Canadian industry and the environment.

3. Detailed proposal

This research will be performed at four metal mine sites located across central and western Canada: Snow Lake, Manitoba (Hudbay Minerals Inc.); Detour Mine, Ontario (Detour Gold Corporation); Côté Gold Mine, Ontario (IAMGOLD Corporation); and Young-Davidson Mine, Ontario (Alamos Gold Inc.). Two mines will be sampled in the fall of 2019 and two in fall 2020, with field sampling performed by environmental consulting companies hired by the mining companies. For each mine site, five benthic invertebrate samples will be taken using a ponar grab in the receiving environment and five in the paired reference site. Specimens will be preserved in DNA-friendly medium (ethanol). When available, up to 300 benthic invertebrate individuals will be identified per sample using traditional methods, and then the same specimens will be used for molecular analysis. DNA barcoding will be performed using standard methods: specimen photography, tissue sampling, DNA extraction, PCR, bidirectional Sanger sequencing, combining forward and reverse sequences into a consensus sequence per specimen, sequence alignment, and analysis. After clustering the sequences into Molecular Operational Taxonomic Units (molecular proxy for species), the same four endpoints (density, taxon richness, Simpson Index, and Bray-Curtis Index) will be calculated for the molecular data as for the morphological data. These metrics will be compared between the receiving and reference sites using ANOVA.

This research is highly feasible, as the front-end work follows standard protocols for the field work (following the governmental technical guidance document) and also standard protocols for the DNA barcoding. The **novelty arises in the geographic scale and replication of our study, how we are directly comparing identification methods, and how we will combine the data into novel analyses.** In addition to performing ANOVAs, a standard for EEM studies, we will build generalized linear mixed models to compare the molecular data to the traditional taxonomic data across study sites. We will build four separate models, with each of the four biodiversity endpoints from each sample in turn serving as the response variable. The predictor variables (fixed effects) will be the identification method (microscopy vs. DNA) and the type of site (reference vs. receiving). The geographic location will be designated as a random effect (i.e. we will control for location of the mine/reference pairings to focus in on examining the influence of identification method and potential anthropogenic impacts). We will also adapt models from metacommunity ecology (e.g. Shurin et al. 2009; Siqueira et al. 2012) to examine the relative influence of spatial (i.e. dispersal) and environmental (e.g. geological, water chemistry parameters) factors on taxon distributions, and we will test whether these conclusions vary between traditional taxonomic methods and DNA-based methods. We propose to adapt prior analytical approaches for our study design by incorporating distance to the reference site as a fixed predictor effect in the generalized linear mixed models, to investigate the influence of dispersal upon the community patterns of aquatic species. We expect our findings will be highly publishable in major journals in ecology, biogeography, and the environmental sciences.

4. Team expertise

The team has pointedly suitable expertise and experience to undertake the proposed research, and we are confident of success.

PI Dr. Sarah Adamowicz (Associate Professor, Department of Integrative Biology & Director, Graduate Program in Bioinformatics, University of Guelph) has published widely on DNA barcoding, freshwater biodiversity, biogeography, and molecular evolution in journals including *PNAS*, *GigaScience*, *Proceedings of the Royal Society B*, *Evolution*, and *Freshwater Science*. She has held $1.4M in grant funding and has supervised 18 graduate students, including students in both the Integrative Biology and Bioinformatics graduate programs. Dr. Adamowicz was recently conferred a Research Excellence Award from the University of Guelph. She has extensive experience in freshwater invertebrate sampling and DNA barcoding as well as a successful history of collaboration with industry. The research proposed here builds upon a successful NSERC Engage-funded collaboration with Stantec Consulting Ltd. As well, she has experience in graduate bioinformatics teaching and working in the R programming language and is therefore well poised to advise students in the analytical portions of this research.

Co-PI Dr. Robert Hanner (Associate Professor, Department of Integrative Biology) has an extensive publication history on DNA barcoding and its socio-economic applications, including for aquatic biomonitoring and food authentication. He has extensive experience in running a large molecular laboratory (including DNA barcoding, qPCR, and use of high-throughput sequencing technologies) and in HQP supervision (including 16 graduate students and 8 postdoctoral fellows). He has also led multiple successful research collaborations with industry, including with Detour Gold Corporation, who join us as a supporting partner for this application. Dr. Hanner has also led the creation of two spin-off companies, providing high-tech employment opportunities and advanced analytical services for Canadian companies. These companies are not involved as supporting partners here (to avoid conflict of interest), but these contributions demonstrate Dr. Hanner's commitment to applying academic innovations for the benefit of the Canadian economy and environment. Moreover, Drs. Adamowicz and Hanner currently co-supervise a graduate student together and have a history of productive, collegial collaboration, which will benefit this research project and the HQP who join as trainees.

This project will also benefit from the expertise of **two collaborators**. **Dr. Karl Cottenie** (Associate Professor, Department of Integrative Biology, Guelph, CV provided) has deep expertise in metacommunity ecology, multivariate biostatistics, and analytics in the R programming language. He will serve as a co-Advisor or Advisory Committee Member for the MSc students involved in this project. **Dr. Mario Thomas** (CEO, Precision Biomonitoring Inc., CV provided) has extensive experience in the biotechnology industry and in transforming scientific innovations into applications. He will contribute to a business-oriented report from this research, to ensure that technology adoption will proceed beyond the funding period.

This project also relies on successful collaboration with the **seven industry partners**. Drs. Adamowicz and Hanner already have a successful history of collaboration with Stantec, Detour, and Alamos. The relationships and trust built up were important for expanding to the present proposal. As outlined in the "Contributions from Supporting Organizations" document, each participating company has designated at least one person to participate directly in this collaboration. Here, we particularly highlight the contributions of **Helga Sonnenburg**, the Principal and Founder of Ecological and Regulatory Solutions Inc. In the fall of 2018, she has already collected specimens for this consortium; these have been preserved in ethanol, identified by a taxonomic expert, and transferred to the University of Guelph to await molecular analysis. Another critical partner is **Mary Murdoch**, a Senior Principal Consultant with Stantec. For the past seven years, Ms. Murdoch has been a vital partner in the transfer of DNA barcoding knowledge and methodology to the private sector. This has included participating in a successful NSERC Engage-funded project with Dr. Adamowicz, undertaking an ongoing collaboration to develop environmental DNA assays in partnership with Dr. Hanner and Precision Biomonitoring Inc., and convincingly communicating with her industrial clients (e.g. in mining) about the value of exploring DNA-based methods for biodiversity surveys and monitoring. Ms. Murdoch and Dr. Adamowicz also jointly presented a conference talk at the CIM Congress in 2018 (Canadian Institute of Mining, Metallurgy, and Petroleum Annual Congress). We expect that this prior history of successful collaboration will continue and will ensure our success.

5. Research management

The academic and industry participants in this collaboration will be involved in quarterly phone meetings to maintain good communication throughout this project. Additionally, academic partners will meet in person at least once with each industry partner, either at the mine site or at a conference of mutual interest. After the 2019 and 2020 fall field collections, specimens will be identified by a taxonomic expert either within or hired by the consulting company and then passed to the academic collaborators for DNA barcoding using standard methods and statistical analysis. The consortium members also plan to collaborate to prepare and deliver a coauthored conference presentation and a coauthored journal article.

6. Training of highly qualified personnel

This project will involve the training of at least **eight HQP**, spanning various academic and career stages.

Two Undergraduate Summer Research Assistants (USRAs), one in each of the first two years, will be hired for this project. The students will gain training in and will assist with specimen photography, tissue sampling, and molecular analysis (DNA extraction, PCR, trouble shooting). The USRAs will interact regularly with the graduate students (particularly MSc #1) and partners. Depending upon their interests and aptitudes, the USRAs will also have the opportunity to expand their summer work into an undergraduate Honours thesis project related to the overall research program. Example Honours projects include comparative phylogeography and comparative population genetics, across multiple taxonomic groups.

This project will also involve **five Masters students**. **MSc #1** would pursue a two-year, thesis-based degree through the Department of Integrative Biology and would focus upon addressing questions #1 and #2 detailed above. This student will gain training in specimen preparation, molecular bench work, and statistical analysis and data visualization using the R language. MSc #1 will also be supported to participate in field sampling. A student in the course-based **Master of Bioinformatics** program will be hired through the Work-Study program to assist with data analysis, in collaboration with MSc #1 and other partners. Specifically, the student will address the issue of data inter-operability, coding a pipeline to reshape and transform the data from the industry partners (based upon morphological identification) into tidy format that is compatible with the data from the DNA-based pipeline, enabling joint analysis of both data types. This would be a valuable work experience in data science and collaboration for a student in this program. **MSc positions #2 and #3** would be suitable for students pursuing the MSc in Bioinformatics program, and each will devote one year of research time to this project. MSc #2 will focus on question #3, building an analytical pipeline to automate metacommunity analysis across multiple hierarchical levels (e.g. spatial levels, taxonomic levels, molecular clustering thresholds). This project will also involve a meta-analysis component, using consistent analytical methods applied to publicly available community datasets to elucidate generalities in the distribution patterns of closely-related species. In addition to yielding fundamental new ecological knowledge, the results of this work will be important for future incorporation of DNA methods into EEM and other biomonitoring programs. For example, should we cluster sequences above the level of the evolutionary species (e.g. perhaps at 5% rather than 2%) in order to detect community-level environmental responses most reliably, rather than random noise? MSc #3 will develop an R Markdown document to automate the process of report writing for EEMs, with morphological identifications, site information, and DNA sequences being the input data; and automated pipeline will conduct statistical analysis and prepare commonly-needed graphics to help to increase the speed of conducting EEMs using molecular data and improving costs going forward. This project would be ideally suited for a student with interests in bioinformatics and business. Finally, our project will incorporate a **Master of Biotechnology** student (a course-based program which combines molecular biotechnology and business themes). This individual will conduct a summer project in collaboration with the PIs, other HQP, industry partners, and collaborator Dr. Mario Thomas to prepare a business plan for DNA-based EEMs.

Finally, this project will involve **one postdoctoral fellow** (PDF) in year three of this project, to focus upon question #4 and helping with the preparation of a synthesis paper harmonizing the findings from this research. We also anticipate at least three publications on the detailed projects.

All HQP will have the opportunity to participate in planning discussions and quarterly meetings with the industry partners. All HQP will also have the opportunity to participate in a suitable conference at the local (USRA), national (Masters students), or international (PDF) levels. These HQP positions are outstanding opportunities for trainees interested in biodiversity, ecology, freshwater resources, population genetics, and molecular analysis tools. These opportunities would be valuable for HQP interested in a career in consulting, environmental management within industry (e.g. mining), governmental environment agencies, as well as academia. Previous graduate students from both the Adamowicz and Hanner labs have gone on to a professional career in environmental consulting.

7. Industrial Relevance and Benefits

Mining partners — As outlined in their letters of support, the four mining partners in this project are immediately interested in the benefits of this research in terms of efficiency and cost effectiveness of their Environmental Effects Monitoring (EEM) programs. As federally mandated, mining companies must undertake cyclical EEMs throughout the active life cycle of each mine. Currently, benthic specimen identification is performed using microscopy, but the partners are interested in the efficiency and cost savings that can result from using molecular methods. Moreover, the companies have needs to conduct biodiversity assessments at other phases, such as establishing baseline information prior to commencing mine operations as well as during mine closure and reclamation activities, as also mentioned in their letters of support. Therefore, participating in this consortium project will enable the companies to gain experience with a DNA-based research project, and this could open doors for future adoption of molecular methods for their other biodiversity survey activities. Immediately following project completion, we anticipate that the companies will be interested in switching to molecular methods for their EEMs, with the benefits including efficiency, cost savings, and increased objectivity of the biodiversity data. **The market for high-quality, affordable environmental services is already present in Canada**, because cyclical EEMs are required of all mines and pulp-and-paper sites, as per federal regulations. The environmental managers also would like to contribute to knowledge about Canadian biodiversity and to the protection of water and fisheries resources. Additionally, better data can contribute to avoiding catastrophic environmental outcomes and negative press coverage, preserving a company's reputation and the legal and social license to operate in Canada and internationally.

Environmental consultants — The collaborating environmental consulting companies also will see benefits from this collaboration. Currently, conducting EEMs using microscopy-based specimen identification can pose a challenge in terms of human resources, as there are becoming fewer trained taxonomic specialists in Canada. Moreover, microscopy-based biodiversity assessments are both time consuming and expensive, which can be a challenge in terms of meeting reporting deadlines for client projects. Consulting companies are interested in the likely benefits of DNA-based methods in terms of cost and efficiency. They will also benefit from access to DNA-validated reference specimens, to be used for training staff involved with morphological identification. Moreover, consultants have expressed interest in being able to offer a wide range of technically-advanced services to their diverse clients that span multiple industrial sectors, in partnership with high-throughput molecular facilities. Therefore, in addition to delivering their current EEM projects more efficiently, consulting companies also anticipate securing additional clients in Canada and internationally by offering a wider variety of cutting-edge methods than typically used in the environmental consulting sector.

8. Benefits to Canada

This collaboration involves four mining partners and three consulting companies. However, there are 80 mines across Canada as well as 120 pulp-and-paper sites that are governed by the federal effluents regulations and hence must complete cyclical EEMs. Therefore, the potential market for DNA-based EEM service provision is large. By presenting at relevant industry conferences, we plan to spread knowledge about how DNA-based methods can be applied in EEMs. Therefore, the impact of this research is expected to have **broad implications across Canada in terms of both the <u>efficiency</u> and the <u>quality</u> of EEMs, for the benefit of the Canadian economy and environment.** In addition to the domestic market for biotechnology services, this research will enable Canada to stay at the cutting-edge of methods for biodiversity surveys, opening new opportunities for the provision of environmental services for international projects.

9. University support

The bench portion of this research will be carried out in a laboratory shared by the PIs, which is well equipped with microscopes, freezers, and molecular research equipment. Additional molecular infrastructure is available through the Advanced Analysis Centre and the Canadian Centre for DNA Barcoding on campus, such as liquid handling robotics for high-throughput DNA extraction, PCR, and sequencing. Standard research support will be provided through the University (e.g. field and lab safety training and documentation, support from the Office of Research for research reporting, etc.). The graduate students will hold one Teaching Assistantship per year in the Department of Integrative Biology to augment their stipends. Additionally, direct University support for this project will include a contribution to research costs through the College of Biological Science, valued at $5,500 per year per eligible domestic MSc student. These funds will be used to support additional opportunities for the HQP, such as participation in a conference or training workshop. These funds will also allow some flexibility in the research, such as to purchase additional reagents to explore interesting findings in more depth. A potential example would be sequencing a complementary molecular marker in the case of unexpected findings using COI from a particular sample. In summary, this project is highly feasible and can be readily carried out by the PIs and collaborating partners, with the facilities and support of the University and for the benefit of the Canadian economy and environment.

Sarah Adamowicz

Form 101 - Application for a Grant

References

References

REFERENCES

Adamowicz SJ. 2015. International Barcode of Life: Evolution of a global research community. *Genome*, 58: 151–162.

Adamowicz SJ, Steinke D. 2015. Increasing global participation in genetics research through DNA barcoding. *Genome*, 58: 519–526.

Adamowicz SJ, Hollingsworth PM, Ratnasingham S, van der Bank M. 2017. International Barcode of Life: Focus on big biodiversity in South Africa. *Genome*, 60: 875–879.

Beermann AJ, Zizka VMA, Elbrecht V, Baranov V, Leese F. 2018. DNA metabarcoding reveals the complex and hidden responses of chironomids to multiple stressors. *Environmental Sciences Europe*, 30: 26.

Cahill AE, Pearman JK, Borja A, Carugati L, Carvalho S, Danovaro R, Dashfield S, David R, Féral J-P, Olenin S, Šiaulys A, Somerfield PJ, Trayanova A, Uyarra MC, Chenuil A. 2018. A comparative analysis of metabarcoding and morphology-based identification of benthic communities across different regional seas. *Ecology and Evolution*, 8: 8908–8920.

Cristescu ME. 2014. From barcoding single individuals to metabarcoding biological communities: towards an integrative approach to the study of global biodiversity. *Trends in Ecology & Evolution*, 29: 566–571.

Cywinska A, Hunter FF, Hebert PDN. 2006. Identifying Canadian mosquito species through DNA barcodes. *Medical and Veterinary Entomology*, 20: 413–424.

Ekrem T, Stur E, Hebert PDN. 2010. Females do count: Documenting Chironomidae (Diptera) species diversity using DNA barcoding. *Organisms Diversity & Evolution*, 10: 397–408.

Elbrecht V, Leese F. 2017. Validation and Development of COI Metabarcoding Primers for Freshwater Macroinvertebrate Bioassessment. *Frontiers in Environmental Science*, 5: 11.

Elbrecht V, Steinke D. 2019. Scaling up DNA metabarcoding for freshwater macrozoobenthos monitoring. *Freshwater Biology*, 64: 380–387.

Environment and Climate Change Canada, Government of Canada. 2012. *Metal Mining Technical Guidance for Environmental Effects Monitoring*. 550 pages.

Hajibabaei M, Shokralla S, Zhou X, Singer GAC, Baird DJ. 2011. Environmental Barcoding: A Next-Generation Sequencing Approach for Biomonitoring Applications Using River Benthos. *PLoS ONE* 6: e17497.

Hebert PDN, Cywinska A, Ball SL, deWaard JR. 2003. Biological identifications through DNA barcodes. *Proceedings of the Royal Society of London B*, 270: 313–321.

Hubert N, Hanner R. 2015. DNA Barcoding, species delineation and taxonomy: a historical perspective. *DNA Barcodes*, 3: 44–58.

Lin X, Stur E, Ekrem T. 2015. Exploring Genetic Divergence in a Species-Rich Insect Genus Using 2790 DNA Barcodes. *PLoS ONE*, 10: e0138993.

Martin GK, Adamowicz SJ, Cottenie K. 2016. Taxonomic resolution based on DNA barcoding affects environmental signal in metacommunity structure. *Freshwater Science*, 35: 701–711.

Overdyk LM, Holm E, Crawford SS, Hanner RH. 2016. Increased taxonomic resolution of Laurentian Great Lakes ichthyoplankton through DNA barcoding: A case study comparison against visual identification of larval fishes from Stokes Bay, Lake Huron. *Journal of Great Lakes Research*, 42: 812–818.

Pfenninger M, Nowak C. 2008. Reproductive Isolation and Ecological Niche Partition among Larvae of the Morphologically Cryptic Sister Species *Chironomus riparius* and *C. piger*. *PLoS ONE*, 3: e2157.

Pfenninger M, Nowak C, Kley C, Steinke D, Streit B. 2007. Utility of DNA taxonomy and barcoding for the inference of larval community structure in morphologically cryptic *Chironomus* (Diptera) species. *Molecular Ecology*, 16: 1957–1968.

Porter TM, Hajibabaei M. 2018. Scaling up: A guide to high-throughput genomic approaches for biodiversity analysis. *Molecular Ecology*, 27: 313–338.

Rivera J, Currie DC. 2009. Identification of Nearctic black flies using DNA barcodes (Diptera: Simuliidae). *Molecular Ecology Resources*, 9 (Suppl. 1): 224–236.

Ruiter DE, Boyle EE, Zhou X. 2013. DNA barcoding facilitates associations and diagnoses for Trichoptera larvae of the Churchill (Manitoba, Canada) area. *BMC Ecology*, 13: 5.

Shurin JB, Cottenie K, Hillebrand H. 2009. Spatial autocorrelation and dispersal limitation in freshwater organisms. *Oecologia*, 159: 151–159.

Siqueira T, Bini LM, Roque FO, Cottenie K. 2012. A Metacommunity Framework for Enhancing the Effectiveness of Biological Monitoring Strategies. *PLoS ONE*, 7(8): e43626.

Xiong W, Li J, Yang Y, Wang W, Shan B, Zhan A. 2018. Data collected in an integrated ecological survey of rotifer communities and corresponding environmental variables in the highly polluted Haihe River Basin, China. *Data in Brief* 17: 141–147.

Xiong W, Yang Y, Zhan A. 2019. Family-level surrogates are too coarse to assess environment-community interactions: A response to Jiang et al. (2019). *Ecological Indicators*, 102: 466–468.

Zhou X, Adamowicz SJ, Jacobus LM, DeWalt, RE, Hebert PDN. 2009. Towards a comprehensive barcode library for arctic life - Ephemeroptera, Plecoptera, and Trichoptera of Churchill, Manitoba, Canada. *Frontiers in Zoology*, 6: 30.

Zhou X, Jacobus LM, DeWalt RE, Adamowicz SJ, Hebert PDN. 2010. Ephemeroptera, Plecoptera, and Trichoptera faunas of Churchill (Manitoba, Canada): insights into biodiversity patterns from DNA barcoding. *Journal of the North American Benthological Society*, 29: 814–837.

Zhou X, Robinson JL, Geraci CJ, Parker CR, Flint OS, Jr., Etnier DA, Ruiter D, DeWalt RE, Jacobus LM, Hebert PDN. 2011. Accelerated construction of a regional DNA-barcode reference library: caddisflies (Trichoptera) in the Great Smoky Mountains National Park. *Journal of the North American Benthological Society*, 30: 131–162.

Personal identification no. (PIN)	Family name of applicant
Valid 236726	Adamowicz

INTELLECTUAL PROPERTY

Complete this section if you need to discuss the plans for protecting and disposing of intellectual property arising from the grant. Do not exceed one page.

The Supporting Organizations agree to NSERC's Policy on Intellectual Property. The Supporting Organizations and the University will enter into an agreement that addresses the following requirements:

Intellectual Property (IP): Any IP arising from this research project will be owned in accordance with the University's policies and collective agreements. Arising IP will be disclosed to Supporting Organizations and if a patent is filed, the University will grant to the Supporting Organizations an opportunity to negotiate a license to arising IP.

Rights for Future Research and Teaching: There is no limitation on the University's use of knowledge or IP arising from the proposed research, for non-commercial purposes of teaching and future research.

Publications: For greater certainty, the University will not be restricted from making any publications for the purposes of presenting the methods and results of the research project, including without limitation presenting at conferences or professional meetings, or from publishing in abstracts, journals, theses, or dissertations whether in printed or electronic media. There shall be no delay in the review and defense of a student's thesis.

Confidentiality: The proprietary and confidential information/assets of all participants will be protected and will not be inadvertently disclosed or published without the express written consent of the applicable participant(s).

Curriculum Vitae

(Abridged Version)

SARAH J. ADAMOWICZ, ASSOCIATE PROFESSOR

CONTACT INFORMATION

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Website:	https://www.uoguelph.ca/ib/adamowicz

EDUCATION

PhD **2006** **Imperial College London**, University of London, UK
Thesis title: *Diversity and Direction: Macroevolution of the Crustacea.*
Advisor: Dr. Andy Purvis

MSc **2002** **University of Guelph**, Canada
Thesis title: *Intercontinental Dispersal, Biogeography, and Speciation in a Freshwater Zooplankter: Investigations of the Daphnia of Argentina.*
Advisor: Dr. Paul D.N. Hebert

BSc (Honours) **1998** **Dalhousie University**, Canada
Thesis title: *Ecological gradient analysis of forest plant communities at Kejimkujik National Park.*
Advisor: Dr. Cynthia A. Staicer

ACADEMIC AND RESEARCH APPOINTMENTS

2019— **Director, Graduate Program in Bioinformatics**
University of Guelph

2016— **Associate Professor**
Department of Integrative Biology & Biodiversity Institute of Ontario, University of Guelph, Guelph, Ontario, Canada.

2009-2016 **Assistant Professor**
Department of Integrative Biology & Biodiversity Institute of Ontario, University of Guelph, Guelph, Ontario, Canada. (parental leaves taken in 2010/11 and 2013/14)

2006-08 **NSERC Post-Doctoral Fellow** (Advisor: Dr. Jonathan Witt)
Department of Biology, University of Waterloo, Waterloo, Ontario, Canada.

RESEARCH PROGRAM OVERVIEW

My research is motivated by the aspiration to understand the mechanisms underlying the evolution and maintenance of biodiversity. My students and I focus on five primary areas of investigation: 1) molecular evolution, such as tests for associations between rates of molecular evolution, biological traits, and environment; 2) tree of life and large-scale patterns in diversification; 3) biodiversity and evolutionary community ecology of Arctic biomes; 4) ancient lakes as study systems for evolutionary diversification; and 5) development of bioinformatics pipelines and methods for the large-scale analysis of biodiversity data. We have a particular focus on aquatic invertebrate life and Arctic biodiversity; we also conduct taxonomically broad research through data mining and developing novel bioinformatics pipelines and software. Our work has additionally involved collaboration with private-sector partners to bring molecular tools to the delivery of environmental effects monitoring programs for freshwaters. We also contribute to building large molecular datasets as part of the International Barcode of Life project, and we make use of these public data for both discovery-oriented and hypothesis-driven biodiversity science.

SELECTED RECENT PUBLICATIONS (OF 53)

(Students that I have advised are underlined.)

51. Young RG, Mitterboeck TF, Loeza-Quintana T, **Adamowicz SJ.** 2018. Rates of molecular evolution and genetic diversity in European vs. North American populations of invasive insect species. *European Journal of Entomology*. 115: 718-728. (doi: 10.14411/eje.2018.071)

50. Loeza-Quintana T, Carr C, Khan T, Bhatt Y, Lyon S, Hebert PDN, **Adamowicz SJ**. 2019. Recalibrating the molecular clock for Arctic marine invertebrates based on DNA barcodes. *Genome*. (doi: https://doi.org/10.1139/gen-2018-0107)

49. Ekrem T, Stur E, Orton MG, **Adamowicz SJ**. 2018. DNA barcode data reveal biogeographic trends in Arctic non-biting midges. *Genome*. 61(11): 787-796. (doi: https://doi.org/10.1139/gen-2018-0100)

48. Orton MG, May JA, Ly W, Lee DJ, **Adamowicz SJ.** 2018. Is molecular evolution faster in the tropics? *Heredity*. (doi: https://doi.org/10.1038/s41437-018-0141-7)

47. Adamowicz SJ, Marinone MC, Menu-Marque S, Allen DC, Martin JW, Pyle MN, De los Ríos-Escalante PR, Sobel CN, Ibañez C, Pinto J, Witt JDS. 2018. The *Hyalella* (Crustacea: Amphipoda) species cloud of the ancient LakeTiticaca originated from multiple colonizations. *Molecular Phylogenetics and Evolution*. 125, 232-242. (doi: https://doi.org/10.1016/j.ympev.2018.03.004)

46. Loeza-Quintana T, **Adamowicz SJ**. 2018. Iterative calibration: a novel approach for calibrating the molecular clock using complex geological events. *Journal of Molecular Evolution*. 86(2): 118-137. (doi: https://doi.org/10.1007/s00239-018-9831-2)

45. Gibson DJ, **Adamowicz SJ**, Jacobs SR, Smith MA. 2018. Host specificity in sub-Arctic aphids. *Environmental Entomology*. 47(1): 77-86. (doi: https://doi.org/10.1093/ee/nvx176)

43. Mitterboeck TF, Liu S, **Adamowicz SJ**, Fu J, Zhang R, Song W, Meusemann K, Zhou X. 2017. Positive and relaxed selection associated with flight evolution and loss in insect transcriptomes. *GigaScience*, 6(10), 1-14. (doi: https://doi.org/10.1093/gigascience/gix073)

42. Young RG, Abbott CL, Therriault TW, **Adamowicz SJ**. 2017. Barcode-based species delimitation in the marine realm: a test using Hexanauplia (Multicrustacea: Thecostraca and Copepoda). *Genome*, 60(2): 169-182. (doi: 10.1139/gen-2015-0209)

41. Vamosi JC, Gong Y-B, **Adamowicz SJ**, Packer L. 2017. Forecasting pollination declines through DNA barcoding: the potential contributions of macroecological and macroevolutionary scales of inquiry. *New Phytologist*, 214(1): 11-18. (doi: doi.org/10.1111/nph.14356)

39. Mitterboeck TF, Fu J, **Adamowicz SJ**. 2016. Rates and patterns of molecular evolution in freshwater vs. terrestrial insects. *Genome*. 59(11): 968-980. (doi: 10.1139/gen-2016-0030)

38. Mitterboeck TF, Chen AY, Zaheer OA, Ma EYT, **Adamowicz SJ**. 2016. Do saline taxa evolve faster? Comparing relative rates of molecular evolution between freshwater and marine eukaryotes. *Evolution.* 70(9): 1960-1978. (doi: 10.1111/evo.13000)

37. Bringloe TT, Cottenie K, Martin GK, **Adamowicz SJ**. 2016. The importance of taxonomic resolution for additive beta diversity as revealed through DNA barcoding. *Genome*, 59(12): 1130-1140. (doi: 10.1139/gen-2016-0080)

35. Bringloe TT, **Adamowicz SJ**, Harvey VFI, Jackson JK, Cottenie K. 2016. Detecting signatures of competition from observational data: a novel approach combining DNA barcoding, diversity partitioning, and checkerboards at small spatial scales. *Freshwater Biology*, 61(5): 646-657. (doi:10.1111/fwb.12732)

34. Martin GK, **Adamowicz SJ**, Cottenie K. 2016. Taxonomic resolution based on DNA barcoding affects environmental signal in metacommunity structure. *Freshwater Science.* 35(2):701–711. (doi: 10.1086/686260)

32. Adamowicz SJ, Steinke D. 2015. Increased global participation in genetics research through DNA barcoding. *Genome*. 58: 519-526. (doi: dx.doi.org/10.1139/gen-2015-0130)

31. Adamowicz SJ. 2015. International Barcode of Life: Evolution of a Global Research Community. *Genome*. 58: 151-162. (Invited; doi: dx.doi.org/10.1139/gen-2015-0094)

30. Boyle EE, **Adamowicz SJ**. 2015. Community phylogenetics: assessing tree reconstruction methods and the utility of DNA barcodes. *PLoS One*. 10(6): e0126662.

SELECTED INVITED SEMINARS

Adamowicz SJ. 2018. Relationships: The Tree of Life. **Invited Presentation as recipient of Research Excellence Award**, University of Guelph, Guelph, Ontario, Canada. April 11, 2018.

Adamowicz SJ. 2018. DNA barcoding and the molecular clock. Biostatistics Seminar Series, University of Guelph, Guelph, Ontario, Canada. March 13, 2018.

Adamowicz SJ. 2017. DNA barcoding and the origin of species. McMaster University, Hamilton, Ontario, Canada. November 2, 2017.

Adamowicz SJ. 2017. Understanding Arctic biodiversity through DNA barcoding. Symposium — Canada's Arctic Biodiversity: The Next 150 Years. Canadian Museum of Nature, Ottawa, Canada. January 27, 2017.

Adamowicz SJ. 2016. DNA barcoding and the origin of species. McGill University, Montreal, Quebec, Canada. November 17, 2016.

Adamowicz SJ. 2016. DNA barcoding and the origin of species. Université du Québec à Montréal, Quebec, Canada. March 23, 2016.

Adamowicz SJ. 2016. DNA barcoding and the origin of species. Trent University, Peterborough, Ontario, Canada. Feb. 24, 2016.

RESEARCH FUNDING

Overview of Research Funding

I have been awarded a total of $1.4M in research funding, including a balance of operating and infrastructure funds. Key operating grants include two NSERC Discovery Grants, support through an NSERC Strategic Network (as a co-PI), an NSERC Engage Grant, and a $500K grant in Bioinformatics and Computational Biology from Genome Canada. I also received a CFI infrastructure award of $300K, enabling me to establish a well-equipped molecular laboratory as well as to purchase field and microscopy equipment. My graduate training program, which has involved 3-7 graduate students each year since 2010, has also been internally supported through co-funding from the College of Biological Science. Research capacity and collaboration has also been greatly enhanced by the high quality of students who have joined my research group. For example, my graduate students have been awarded NSERC Scholarships (F. Mitterboeck, T. Bringloe), Ontario Graduate Scholarships (T. Mitterboeck, T. Bringloe), the Queen Elizabeth II Graduate Scholarship in Science and Technology (M. Merilo, G. Martin), and a large doctoral scholarship from CONACYT, the Mexican National Council for Science and Technology (T. Loeza Quintana).

Grants Awarded

Start – End	**PIs**	**Agency**	**Title**	**Amount[1]**
2018-2021	Adamowicz PI (Hebert co-PI, + 3 co-applicants)	Genome Canada and Ontario Ministry of Research & Innovation	*Extracting Signal from Noise: Big Biodiversity Analysis from High-Throughput Sequence Data*	$507K
2016-2021	Adamowicz	NSERC Discovery	*Life in transition: the evolutionary consequences of ecological and habitat shifts*	$140K
2014-2016	Adamowicz, for student M. Pyle	College of Biological Science, UGuelph	Graduate stipend co-funding for MSc project: *Insights into post-glacial colonization of northern environments*	$13.5K
2013	Adamowicz	NSERC Engage	*Incorporating DNA Barcoding into Environmental Effects Monitoring Projects*	$24.5K
2012–2013	Adamowicz, Hajibabaei & Smith	CFI Leaders Opportunity Fund & MRI[2]	*Integrative & Innovative Biodiversity Analysis from the Tundra to the Tropics*	$924K ($308K[1])
2013	Adamowicz, for student T. Bringloe	College of Biological Science, UGuelph	International travel award for MSc project: *Hierarchical spatial structuring of stream insect diversity through DNA barcoding*	$4.2K
2012–2014	Adamowicz, for student F. Mitterboeck	Department of Integrative Biology & College of Biological Science, UGuelph	Co-funding for PhD Scholarship: *Patterns of molecular evolution associated with repeatedly evolved traits*	$12.5K
2011–2012	Adamowicz, for student M. Merilo	College of Biological Science, UGuelph	Graduate stipend co-funding for MSc project: *DEEPR: A Dirichlet-multinomial randomization test for estimating relative coevolutionary event differences between groups of symbiotic species*	$12.5K
2010–2015	MacIsaac and	NSERC network	*NSERC Canadian Aquatic Invasive Species*	$5M

	27 others		*Network*	($150K[1])
2011–2013	Hebert and 16 others	ORF[3]	*International Barcode of Life Project: Bringing Genomics to Biodiversity*	$8.08M ($36K[1])
2010–2016	Adamowicz	NSERC Discovery	*Arctic Biodiversity and Evolutionary Community Structure*	$169K
2009	Adamowicz	Churchill Northern Studies Centre	*Freshwater Biodiversity of Churchill*	$500
2009	Adamowicz	UGuelph Start-up	*Evolution of Biodiversity Laboratory*	$10K
Total to my research group:				**$1.4M**

[1] Amount to my lab in cases of group grants; Canadian dollars**.**

[2] MRI- Ministry of Research and Innovation, Ontario, Canada.

[3] Ontario Research Fund of the Ontario Ministry of Research and Innovation

SELECTED HONOURS AND AWARDS

Period	Value	Award
2017	$5,000	Research Excellence Award, University of Guelph
2006 – 2008	$80,000	Natural Sciences and Engineering Research Council of Canada Post-doctoral Fellowship (NSERC, PDF)

STUDENT SUPERVISION 2009-2019

- 1 Postdoctoral Fellow
- 1 Research Technician
- 4 PhD students in Integrative Biology
- 2 PhD students in Bioinformatics
- 6 MSc students (thesis program) in Integrative Biology
- 3 MSc students (thesis program) in Bioinformatics
- 5 Major Research Projects for Master of Bioinformatics students
- 33 undergraduate Honours thesis students and summer students

TEACHING

Arctic Ecology BIOL*4610
Topics in Bioinformatics BINF*6890
Software Tools for Biological Data Analysis and Organization BINF*6210

College of Biological Science,

Integrative Biology

Robert Harland Hanner

CURRICULUM VITAE

RESEARCH INTERESTS

- Molecular Biology, DNA Barcoding, Forensics, Molecular Diagnostics, Natural History Collections, Standards Development, Translational Taxonomy, Systematics, Quality Assurance/Quality Control

EDUCATION AND DEGREES:

- Ph.D. University of Oregon. USA, Eugene, OR, Evolutionary Biology, 1997
- B.S. Eastern Michigan University, Michigan, Biology, 1992

RECENT EMPLOYMENT HISTORY:

- Associate Professor, University of Guelph (2011 - Present), Guelph, Ontario.
- Assistant Professor, University of Guelph (2005. - 2011), Guelph, Ontario.
- Associate Director, Canadian Barcode of Life Network, University of Guelph (2005. - 2011), Guelph, Ontario.

TENURE STATUS

Tenured

RELEVANT RESEARCH FUNDING RECEIVED:

2019-2020: Environmental DNA (eDNA), meta-barcoding and transcriptional profiling to improve sustainability of freshwater fisheries and fish culture. (Pending). Co-Investigator, GOV-Agriculture and Agri-food Canada AFC and GOV-GENOME CANADA

2019-2020: Understanding Molecular DNA Tools and the Integrated Energy Network. ($65,000.00). Principal Investigator, LIMNOTECH, Inc.

2019-2020: Genomic Applications for Plant and Animal Health. ($600,000.00) Principal Investigator, GOV- CANADIAN FOOD INSPECTION AGENCY.

2019-2020: Point-of-Need qPCR assay for pathogens of concern in commercial greenhouse operations. ($20,000). Principal Investigator, Ontario Agri-Food Innovation Alliance

2018-2019: Adding value: DNA authenticity for Ontario meat products ($140,000.00 Pending), Principal Investigator, GOV-OMAFRA.

2017-2023: Developing Genomics Tools as Indicators of Soil Health and Sustainable Productive Agriculture ($474,887.00), Co-Principal Investigator, GOV-NSERC collaborative research & development grant.

2017-2019: Point-of-need molecular biomonitoring of aquatic species Phase IIa ($123,700.00), Principal Investigator, GOV-NSERC IDEA TO INNOVATION (I2I).

2017-2018: Point-of-need molecular biomonitoring of aquatic organisms and pathogens ($125,000.00), Principal Investigator. Ontario Centres of Excellence. OCE Voucher for Innovation and Productivity (VIP) II

2017-2018: Genomic Applications for Species Identification ($300,000.00), Principal Investigator, GOV-CANADIAN FOOD INSPECTION AGENCY. Federal Assistance Partnership (FAP) Program.

PUBLICATIONS / PRESENTATIONS

Books

- *Naaum, A. & Hanner, R. (eds.) (2016). *Seafood Authenticity and Traceability: a DNA Based Perspective* Academic Press, Elsevier Inc. (Editor)

Articles

- *Loeza-Quintana, L. & Hanner, R. (submitted 2019). Environmental DNA detection of endangered and invasive species in Kejimkujik National Park and Historic Site. Initial submission to *Environmental DNA*. .

- Madden, M., Young, R., Brown, J., Miller, S., *Frewin, S., Hanner, R. (submitted 2019). Efficacy of DNA barcoding to improve invasive pest identification at U.S. ports-of-entry. *Plos One.*
- *Blair, J., *Gwiazdowski, R., *Borrelli, A., *Hotchkiss, M., *Park, C., *Perrett, G., Hanner, R. (in press 2019). Toward a catalogue of biodiversity databases: An ontological case study. *Biodiversity Data Journal.*
- *Shehata, H., *Bourque, D., Steinke, D., Chen, S., & Hanner, R. (2019). Survey of mislabelling across finfish supply chain reveals mislabelling both outside and within Canada. *Food Research International, 121*, 723-729.
- Newmaster, S., Shanmughanandhan, D., Kesanakurti, P., *Shehata, H., *Faller, A., Della Noce, I., Lee, J. Y., Rudzinski, P., Lu, Z., Zhang, Y., Swanson, G., Hanner, R., Ragupathy, S. (2019). Recommendations for Validation of Real-Time PCR Methods for Molecular Diagnostic Identification of Botanicals. *Journal of AOAC International*. doi: 10.5740/jaoacint.18-0321.
- *Shehata, H., *Naaum, A., *Chen, S., *Murphy, T., *Li, J., Shannon, K., Awmack, A. Locas, Hanner, R. (2019). Re-visiting the occurrence of undeclared species in sausage products sold in Canada. *Food Research International*, doi: doi.org/10.1016/j.foodres.2019.01.030.
- Skinner, M., Murdoch, M., *Loeza-Quintana, T., *Crookes, S., & Hanner, R. (2019). A comparison of laboratory land field-based eDNA solutions for detection and quantification of striped bass (Morone saxatilis) in marine ecosystems. Initial submission to *Environmental DNA*.
- Tarof, S., *Crookes, S., *Loeza-Quintana, T., & Hanner, R. (2019). Environmental DNA Bioassays Corroborate Field Data for Detection of Overwintering Species at Risk Blanding's Turtles (Emydoidea blandingii). Initial submission to *Environmental DNA*.
- *Morey, K. & Hanner, R. (2019). "Validating environmental DNA metabarcoding for marine fishes in diverse ecosystems using a public aquarium," Initial submission to *Environmental DNA*.
- *Crookes, S. & Hanner, R. (2019). "Multiple repositories of environmental DNA: triple source detection of the Endangered Jefferson salamander Ambystoma jeffersonianum," Initial submission to *Environmental DNA*.
- Gec, P., MacDonald, C., Mason, B., McIsaac, D., Nicholson, A., Rein, W., Wrobel, J., Hanner, R., (2019). Metadata for eDNA: what is being reported? Initial submission to *Environmental DNA*.
- *Shehata, H., *Naaum, A., *Chen, S., *Murphy, T., *Li, J., Shannon, K., Awmack, A., Locas, A., Hanner, R. (2019). Re-visiting the occurrence of undeclared species in sausage products sold in Canada. *Food Research International*, 121, 723-729.
- *Crookes, S., Sollen, J., *Naaum, A., *Loeza-Quintana, T., Tosh, M., Hanner, R., (2018). A practical pipeline to conduct environmental DNA (eDNA) surveys in real-time to facilitate the rapid assessment of aquatic taxa. Initial submission to *Biology Letters*.
- Riley, J., Stewart, D., Murdoch, M., Hanner, R., *Crookes, S., Thomas, M., (2018). Environmental DNA – Real Time Results in the Field to Confirm the Presence of Target Species. Initial submission to *Right of Way Conference*.
- *Shehata, H., *Bourque, D., Steinke, D., Chen, S., & Hanner, R. (2018). Survey of mislabelling in seafood supply chain reveals mislabelling both outside and within Canada. *Food Research International, 121*, 723-729.
- *Bourque, D., Bradley, D., Daley, J., Patrick, P., Hanner, R., *Naaum, A. (2018). Real-time PCR Assays for Identification of Commonly Entrained Freshwater Species from the Great Lakes. *Conservation Genetics Resources*, 1-6.
- *Shehata, H., *Naaum, A., & Garduno, R., Hanner, R. (2018). DNA Barcoding as a Regulatory Tool for Seafood in Canada. *Food Control*, 92, 147-153.
- Warner, K., Lowell, B., Timme, W., Shaftel, E., & Hanner, R. (2018). Seafood sleuthing: How citizen science contributed to the largest market study of seafood mislabeling in the U.S. and informed policy. *Marine Policy*, 304-311
- *Naaum, A., *Shehata, H., Chen, S., Li, J., Tabujara, N., Awmack, D.; Lutze-Wallace, C. & Hanner, R. (2018) Complementary molecular methods detect undeclared species in sausage products at retail markets in Canada. *Food Control, 84*, 339-344.
- Hu, Y., Huang, S., Hanner, R., Levin, J., & Lu, X. (2018). Study of fish products in Metro Vancouver using DNA barcoding methods reveals fraudulent labeling. *Food Control*, 94, 38-47.
- *Phillips, J., Gillis, D., & Hanner, R. (2018). Incomplete estimates of genetic diversity within species: Implications for DNA barcoding. *Ecology and Evolution*, 9 (5), 2996-3010.
- Steinke, D., Bernard, A., Horn, R., Hilton, P., Hanner, R., Shivji, M. (2017). DNA analysis of traded shark fins and mobulid gill plates reveals a high proportion of species of conservation concern. *Scientific Reports, 7*.
- Hutama, A., Dahruddin, H., Busson, F., Sauri, S., Kent, P., Hadiaty, R.K., Hanner, R., Suryobroto, B., Hubert, N. (2017). Identifying spatially concordant evolutionary significant units across multiple species through DNA barcodes: Application to the conservation genetics of the freshwater fishes of Java and Bali. *Global Ecology and Conservation, 12*, 170-187.
- *Shehata, H., Li, J., Chen, S., Redda, H., Cheng, S., N. Tabujara, H. Li, K. Warriner, R. Hanner (2017). Droplet

digital polymerase chain reaction (ddPCR) assays integrated with an internal control for quantification of bovine, porcine, chicken and turkey species in food and feed. *PLoS ONE, 12 (1)*.

- Cariani, A., Messinetti, S., Ferrari, A., Aralea, A., Hanner, R., J. Bonello, et al. (2017). Improving the Conservation of Mediterranean Chondrichthyans: The ELASMOMED DNA Barcode Reference Library. *PLoS ONE*, 2(1), e0170224
- Mariani, S., Cawthorn, D. M., & Hanner, R. (2017). Mislabelling seafood does not promote sustainability: a comment on Stawitz et al. *Conservation Letters*, 10(6), 781-782.
- *Overdyk, L., *Braid, H., *Naaum, A., & Hanner, R. (2016). Real-time PCR identification of lake whitefish (Coregonus clupeaformis) in the Great Lakes. *Journal of Fish Biology, 88 (4)*.
- Bréchon, A., Hanner, R., & Mariani, S. (2016). A systematic analysis across North Atlantic countries unveils subtleties in cod product labelling. *Marine Policy, 69*, 124-133
- Lewis, L., Richardson, D., Zakharov, E., & Hanner, R. (2016). Integrating DNA barcoding of fish eggs into ichthyoplankton monitoring programs. *Fishery Bulletin, 114*, 153-168.
- *Ondrejicka, D., *Morey, K., & Hanner, R. (2016). *DNA Barcodes Identify Medically Important Tick Species in Canada. *Genome*.
- Thomas, V., Hanner, R., & Borisenko, A. (2016). DNA-based identification of invasive alien species in relation to Canadian federal policy and law, and the basis of rapid-response management. *Genome*, 59 (11),1023-1031
- Dahruddin, H., Hutama, A., Busson, F., Sauri, S., Hanner, R., Keith, P., Hadiaty, R., & Hubert, identification accuracy, cryptic diversity and identification of exotic species. *Molecular Ecology Resources,* doi:10.1111/1755-0998.12528.
- Hubert, N. & Hanner, R. (2015). DNA Barcoding, species delineation and taxonomy: a historical perspective. *DNA Barcodes, 3 (44-58)*.
- *Phillips, J., *Gwiazdowski, R., Ashlock, D., & Hanner, R. (2015). An exploration of sufficient sampling effort to describe intraspecific DNA barcode haplotype diversity: examples from the ray-finned fishes (Chordata: Actinopterygii). *DNA Barcodes, 3*, 66-73.
- *Naaum, A. & Hanner, R. (2015). Community engagement in seafood identification using DNA barcoding reveals market substitution in Canadian seafood. *DNA Barcodes, 3*, 74-79.
- *Overdyk, L., *Braid, H., Crawford, S., & Hanner, R. (2015). Extending DNA Barcoding Coverage for Lake Whitefish (Coregonus clupeaformis) Across the Three Major Basins of Lake Huron. *DNA Barcodes, 3*, 59-65.
- *Naaum, A., St. Jaques, J., Warner, K., Santschi, L., Imondi, R., & Hanner, R. (2015). Standards for Conducting a DNA Barcoding Market Survey: Minimum Information and Best Practices. *DNA Barcodes, 3*, 80-84.
- Henriques, J., da Costa Silva, G., Ashikaga, F., Hanner, R., Foresti, F., & Oliveira, C. (2015). Use of DNA barcode in the identification of fish species from Ribeira de Iguape Basin and coastal rivers from São Paulo State (Braz (Brazil). *DNA Barcodes, 3*, 118-128.
- *Strohm, J., *Gwiazdowski, R., & Hanner, R. (2015). Mitogenome metadata: current trends and proposed standards. *Mitochondrial DNA*. doi: 10.3109/19401736.2015.1015003.
- *Overdyk, L., Holm, E., Hanner, R., & Crawford, S. (2015). Increased taxonomic resolutions of Laurentian Great Lakes ichthyoplankton through DNAbarcoding: Case study comparison against visual identification Stokes Bay, Lake Huron. *Journal of Great Lakes Research*.
- *Bartley, T., *Braid, H., McCann, K., Lester, N., Shuter, B., & Hanner, R. (2015). DNA barcoding increases resolution and changes structure in Canadian boreal shield lake food webs. *DNA Barcodes, 3*, 30-43.
- Jabado, R., Ghais, S., Hamza, W., Henderson, A., Spaet, J., Shivji, M., & Hanner, R. (2015). Characterizing the trade in sharks and their products in the United Arab Emirates through market surveys and DNA barcoding. *Biological Conservation, 181*, 190-198.
- *Strohm, J., *Gwiazdowski, R., & Hanner, R. (2015). Fast fish face fewer mitochondrial mutations: patterns of dN/dS across fish mitogenomes. *Gene*, 572(1), 27-34.

Conference Presentations/Papers/Posters

- Hanner R. *Pathways to Increase Standards and Competency of eDNA Syrveys (PISCeS).* Annual Symposium of the Fisheries Society of the British Isles, University of Hull, England, July 19, 2019.
- Hanner, R. *Curating Reference Libraries for Regulatory Applications of DNA Barcoding.* 8th International Barcode of Life Conference, Trondheim, Norway, June 20, 2019.
- *Crookes, S., *Sollen, J., *Blair, J., *Naaum, A., & Hanner, R. *Multiple repositories of environmental DNA: triple source detection of the Endangered Jefferson salamander Ambystoma jeffersonianum.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario. Nov. 14, 2018.
- Tarof, S., *Crookes, S., & Hanner, R. *Environmental DNA Detection of an Overwintering Species at Risk.* 2018. Latornell Conservation Symposium, Alliston, Ontario. Nov. 14, 2018. .
- *Loeza-Quintana, T., *Crookes, S., *Li, P., Reid, D., & Hanner, R. *eDNA, a successful tool for biomonitoring*

Species-At-Risk and Aquatic Invasive Species in highly acidic aquatic environments. Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario. October, 2018.

- *Bourke, D., Fryxell, J., & Hanner, R. *Ecological aspects of eDNA in a large mesocosm.* Canadian Society for Ecology and Evolution Annual Meeting, Guelph, Ontario. Canadian Society for Ecology and Evolution 2018. Meeting on July 21, 2018.
- *Loeza-Quintana, T., *Crookes, S., Tarof, S., Hanner, R., Thomas, M., R. Hanner. *eDNA detection of brumating Blanding's turtles in central Ontario.* Canadian Society for Ecology and Evolution Annual Meeting, Guelph, Ontario. Canadian Society for Ecology and Evolution 2018. Meeting on July 21, 2018.
- Mabragana, E., Gabbanelli, V., Vazquez, D., Delpiana, S., Jurado, C., Hanner, R., Diaz de Astarloa. *DNA barcoding Southwestern Atlantic skates: assessing its effectiveness for species identification and highlighting cryptic species.* Sharks International Conference, Ioao Pessoa, Brazil. June 2018.
- *Crookes, S., Tarof, S., Murdoch, M., & Hanner, R. *On Site eDNA Assessment of Species-at-Risk (SAR): Implications of Real-Time Decision Making for Aquatic Biodiversity Resource Management.* International Association of Great Lakes Research Annual Meeting, Toronto, Ontario. June 20, 2018.
- *Bourke* D., Hanner, R., Fryxell, J., & McCann, K. *The relationship between eDNA signal and organism abundance in large mesocosms.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- *Chatila-Amos, K., Orton, M., Hanner, R., & Adamowicz, S. *eDNA in the Field: Identifying the Factors that Influence the Detection of Benthic Macroinvertebrates using Environmental DNA in the Subarctic.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- *Crookes, S., *Loeza-Quintana T., *Simone, V., *Shirokova, V., & Hanner, R. *Comparative assessment of presence and abundance of potamodromous fishes using two-pass electrofishing and eDNA detection* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, ON, October, 2018.
- *Gasparini, L., *Crookes, S., Prosser, R., & Hanner, R. *Examining the ecology of eDNA in riverine systems: A case study using imperilled freshwater mussels.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- *Gec, P., *MacDonald, C., *Burke, E., *McIsaac, D., *Nicholson, A., *Rein, W. *Wrobel, J. and R. Hanner. *An analysis of metadata reporting in freshwater environmental DNA research calls for development of best practice guidelines.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- *Gleason, J., Cottenie, K., & Hanner, R. *Quantifying variation in eDNA for aquatic insect community datasets in streams.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Oct., 2018.
- *Morey, K., *Bartley, T., & Hanner, R. *Validating eDNA metabarcoding for marine fishes in diverse ecosystems using a public aquarium case study.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- Skinner, M., Hanner, R., *Crookes, S., *Loeza-Quintana, T., Thomas, M., M. Murdochm *eDNA Solutions for Species Detections in Tidal Energy Environmental Effects Monitoring.* Pathway to Increase Standards and Competency of eDNA Surveys (PISCeS), Guelph, Ontario, October 2018.
- *Simone, V., *Li, P., *Crookes, S., *Loeza-Quintana, T., Reid, D., R. Hanner *Onsite early detection of aquatic invasive species using eDNA.* Canadian Society for Ecology and Evolution Annual Meeting, Guelph, Ontario July 21, 2018.
- *Tosh, M., *Crookes, S., *Loeza-Quintana, T., & Hanner, R. *DNA detection with a hand-held real time PCR field tool -- implications and advantages in the world of eDNA.* Canadian Society for Ecology and Evolution Annual Meeting, Guelph, Ontario, July 21, 2018.
- *Crookes, S., Hanner, R., Murdoch, M., & Thomas, M. *A point of need Environmental DNA (eDNA) platform to facilitate the real-time monitoring of aquatic ecosystems.* Canadian Ecotoxicology Workshop, Guelph. Ontario. Steve Crookes, post doc in Hanner lab, presented the talk, October, 2017.

Invited talks / keynotes

- Rotary Club of Guelph, ON. Invited talk “Detecting Food Fraud Using DNA”, July 12, 2019.
- Agri-food Excellence Symposium, University of Guelph, ON. Invited talk “Food Fraud”, June 25, 2019.
- 'Pint-of-Science' Festival Series, Guelph, ON. Invited talk “Something’s fishy: food safety, traceability and authenticity”, May 20, 2019.
- Precision Biomonitoring Inc. eDNA Webinar: invited talk: “eDNA Research - Pushing at the Boundaries”, Guelph, ON, April 17, 2019.
- Great Lakes Institute for Environmental Research Graduate Student Symposium, invited keynote: “From Barcodes to Biomonitoring.” Windsor, ON, April 11, 2019.
- Electrical Power Research Institute. Webinar- “Environmental DNA Training” sponsored by the Electrical Power

Research Institute; 3 sessions November 8, 9 and 16, 2018.

- *An Introduction to eDNA and its Detection.* Invited presentation at 2018. Latornell Conservation Symposium, Alliston, Ontario. November, 2018.
- Advanced Issues in Aquaculture course (ANSC 3050). Invited lecture at University of Guelph- "Applications of DNA Methods for Aquaculture", October 26, 2018.
- 15th Annual Guelph Food Safety Seminars (GFSS) Symposium on Food Fraud. Keynote address- "Genomic Tools for Food Fraud Detection" - to 15th Annual Guelph Food Safety Seminars (GFSS) Symposium on Food Fraud, Ontario Ministry of Agriculture Food and Rural Affairs, Guelph, ON. October 24, 2018.
- National Workshop on Environmental DNA. Contributed talk titled "Introduction to eDNA methods and applications." PISCeS National eDNA Workshop, Guelph October 11, 2018.
- Potential Use of Whole Genome Sequencing for the Canadian Food Industry - CRIFS/Illumina Symposium, Guelph, Ontario. Invited talk "Uses of WGS for food fraud", September 26, 2018.
- USP & FDA Co-Sponsor DNA Standards for Botanical Identification Workshop. Invited talk "Multitude of Methods: Guidelines to Compare Them", August 22, 2018.
- CARIRI Food Fraud Conference, Port of Spain, Trinidad. Invited talk "DNA-based detection of food adulteration/fraud, its role in mitigating risk and opportunities for brand differentiation", July 4, 2018.
- 122nd Annual Education Conference of the Association of Food and Drug Officials, Burlington, Vermont. Invited lecture to the Food Protection & Defense Committee at the 122nd Annual Educational Conference of the Association of Food and Drug Officials (in Burlington, Vermont) titled "Genomic Countermeasures to Food Fraud", June 10, 2018.

Professional Workshop / Courses Facilitated

- National Workshop on Environmental DNA. Organized and hosted workshop at University of Guelph, "Pathways to Increase Standards and Competency in eDNA Surveys (PISCES): a National Workshop on Environmental DNA" October 11, 2018.
- Global Biodiversity Information Facility (GBIF), Ann Arbor, Michigan. "Digital Data and the North American Nodes of the Global Biodiversity Information Facility," workshop led at the Inaugural Digital Data in Biodiversity Research Conference, as North American Node Representative to the Global Biodiversity Information Facility (GBIF), June 6, 2017.
- Seafood Expo North America, Boston, Massachusetts. Organized a workshop on Seafood Fraud, March 19, 2017.

Conference: Session / Panel Organizer

- 8th International Barcode of Life Conference, Trondheim, Norway. Organized a thematic session on 'Regulatory and Forensic Applications of Barcoding' on June 20, 2019.
- 2018 Latornell Conservation Symposium, Alliston, Ontario. Organized session titled "Environmental DNA as a new tool for biomonitoring" on November 14, 2018.

Professional Workshop / Courses Facilitated

- National Workshop on Environmental DNA. Organized and hosted workshop at University of Guelph, "Pathways to Increase Standards and Competency in eDNA Surveys (PISCES): a National Workshop on Environmental DNA" October 11, 2018.

RELEVANT RECENT MEDIA INTERVIEWS/COVERAGE

- Research on seafood mislabeling featured in NGO Oceana's report to the House of Commons standing committee May 10, 2019.
- Canadian Press. Interviewed by Liam Casey regarding sausage adulteration in Canada, February 14, 2019.
- Global News, Kitchener-Waterloo. Canadian Press report "Canadian study finds 14% of sausages contain meats not on the label" picked up and aired February 14, 2019.
- CTV Inquiry. Interviewed regarding Sausage meat mislabeling for show airing February 14, 2019.
- Huffington Post. "Seafood Fraud Is a Bait And Switch That Hurts Honest Canadians," co-authored letter including petition on the issue of seafood fraud, September 20, 2017.
- BBC News. The August 3, 2017. Canadian Press interview on sausage mislabelling was quoted extensively in the BBC News coverage of the story, August 4, 2017.
- Maclean's Magazine. Coverage of the sausage mislabelling story contained a link to the August 3, 2019 Canadian Press interview on the issue, August 4, 2017.
- Global News. The August 3, 2017. Canadian Press interview on sausage mislabelling was quoted extensively in the Global News coverage of the story, August 3, 2017.

C.V. Karl Cottenie

EDUCATION

Degree	University	Date
PhD Ecology	Catholic University Leuven	2002
MSc Statistics	Catholic University Leuven	1997
MSc Biology	Catholic University Leuven	1996

WORK EXPERIENCE

Position	University	Date
Associate Professor	University of Guelph	07/01/2011 - present
Graduate Program Coordinator Integrative Biology	University of Guelph	09/01/2014-08/31/2018
Assistant Professor	University of Guelph	07/01/2005 - 06/30/2011
Postdoctoral Associate	University of California, Santa Barbara	02/01/2003 - 06/30/2005
Researcher	Catholic University Leuven	10/01/2001 - 01/31/2003
Research Assistant	Catholic University Leuven	10/01/1997 – 09/30/2001

Published papers in refereed journals:

Jennifer Gleason, Jody Daniel, Karl Cottenie, Rebecca Rooney (In Press) - *Stochastic and deterministic processes drive wetland community assembly across a gradient of environmental filtering.* Oikos
Rebecca Zawalski, Weston H. Nowlin, Karl Cottenie, Archis Grubh & Astrid N. Schwalb (2019) - *Distinctive macroinvertebrate communities in a subtropical river network*. Journal of Freshwater Ecology 34:135-150
Genevieve Newton, Kim Poung, Amar Laila, Zoe Bye, William Bettger, Karl Cottenie, John Dawson, Steffen Graether, Shoshanah Jacobs, Coral Murrant, John Zettel (2019) - *Perception of Biology Instructors on Using Student Evaluations to Inform Their Teaching.* International Journal of Higher Education 8:133-147
Cunningham*, J., Elliott, K., Hatch, S., Cottenie, K., & Jacobs, S. R. (2018) - *Rhinoceros auklets*

(Cerorhinca monocerata) as samplers of forage fish in the Gulf of Alaska. Marine Ecology Progress Series 605:225-240, [Featured on the CBS website]

Houlahan, J., Currie, D., Cottenie, K., Cumming, G., Findlay, C., Fuhlendorf, S; Legendre, P; Muldavin, E; Noble, D; Russell, R; Stevens, R; Willis, T; Wondzell, S, (2018) - *Negative relationships between species richness and temporal variability are common but weak in natural systems.* Ecology 99:2592-2604

Ward-Campbell, B., Cottenie, K., Mandrak, N.E., McLaughlin, R. (2017) - *Maintenance of agricultural drains alters physical habitat, but not macroinvertebrate assemblages exploited by fishes.* Journal of Environmental Management 203, 29-39

J Sunga, J Sayers, K Cottenie, CJ Kyle, **DM Ethier** (2017) - *The effects of roads on habitat selection and movement patterns of American badgers (Taxidea taxus jacksoni) in Ontario, Canada.* Canadian Journal of Zoology 11, 821-829

McDonald, L., **Van Woudenberg, M.**, **Dorin, B.**, **Begley, A.**, McMullin, T, Cottenie, K. (2017) - *The effects of bark quality on corticolous macro-lichen community composition in urban parks.* Botany 95,1141-1149

Ward-Campbell, B., Cottenie, K., Mandrak, N.E., McLaughlin, R. (2017) - *Fish assemblages in agricultural drains are resilient to habitat change caused by drain maintenance.* Canadian Journal of Fisheries and Aquatic Science 74, 1538-1548

Helmers, A., Platek, A., Ponte, M., Secen, N. & Cottenie, K. (2016) - *Anthropogenic disturbance on plant species richness in lakes of Algonquin Provincial Park.* Studies by Undergraduate Researchers at Guelph

Bringloe, T., Cottenie, K., **Martin, G.K.** & Adamowicz, S.J. (2016) - *The importance of taxonomic resolution for additive beta diversity as revealed through DNA barcoding.* Genome 59:1130-1140

Martin, G.K., Adamowicz, S.J. & Cottenie, K. (2016) - *Taxonomic resolution based on DNA barcoding affects environmental signal in metacommunity structure*. Freshwater Science 35:701-711

Gibson, C., Turetsky, M., Cottenie, K., Kane, E., Houle, G. & Kasischke, E. (2016) - *Variation in plant community composition and vegetation carbon pools a decade following a severe fire season in interior Alaska.* Journal of Vegetation Science 27:1187-1197

Pandit, S., Cottenie, K., Enders, E. & Kolasa, J. (2016) - *The role of local and regional processes on population synchrony along the gradients of habitat specialization.* Ecosphere 7:e01217

Linquist, S., **Saylor, B.**, **Elliot, T.,** Kremer, S., Gregory, R. & Cottenie, K. (2016) - *Yes! There are resilient generalisations (or 'laws') in ecology.* Quarterly Review of Biology 91:119-131

Linquist, S., Cottenie, K., **Elliot, T.A., Saylor, B.**, Kremer, S.C. & Gregory, T.R. (2015) - *Applying ecological models to communities of genetic elements: the case of Neutral Theory.* Molecular Ecology 24:3232-3242

Cottenie, K. & Staempli, M. (2016) - *Concept mapping as a means to critical thinking.* Teaching and Learning Innovations 18:1-10

Liu, S., Xie, G., Wang, L., Cottenie, K., Liu, D. & Wang, B. (2016) - *Different roles of environmental variables and spatial factors in structuring stream benthic diatom and macroinvertebrate in Yangtze River Delta, China.* Ecological Indicators 61:602-611

Bringloe, T., Adamowicz, S.J., Harvey, V.F.I., Jackson, J.K. & Cottenie, K. (2016) - *Detecting signatures of competition from observational data: a novel approach combining DNA barcoding, diversity partitioning, and checkerboards at small spatial scales.* Freshwater Biology 61:646-657
Gonçalves-Souza, T., Romero, G.Q. & Cottenie, K. (2015) - *Metacommunity versus biogeography: A case study of two groups of neotropical vegetation-dwelling arthropods.* PloS One 9:e115137
Piasecka, A., Bernstein, R., Ollevier, F., Meersman, F., Souffreau, C., Bilad, R.M., Cottenie, K., Vanysacker, L., Denis, C. & Vankelecom, I. (2015) - *Study of biofilms on PVDF membranes after chemical cleaning by sodium hypochlorite*. Separation and Purification Technology 141:314-321
Schwalb, A. N., Morris, T. J., & Cottenie, K. (2015) - *Dispersal abilities of riverine freshwater mussels influence metacommunity structure*. Freshwater Biology 60: 911-921
Heino, J., Melo, A.S., Bini, L.M., Altermatt, F., Al-Shami, S.A., Angeler, D.G., Bonada, N., Brand, C., Callisto, M., Cottenie, K. and others (2015) - *A comparative analysis reveals weak relationships between ecological factors and beta diversity of stream insect metacommunities at two spatial levels*. Ecology and Evolution 5:1235-1248
Schwalb, A.N., Alexander, A.C., Paul, A.J., Cottenie, K., Rasmussen, J.B. (2014) - *Changes in migratory fish communities and their health, hydrology, and water chemistry in rivers of the Athabasca oil sands region: A review of limited historical and current data.* Environmental Reviews 23:133-150
Vandamme, S., Maes, G., Raeymaekers, J., Cottenie, K., Imsland, A., Hellemans, B., Lacroix, G., Mac Aoidh, E., Martinsohn, J.T., Martínez, P., Robbens, J., Vilas, R., & Volckaert, F.A.M. (2014). *Regional environmental pressure influences population differentiation in turbot (Scophthalmus maximus).* Molecular Ecology 23:618-636.
Thompson, K.A., Sora, D.M., Cross, K.S., St. Germain, J.M., & Cottenie, K. (2014). *Mucilage reduces leaf herbivory in Schreber's watershield, Brasenia schreberi JF Gmel.(Cabombaceae)*. Botany 92:412-416. (Editor’s Choice - Botany - July 2014)
Vollbrecht, L., Rush, m. & Cottenie, K. (2014) -*Improving dichotomous keys for undergraduate teaching.* Studies by Undergraduate Researchers at Guelph. 7:23-32.
Schwalb, A., Morris, T., Mandrak, N., & Cottenie, K. (2013). *Distribution of unionid freshwater mussels depends on the distribution of host fishes on a regional scale*. Diversity and Distributions 19:446-454.
Saylor, B., **Elliott, T.A.**, Linquist, S., Kremer, S.C., Gregory, R. & Cottenie, K. (2013) - *A novel application of ecological analyses in transposable element distribution: Bos taurus genome.* Genome 56:521-533
Pandit, S., Kolasa, J., & Cottenie, K. (2013). *Population synchrony decreases with richness and increases with environmental fluctuations in an experimental metacommunity*. Oecologia 171:237-247.
Germaine, R.M., Johnson, L., Schneider, S., Cottenie, K., Gillis, E.A. & MacDougall, A.S. (2013) -

Spatial variability in plant predation determines the strength of stochastic community assembly. American Naturalist 182:169-179
Linquist, S., **Saylor, B.,** Cottenie, K., **Elliot, T.,** Kremer, S. & Gregory, R. (2013) - *Distinguishing ecological from evolutionary approaches to transposable elements.* Biological Reviews 88:573-584
Gonçalves-Souza, T., Romero, G.Q. & Cottenie, K. (2013) - *Reevaluating the ubiquity of linear local-regional species richness relationships.* Oikos 122:961-966 (Editor's choice for July 2013)
Siqueira, T., Bini, L.M., Roque, F.O. & Cottenie, K. (2012) - *A metacommunity framework for enhancing the efficiency of conservation and monitoring strategies*. PloS ONE 7:e43626 (featured in Faculty of 1000 http://f1000.com/prime/717988254**)**
Stamplecoskie, K., **Binder, T**., Lower, N., Cottenie, K., McLaughlin, R. & McDonald, G. (2012) - *Response of migratory sea lampreys (*Petromyzon marinus*) to artificial lighting in portable traps.* North American Journal of Fisheries Management 32:563-572
Winegardner, A., Jones, B., Ng, I.S.Y., Siqueira, T. & Cottenie, K. (2012) – *The terminology of metacommunity concepts.* Trends in Ecology and Evolution 27:253-254
Siqueira, T., Bini, L.M., Roque, F.O., Pepinelli, M., Ramos, R.C., Marques Couceiro, S.R., Trivinho-Strixino, S. & Cottenie, K. (2012) – *Common and rare species respond to similar niche processes in macroinvertebrate metacommunities.* Ecography 35:1683-1693 (featured in Faculty of 1000 http://f1000.com/717248107**)**
MacIntyre, O.J., Trevors, J.T., Dixon, M.A. & , Cottenie, K. (2011) - *Application of Plant Growth Promoting Rhizobacteria in a Hydroponics System for Advanced Life Support in Space*. Acta Horticulturae (ISHS) 893:1285-1292
Schwalb, A.N., Cottenie, K., Poos, M.S. & Ackerman, J.D. (2011) - *Dispersal limitation of unionid mussels and implications for their recovery.* Freshwater Biology 56:1509-1518
Hájek, M., Roleček, J., Cottenie., K., Kintrová, K., Horsák, M., Poulíčková, A., Hájková, P., Fránková, M. & Dítě, D. (2011) - *Environmental and spatial controls of biotic assemblages in a discrete semi-terrestrial habitat: comparison of organisms with different dispersal ability sampled in the same plots*. Journal of Biogeography 38:1683-1693
Jones, B., Molenda, O., Hayward, C., D'Aigar, M., Miller, N., Rye, L. & Cottenie, K. (2011) – *Patterns of tree diversity in response to logging in Algonquin Provincial Park.* SURG 4:56-62
Sikes, B.A., Cottenie, K. & Klironomos, J.N. (2009) – *Plant and fungal identity determines pathogen protection of plant roots by arbuscular mycorrhizas.* Journal of Ecology 97:1274-1280
Pandit, S.N., Kolasa, J. & Cottenie, K. (2009) – *Contrasts between habitat generalists and specialists: an empirical extension to the basic metacommunity framework*. Ecology 90:2253-2262
Ng, I. S. Y., Carr, C. & Cottenie, K. (2009) – *Hierarchical zooplankton metacommunities: distinguishing between high and limiting dispersal mechanisms*. Hydrobiologia 619:133-143
Shurin, J., Cottenie, K. & Hillebrand, H. (2009) – *Spatial autocorrelation and dispersal limitation in freshwater organisms*. Oecologia 159:151-159

Bouvier, L., Cottenie, K. & Doka, S. (2009) - *Aquatic connectivity and fish metacommunities in wetlands of the lower great lakes*. Canadian Journal of Fisheries and Aquatic Sciences 66:933-948
Vanormeling, P., Cottenie, K., Michels, E., Muylaert, K., Vyverman, W. & De Meester, L. (2008) – *The relative influence of dispersal and local processes on the phytoplankton communities in a set of highely interconnected ponds*. Freshwater Biology 53:2170-2183
van de Meutter, F., Cottenie, K. & De Meester, L. (2008) – *Emersed, floating-leaved and submersed vegetation support different macroinvertebrate communities in shallow ponds.* Fundamental and Applied Limnology 173:47-57
Houlahan, J., Cottenie, K. et al. (2008) – *The utility of covariances: a response to Ranta et al.*. Oikos 117:1912-1913
Houlahan, J., Cottenie, K. et al. (2007) – *Compensatory dynamics are rare in natural communities*. Proceedings of the National Academy of Sciences 104:3273-3277
Halpern, B.S. & Cottenie, K. (2007) - *Little evidence for climate effects on local-scale structure and dynamics of California kelp forest communities*. Global Change Biology 13:236-251
Van der Gucht, K., Cottenie, K., Muylaert, K., Vloemans, N., Cousin, S., Declerck, S., Jepessen, E., Conde-Porcuna, J.-M., Degans, H., Vyverman, W. & De Meester, L. (2007) – *The power of lineage sorting: local factors drive bacterial community composition over a wide range of spatial scales*. Proceedings of the National Acadamy of Sciences 104: 20404-20409
Halpern, B.S., Cottenie, K. & Broitman, B.B. (2006) – *Indeed, strong top-down control of California kelp forest.* Science 313:1737-1738
Halpern, B.S., Cottenie, K. & Broitman, B.B. (2006) – *Strong top-down control in southern California kelp forest ecosystems*. Science 312:1230-1232
Ashlock, D., Cottenie, K., Carson, L., Bryden, K.M. & Corns, S. (2006) - *An evolutionary algorithm for the selection of geographically informative species.* Proceedings of the 2006 IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology: 279-285
Cottenie, K. (2005) – *Integrating environmental and spatial processes in ecological community dynamics*. Ecology Letters 8:1175-1182
Cottenie, K. & De Meester, L. (2005) - *Metacommunity structure: synergy of biotic interactions as selective agents and dispersal as fuel*. Ecology 85:114-119
Cottenie, K., Michels, E., Nuytten, N. & De Meester, L. (2004) - *Zooplankton metacommunity structure: regional vs. local processes in highly interconnected ponds.* Ecology 84:991-1000
Cottenie, K. & De Meester, L. (2003) - *Connectivity and cladoceran species richness in a metacommunity of shallow lakes*. Freshwater Biology 48: 823-832
Forro, L., De Meester, L., Cottenie, K. & Dumont, H.J. (2003) - *An update on the inland cladoceran and copepod fauna of Belgium, with a note on the importance of temporary waters.* Belgian Journal of Zoology 133:31-36
De Meester, L., Forro, L., Michels, E., Cottenie, K., Louette, G. & Dumont, H.J. (2002) - *The status of some exotic cladoceran (Crustacea: Branchiopoda) species in the Belgian fauna.* Bulletin of the Royal Belgian Institute for Natural Sciences – Biology 72: 87-88
Cottenie, K. & De Meester, L. (2003) - *Comment to Oksanen (2001): Reconciling Oksanen (2001) and Hurlbert (1984)*. Oikos 100:394-396

Cottenie, K., Nuytten, N., Michels, E. & De Meester, L. (2001) - *Zooplankton community structure and environmental conditions in a set of interconnected ponds.* Hydrobiologia 442:339-350
Maes, J., Taillieu, A., Van Damme, P.A., Cottenie, K. & Ollevier, F. (1998) - *Seasonal Patterns in the Fish and Crustacean Community of a Turbid Temperate Estuary (Zeeschelde Estuary, Belgium).* Estuarine, Coastal and Shelf Science 47:143-151

Research funding:

Date	Agency	Title	Amount/ Year	Duration	Co-applicant
2018	NSERC	Aquatic ecosystem services and eDNA/metabarcoding	$26,500	3 years	R. Hanner
2018	NSERC	Metacommunity dynamics across scales	$46,000	5 years	
2017	COESP research grant	Fostering metacognitive approaches to course engagement in undergraduate student learning.	$7,000	8 months	S. Jacobs and C. Coulter
2016	NSERC-USRA	Badger population dynamics	4,500	4 months	Julia Sunga
2012	NSERC	Temporal dynamics in metacommunities	26,000.00	5 years	
2011	Indian Affairs and Northern Development	Support work of Brittany Jones in the North	2,325.00	1 year	Brittany Jones
2011	Churchill Northern Studies Centre	Northern Research Fund	2,500.00	1 year	Brittany Jones
2010	Churchill Northern Studies Centre	Northern Research Fund	3,000.00	1 year	Amanda Winegardner
2010	Indian Affairs and Northern Development	Support work of Brittany Jones in the North	2,325.00	1 year	Brittany Jones
2010	Indian Affairs and Northern Development	Support work of Amanda Winegardner in the North	2,325.00	1 year	Amanda Winegardner
2010	NSERC	Northern Research Internship	8,500.00	3 months	Amanda Winegardner

2010	NSERC-USRA	Salinity and resting eggs in Churchill rock pools	4,500.00	4 months	Brittany Jones
2009	Indian Affairs and Northern Development	Support work of Ingrid Ng in the North	2,400.00	1 year	Ingrid Ng
2009	Indian Affairs and Northern Development	Support work of Amanda Winegardner in the North	2,382.00	1 year	Amanda Winegardner
2009	NSERC-USRA	Metacommunity dynamics in Churchill rock pools	4,500.00	4 months	Erinn Ipsen
2008	Indian Affairs and Northern Development	Support work of Ingrid Ng in the North	1,878.50	1 year	Ingrid Ng
2008	NSERC-USRA	Effect of logging on zooplankton community structure	4,500.00	4 months	Robin Crossley
2007	NSERC	Freshwater metacommunity: dispersal through space and time	23,100.00	5 years	
2007	CFI	Aquatic metacommunity dynamics laboratory	162,341.00	1 year	
2006	UoGuelph-URA	Sampling and analysis of zooplankton metacommunities	6,500.00	4 months	Jessica Martino
2005	UoGuelph-URA	DNA Barcoding of Ontario Cladodera.	6,500.00	4 months	Kristy Grigg

Graduate Students Supervised:

Name	Degree/Date (year)	% of Supervision	Co-supervisor
Jennifer Gleason	PhD/In progress	50	Hanner
Anna Solecki	PhD/In progress	50	
Carolyn Trombley	PhD/In progress	50	Schwalb
Simon Denomme-Brown	PhD/In progress	50	McAdam
Brent Saylor (CBS PhD award)	PhD/In progress	50	Gregory

Xin Wei	MBinf/2018	100	
Joshua Cunningham	MSc/2017	50	Jacobs
Laura Lanteigne	MBinf/2017	100	
Danielle Petsch (Sandwich Award, 5 month exchange)	PhD/2017	100	
Trevor Bringloe	MSc/2014	50	Adamowicz
Gillian Martin	MSc/2013	50	Adamowicz
Thiago Goncalves-Souza (Sandwich Award, 1 year exchange)	PhD/2012	100	
Brittany Jones	Msc/ 2012	100	
Amanda Winegardner (NSERC, 1year)	Msc/2011	100	
Tadeu Siqueira (Sandwich Award, 1 year exchange)	PhD/2009	100	
Ingrid Ng (OGS, 1 year)	Msc/2009	90	Sibley

APPENDIX F
COMMITMENTS REGISTRY AND EMP SCHEDULE

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-PC18.1	Methyl Mercury	Monitoring/Follow-Up Program	Provincial EA Condition 18.1 - Methyl Mercury Monitoring - To establish baseline conditions, the Proponent shall undertake monitoring of methyl mercury levels prior to dam construction as well as post dam construction to determine if methyl mercury levels in fish tissue and surface water have become elevated as a result of alterations to waterways. The mercury monitoring program shall include, but need not be limited to, data from lakes with water level increases (Bagsverd Lake, Chester Lake), lakes downstream of Chester Lake exposed to re-directed flow (Clam Lake), and other lakes exposed to potential effluent sulfate stimulation (Neville Lake). - The Proponent must conduct the methyl mercury sampling and analysis in accordance with Ministry guidance and protocols. The Proponent must prepare a study plan outlining the frequency of proposed sampling during the pre-dam construction and post-dam construction periods, and include this study plan in the Compliance Monitoring Program Report required by Condition 5 of this Notice of Approval. The results of the monitoring will be submitted to the District Manager and made available to the public on the proponent website. MECP Clarification (April 2019): During the EA, the proponent received the MECP Northern Region guidance document for mercury monitoring. The proponent should consult with the MECP Regional Technical Support about the implications for baseline data collection needs arising from changes in project design that have occurred since the EA. A first step is for the proponent to provide the MECP with the baseline data collected to date (refer to Condition 11.3), including low-level mercury (total, methyl) in water and mercury in fish tissue.	Mercury EMP to be prepared as separate document prior to construction (see Table F.2).	21-Jan-2020
EA-FC3.1	Fish and Fish Habitat	Mitigation	Federal EA Condition 3.1 - Fish and Fish Habitat The Proponent shall implement erosion and sediment control measures during all phases of the Designated Project, including measures for sedimentation catchments downstream of active construction areas.	Sediment and Erosion Control EMP to be prepared as a separate document prior to construction (see Table F.2).	21-Jan-2020
EA-FC3.2	Fish and Fish Habitat	Permitting Requirements	Federal EA Condition 3.2 - Fish and Fish Habitat The Proponent shall comply with the Metal Mining Effluent Regulations and subsection 36(3) of the Fisheries Act regarding the deposit of effluent to waters frequented by fish from the Designated Project, taking into account the Canadian Council of Ministers of the Environment's Water Quality Guidelines for Protection of Aquatic Life. In doing so, the Proponent shall: -3.2.1: manage potentially acid generating mine waste to avoid acid generation and metal leaching into the environment; -3.2.2: implement seepage control measures at the tailings management facility; -3.2.3: collect effluent produced by the Designated Project before it is deposited in water frequented by fish; and -3.2.4: treat process water for cyanide prior to directing it into the tailings management facility.	Addressed in facility design though water management systems and EEM will be addressed during operations or once the mine discharges 50 m^3/day.	21-Jan-2020
EA-FC3.3	Fish and Fish Habitat	Water Quality	Federal EA Condition 3.3 - Fish and Fish Habitat The Proponent shall treat at the polishing pond any effluent produced by the Designated Project prior it is deposited to waters frequented by fish if required to comply with condition 3.2.	Addressed in the water management design.	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-FC3.4	Fish and Fish Habitat	Timing Windows	Federal EA Condition 3.4 - Fish and Fish Habitat The Proponent shall conduct in-water construction activities during timing windows of least risk for the area, unless otherwise agreed to by relevant federal and provincial authorities. If in-water construction activities cannot be conducted during identified timing windows of least risk, the Proponent shall develop and implement additional mitigation measures, in consultation with Fisheries and Oceans Canada, to protect fish during sensitive life-stages.	Addressed in Offsetting Plan and EMPs (see Table F.2).	21-Jan-2020
EA-FC3.5	Fish and Fish Habitat	Fish Relocation	Federal EA Condition 3.5 - Fish and Fish Habitat The Proponent shall, in a manner consistent with the Fisheries Act, relocate fish to suitable habitats prior to fish habitat alteration or loss, taking into consideration environmental conditions and lifecycle requirements of the fish species that are relocated.	Addressed in Offsetting Plan and EMPs (see Table F.2).	21-Jan-2020
EA-FC3.6	Fish and Fish Habitat	Realignments	Federal EA Condition 3.6 - Fish and Fish Habitat The Proponent shall design, construct and operate realignment channels and dams in a manner that will maintain fish habitat during all phases of the Designated Project and be consistent with any offsetting plan. In doing so, the Proponent shall maintain fish passage in the realigned channels and the natural channels impacted by the Designated Project.	Addressed in Offsetting Plan, Sections 3 and 4.	21-Jan-2020
EA-FC3.7	Fish and Fish Habitat	Permitting Requirements	Federal EA Condition 3.7 - Fish and Fish Habitat The Proponent shall, to the satisfaction of Fisheries and Oceans Canada and Environment and Climate Change Canada, and in consultation with Indigenous groups, develop and implement any plan(s) required to offset the loss of fish and fish habitat associated with the carrying out of all phases of the Designated Project.	Addressed in Offsetting Plan.	21-Jan-2020
EA-FC3.8	Fish and Fish Habitat	Permitting Requirements	Federal EA Condition 3.8 - Fish and Fish Habitat For any fish habitat offset areas proposed in any offsetting plan(s) under condition 3.7 and prior to submitting a plan to Fisheries and Oceans Canada and Environment and Climate Change Canada, the Proponent shall determine whether there are adverse effects: -3.8.1: on migratory birds and their habitats; -3.8.2: on terrestrial species, including amphibians and reptiles, and their habitats; -3.8.3: on listed species at risk and their habitats; -3.8.4: on health and socio-economic conditions; -3.8.5: on current use of lands and resources for traditional purposes; -3.8.6: on the flow rates, water depths or water widths that may affect the passage of a vessel, including a vessel used by Indigenous Peoples in the context of their current use of lands and resources for traditional purposes; -3.8.7: on physical and cultural heritage and structure, site or thing of historical, archaeological, paleontological or architectural significance; and -3.8.8: from potential sources of contamination including iron, copper and zinc in the receiving environment.	Addressed in the EA and EER, and will continue to be monitored in the EMPs (see Table F.2).	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-FC3.9	Fish and Fish Habitat	Permitting Requirements	Federal EA Condition 3.9 - Fish and Fish Habitat The Proponent shall, if there are adverse effects on any of the elements set out in conditions 3.8.1 to 3.8.8 avoid or lessen those effects.	Mitigation provided in EA, EER, through modified designs, and will continue to be monitored in EMPs (see Table F.2).	21-Jan-2020
EA-MT60	Fish and Fish Habitat	Methyl Mercury	EER Mitigation Commitment 60 - Construction of the watercourse realignments will result in flooding of some terrestrial vegetation which could cause methyl mercury production and potentially affect recreational use of sport fish through consumption limits. - Mitigation: Removal of terrestrial vegetation and organic soils prior to flooding will reduce the potential for methyl mercury production through decaying of terrestrial vegetation. - Commitment: Terrestrial vegetation and organic soils will be removed prior to flooding. - Standard: Health Canada consumptions restriction guideline (0.61 mg/kg Hg)- Health Canada 2004.	Addressed in the Offsetting Plan and Mercury EMP (see Table F.2).	21-Jan-2020
EA-MT61	Fish and Fish Habitat	Fish Relocation	EER Mitigation Commitment 61 - Fish will be relocated from habitats that will be lost during the construction phase (i.e., open pit, MRA and TMF) but not all fish will be able to be collected, therefore individual fish will be lost during construction. - Mitigation: Relocate fish (representative numbers of the community) to established habitats. Time relocation relative to life cycle requirements and environmental conditions to minimize stress. - Commitment: Non-destructive fishing will be conducted in fish habitats that will be lost. Timing of removals will be planned around life cycle requirements to minimize losses of individuals. Fish captured as part of the relocation program will be released within the watershed they are captured. Small and large-bodied fish will be targeted. A biologist will be present to monitor the capture and proper care of any aquatic life found. - Standard: Section 35 of the Fisheries Act does not allow for the destruction of fish. A permit is required to provide for loss of some individuals.	Addressed in Offsetting Plan, Section 4 and described in Fish and Fish Habitat EMP (see Table F.2).	21-Jan-2020
EA-MT62	Fish and Fish Habitat	Realignments	EER Mitigation Commitment 62 - Loss of existing lentic and lotic habitat will occur through the construction of the Project. - Mitigation: Design of the realignment channels will incorporate the life cycle requirements of the resident fish species and promote, where possible, an increase in habitat that is currently limited within the local study area. - Commitment: Construct realignments to provide for life cycle requirements of resident fish - Standard: Fisheries Act Section 35. No loss of productive habitat related to commercial, aboriginal or recreational fisheries.	Addressed in the Offsetting Plan.	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-MT63	Fish and Fish Habitat	Water Intakes	EER Mitigation Commitment 63 - Water intake structures will trap, impinge fish. - Mitigation: Design water intake structures to meet DFO requirements to prevent/limit fish impingement. - Commitment: Ensure intake pipe are fitted with screens to prevent fish impingement and consistent with DFO guidelines. - Standard: DFO Freshwater Intake End-of-Pipe Fish Screen Guideline.	Will be incorporated into intake design prior to construction.	21-Jan-2020
EA-MT64	Fish and Fish Habitat	Blasting	EER Mitigation Commitment 64 - Blasting in the open pit during construction may affect spawning success and limit habitat utilization by some fish in water bodies adjacent to the open pit. However, the area affected is primarily profundal habitat and is of limited value for fish spawning thus any effects are expected to be minimal. - Mitigation: The spawning habitat within the water bodies affected will be included in the Fisheries Act Authorization for the site as a loss of habitat and will be addressed through the compensation plan. - Commitment: Spawning habitat in Clam Lake within 238.5 m from open pit will be included in the Fisheries Act Authorization and ensuing compensation plan. - Standard: DFO guideline - Wright D-G., and Hopky G-E., 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Fisheries Act Section 35. No loss of productive habitat related to commercial, aboriginal or recreational fisheries.	Mitigation described in Section 4.5 of the Offsetting Plan.	21-Jan-2020
EA-MT65	Fish and Fish Habitat	Realignments	EER Mitigation Commitment 65 - During the first years of operation the watercourse realignments may not be fully established and resident fish may experience some interruption in access to habitat or the quality of habitats. - Mitigation: Time construction of watercourse realignments to allow for vegetation growth for one season prior to commissioning of watercourse realignments, if possible or conduct planting of aquatic vegetation immediately following commissioning of channel realignments to promote the establishment of vegetation within the newly constructed habitats. - Commitment: Construct habitat/realignments during the winter so that growth can occur over the spring and summer period and water can inundate new habitat areas to allow for vegetation growth or conduct planting of aquatic vegetation in newly constructed habitats immediately following commissioning. Planting of aquatic vegetation during this time will promote more rapid establishment of habitat. - Standard: Section 35 Fisheries Act authorization.	Described in Section 4.0, 4.1 and 4.2 of the Offsetting Plan and in the Fish and Fish Habitat EMP (see Table F.2).	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-MT66	Fish and Fish Habitat	Dams	EER Mitigation Commitment 66 - Dams will be removed and the open pit reconnected to Upper Three Duck Lakes through an outlet channel. Until these habitats are established some reduction in fish access to habitat or the quality of habitats may occur. Once established a net increase in fish habitat will be provided. - Mitigation: Time construction of water realignments to allow for vegetation growth for one or more growing seasons prior to commissioning of watercourse realignments or conduct planting of aquatic vegetation immediately following commissioning of channel realignments to promote the establishment of vegetation within the newly constructed habitats. - Commitment: Construct habitat/realignments during the winter so that growth can occur over the spring and summer period and water can inundate new habitat areas to allow for vegetation growth or conduct planting of aquatic vegetation in newly constructed habitats immediately following commissioning. Planting of aquatic vegetation during this time will promote more rapid establishment of habitat. - Standard: Section 35 Fisheries Act authorization.	Described in Section 4.0 of the Offsetting Plan and the Fish and Fish Habitat EMP (see Table F.2).	21-Jan-2020
EA-MN26	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 26 - Aquatic Biology / Water - TSS and turbidity - Parameter: Water- TSS and turbidity. - Monitoring Method: Standard Methods and water quality multi-meter. - Standard: 1 mg/L TSS and 1 Nephelometric Turbidity Unit (NTU) as Method Detection Limits (MDLs). - Frequency / Timeframe: Daily. - Location: Downstream of active construction areas.	Described in Section 5.2.2 of the Offsetting Plan and to be included in the Water EMP to be prepared prior to construction (see Table F.2).	21-Jan-2020
EA-MN27	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 27 - Aquatic Biology / Noise and Vibration - Parameter: Noise and Vibration. - Monitoring Method: Acoustic monitoring to confirm the predicted effects of blasting in the Open Pit. - Standard: DFO guideline for instantaneous underwater over pressure of 100 kPa for various fish habitats and a 13 mm/sec vibration guideline for various spawning habitats (Wright and Hopky 1998). - Frequency / Timeframe: During Construction and within the first two years of Operations. - Location: South east bay of Clam Lake and the north bay of New Lake.	Mitigation described ins Section 4.5 of the Offsetting Plan.	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-MN28	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 28 - Water - metals, pH, nutrients, hardness, dissolved organic carbon, alkalinity - Parameter: Water - metals, pH, nutrients, hardness, dissolved organic carbon, alkalinity. The parameters suite may be reduced if it can be demonstrated that any of the tests are not applicable. Additional parameters may be considered depending on site-specific characteristics. - Monitoring Method: Surface water grab sample collection using in-field filtering and preservation, as required. Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Quality assurance /quality control samples such as blind duplicates, trip blanks, field blanks and filter blanks will be collected during each sampling event to represent a minimum of 10% of the samples. - Standard: (MDL< PWQO/CWQG standards). Concentrations in mine-exposed areas will also be compared to baseline and reference area values. - Frequency / Timeframe: Sampling events will be conducted during all project phases at a frequency sufficient to detect changes in water quality; the frequency will therefore depend on the station location and will aim to capture a range of flow conditions, as required monitoring will be conducted until conditions are stable or less than guidelines for the protection of aquatic life. - Location: Downstream of Project discharge and in all areas potentially affected by mine related discharges as well as in appropriate reference areas.	To be included in a Water Monitoring EMP to be developed prior to construction (see Table F.2). Baseline monthly monitoring to achieve this condition is currently being conducted.	21-Jan-2020
EA-MN29	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 29 - Sediment-metals, total organic carbon, grain size, mercury and methyl mercury - Parameter: Sediment-metals, total organic carbon, grain size, mercury and methyl mercury. The parameters suite may be reduced if it can be demonstrated that any of the tests are not applicable. Additional parameters may be considered depending on site-specific characteristics. - Monitoring Method: Surficial sediment collected from grab or core sample (top depositional layer). Method detection limits will be less than federal and provincial water quality guidelines. - Standard: Ontario's Provincial Sediment Quality Objectives and the Canadian Sediment Quality Guidelines. Concentrations in mine-exposed areas will also be compared to baseline and reference area values. - Frequency / Timeframe: Every 3 years during Operations and twice following Closure. - Location: Locations downstream of Project discharge and reference areas.	Baseline monitoring has been conducted (Minnow 2014 and 2017a) and additional sediment and benthic invertebrate monitoring was conducted in 2019, and is planned for 2020 and 2021 to provide two years of date prior to operations.	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-MN30	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 30 - Benthic invertebrate community - Parameter: Benthic invertebrate community. - Monitoring Method: Depositional sampling using petite Ponar, reduced to 500 micron and identified to lowest practical level. - Standard: EEM under Federal Metal Mining Effluent Regulations (MMER) and Canadian-Ontario Agreement (COA) requirements under OWRA. - Frequency / Timeframe: Every 3 years during Operations and twice following Closure. - Location: Locations downstream of the Project discharge and reference areas.	Baseline monitoring has been conducted (Minnow 2014 and 2017a) and additional sediment and benthic invertebrate monitoring was conducted in 2019, and is planned for 2020 and 2021 to provide two years of date prior to operations. EEM monitoring will be implemented when the Mine discharges in excess of 50 m^3/day.	21-Jan-2020
EA-MN31	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 31 - Fish community - Parameter: Fish community. - Monitoring Method: Collect fish (small-bodied and large bodied) using standardized collection methods. Identify and enumerate and determine relative abundance. - Standard: EEM under MMER and COA requirements under OWRA. - Frequency / Timeframe: Every 3 years during Operations and twice following Closure. - Location: Locations downstream of the Project discharge and habitats affected by watercourse realignments.	Will be included in EEM monitoring and a site wide Aquatic Effects Monitoring Program (AEMP) once the mine is operational or discharges in excess of 50 m^3/day. The AEMP will be described in an EMP document prior to construction (see Table F.2).	21-Jan-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
EA-MN32	Fish and Fish Habitat	Monitoring/Follow-Up Program	EER Monitoring Commitment 32 - Fish health - Parameter: Fish health. - Monitoring Method: Two sentinel species – either a non-destructive study design (i.e. 100 individuals for length, weight and age) or a lethal survey (40 males and 40 females for length, weight, age, liver weight, gonad weight, egg size and fecundity). Measures of abnormalities on all fish collected. - Standard: EEM under MMER and COA requirements under OWRA. - Frequency / Timeframe: Every 3 years during Operations and twice following Closure. - Location: Locations downstream of the Project discharge and reference areas.	Will be included in EEM monitoring and a site wide Aquatic Effects Monitoring Program (AEMP) once the mine is operational or discharges in excess of 50 m^3/day. The AEMP will be described in an EMP document prior to construction.	21-Jan-2020
EA-MN33	Fish and Fish Habitat	Fish and Fish Habitat	EER Monitoring Commitment 33 - Fish tissue Parameter: Fish tissue. Monitoring Method: Non-lethal biopsy tissue sampling methods will be used to collect skinless, boneless muscle samples (5 g filet) from live individuals. Samples will be analyzed for total mercury. Samples will be weighed and acid digested prior to analysis using a variant of “Environmental Protection Agency Method 1631- mercury in water by oxidation, purge and trap, and cold vapour atomic fluorescence spectrometry”. Using this technique, low method detection limits of approximately 1 ng Hg/g wet tissue weight can be achieved. Standard: Health Canada and Ministry of the Environment and Climate Change consumption benchmarks. Frequency / Timeframe: Every 3 years during Operations and twice following Closure or until mercury concentrations in fish are stable or equal to reference areas. Location: In areas affected by stream realignments and reference areas.	Conducted for baseline (Minnow 2014 and 2017a) and will be described in the Mercury EMP to be provided prior to construction (see Table F.2).	21-Jan-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment Monitoring and maintaining Unnamed Pond and the outlet channel to ensure its proper biological functioning and therefore is not included as a lost in the offsetting plan. If monitoring has indicated that seepage loss is affecting habitat functioning then additional offsetting measures will be pursued.	Offsetting Plan, Section 3.2.1, 3.3.6, and will be described in Water Management EMP (see Table F.2)	24-Mar-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment To restrict blasting charge size per delay in identified areas of the open pit in proximity to New Lake during the fish spawning period.	Offsetting Plan, Section 3.3.4 and Noise and Vibration Management (see Table F.2).	24-Mar-2020

Table F.1: List of Commitments for Fish and Fish Habitat in EA, EER and Habitat Offsetting Plan

Tracking No.	Category	Sub-Category	Commitment	Reference or Location in Document	Last Update
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment Funding for research on environmental deoxyribonucleic acid (eDNA) barcoding methods for Environmental Effects Monitoring (EEM). This work is being completed in collaboration of the University of Guelph and several other industry stakeholders. The objective of this research is to advance the procedure for using environmental DNA barcoding or DNA meta barcoding for EEM and baseline studies to provide enhanced species specific information, specifically for benthic invertebrates, which will allow for better determination of effects.	Offsetting Plan, Section 3.3.11 and Appendix E.	24-Mar-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment The construction contractor will coordinate all biological monitoring with a contracted biologist.	Offsetting Plan, Section 4.4.	24-Mar-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment The fish offsetting monitoring program will include habitat condition and stability, including: - geomorphic stability - habitat structures and vegetation growth (riparian and aquatic plants) - benthic invertebrate community composition and biomass The objective of this aspect of the monitoring program will be to document the post commissioning habitat relative to the design and the requirements of the target species.	Offsetting Plan, Section 5.2.1 and will be described in Fish and Fish Habitat Management Plan (see Table F.2)	24-Mar-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment The offsetting monitoring program will include water quality and flow. The water quality up and downstream, as well as within the constructed habitats will be monitored to evaluate post-construction conditions. Water levels in Upper Three Duck Lake, New Lake, and Clam Lake as well as flow in all constructed channels will be monitored to confirm no changes to fish habitat.	Offsetting Plan, Section 5.2.2 and will be described in the Water Management EMP and Fish and Fish Habitat EMP (see Table F.2)	24-Mar-2020
	Fish and Fish Habitat	Fish and Fish Habitat	Offsetting Plan Commitment The offsetting monitoring program will include fish utilization, abundance, community structure and health. The objective of this aspect of the program will be to demonstrate fish usage of the created habitat for the intended life history stage (e.g., spawning, juvenile rearing, and adult foraging). In addition, the monitoring will demonstrate whether the fish populations are successful (reproducing) and are healthy (condition), where both small- and large-bodied fish sampling will be incorporated.	Offsetting Plan, Section 5.2.3 and will described in the Fish and Fish Habitat EMP (see Table F.2)	24-Mar-2020

Notes: EEM - Environmental Effects Monitoring, EMP - Environmental Monitoring Plan, EA - Environmental Assessment, EER - Environmental Effects Review, MECP - Ministry of Environment, Conservation and Parks

Table F.2: Master List of Environmental Management Plans

Environmental Monitoring Plan[a]	Anticipated Completion Phase
Project EMP (Overarching)	Phase 1
Community Communication Plan	Pre-Construction
Management of Community Grievances (Complaint Protocol)	Pre-Construction
Indigenous Consultation Plan	Pre-Construction
Socio-Economic/Community Management Plans	Construction Initiation
Traditional Land and Resource Use Follow-Up Program	Construction Initiation
Indigenous Health Follow-Up Program	Construction Initiation
Archaeology and Heritage Management Plan	Pre-Construction
Human Resources Management Plan	Phase 2
Land Use and Access Management Plan	Pre-Construction
Transportation and Traffic Management Plan	Pre-Construction
Aquatic Management and Monitoring Plan	Phase 1
Fish and Fish Habitat Management and Monitoring Plan	Pre-Construction / Construction Initiation
Terrestrial Systems & Habitat Biodiversity Management and Monitoring Plan	Pre-Construction
Water Management and Monitoring Plan	Construction Initiation
Air Quality Management and Monitoring Plan	Construction Initiation
Noise and Vibration Management and Monitoring Plan	Construction Initiation
Blasting/Explosives Management Plan	Phase 1
Mine Rock and ARD/ML Management Plan	Phase 3
Soil Management Plan	Construction Initiation
Erosion and Sediment Control Plan	Pre-Construction
Waste Management Plan	Phase 3
Dam Management Plan	Phase 3
Spills Prevention and Response Plan	Pre-Construction
Construction Spills Prevention and Response Plan for IAMGOLD staff and contractors	Pre-Construction
Emergency Response Plan	Pre-Construction

[a] These plans may include subplans appended to the main document. Subplans to be defined by the author. Compliance registry will track at the master plan level. Plan-specific concordance tables will be developed as plans progress.

Notes: Pre-Construction: Date of submission of Notice of Intent to Proceed to actual Construction Initiation, Construction Initiation: Construction Commencing as defined by the physical and purposeful disturbance of soil, Phase 1: Approximately first year of Construction, Phase 2: Approximately second year of construction, Phase 3: Approximately third year of construction.