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APPENDIX B
Updated Technical Memoranda

B-1: Updated Geochemical Characterization
B-2: Updated Technical Memorandum: Air Quality
B-3: Updated Technical Memorandum: Noise and Vibration
B-4: Updated Technical Memorandum: Hydrogeology
B-5: Updated Technical Memorandum: Hydrology and Climate
B-6: Updated Technical Memorandum: Water Quality
B-7: Updated Technical Memorandum: Terrestrial Biology
B-8: Updated Technical Memorandum: Aquatic Biology
B-9: Updated Technical Memorandum: Land and Resource Use
B-10: Updated Technical Memorandum: Traditional Land Use
B-11: Updated Technical Memorandum: Human and Ecological Health Risk
B-12: Updated Technical Memorandum: Visual Aesthetics
B-13: Updated Technical Memorandum: Socio-Economic
B-14: Updated Technical Memorandum: Archaeology and Built Heritage

Côté Gold Project
Environmental Effects Review Report
September 2018
EA: EA 05-09-02; EAIMS: 13022; CEAA: 80036

B-1: Updated Geochemical Characterization

Memorandum

To:	Steven Woolfenden / David Brown	**From:**	Steve Walker / Jennifer Boak
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Stephan Theben (SLR Consulting) Steve Sibbick, Debbie Dyck, Don Carr (Amec Foster Wheeler)	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED GEOCHEMICAL CHARACTERIZATION		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment (EA) Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'

This updated geochemical characterization has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;

- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Geochemical Characterization

A geochemical characterization study for the Project was previously completed by Amec Foster Wheeler to support an understanding of the risk of metal leaching and acid rock drainage (ML/ARD) for the EA. IAMGOLD has requested that Amec Foster Wheeler evaluate current and available geochemical data for the Project as part of the EER. Overall, the Project components are similar to those within the EA. These components include the following:

- Ore Stockpile;
- Tailings Management Facility (TMF).
- Overburden Stockpile;
- watercourse realignment channels;
- open pit; and
- Mine Rock Area (MRA).

This memorandum provides a summary and interpretation of available geochemical data related to the Project components under the optimized mine plan.

2.0 SCOPE OF REVIEW

Amec Foster Wheeler was requested by IAMGOLD to identify and evaluate changes to the mine plan that are relevant to the EER geochemical assessment. The existing geochemical characterization results were reviewed and compared to the optimized mine plan to confirm that the previous assessment completed for the 2014 EA is adequate. Specifically, the number, type and locations of samples, as well as the overall proportions of potentially acid generating (PAG) and non-potentially acid generating (NPAG) were evaluated in the context of the updated mine plan.

The water quality assessment has been handled under separate scope by Golder Associates Ltd. (Golder). Source terms for tailings and waste rock were developed from geochemical test work directed by Amec Foster Wheeler. In support of the Project, updated source terms have been provided to IAMGOLD which included humidity cell data collected after submission of the EA. The intent was to continue to provide updated data for incorporation into future water quality models.

Humidity cell data was considered most relevant to support development of water quality estimates at the time of the EA; however, collection of mine rock field cell data has been on-going since submission. Field cells were developed early in the project by placing selected representative intervals of drill core in 200 L drums and monitoring drainage quality from the drums over time. Screening of the field cell data, which continues to be collected, was completed in this data review to provide further information on potential metal leaching from waste rock.

3.0 BASIS OF EVALUATION AND METHODOLOGY

The evaluation included reviewing the Project layout in comparison to the layout in the EA (Figure 1). The project size, tonnage to be mined and open pit size have been reduced, resulting in less waste rock and tailings being generated. For each of the mine components listed above, the number, type, and location of samples that supported the EA were reviewed with consideration given to the changes in the Project optimization, which are as follows:

- Location of the ore stockpile is similar; however, the footprint has been expanded, and the stockpile has been segregated into low- and medium-grade zones. It is understood that the ore stockpile will be used as a temporary management storage facility that will allow blending of ore as needed, and will be continually processed and replenished throughout the mine life. A portion of the stockpile may be reserved for use in future ore processing towards the end of the Project Operations phase.
- A new Overburden Stockpile location has been identified west of the MRA and south of Clam Lake.
- Watercourse realignment channel locations are within approximately 1 km of the previous locations, but have been modified to reduce channel length.
- The TMF has been relocated to west of the open pit, and the footprint has been reduced.
- The open pit location is unchanged, but has been optimized and decreased in size.
- The MRA location is similar though the footprint has been modified slightly.

Minor changes related to ore processing have been incorporated into the optimized mine plan. Additional metallurgical test work completed since completion of the EA focused on implementing High Pressure Grinding Rolls (HPGR) rather than Semi-autogenous Grinding (SAG) mills which were originally proposed. In addition, it has also been identified that the optimized mine plan may direct all diabase to waste (and exclude from ore processing), where the original plan had no segregation of diabase rock from ore processing. This could result in an increase in diabase in the MRA. Considerations due to increased diabase rock from ore processing are discussed in the following sections.

The following sections describe the evaluation of available geochemical data in support of the Project. Previous characterization work for the EA included screening of acid base accounting (ABA) results conservatively assuming that neutralization potential ratio (NPR) values of less than 2 represented PAG waste rock or tailings. As identified in the previous investigations, assessment of carbonate NPR (Carb NPR) on the basis of total C and total S was a reasonable screening tool to assess NPR based on modified Sobek neutralization potential (NP) and acid potential (AP) based on sulphide content.

4.0 TAILINGS AND ORE

ABA data available for the Project have identified that project tailings are NPAG. The most significant possible changes in project planning related to ore and tailings include:

- the possible exclusion of diabase material from the ore processing;
- the adoption of a change in grinding process (HPGR rather than SAG mills); and
- potentially longer storage of ore prior to milling (a portion of medium or low grade ore could now be stored until closer to the end of mine life compared to the previous mine plan).

4.1 Tailings

The exclusion of diabase from the ore processing is not expected to have a notable effect on ML/ARD characteristics of tailings due to the low volume of diabase (<1%) in comparison to other rock types. Diabase on average appears to have a slightly higher proportion of PAG material on the basis of available testing (two out of eight samples, or 25%). Therefore, the net effect on the overall geochemical characteristics of tailings if diabase is excluded from processing (if any) could be a very slight decrease in AP and increase in NP in the overall tailings.

Apart from the possible diabase exclusion from the ore discussed above, the nature of the ore to be processed has not changed from the ore assessed within the EA. A change in grinding will not alter the input to the mill and therefore, a switch to HPGR rather than SAG mill grinding is not expected to change the nature of the future tailings in terms of potential for ML/ARD.

HPGR grinding is expected to produce a generally coarser material than conventional SAG mill grinding. However, the nature of the grind tends to result in greater fracturing of the particles resulting in increased surfaces available for leaching of gold within these coarser particles. This decreases the necessity for finer grinding by the SAG mill method. The quantity of NP and AP in ore crushed by the two methods would be the same and tailings are therefore considered to be NPAG as per previous testing completed (Amec Foster Wheeler 2013).

The different grind character could potentially result in different availability of sulphide surfaces for metal leaching (either increased or decreased); however, the low metal contents of the ore and previous testing of the finely ground SAG mill representative tailings does not indicate any particular risk of metal leaching. Humidity cell data developed for composite tailings samples for the project are expected to continue to provide a reasonable estimate of future tailings leaching behavior and are suitable for application in updated modelling efforts being completed by Golder.

4.2 Ore

Specific testing of ore for the Project has not been completed since operations are generally expected to minimize exposure time of ore at surface. Ore will continually be consumed from the stockpile and all stockpiled material is to be processed by the end of mine life. There is a possibility that some low to medium grade ore could be stored for a number of years (specifically for blending at the end of mine life) and a review of previous characterization data was completed to assess whether this would represent a risk for ARD.

While there is no specific analysis of ore samples, 93 discrete tailings samples were generated in a previous metallurgical testing program directed by IAMGOLD and are expected to be representative of the range of ore characteristics. Analysis of each sample included ABA testing. Each of the discrete tailings samples represented individual drill core intervals and are comparable to discrete ore samples. Therefore, the subset of discrete tailings samples are expected to provide a reasonable estimate of the range of ABA characteristics expected in future unprocessed ore. The average NP value for the 93 tailings samples was 36 kg Calcium carbonate per tonne ($CaCO_3$/t) (ranging from 3.2 kg $CaCO_3$/t to 100 kg $CaCO_3$/t, primarily from carbonate). Since 97% of the discrete samples have an NPR >2, the minor set of samples with NPR < 2 represent a small fraction of material that will be diluted within the ore stockpile. Considering the low sulphide content (90% of discrete tailings samples <0.25% S) and the available excess NP there is little risk of ARD should storage of ore to the end of mine life be required.

5.0 OVERBURDEN AND WATERCOURSE REALIGNMENT CHANNELS

Static testing completed on overburden samples within the footprint of the previous open pit (35 samples) remains directly applicable to the Project open pit as current and previous pit footprints are essentially the same. On this basis, the risk of ML/ARD of these materials is considered low.

Analysis of overburden near proposed watercourse realignment channels was also completed in support of the EA. Current watercourse realignment channels have now been relocated (Figure 1). Analysis of materials from within the new proposed routes has not been completed; however, proposed routes are expected to intersect geologically similar overburden material previously tested for the site.

Designs are not yet complete for the watercourse realignment channels; however, the planned channel lengths have reduced materially from ~7.9 km down to ~2.9km and cross relatively flat lying ground and excavations are expected to be generally shallow (< 2.5 m) with a short section of one channel up to 7 m deep. Similarly bedrock cuts (if required) are expected to be materially reduced small and within similar geological terrain as the nearby open pit. Extensive testing of the open pit mine rock has identified a low risk of ML/ARD (Amec Foster Wheeler 2013 and Amec Foster Wheeler 2014).

Based on the reduction of channel lengths and the need for rock cuts to accommodate the proposed realignments and considering the chemistry of rock within the project area, risk of ML/ARD is expected to be low.

6.0 OPEN PIT AND MINE ROCK

EA static and kinetic testing work for the open pit and mine rock including ABA and humidity cell tests determined a generally low risk of ARD for the open pit and mine rock (Amec Foster Wheeler 2013 and Amec Foster Wheeler 2014). Sampling and analysis identified that around 94% of the mine rock was expected to have an NPR > 2 and similar percentage based on Carb NPR. In addition, mine rock was determined to have a high excess of neutralization potential, further supporting the low potential risk for ARD. Due to the reduced pit dimensions, a reevaluation of the existing data within the updated pit shell was completed as a check on the overall proportion of PAG and NPAG rock within the updated pit shell.

It has also been identified that diabase may be excluded from ore processing in the mine plan resulting in an increased proportion of diabase to the mine rock stockpile.

The above described changes are considered and discussed in the following sections.

6.1 Data Reevaluation for the Optimized Pit Shell

The existing ABA and Leco C and S databases used to support the EA (Amec Foster Wheeler 2013) were filtered to extract any samples outside the optimized pit shell. In total, 40 samples were removed from the ABA database, which represents 17% of the total number of samples and included the following lithologies: Magma Mixing Breccia, Intrusive Feldspar Porphyry, Intermediate and Felsic Dykes, Diorite, Tonalite, Mafic Dykes and Diabase Dykes. An additional 77 samples (8%) were removed from the Leco database, including samples of Diorite Breccia, Diorite Mega Breccia, Mafic Breccia, Intrusive Feldspar Porphyry, Intermediate and Felsic Dykes, Diorite, Quartz Diorite, Tonalite, Mafic Dykes, Diabase Dykes, and Intrusive Mafic Lamprophyre.

Table 1 summarizes the number of samples that were used in the EA geochemical characterization study (Amec Foster Wheeler 2013) compared to the number of samples within the Project optimized pit shell.

The updated ABA and Leco databases were used to calculate the number and percentage of PAG and NPAG samples for each rock type within the optimized pit shell. Overall, sample coverage within the Project pit shell is comparable to coverage within the EA pit.

Table 1: Number of Mine Rock Samples in Geochemical Characterization Study (2014) Compared to Number of Samples in 2017 Optimized Pit Shell

Location	Sample Type	Analysis Type	
		ABA	Leco C and S
Open Pit - 2014 Pit Shell	Mine Rock	236	1114
Open Pit - 2017 Optimized Pit Shell	Mine Rock	196	835

6.2 Updated Proportions of NPAG and PAG in Mine Rock

The percentage of NPAG and PAG samples (NPR < 2) in the 2014 databases (ABA and Leco) was the same as the percentage of NPAG and PAG samples within the Project optimized pit shell (94% NPAG; 6% PAG). The majority of individual rock types also reported identical percentages of NPAG and PAG samples in the ABA database with only the Intermediate and Felsic Dykes, Diorite, and Mafic Dyke lithologies reporting a slight difference (between 1% and 3%) in the proportions of NPAG and PAG samples, however, this small difference did not impact the overall proportions of NPAG and PAG in the larger dataset (Table 2).

In comparison, the Leco database also had identical percentages of NPAG and PAG samples (Carb NPR < 2), with the Diorite Breccia, Diorite Mega Breccia, Mafic Breccia, Magma Mixing Breccia, Quartz Diorite, Diabase Dykes, and Intrusive Mafic Lamprophyre lithologies reporting less than a 5% difference in NPAG and PAG samples (Table 3).

6.3 Potential Increase in Diabase to Mine Rock

Considering previous estimates of diabase in waste rock (at 0.7% of mine rock) segregation would be expected to result in a small proportion in the waste rock stockpile (e.g. <2%). Previous analysis has determined that due to slightly lower than average NP and slightly higher sulphide content (though average sulphide content still low at about 0.2%), diabase may have a slightly higher percentage of PAG rock than other rock types (15% to 20% based on ABA and Leco C and S data sets respectively). However, the diabase dykes occur as narrow and widely spaced sub-parallel features ranging in thickness between a few centimeters to 30 m wide (Amec Foster Wheeler 2013). Dispersal of the small fraction of diabase within the waste rock stockpile with slightly higher proportion as PAG material (<20%) is not expected to alter the original assessment of net non-acid generating character of the mine rock stockpile.

Table 2: Summary of Neutralization Potential Ratio Distribution of Mine Rock by Acid Base Accounting 2017 Environmental Effects Review Updated Pit Shell

Lithological Classification	NPR Distribution (ABA)			
	2014 ABA Database		2017 Optimized Pit Shell ABA Data	
	PAG (NPR < 2)	NPAG (NPR > 2)	PAG (NPR < 2)	NPAG (NPR > 2)
All	6%	94%	6%	94%
Diorite Breccia	8%	92%	8%	92%
Diorite Mega Breccia	14%	86%	14%	86%
Fault Breccia	0%	100%	0%	100%
Hydrothermal Breccia	33%	67%	33%	67%
Mafic Breccia	0%	100%	0%	100%
Magma Mixing Breccia	0%	100%	0%	100%
Quartz Carbonate Heterolithic Breccia	0%	100%	0%	100%
Fault	20%	80%	20%	80%
Intrusive Feldspar Porphyry	0%	100%	0%	100%
Intermediate and Felsic Dykes	17%	83%	20%	80%
Diorite	4%	96%	5%	95%
Quartz Diorite	0%	100%	0%	100%
Tonalite	6%	94%	6%	94%
Mafic Dykes	5%	95%	7%	93%
Diabase Dykes	0%	100%	0%	100%
Intrusive Mafic Lamprophyre	0%	100%	0%	100%
Quartz Sericite Schist	0%	100%	0%	100%

Lithological Classification	CarbNPR Distribution			
	2014 ABA Database		2017 Optimized Pit Shell	
	PAG (NPR < 2)	NPAG (NPR > 2)	PAG (NPR < 2)	NPAG (NPR > 2)
All	7%	93%	7%	93%
Diorite Breccia	15%	85%	15%	85%
Diorite Mega Breccia	14%	86%	14%	86%
Fault Breccia	0%	100%	0%	100%
Hydrothermal Breccia	33%	67%	33%	67%
Mafic Breccia	0%	100%	0%	100%
Magma Mixing Breccia	0%	100%	0%	100%
Quartz Carbonate Heterolithic Breccia	0%	100%	0%	100%
Fault	0%	100%	0%	100%
Intrusive Feldspar Porphyry	0%	100%	0%	100%
Intermediate and Felsic Dykes	17%	83%	20%	80%
Diorite	7%	93%	8%	93%
Quartz Diorite	0%	100%	0%	100%
Tonalite	6%	94%	6%	94%
Mafic Dykes	5%	95%	0%	100%
Diabase Dykes	33%	67%	25%	75%
Intrusive Mafic Lamprophyre	0%	100%	0%	100%
Quartz Sericite Schist	0%	100%	0%	100%

Table 3: Summary of Neutralization Potential Ratio Distribution of Mine Rock Samples by Leco Carbon and Sulphur
2017 Environmental Effects Review Updated Pit Shell

Lithological Classification	NPR Distribution (Leco C and S)			
	2014 Leco Database		2017 Optimized Pit Shell Leco Data	
	PAG (NPR < 2)	NPAG (NPR > 2)	PAG (NPR < 2)	NPAG (NPR > 2)
All	6%	94%	6%	94%
Diorite Breccia	3%	97%	4%	96%
Diorite Mega Breccia	5%	95%	4%	96%
Fault Breccia	0%	100%	0%	100%
Hydrothermal Breccia	0%	100%	0%	100%
Mafic Breccia	33%	67%	0%	100%
Magma Mixing Breccia	4%	96%	5%	95%
Quartz Carbonate Heterolithic	0%	100%	0%	100%
Fault	0%	100%	0%	100%
Intrusive Feldspar Porphyry	4%	96%	6%	94%
Intermediate and Felsic Dykes	11%	89%	14%	86%
Diorite	4%	96%	4%	96%
Quartz Diorite	3%	97%	0%	100%
Tonalite	7%	93%	7%	93%
Mafic Dykes	7%	93%	7%	93%
Diabase Dykes	19%	81%	18%	82%
Intrusive Mafic Lamprophyre	17%	83%	22%	78%
Quartz Sericite Schist	0%	100%	0%	100%

7.0 FIELD CELL DATA REVIEW

Though not specifically affected by the optimized mine plan, the results of ongoing mine rock field cells monitoring is considered relevant to the Project, and is therefore included below.

Field cells were originally constructed in 2013. One season of leachate was collected from these cells, however, in spring/summer 2014, the original cells were noted to leak and were reconstructed in the late summer 2014. During the reconstruction, field cells were renamed as described in Table 4 below. At that time one cell was deemed redundant due to recategorization of lithologies (FC-3) and was retired. An additional cell for diorite was commissioned and seepage has been collected from each field cell several times per year since.

Table 4: Field Cell Summary

2013 Field Cell Name	2014 Reconstructed Field Cell Name	Rock Type
FC1	FC14-1	Tonalite
FC2	FC14-2	Tonalite
FC3*	-	Magma Mixing Breccia
-	FC14-3**	Diorite
FC4	FC14-4	Magma Mixing Breccia
FC5	FC14-5	Diorite Breccia
FC6	FC14-6	Diorite
FC7	FC-Rain	Empty field cell blank

* FC3 terminated in 2014
**FC14-3 initiated in 2014

Appendix I presents the results of field cell monitoring. In general, most metals concentrations have decreased since the start of monitoring in all cells including Ag, Al, As, B, Ca, Cd, Cu, K, Li, Mg, Mo, Na, P, Se, Sr, U, and V. Some parameters reported detection limits in the last two years that were higher than previous: Co, Cr, Fe, Ni, Pb, Sb, Ti, Tl, V, Zn.

Field cell concentrations were compared to Provincial Water Quality Objectives (PWQO) for screening purposes only. Results are not meant to imply conformance or non-conformance with guidelines, rather they are a comparison to identify parameters of potential concern that may leach from mine rock. This is a screening tool and a more comprehensive assessment of future site water quality has been completed by Golder.

No elements of potential concern have been identified from the field cell monitoring data. Screening of the data (Appendix I) did identify the following observations:

- All field cells had multiple samples that reported concentrations of dissolved Al that were higher than the conservative minimum interim PWQO value of 0.015 mg/L. Note that this value is based on receiver water quality with pH between 4.5 and 5.5 and is not directly applicable to field cell leachate. Concentrations of Al were also screened using the higher value of 0.075 mg/L, which is based on receiving water quality pH values between 6.5 and 9.0 which is generally consistent with field measured pH values. Only one sample each from field cells FC-1, FC14-3, and FC-4 reported concentrations of Al that were above 0.075 mg/L.

- We note that elevated pH was noted in field measurements during some monitoring events in later summer (above pH 9); however, this may be a relic of warming of the field cells and biological activity not representative of the field scale operations in a waste rock stock-pile.
- Six field cells (FC-1, FC-2, FC-3, FC-4, FC-5 and FC-6) reported concentrations of dissolved Cu in the first three to four samples collected between 2013 and the first sample in 2014 that were higher than the in-place PWQO value of 0.005 mg/L. All of these cells reported decreasing Cu concentrations that were below the in-place PWQO value in subsequent samples.
- Five field cells (FC-1, FC-2, FC-3, FC-4, and FC-5) reported concentrations of dissolved U that were above the interim PWQO value of 0.005 mg/L in the first several samples that were collected. Field cell FC-6 also reported one concentration of dissolved U that was higher than the interim PWQO value in one sample collected in 2013. All six field cells reported decreasing U concentrations, though cells FC-1, FC-2, FC-4, and FC-5 each reported one sample in 2016 and 2017 that had a dissolved U concentration that was slightly higher than the interim PWQO value.
- Two field cells (FC-1 and FC-6) reported concentrations of total P that were higher than most conservative interim PWQO value of 0.02 mg/L. Field Cell 7, the empty rainwater field cell, also reported several concentrations of total P that were above the conservative interim objective concentration of 0.02 mg/L.
- Two field cells (FC-2 and FC-5) also reported concentrations of dissolved Cr that were higher than the most conservative PWQO value of 0.001 mg/L for hexavalent Cr, but were below the higher PWQO value of 0.0089 mg/L for trivalent Cr. Speciation of Cr was not completed for these samples; however hexavalent chromium is not expected in drainage from crushed rock. In 2016 and 2017, the laboratory detection limit was higher than the conservative PWQO value of 0.001 mg/L.
- The field blank cell FC-7 (rainwater) reported two concentrations of dissolved zinc near the start of monitoring that were similar to but slightly above the in-place PWQO value of 0.03 mg/L.

8.0 CONCLUSIONS

In conclusion, the Project has not resulted in any critical geochemical data gaps. The available data remains supportive of the Project in understanding the potential for metal leaching and acid rock drainage (ML/ARD) at a level of detail sufficient to support the EER.

9.0 REFERENCES

Amec Foster Wheeler 2013. Côté Gold Project Geochemical Characterization Report, dated December 2013.

Amec Foster Wheeler 2014. Côté Gold Project, Amended Environmental Impact Statement / Final Environmental, Assessment Report, Addendum to Appendix E – Geochemical Characterization Report. Memo, dated December 2014.

10.0 ACRONYMS AND ABBREVIATIONS

ABA	Acid Base Accounting
AP	Acid Potential
ARD	Acid Rock Drainage
$CaCO_3$/t	Calcium Carbonate Per Tonne
Carb NPR	Carbonate Neutralization Potential Ratio
EA	Environmental Assessment
EER	Environmental Effects Review
HPGR	High Pressure Grinding Rolls
km	Kilometres
ML/ARD	Metal Leaching And Acid Rock Drainage
mg/L	Milligrams per Liter
MRA	Mine Rock Area
PAG	Potentially Acid Generating
PWQO	Provincial Water Quality Objectives
NPAG	Non-Potentially Acid Generating
NP	Neutralization Potential
NPR	Neutralization Potential Ratio
SAG	Semi-Autogenous Grinding
TMF	Tailings Management Facility

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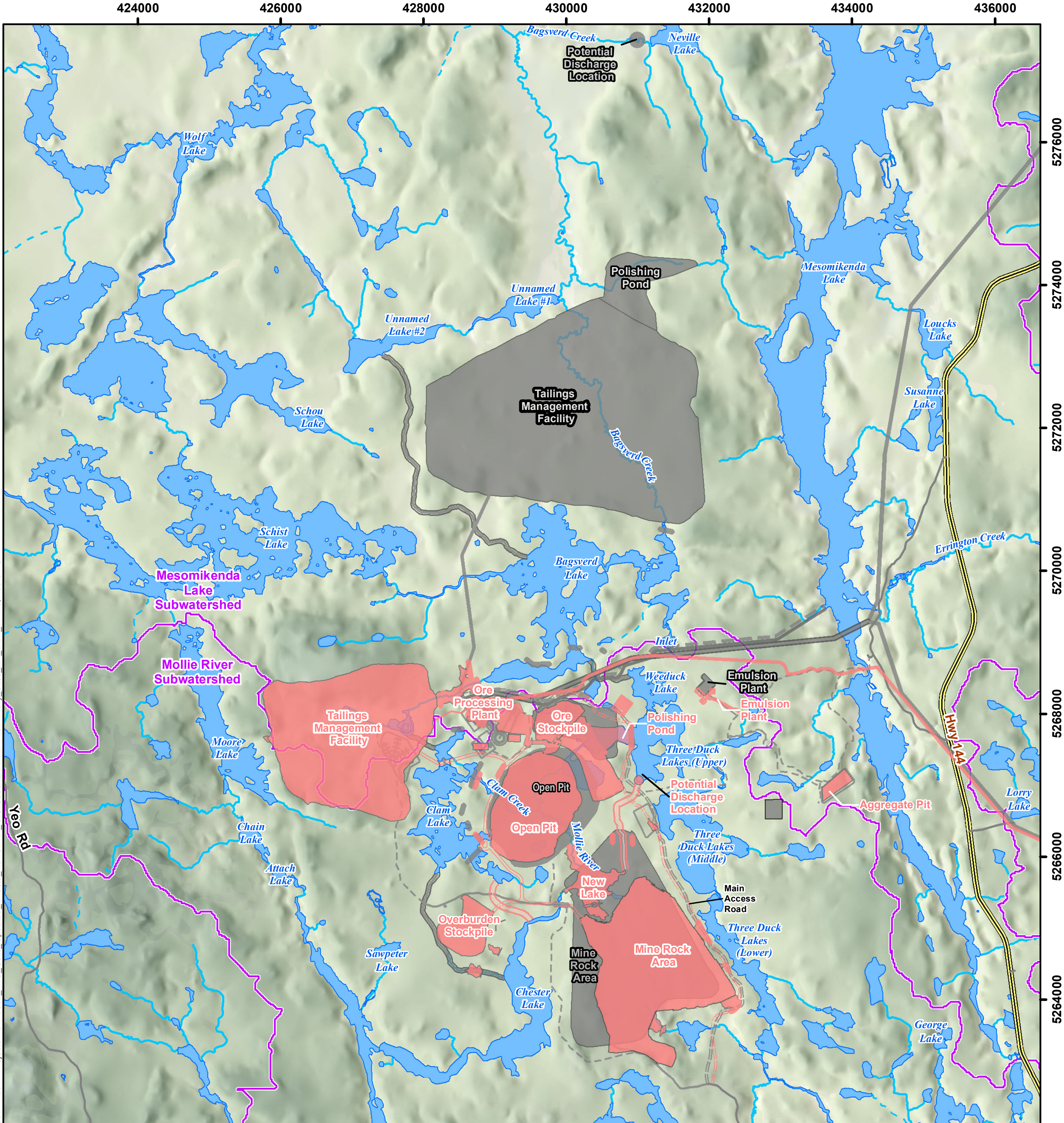
FIGURES



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LEGEND

- Environmental Assessment (EA) Site Facility
- Environmental Effects Review (EER) Site Facility
- Existing Intermittent Watercourse
- Highway
- Existing Permanent Watercourse
- Local Road
- Subwatershed Boundary
- Existing Waterbodies

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N E S W

IAMGOLD CORPORATION

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CÔTÉ GOLD PROJECT

Site Facility Comparison EA and EER

PROJECT N^{o}: TC170502

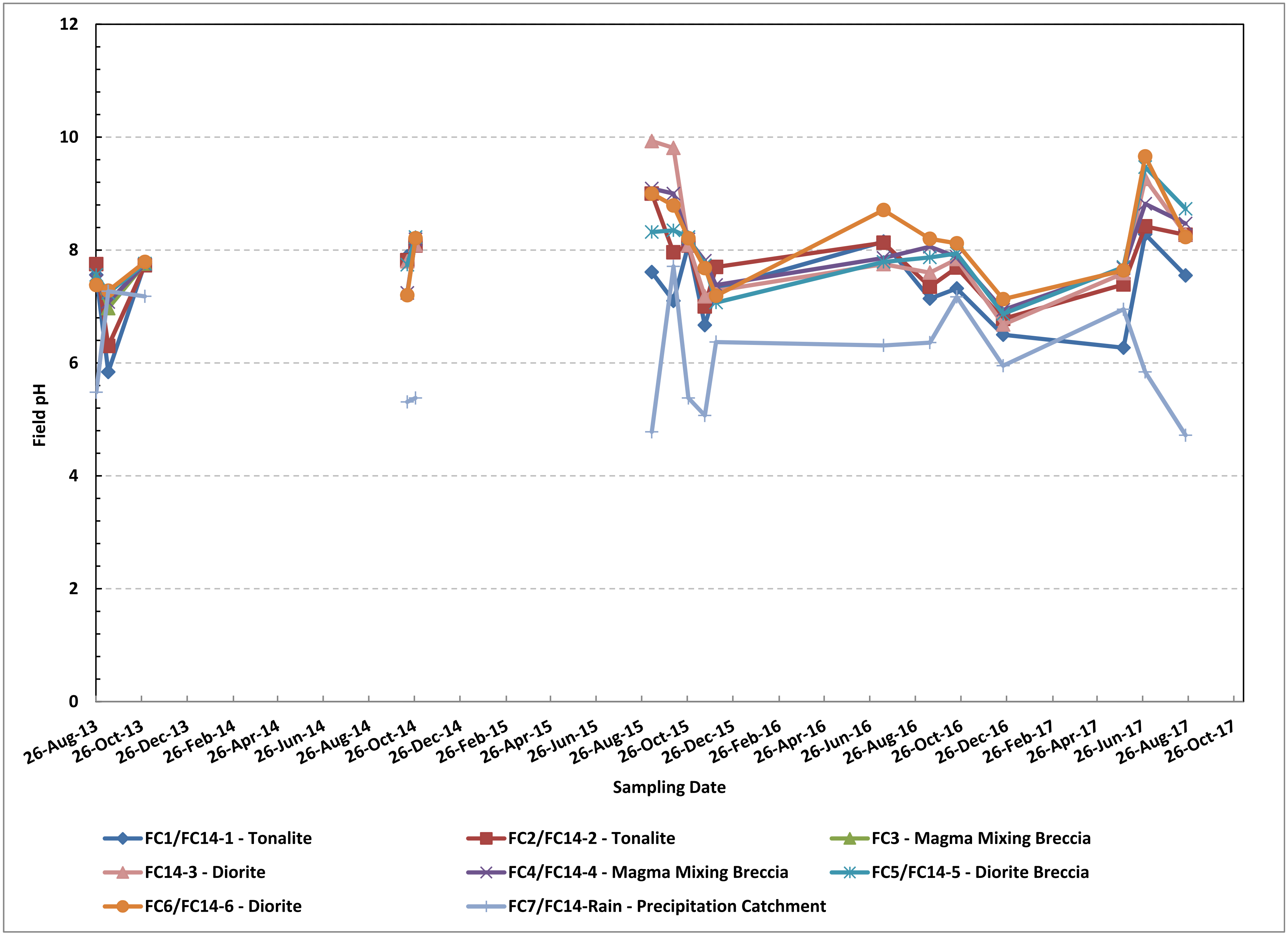
FIGURE: 1

SCALE:1:72,000

DATE: January 2018

APPENDIX I

FIELD CELL DATA



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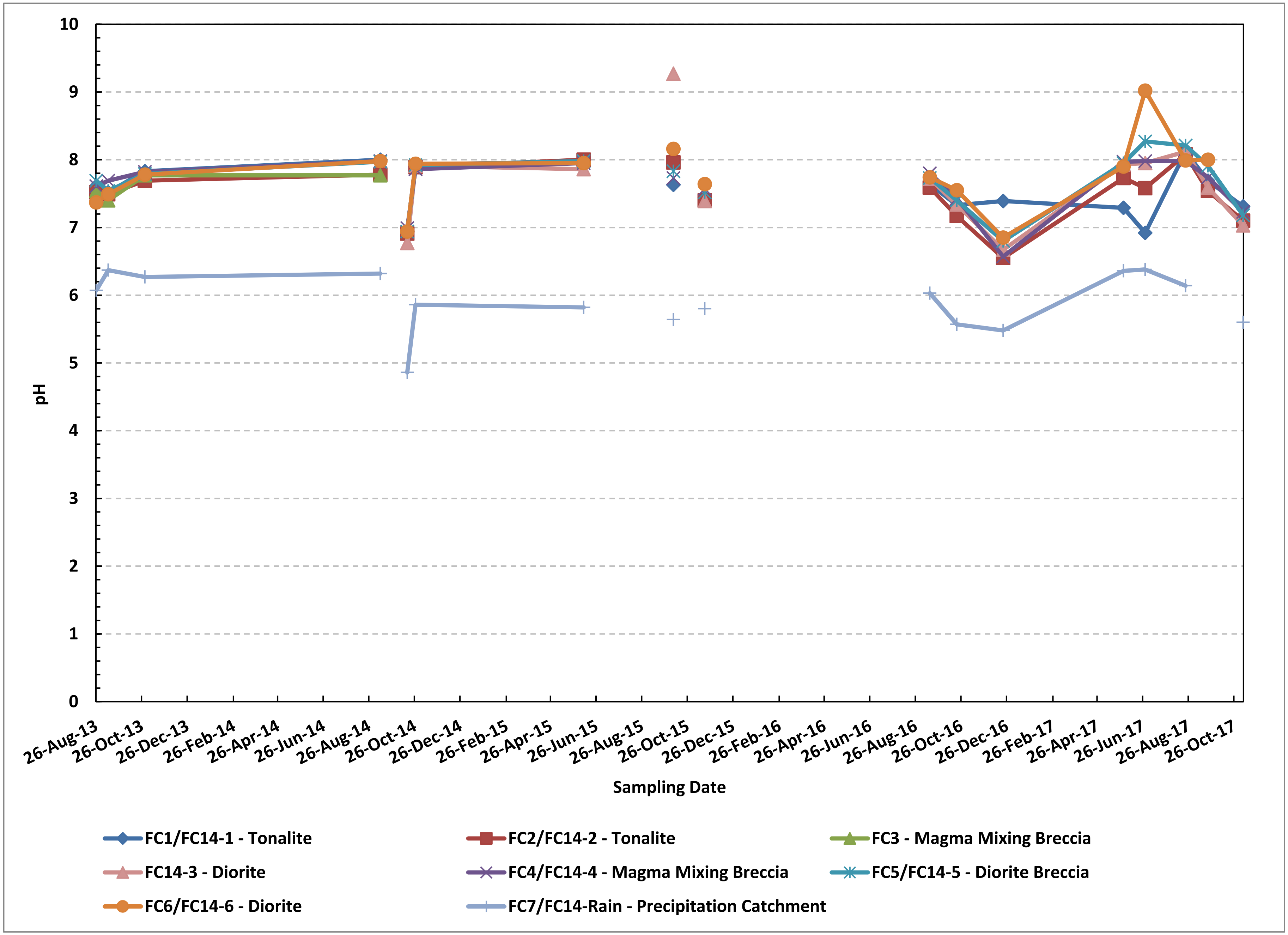
26-Aug-16
26-Oct-16
26-Dec-16
26-Feb-17
26-Apr-17
26-Jun-17
26-Aug-17
26-Oct-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC14-Rain - Precipitation Catchment



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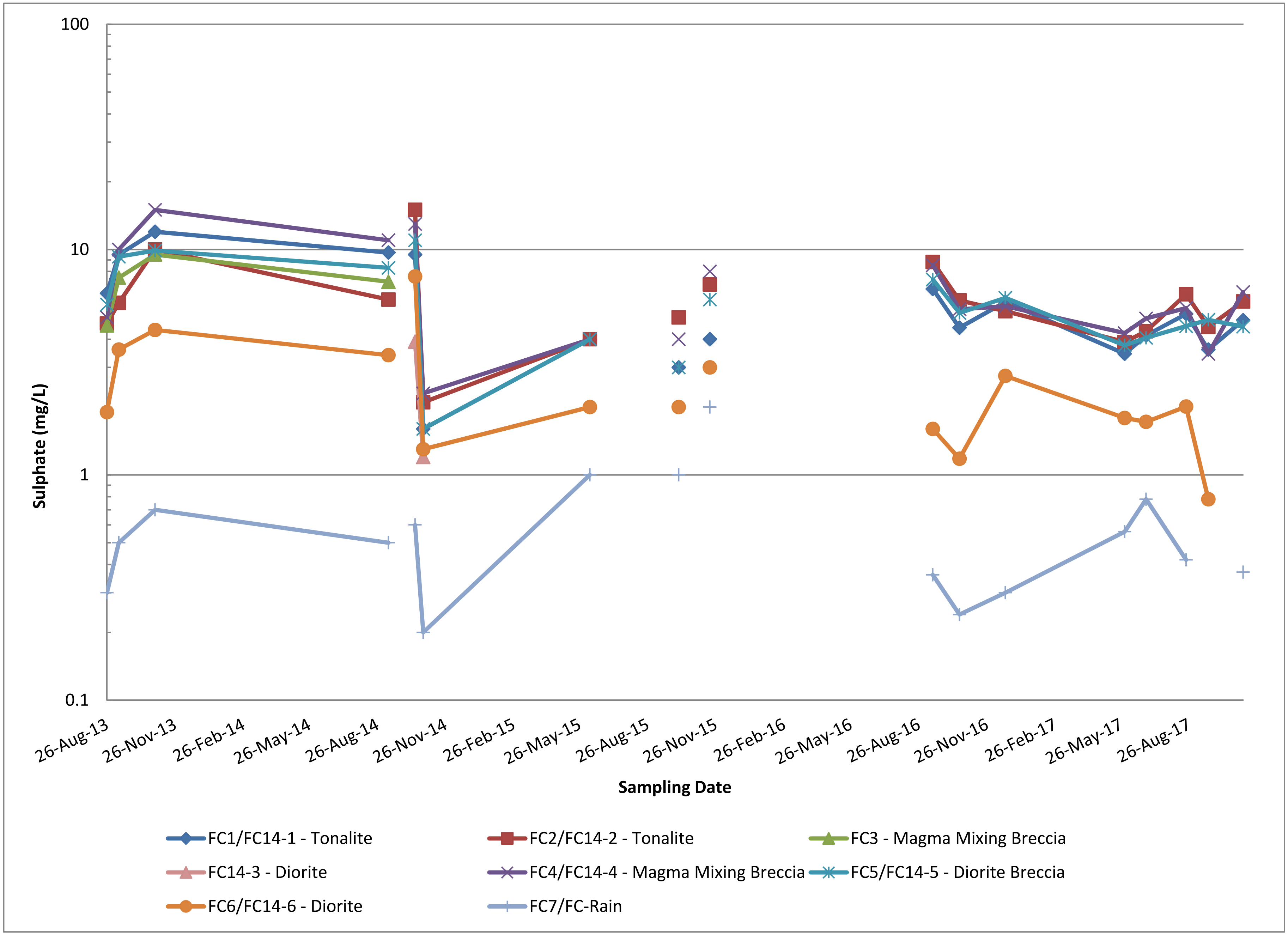
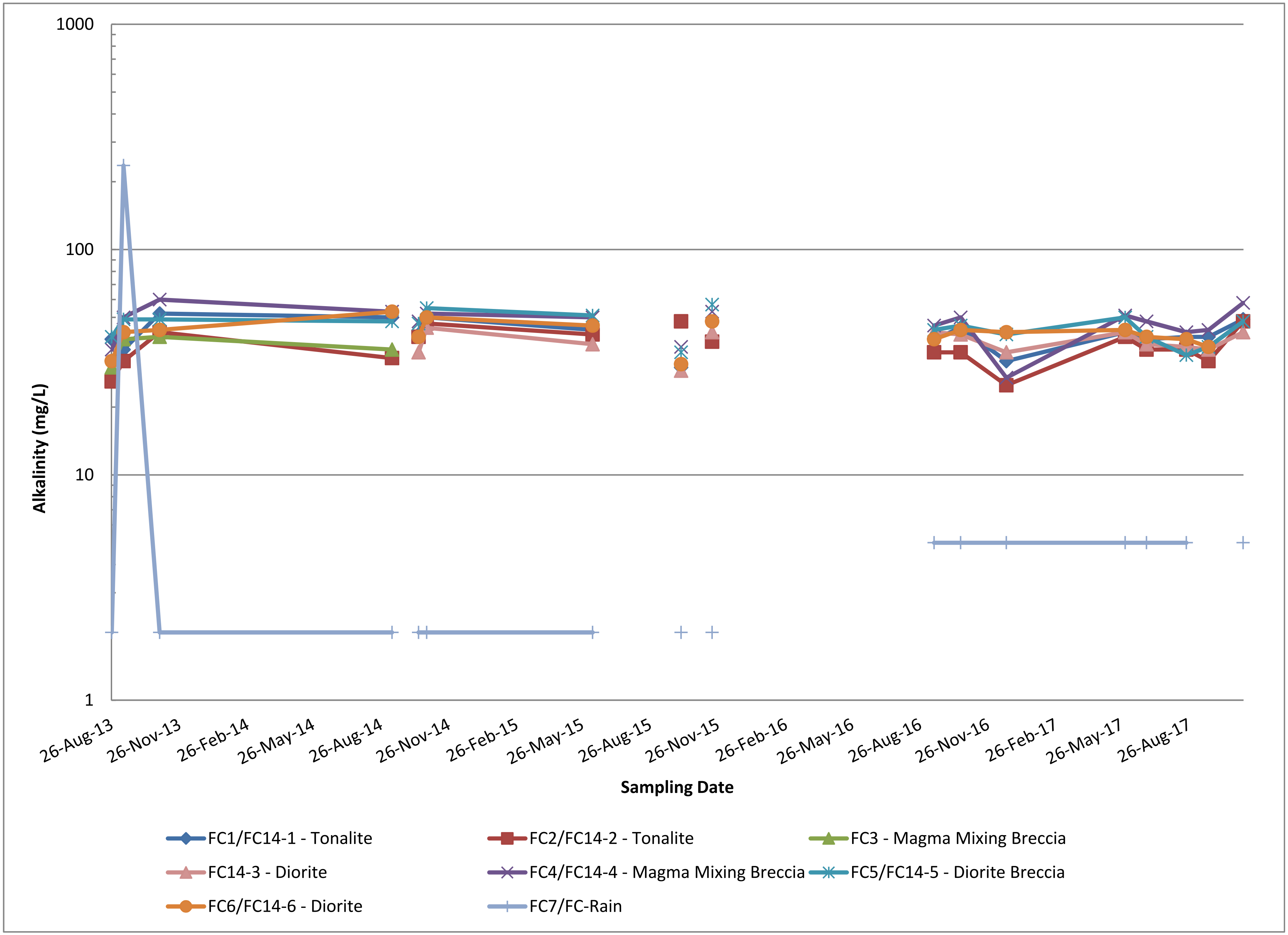
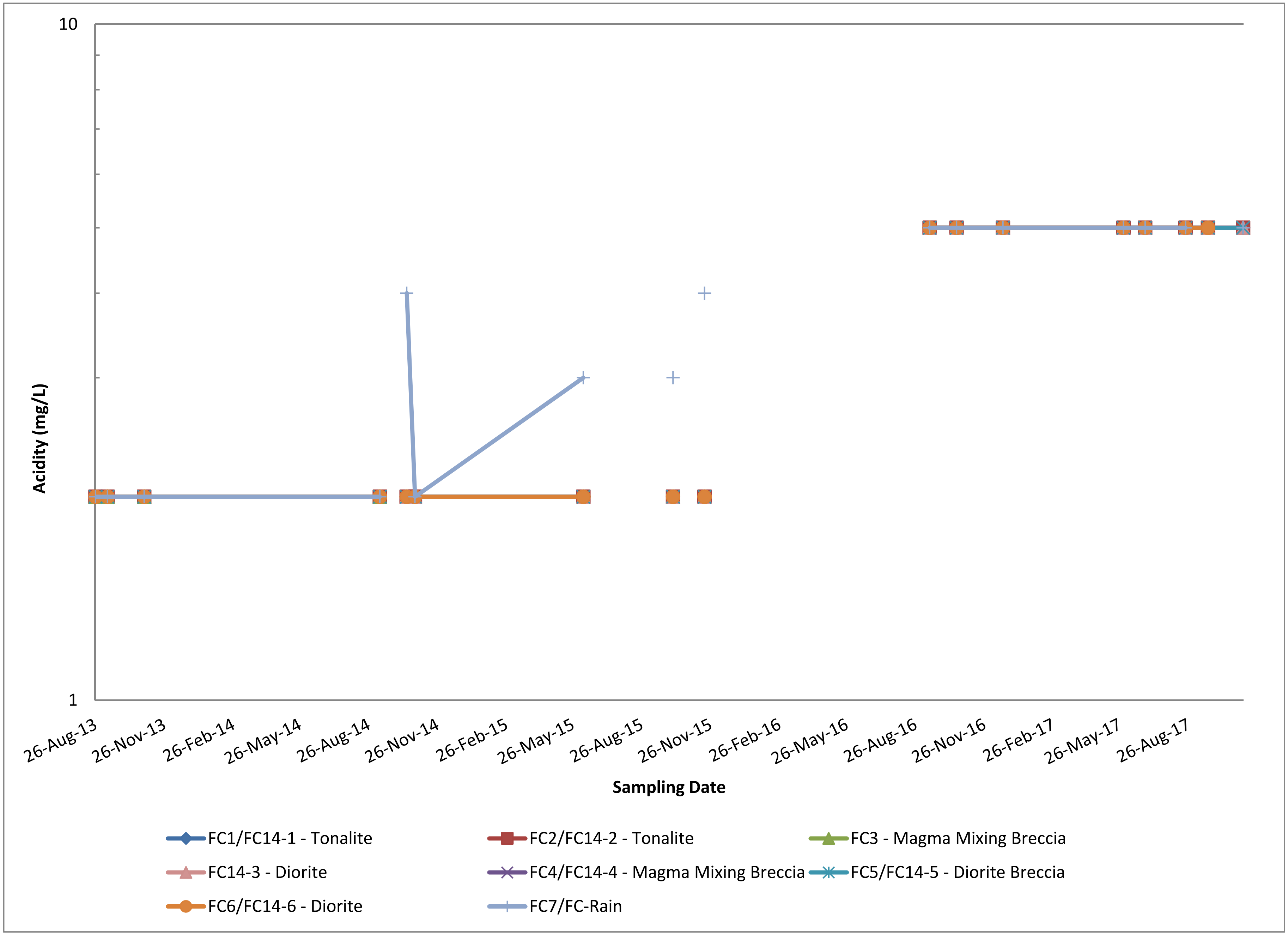
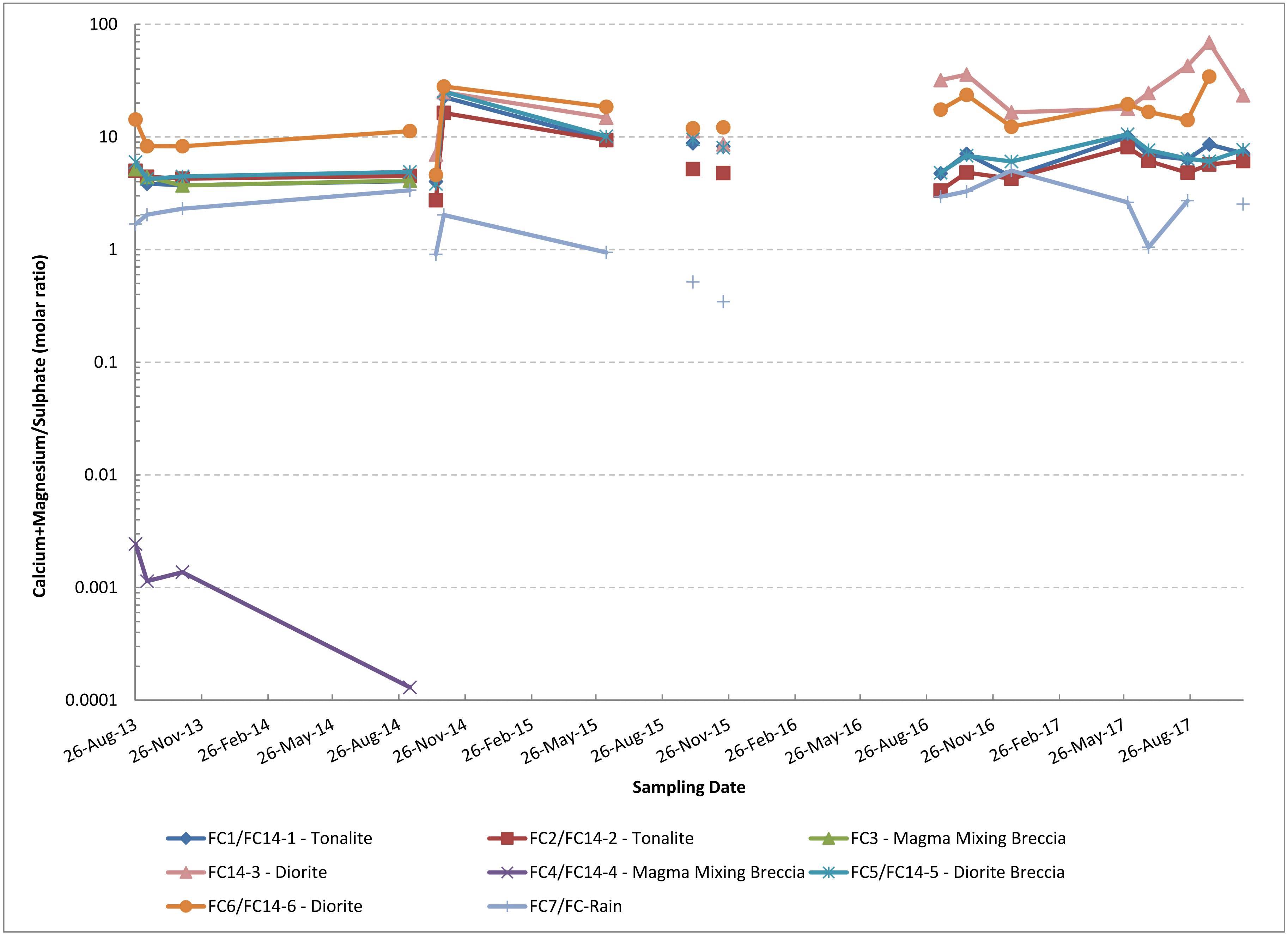
26-Apr-17
26-Jun-17
26-Aug-17
26-Oct-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC14-Rain - Precipitation Catchment


100
10
1
0.1
Sulphate (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain

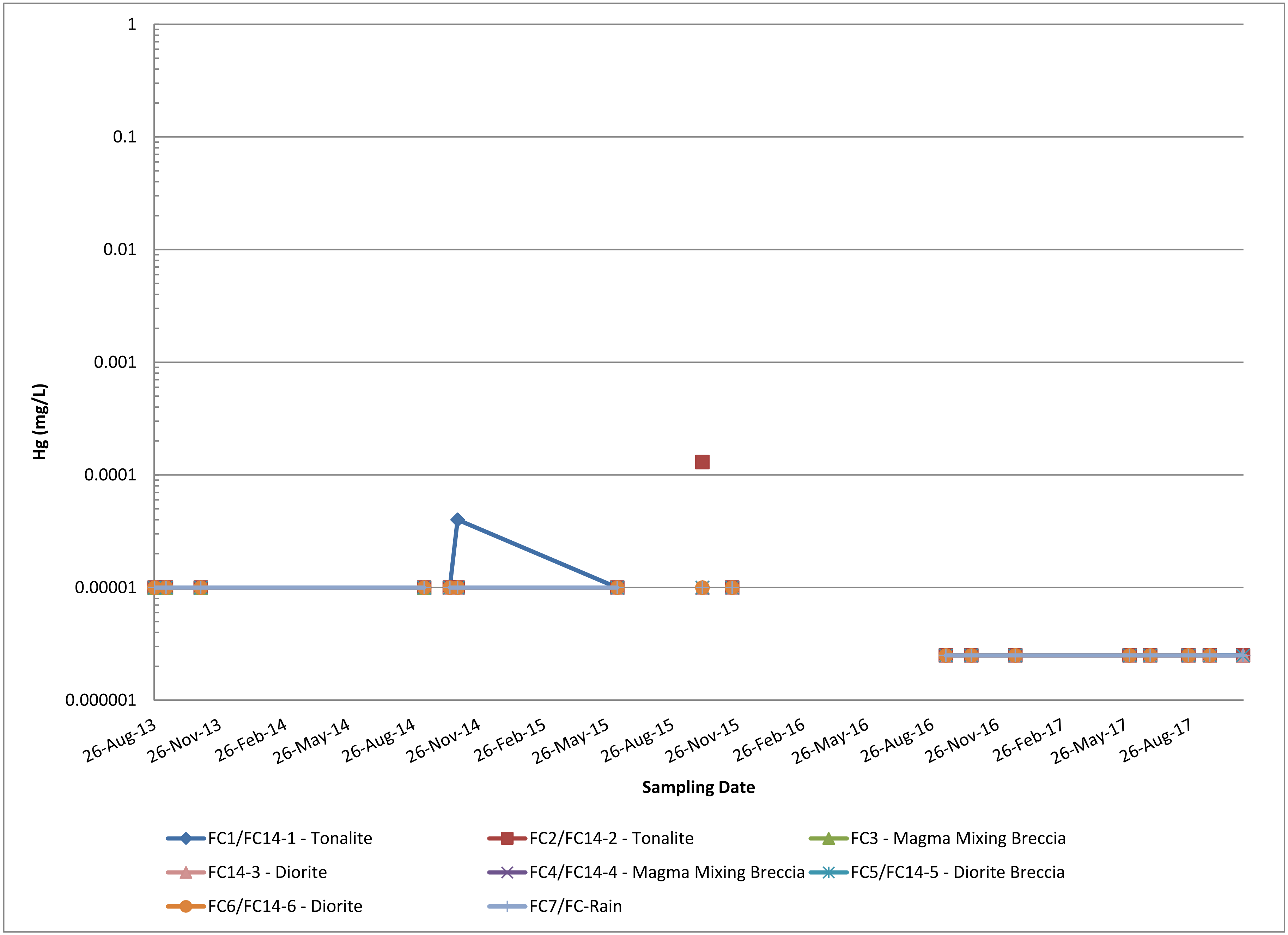

1000
100
10
1
Alkalinity (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



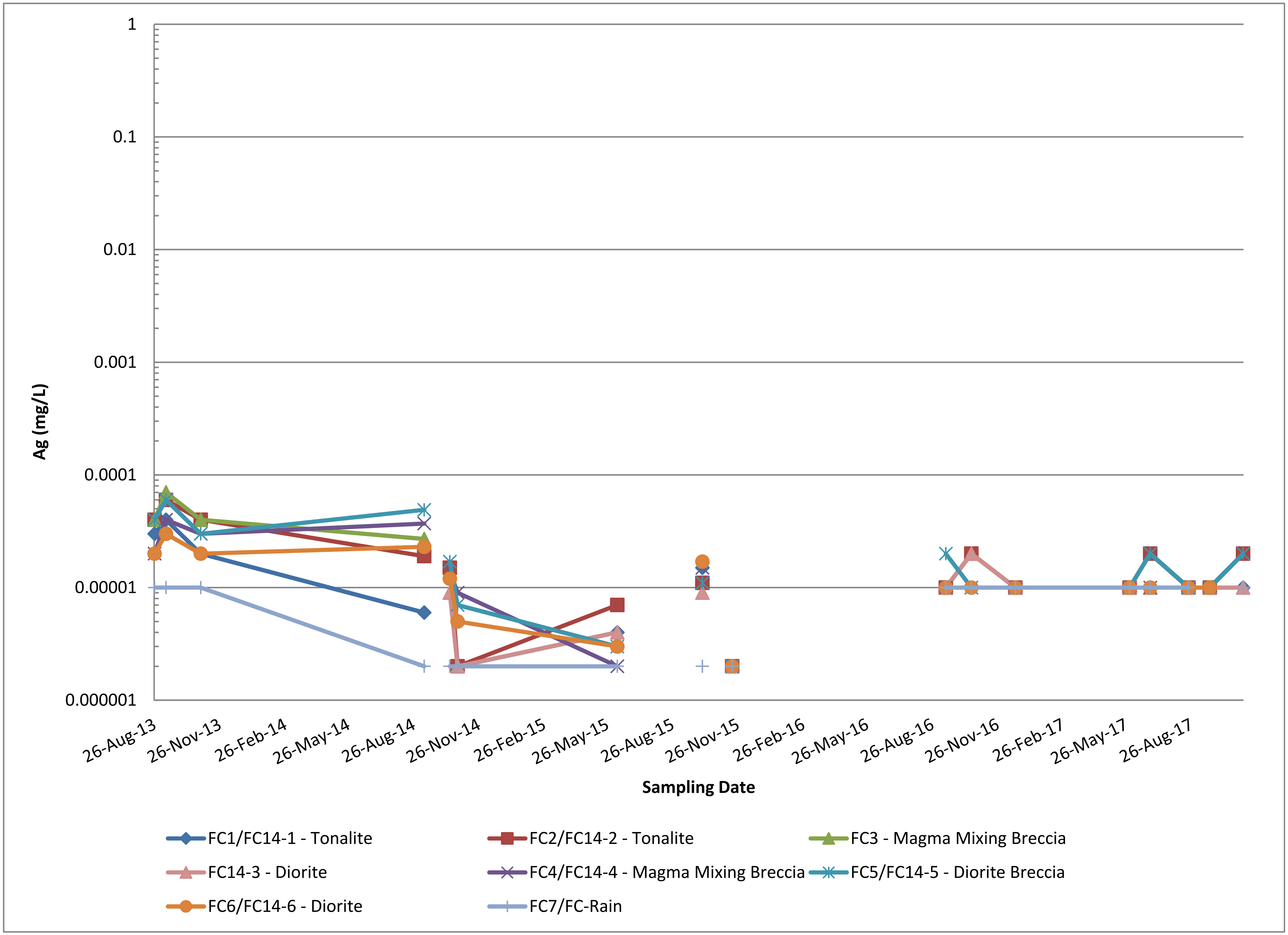
10
1
Acidity (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



100
10
1
0.1
0.01
0.001
0.0001
Calcium+Magnesium/Sulphate (molar ratio)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
0.1
0.01
0.001
0.0001
0.00001
0.000001
Hg (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
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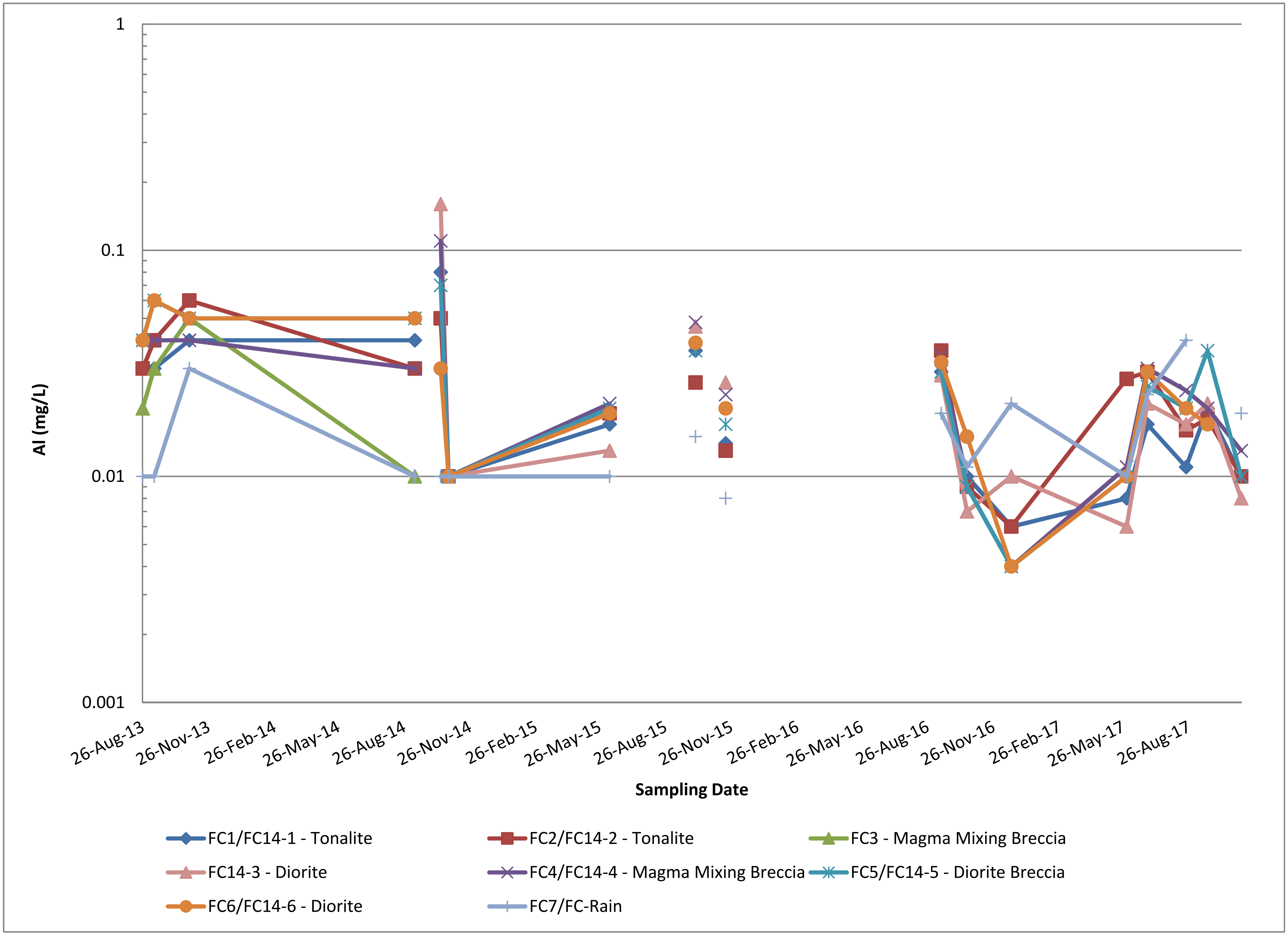
0.01
0.001
0.0001
0.00001
0.000001
Ag (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



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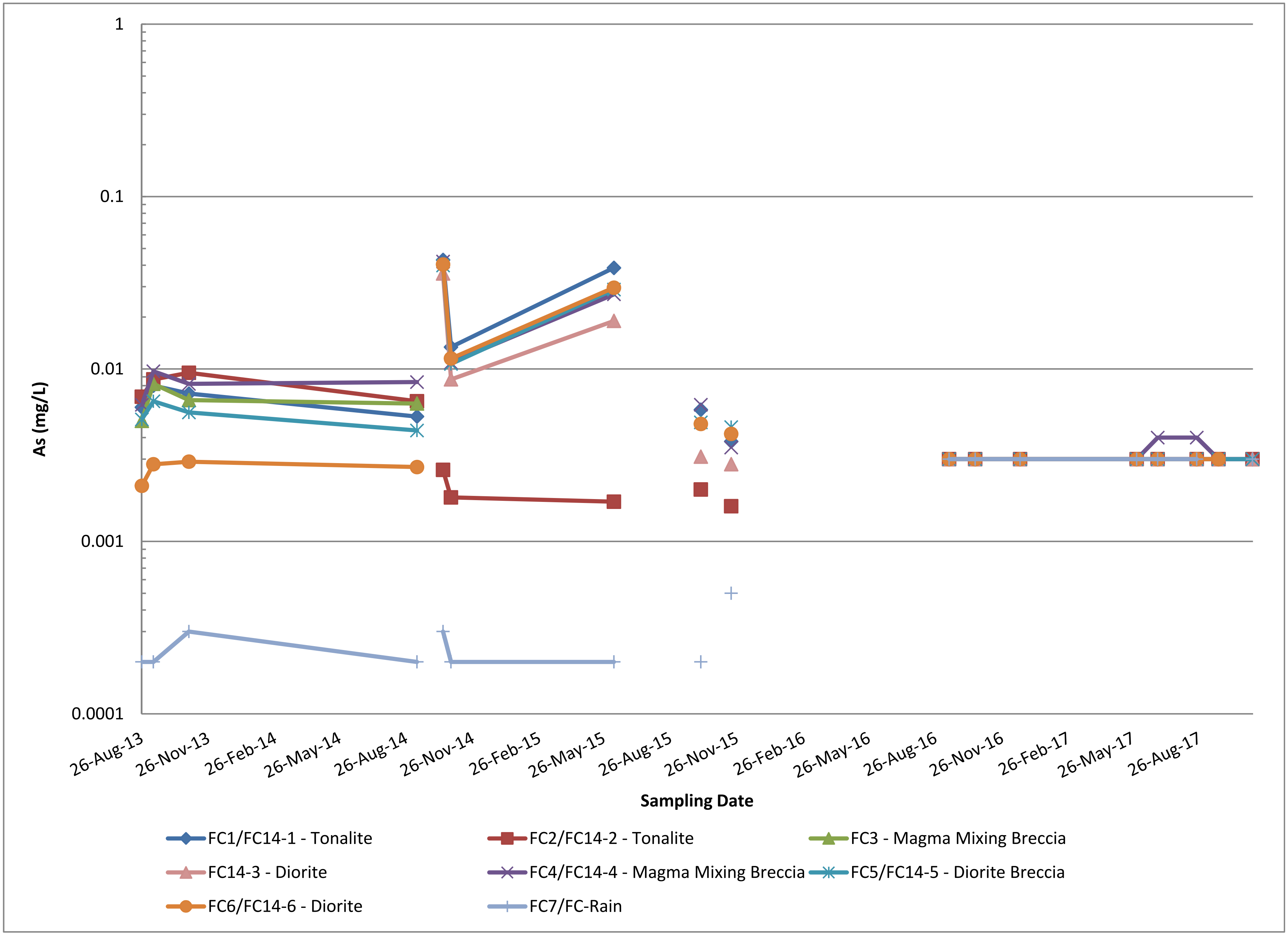
0.01
0.001
Al (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



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0.001
0.0001
As (mg/L)
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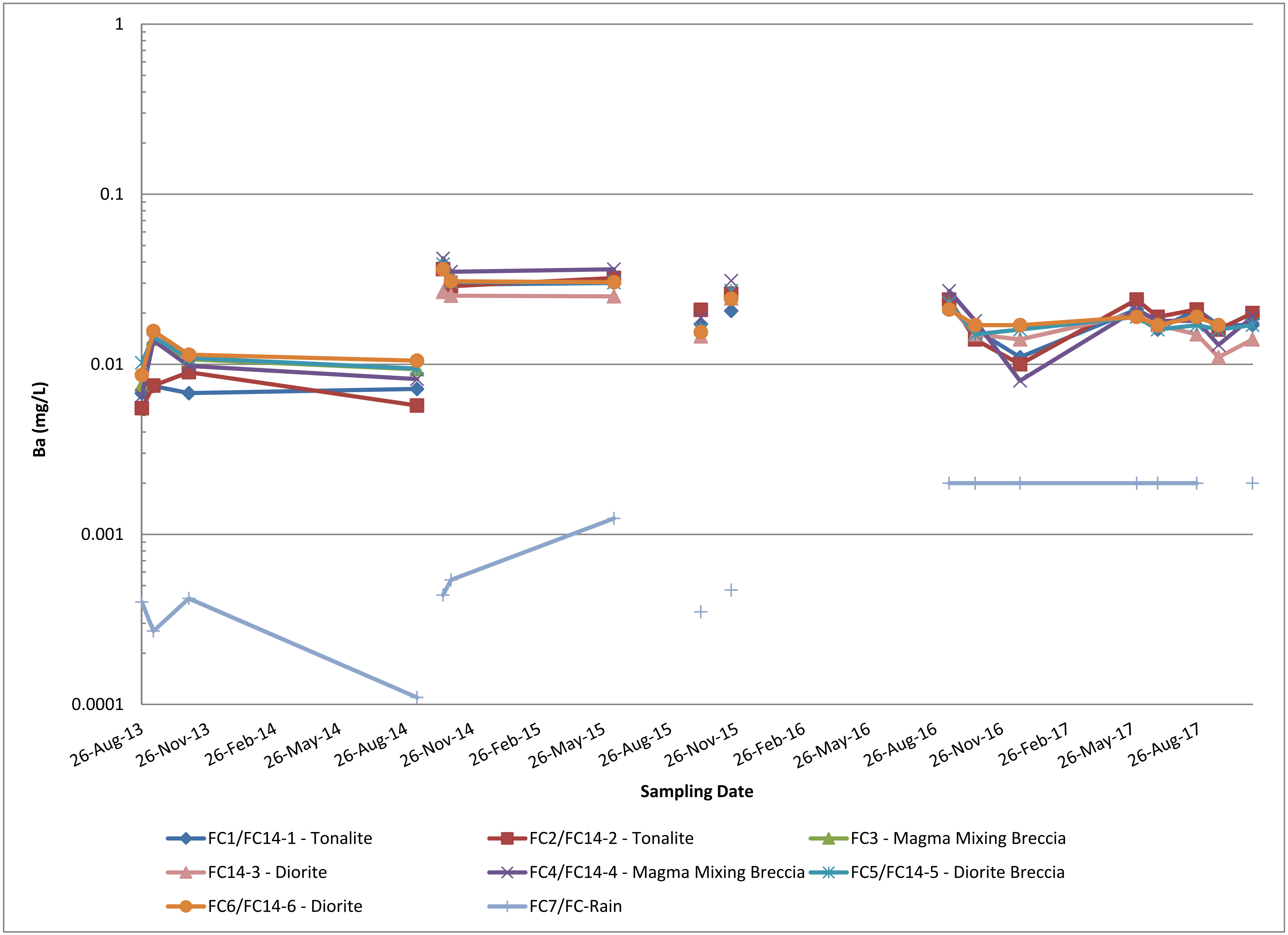
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain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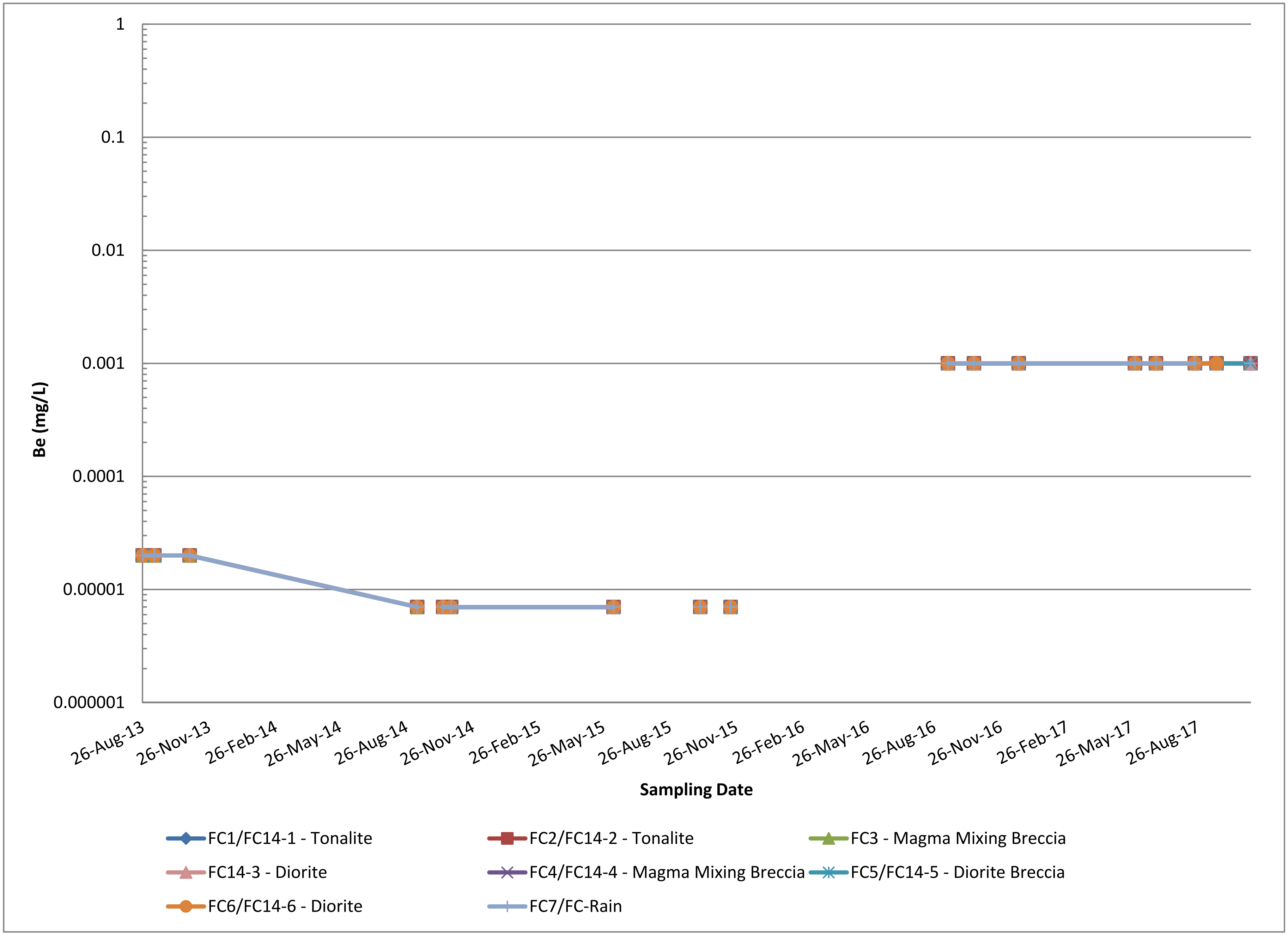
0.001
0.0001
Ba (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



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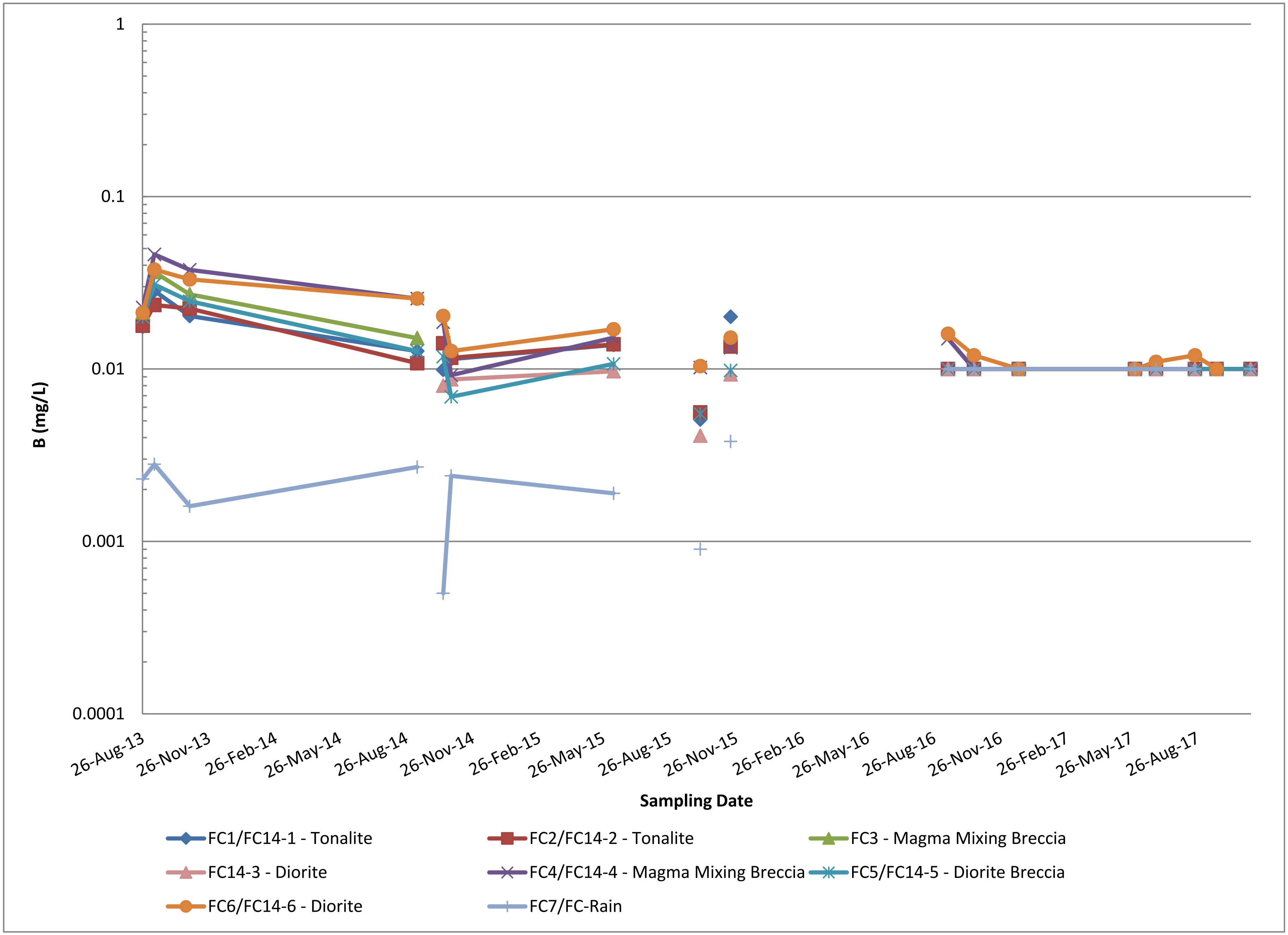
0.001
0.0001
0.00001
0.000001
Be (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain


B (mg/L)
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0.01
0.001
0.0001
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
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26-Nov-14
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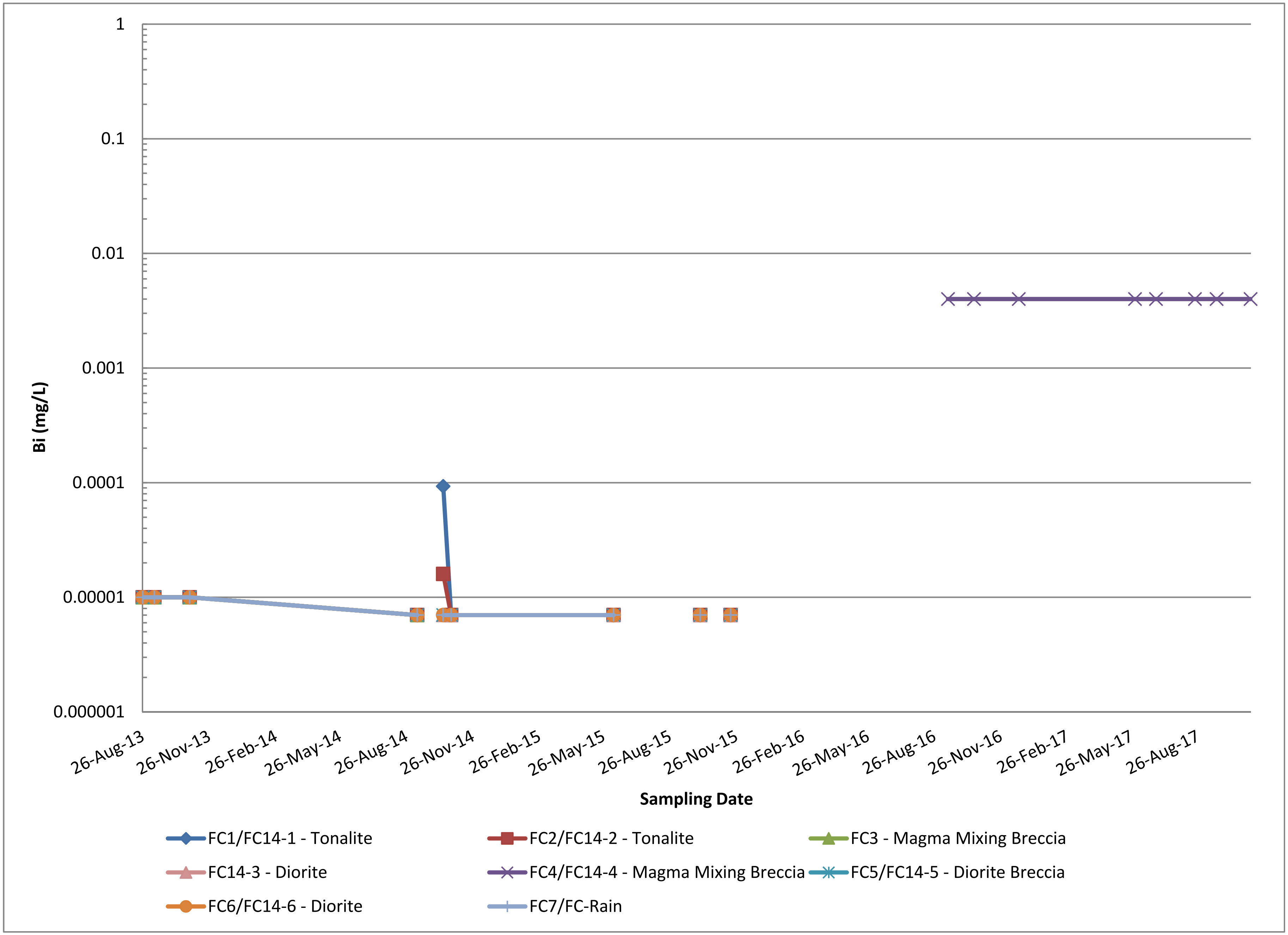
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
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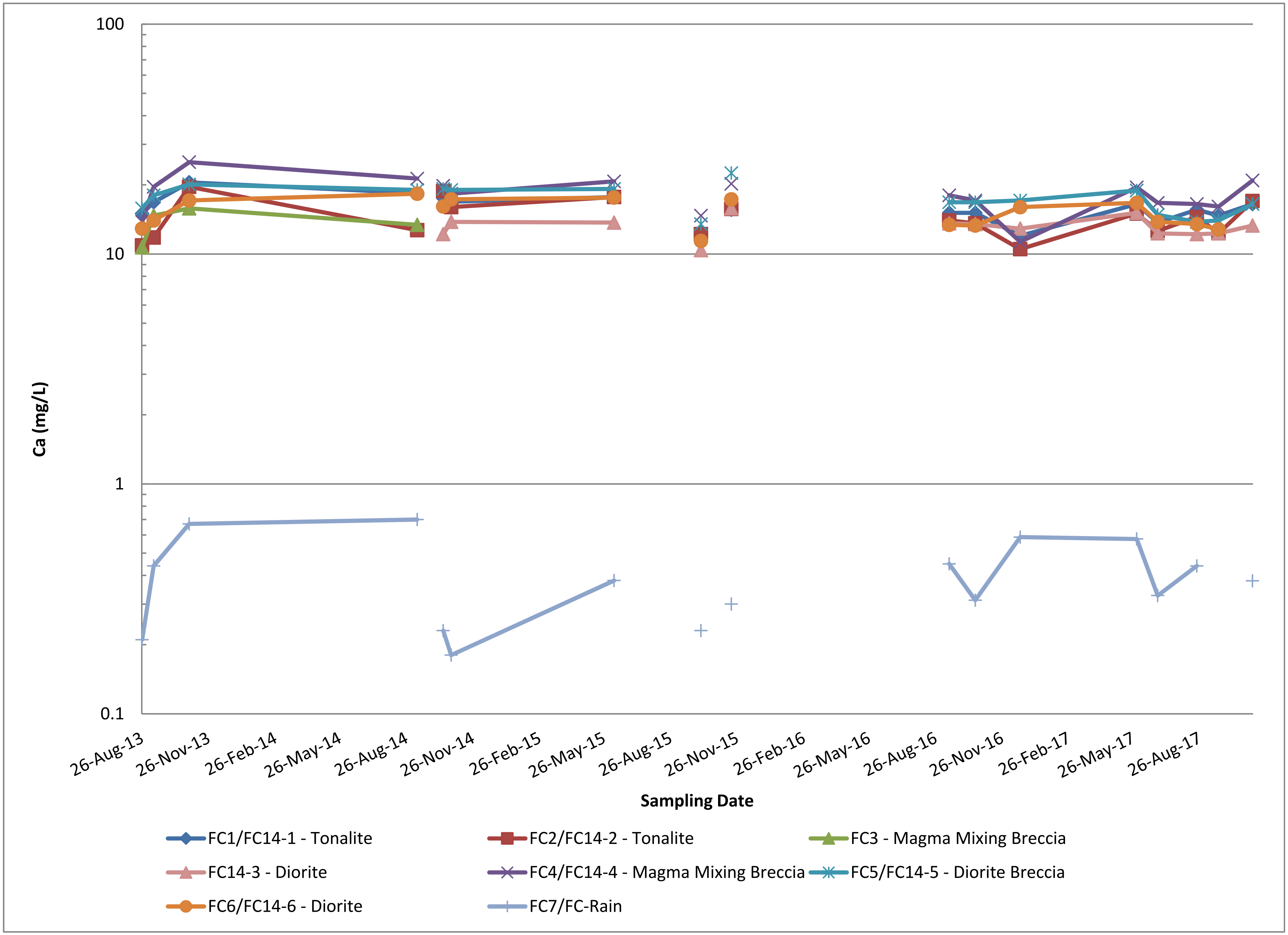
0.01
0.001
0.0001
0.00001
0.000001
Bi (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



100
10
1
0.1
Ca (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
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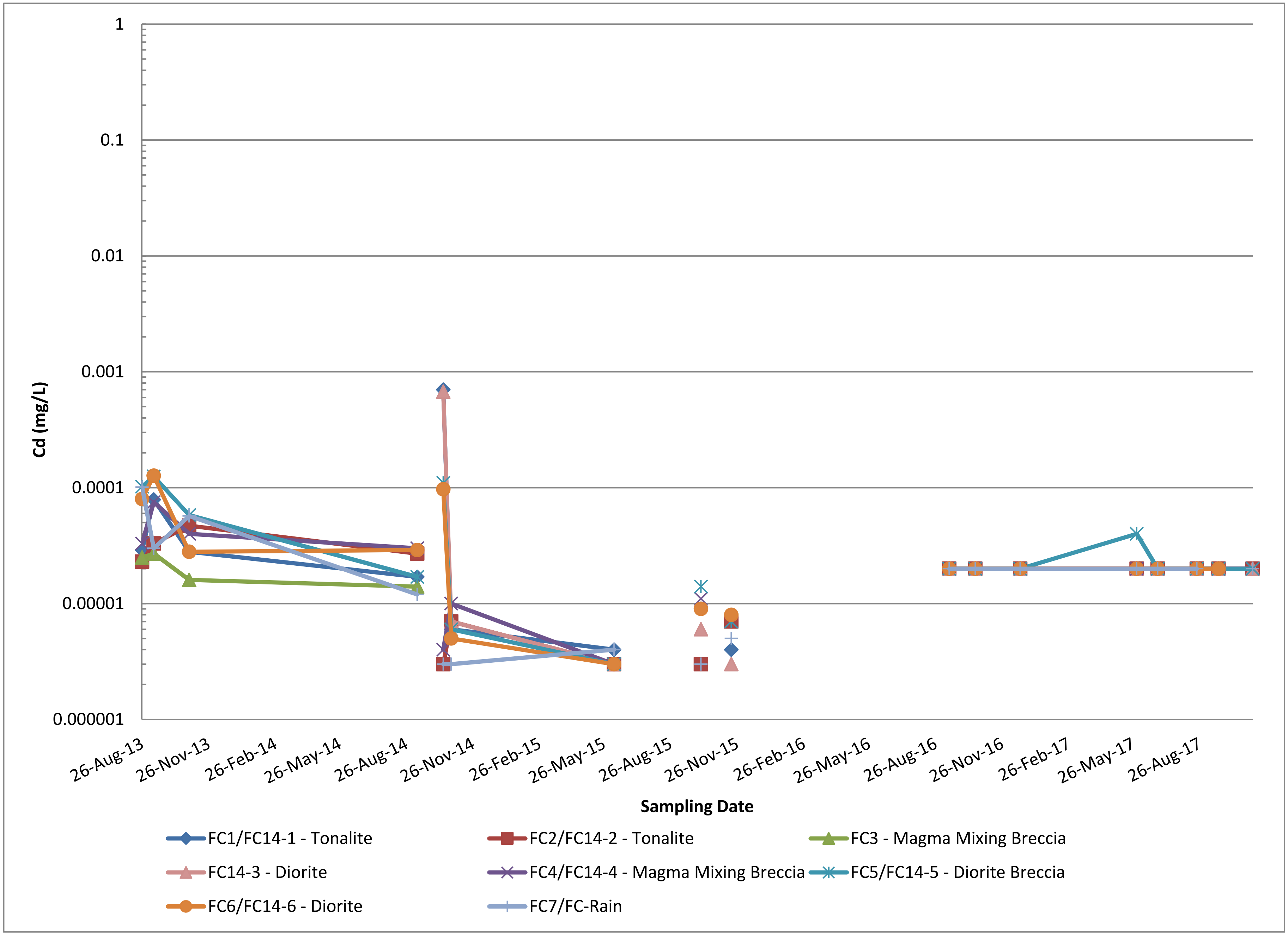
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



Cd (mg/L)
1
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0.00001
0.000001
26-Aug-13
26-Nov-13
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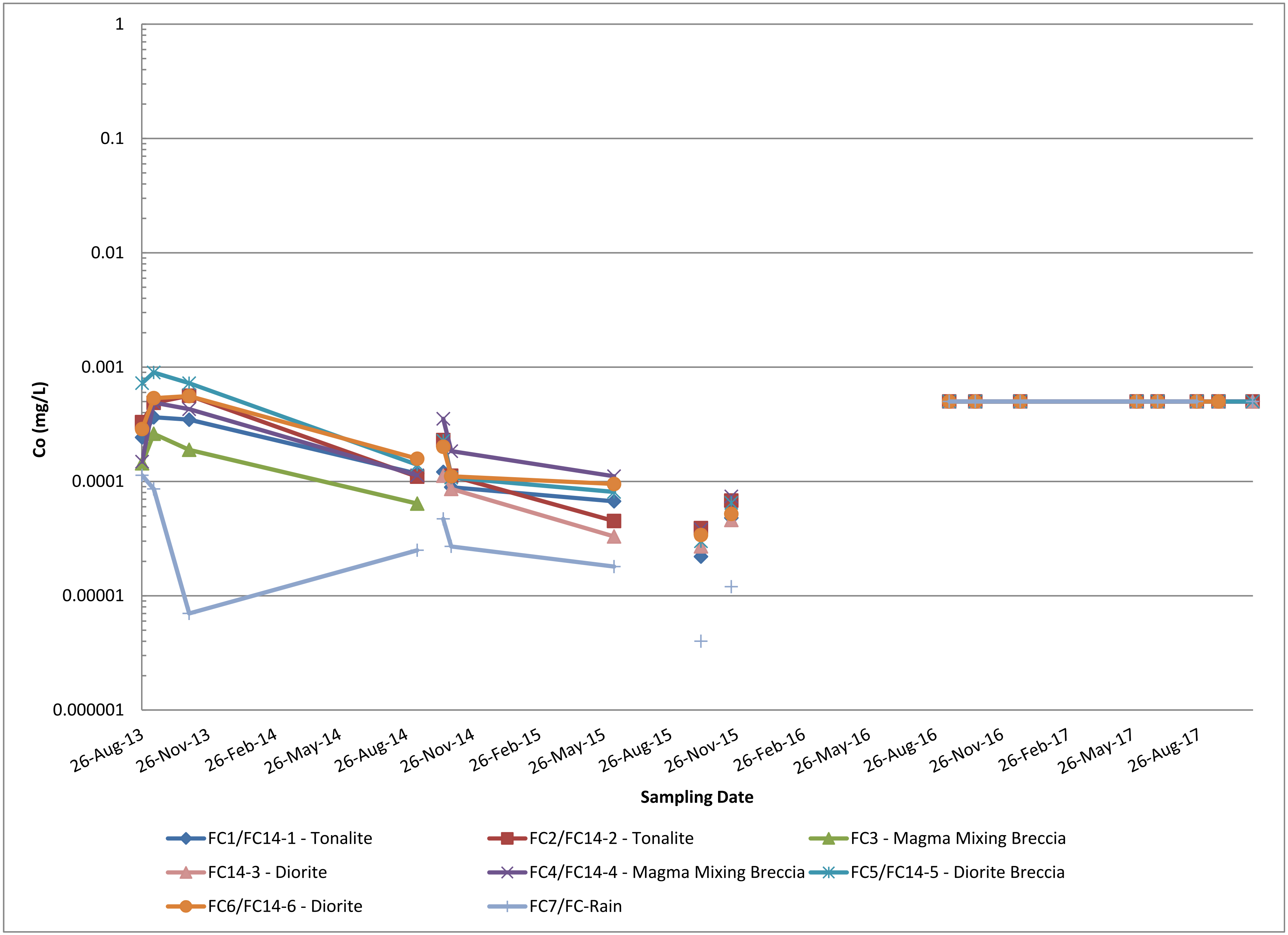
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
0.1
0.01
0.001
0.0001
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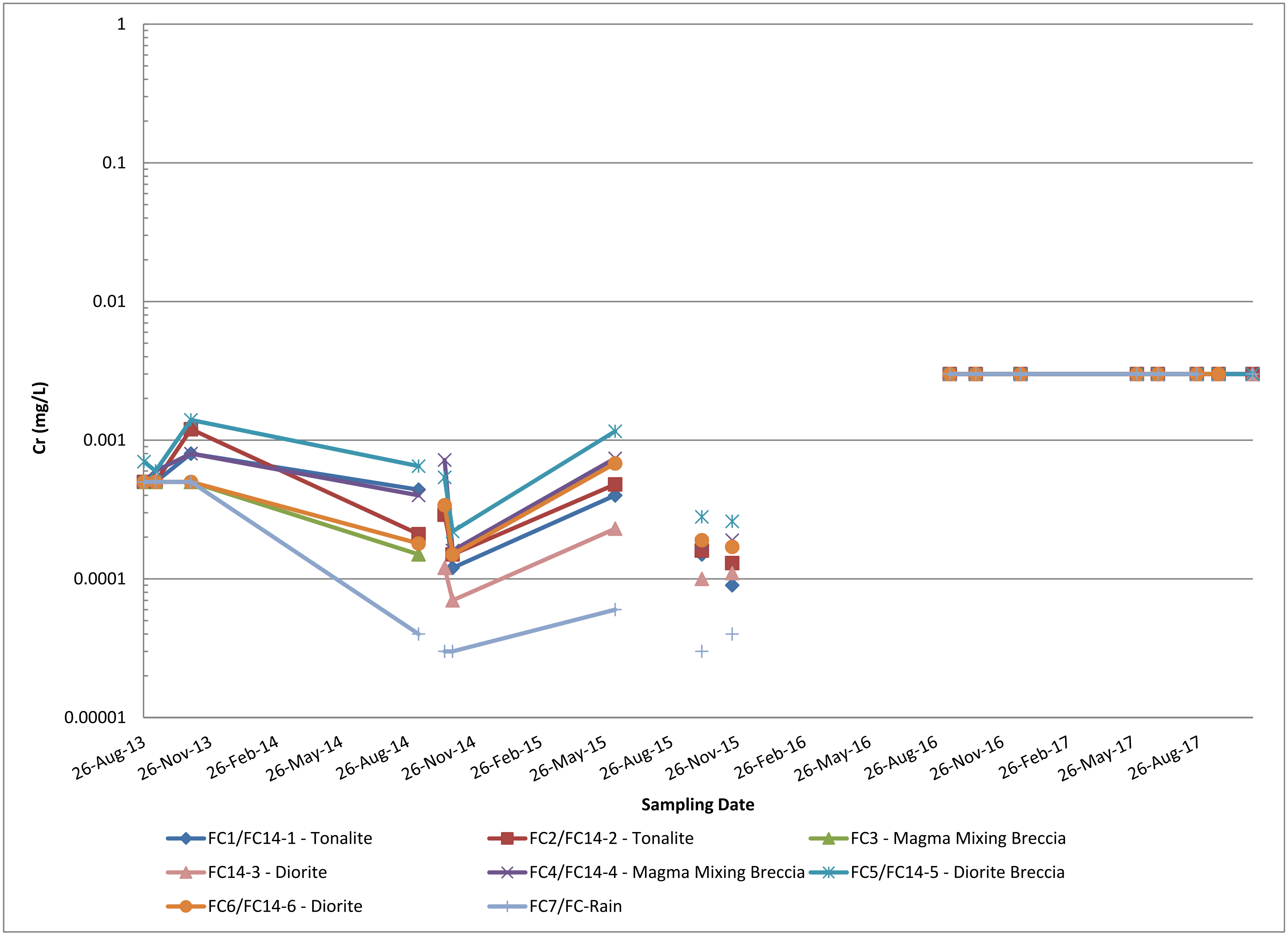
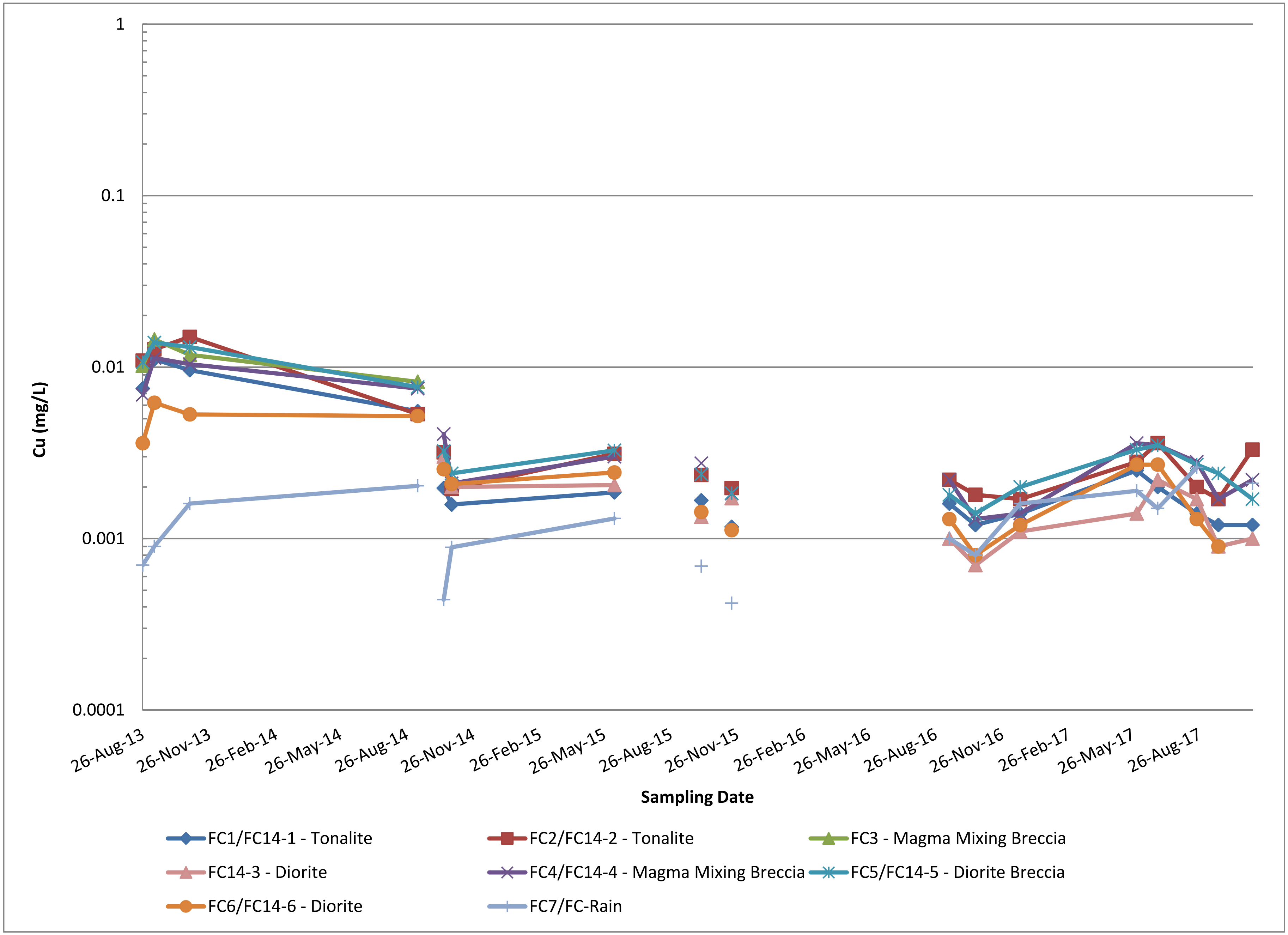
0.000001
Co (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
0.1
0.01
0.001
0.0001
0.00001
Cr (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



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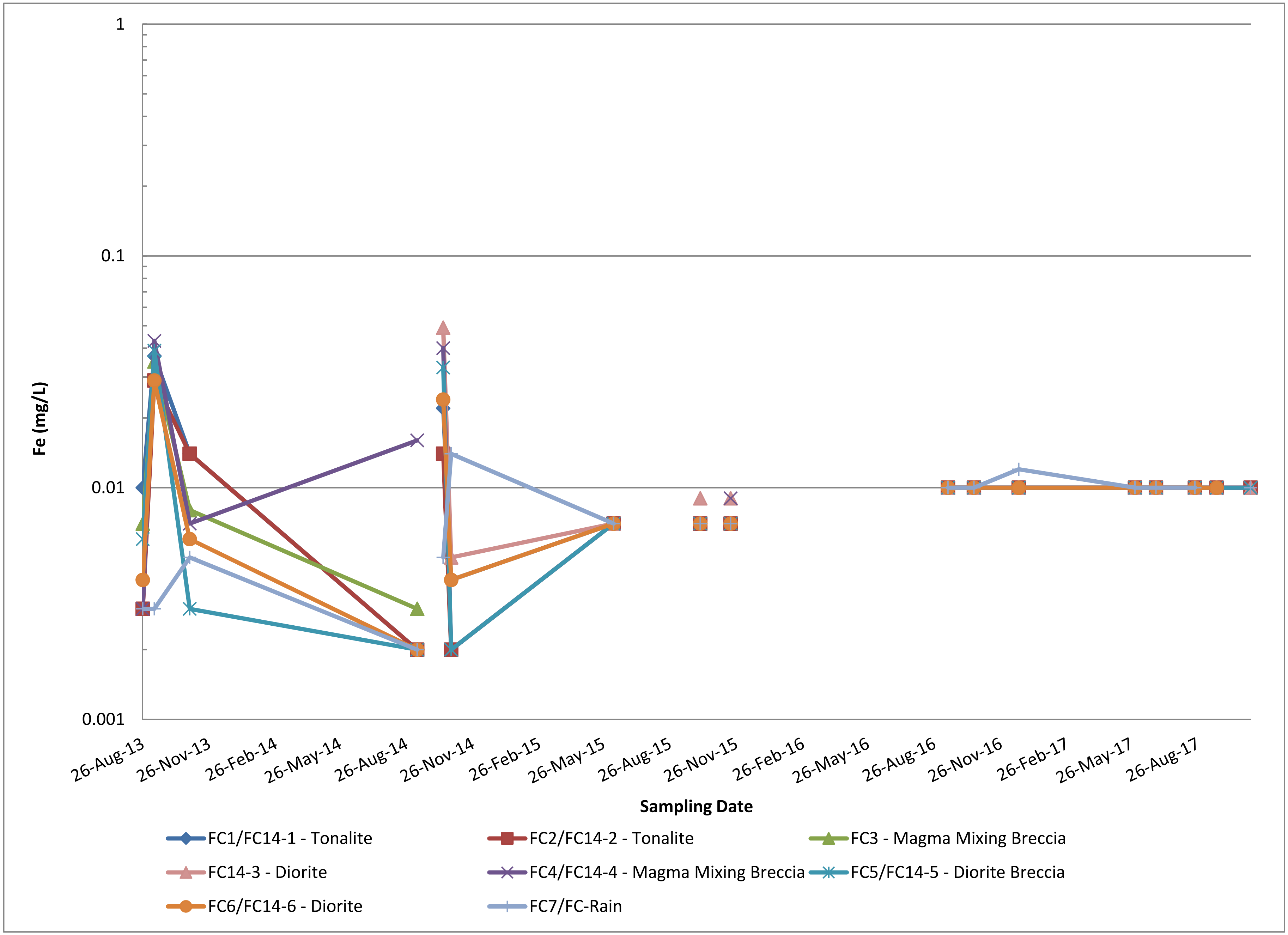
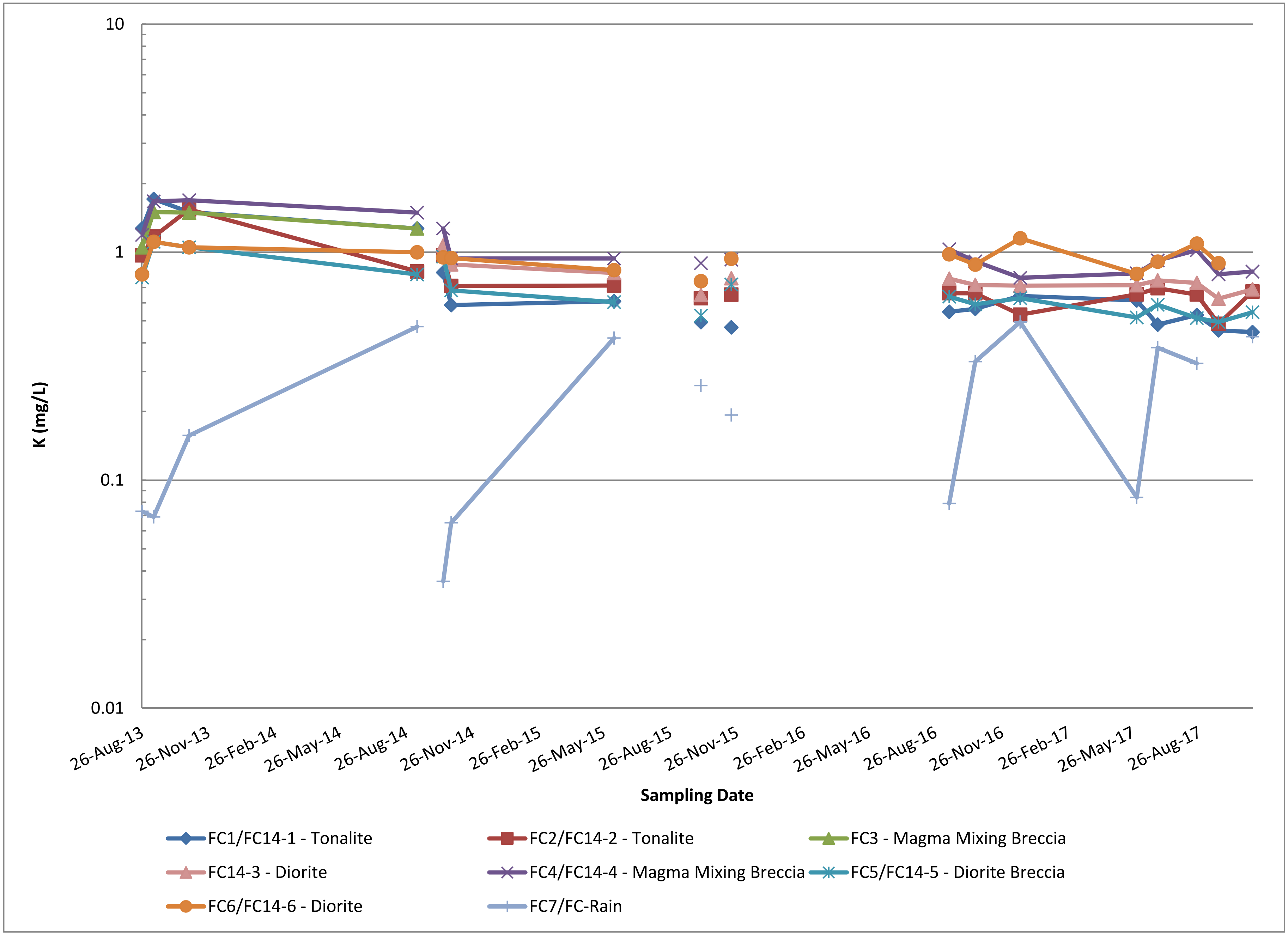
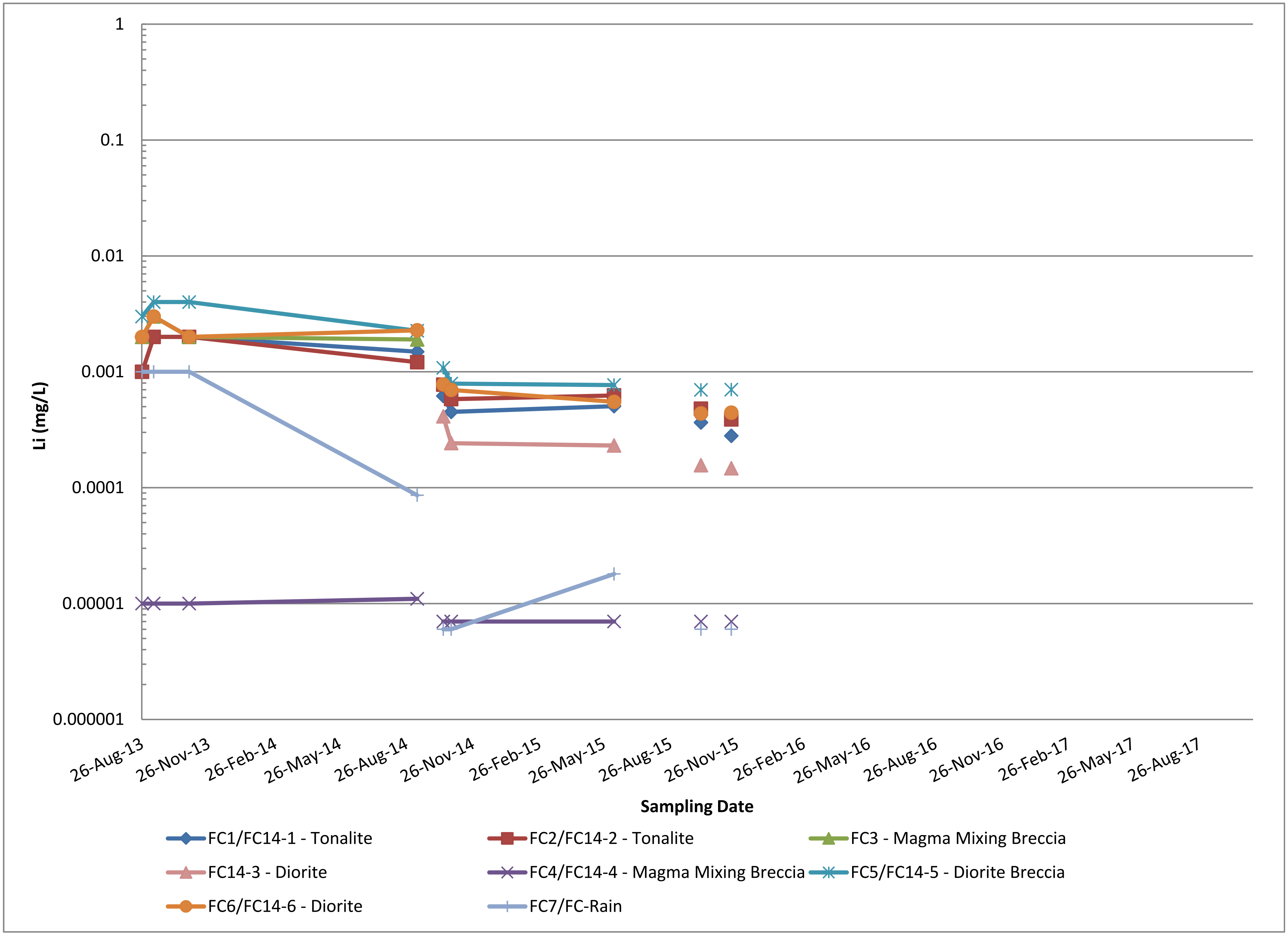
0.1
0.01
0.001
0.0001
Cu (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



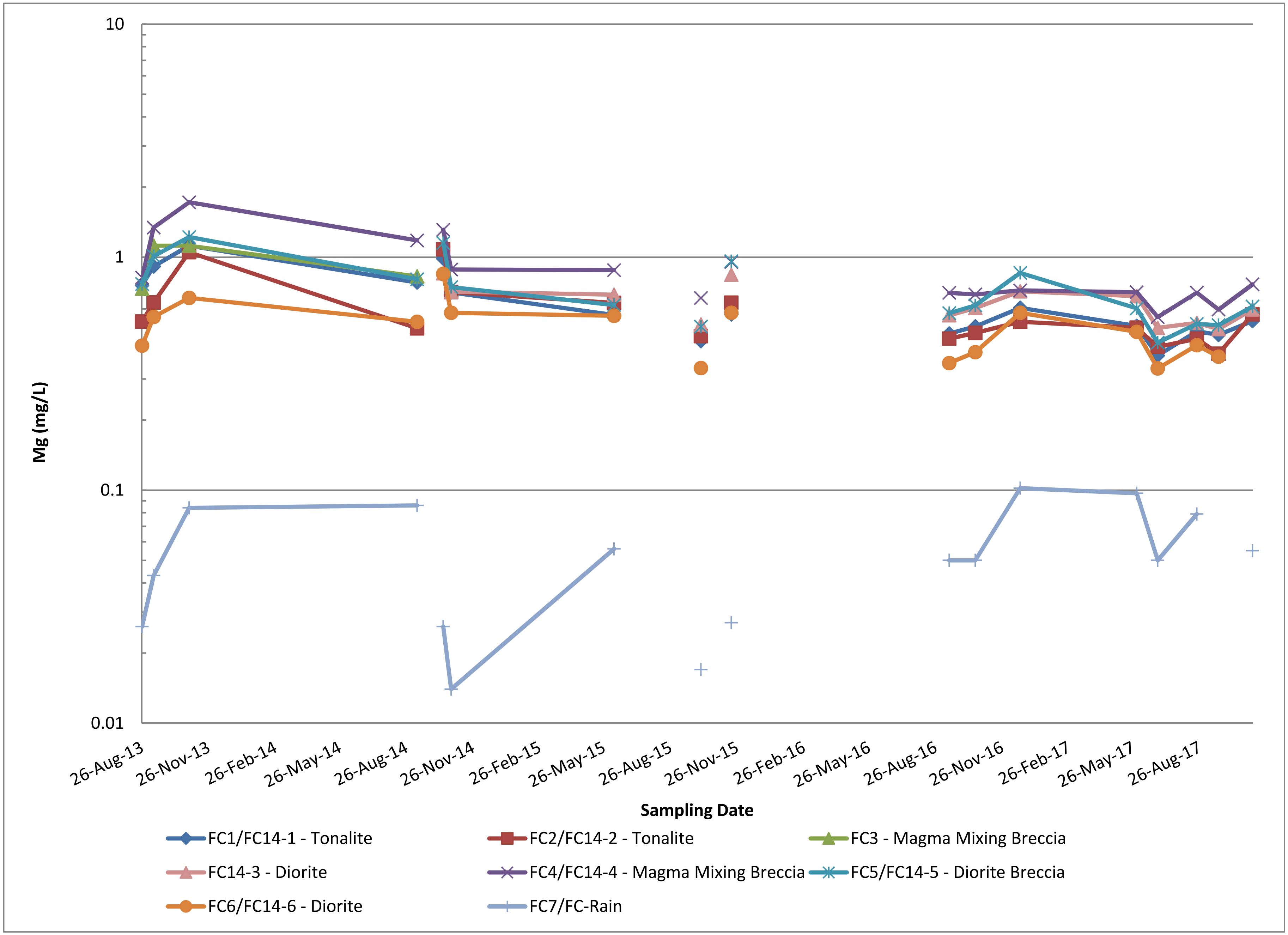
Fe (mg/L)
1
0.1
0.01
0.001
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



10
1
0.1
0.01
K (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



1
0.1
0.01
0.001
0.0001
0.00001
0.000001
Li (mg/L)
26-Aug-13
26-Nov-13
26-Feb-14
26-May-14
26-Aug-14
26-Nov-14
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain


10
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Mg (mg/L)
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26-Nov-13
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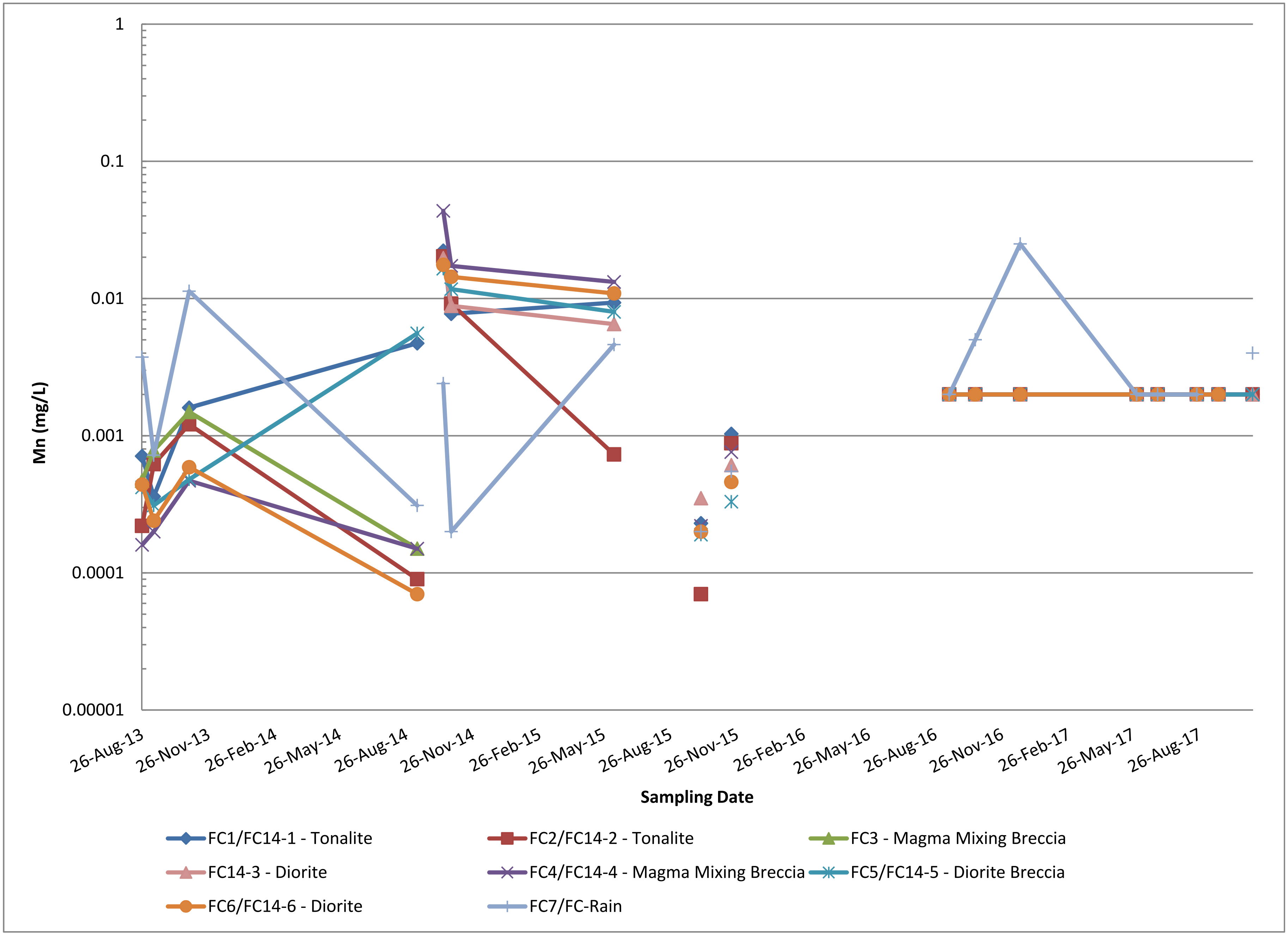
26-Feb-15
26-May-15
26-Aug-15
26-Nov-15
26-Feb-16
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



Mn (mg/L)
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0.0001
0.00001
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26-May-14
26-Aug-14
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26-Aug-15
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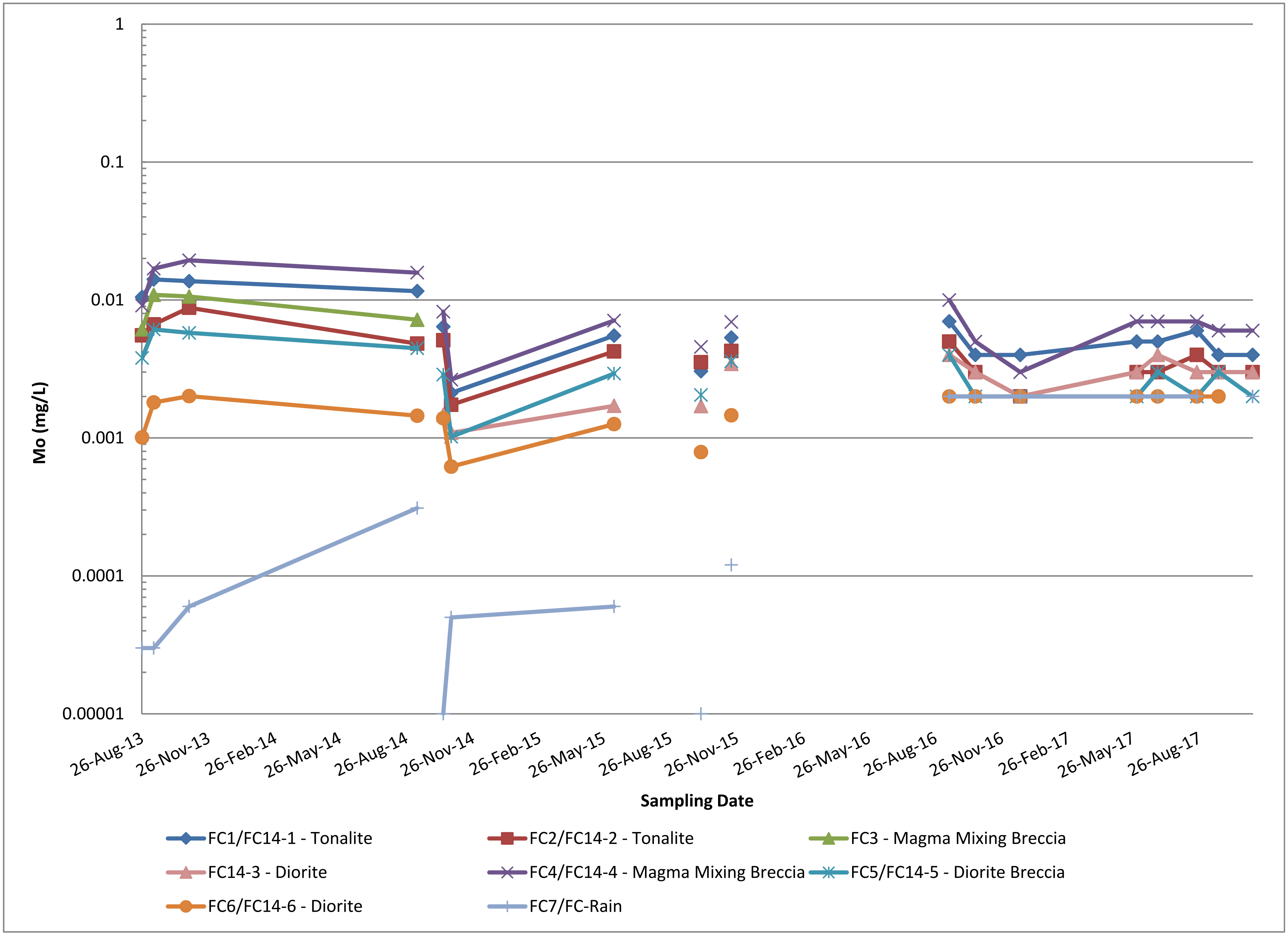
26-May-16
26-Aug-16
26-Nov-16
26-Feb-17
26-May-17
26-Aug-17
Sampling Date
FC1/FC14-1 - Tonalite
FC2/FC14-2 - Tonalite
FC3 - Magma Mixing Breccia
FC14-3 - Diorite
FC4/FC14-4 - Magma Mixing Breccia
FC5/FC14-5 - Diorite Breccia
FC6/FC14-6 - Diorite
FC7/FC-Rain



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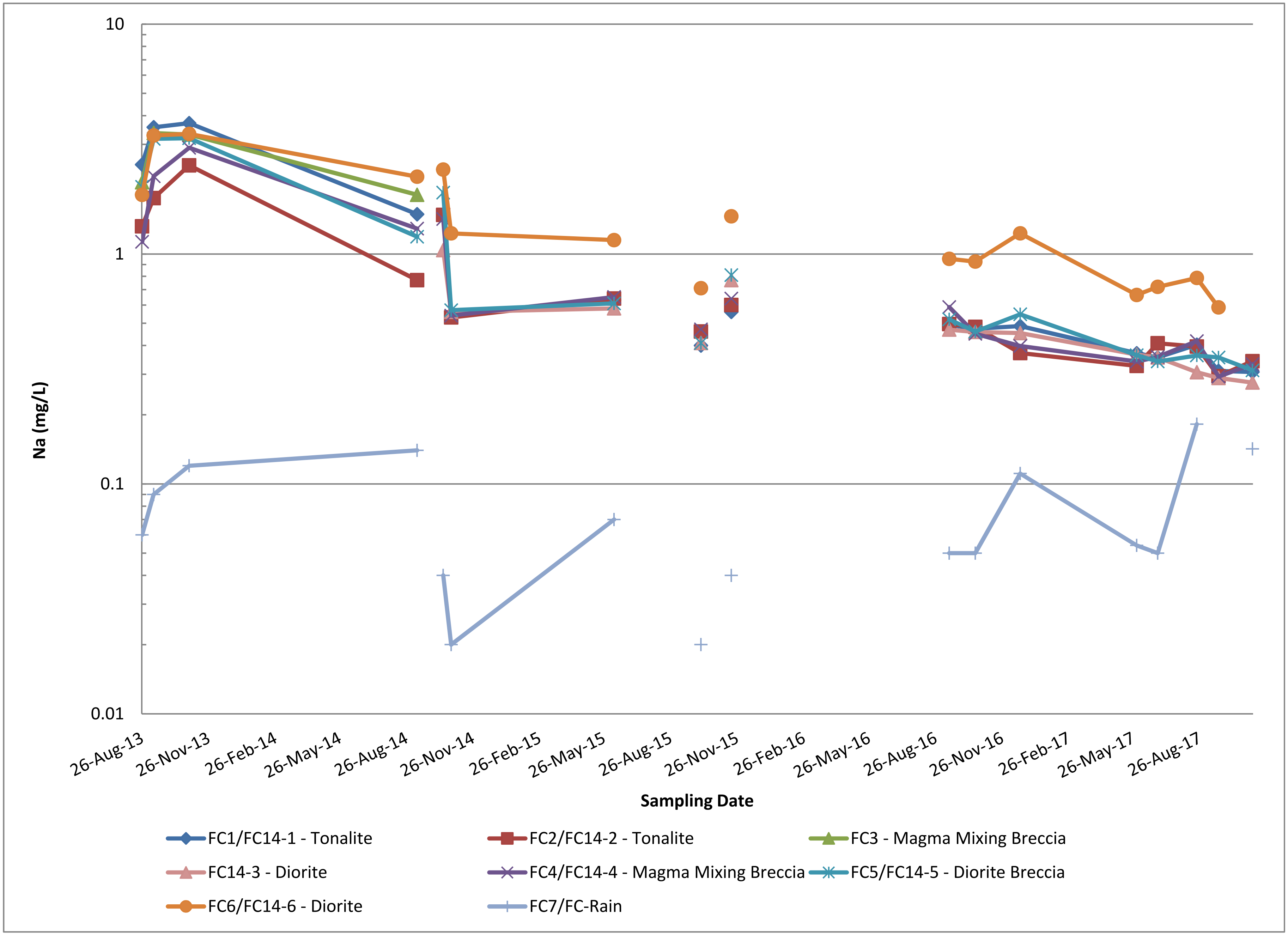

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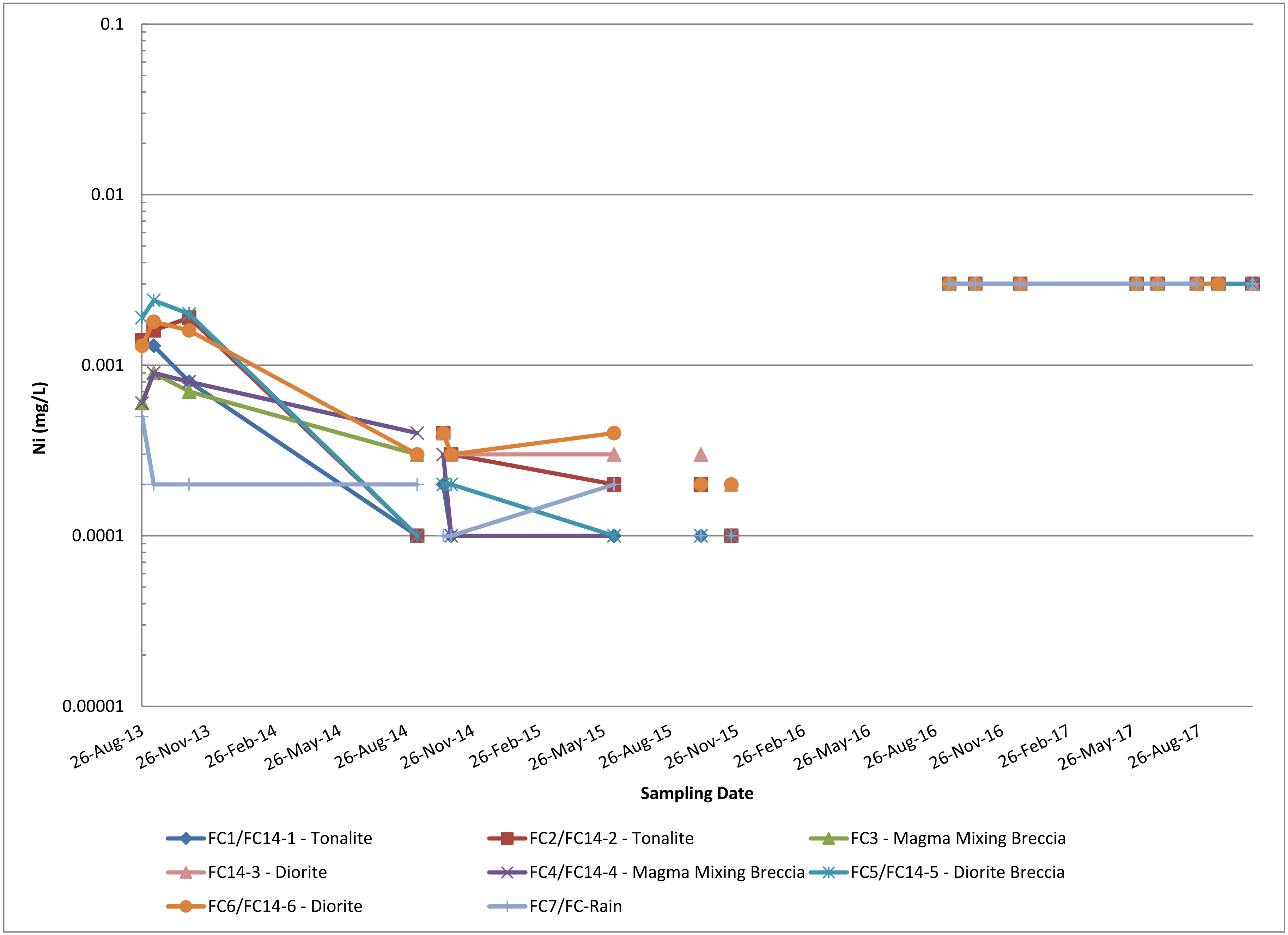

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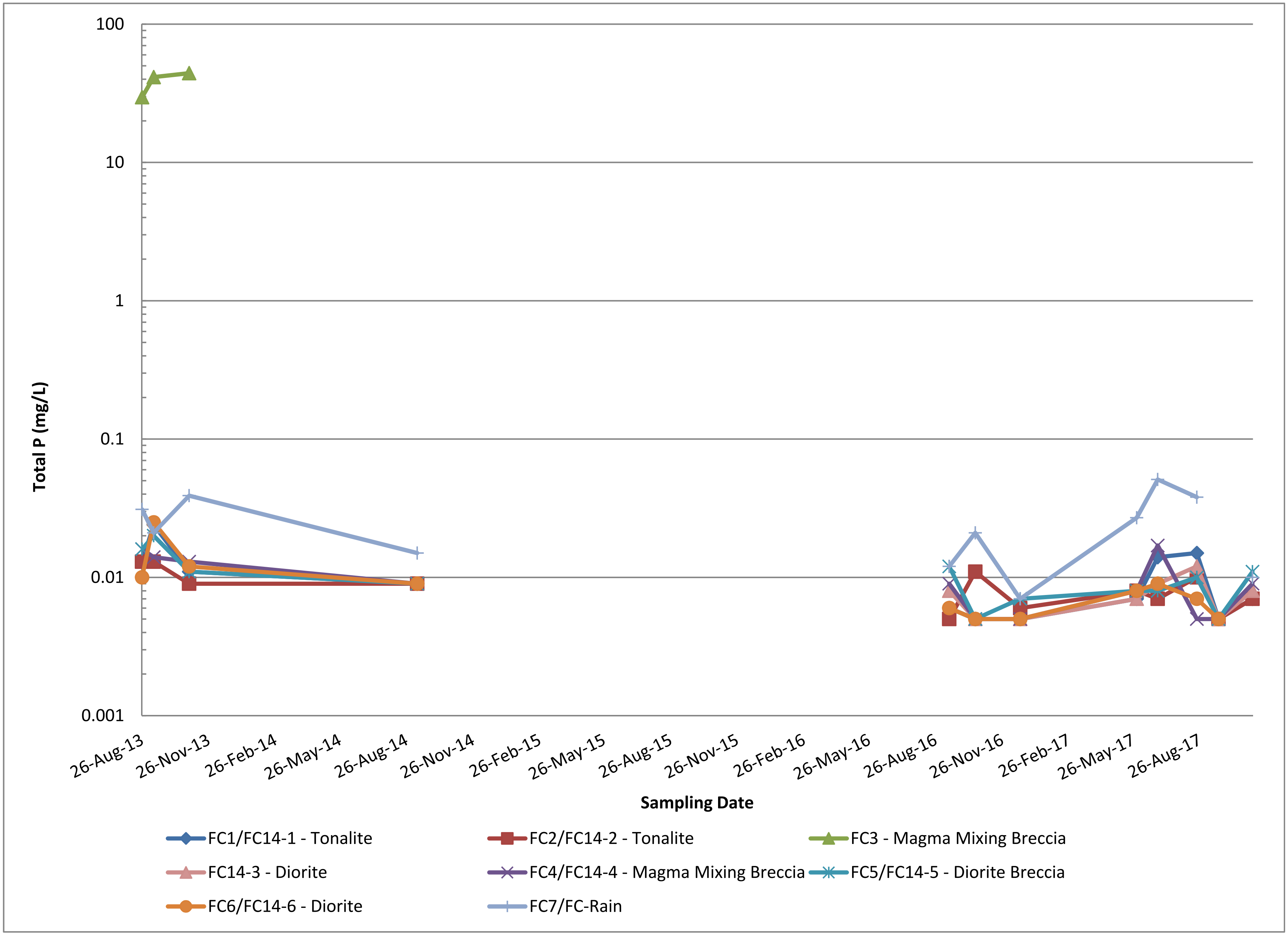

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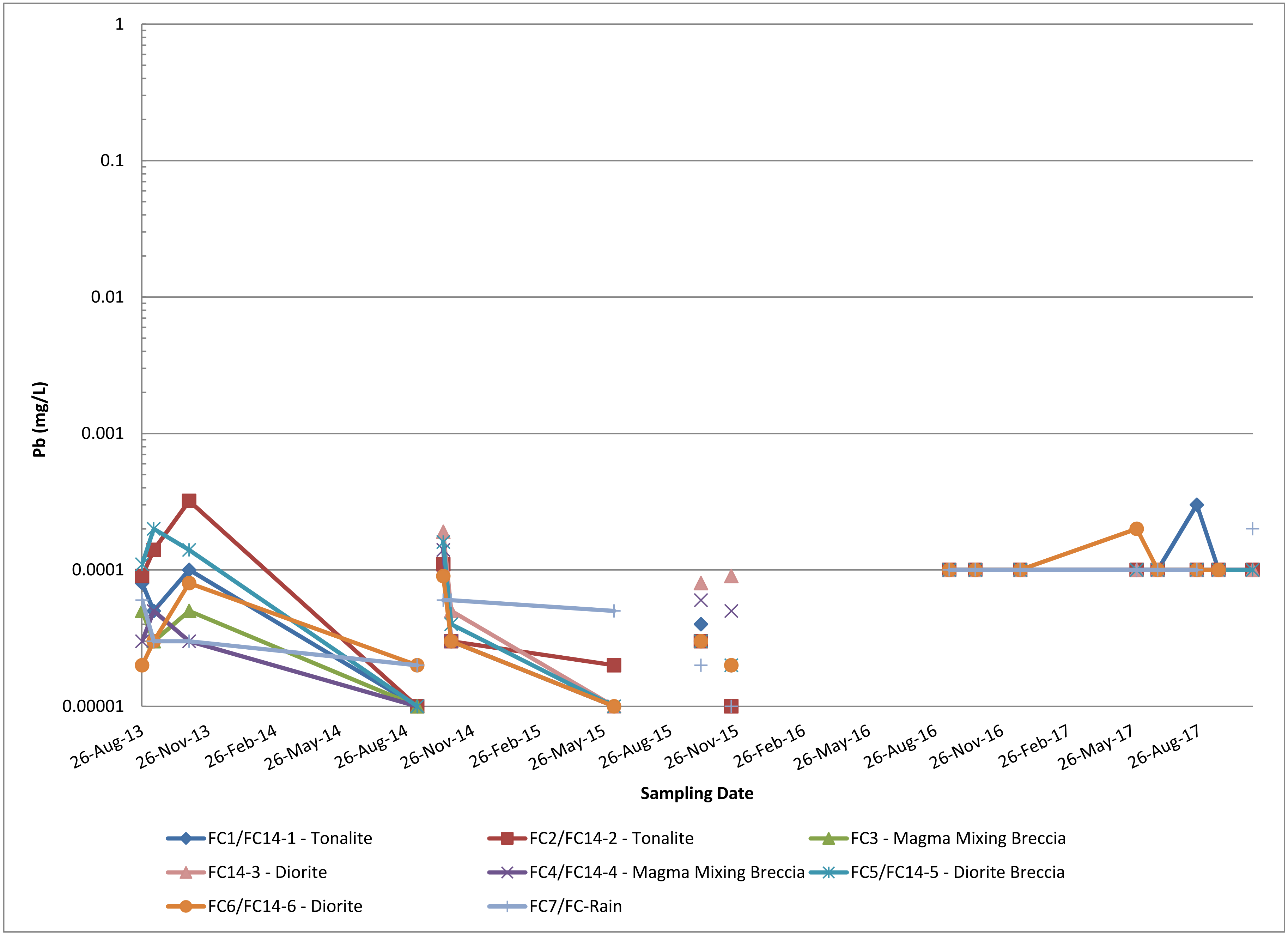

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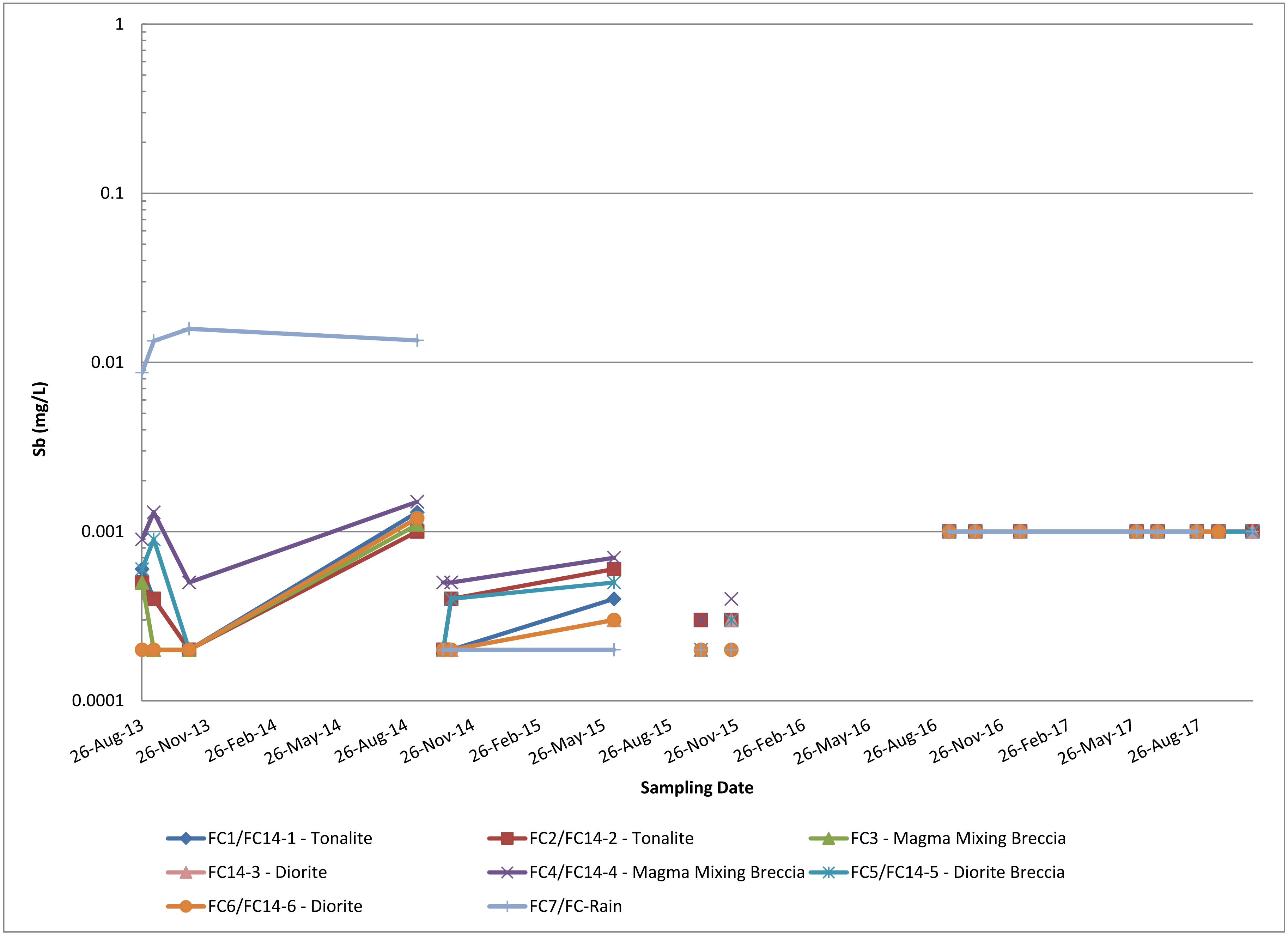

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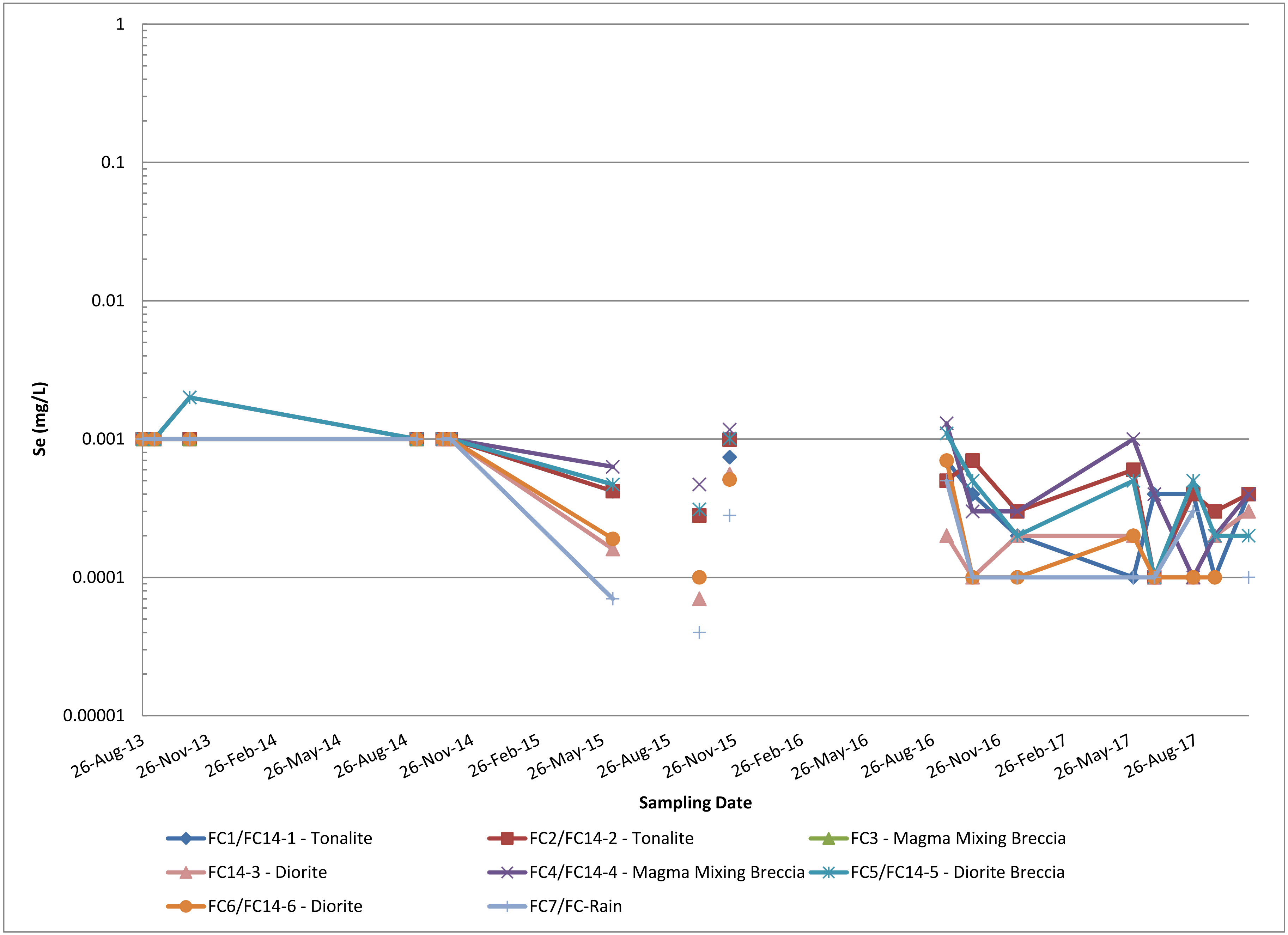

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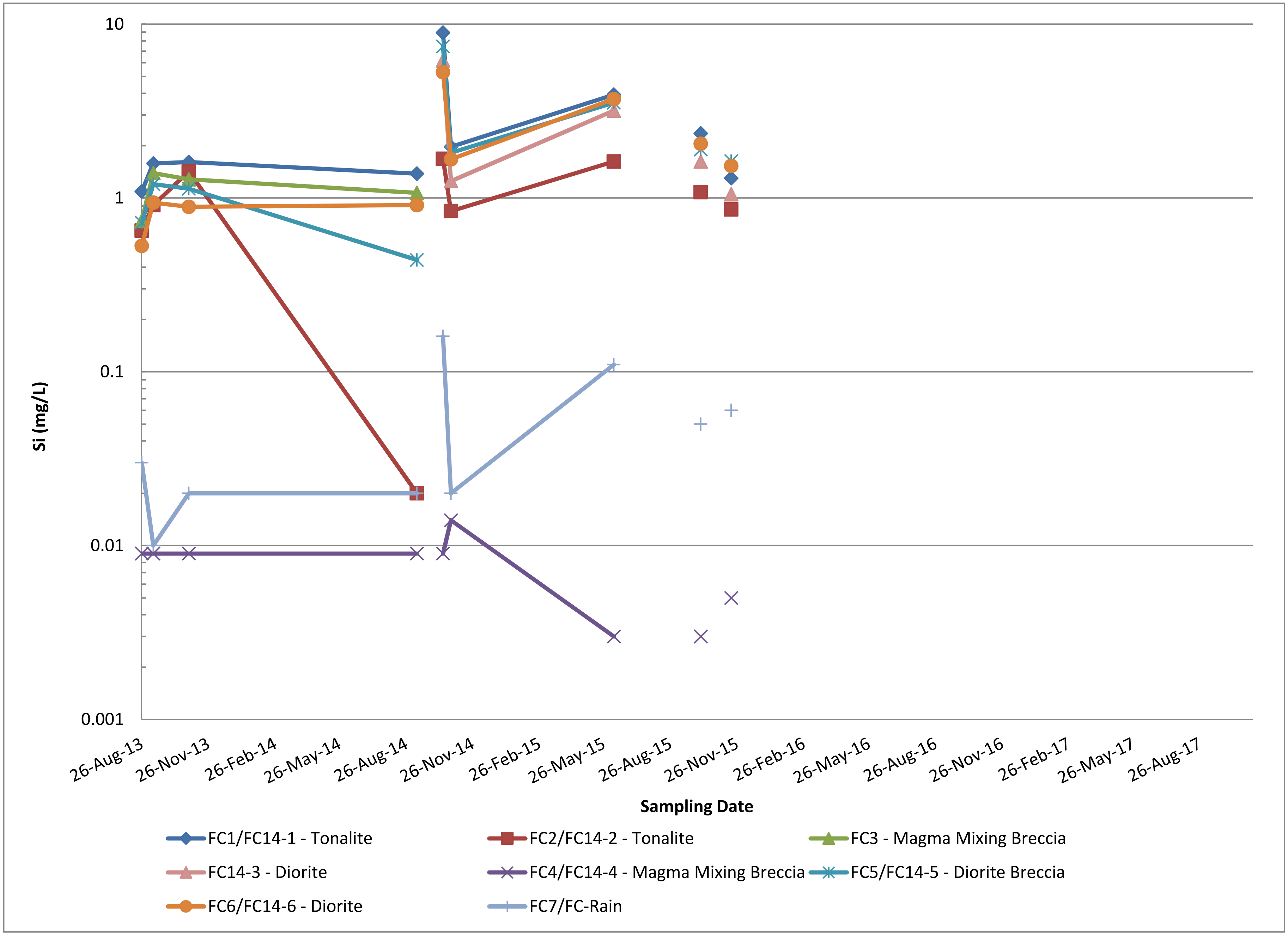

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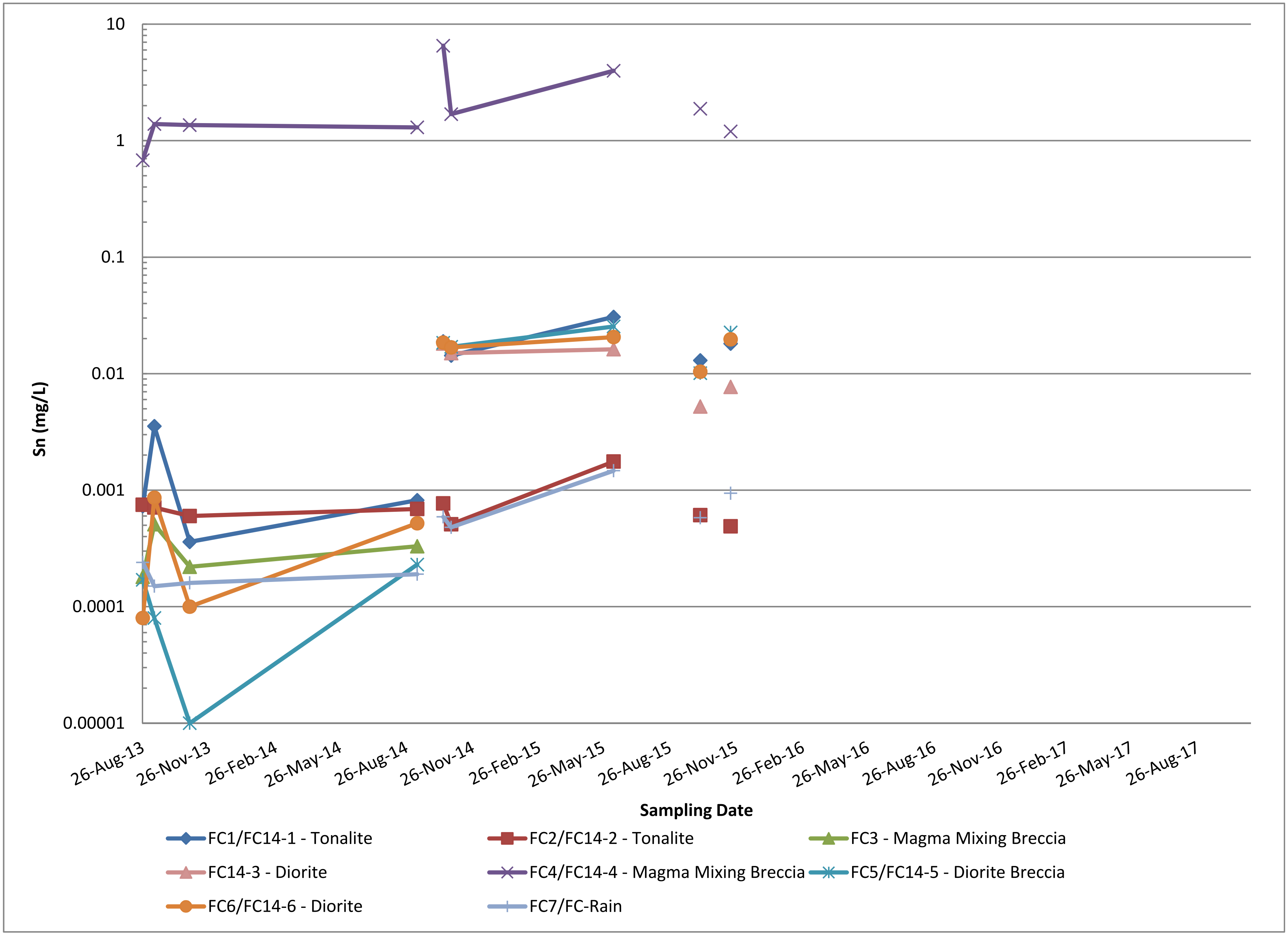
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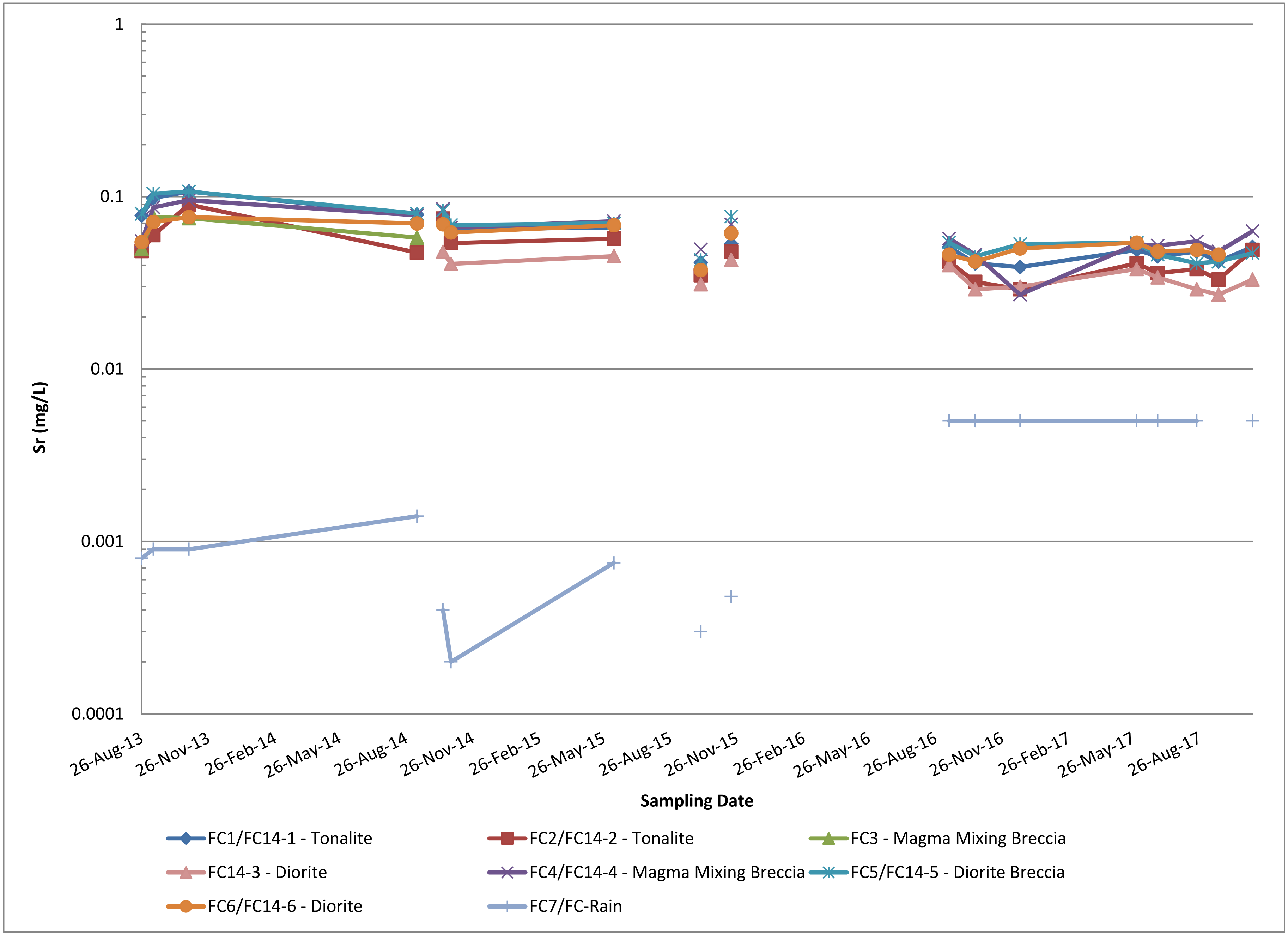

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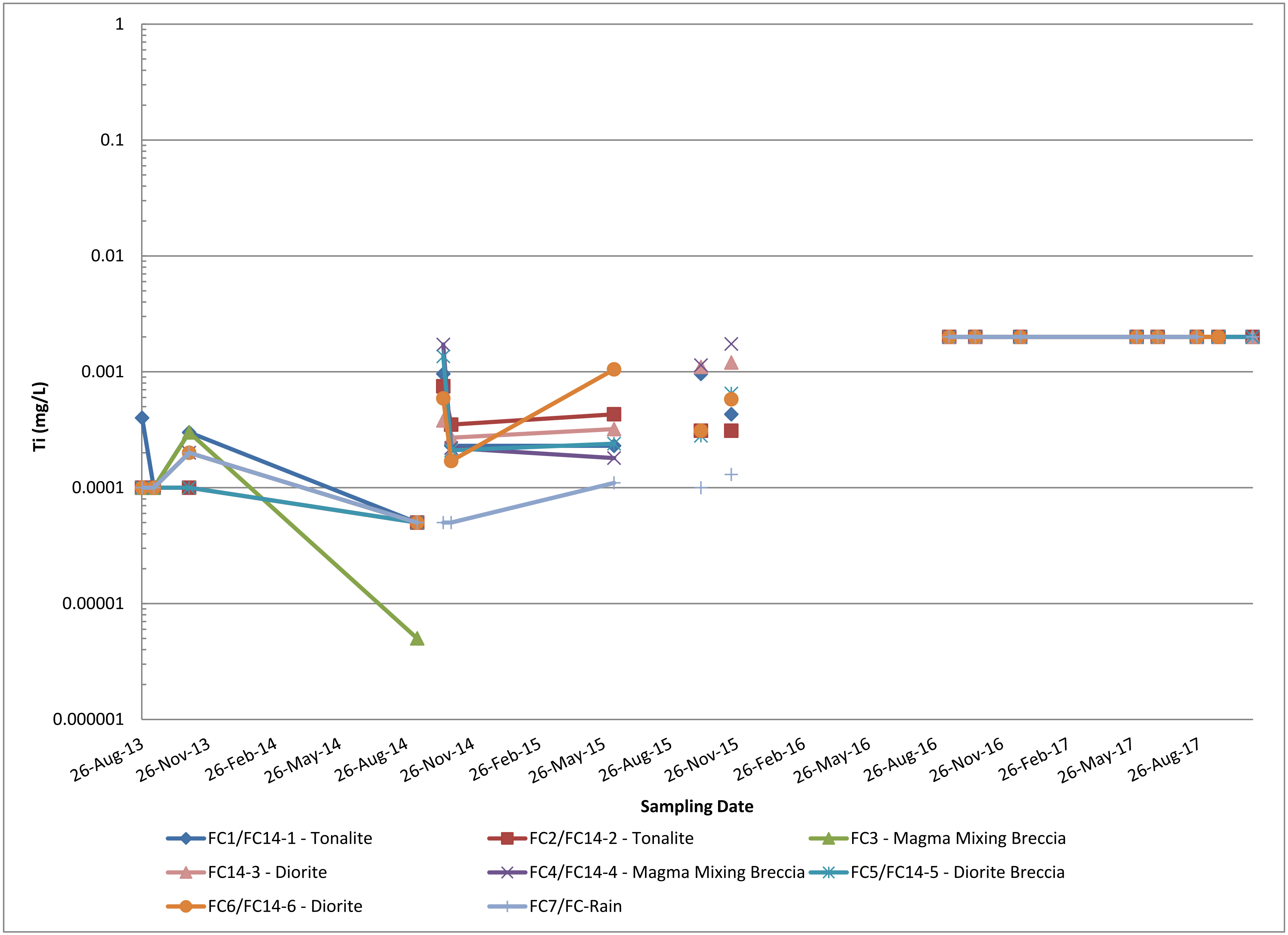

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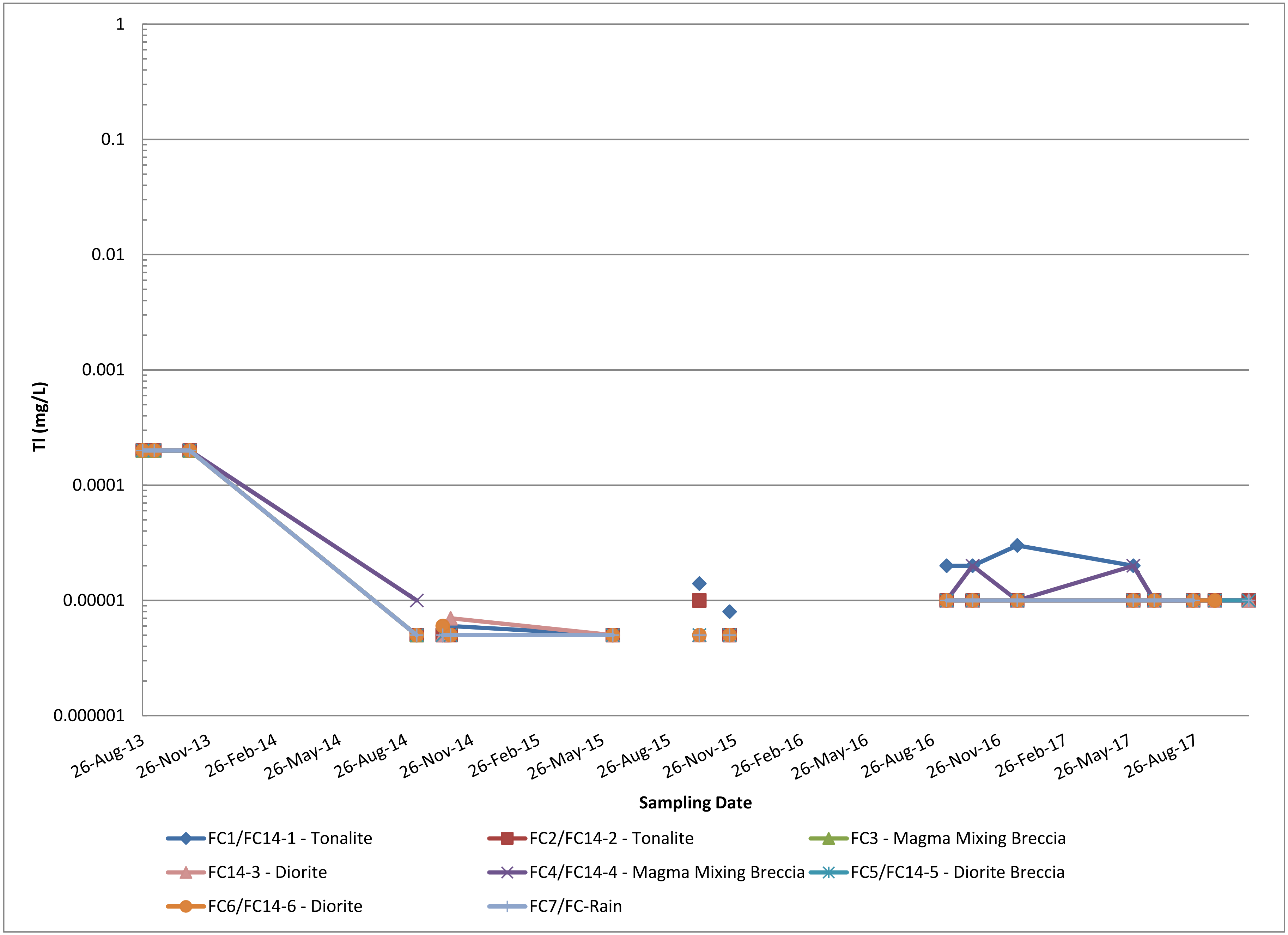

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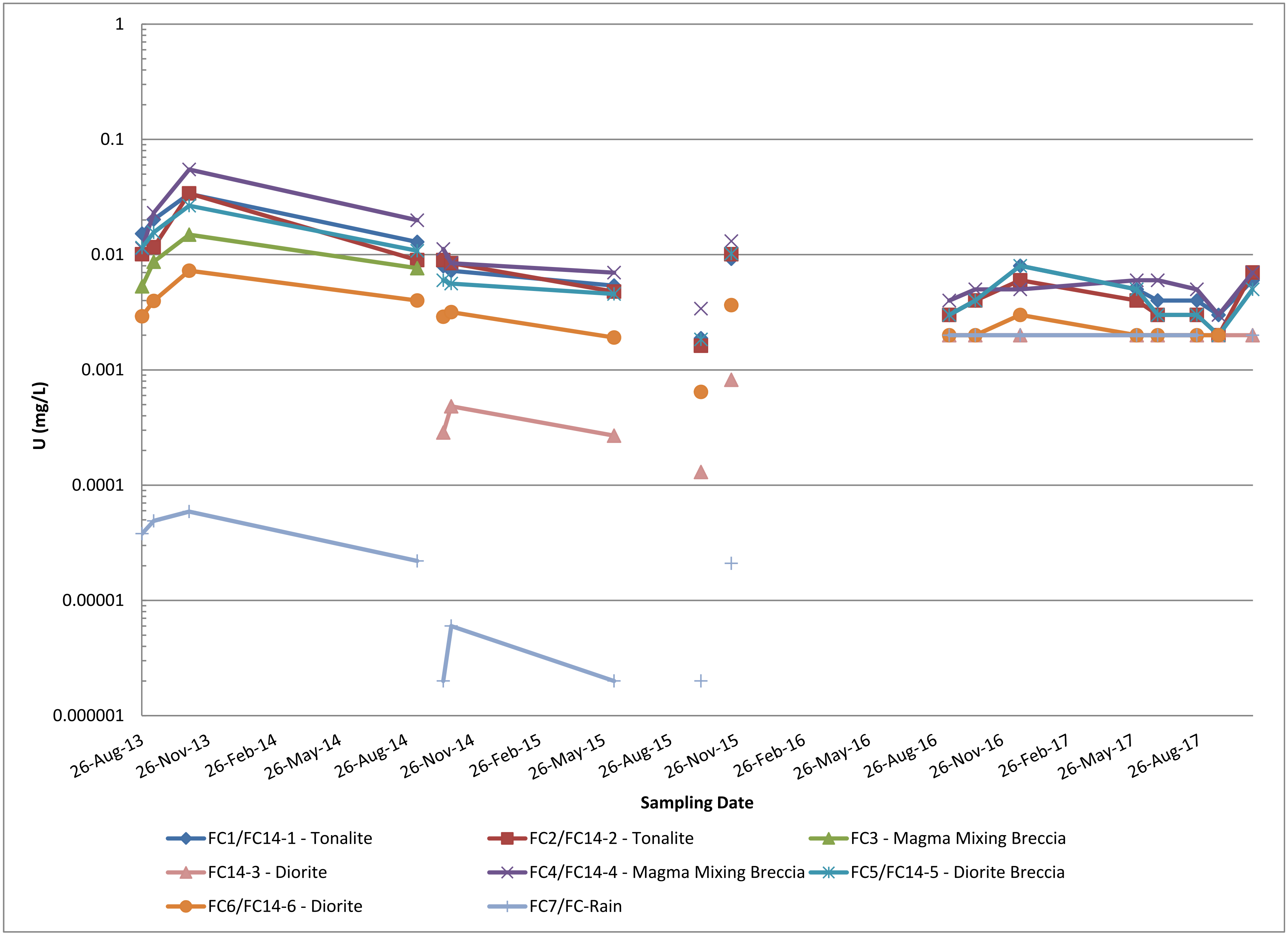

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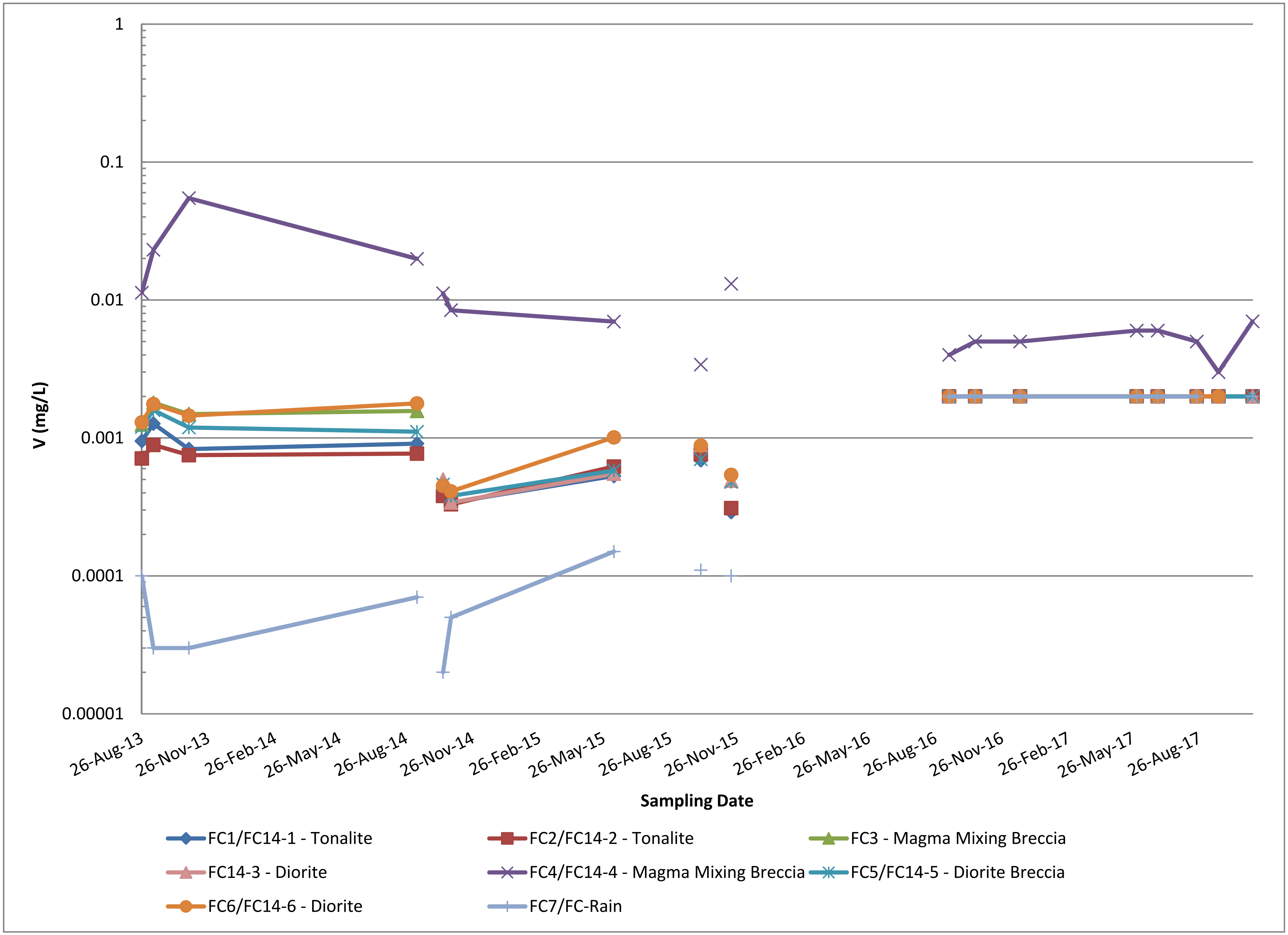

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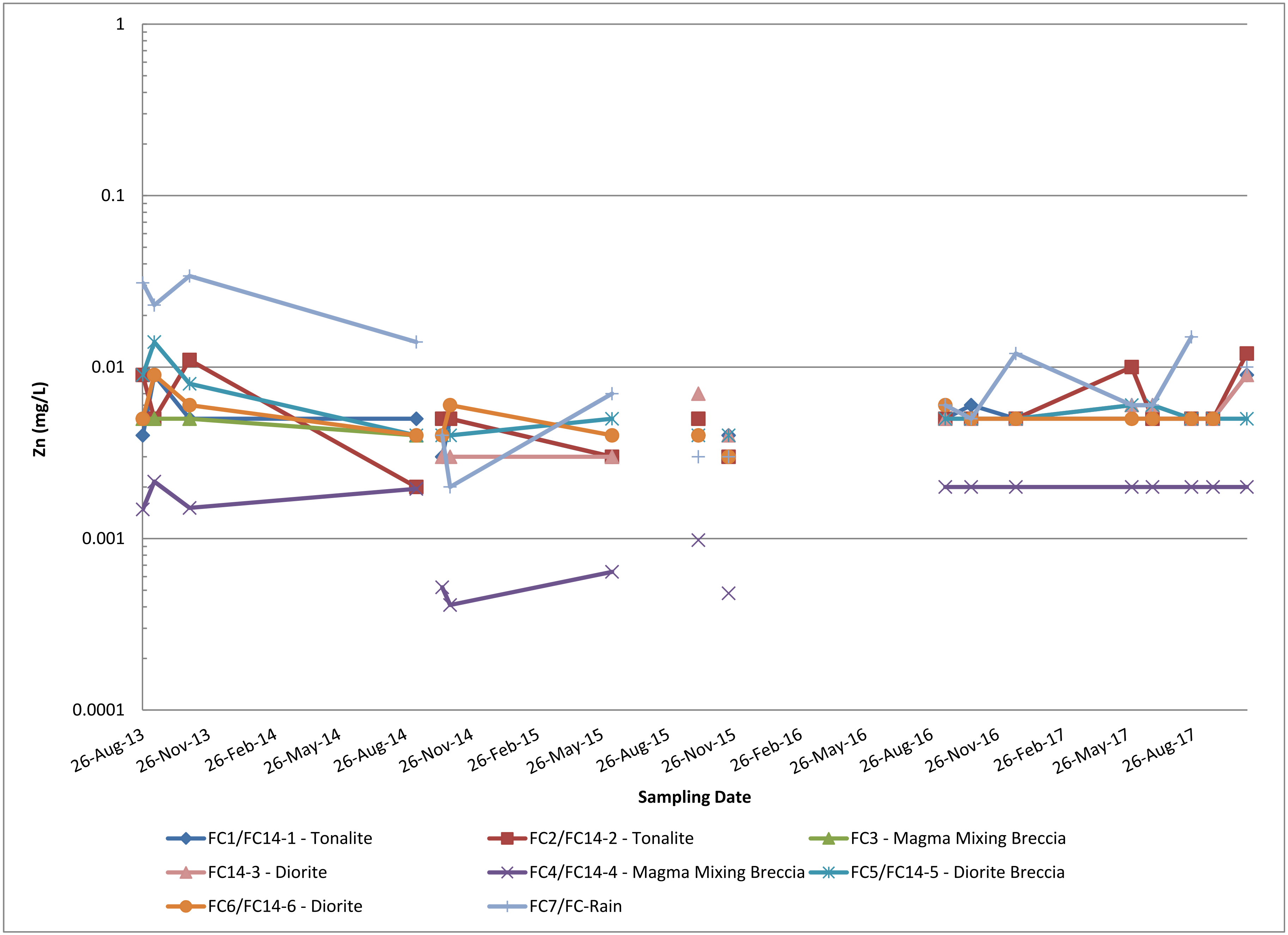

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FC7/FC-Rain

B-2: Updated Technical Memorandum: Air Quality

Memorandum

To:	Steven Woolfenden	**From:**	Linda Lattner, Tony van der Vooren
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Stephan Theben (SLR Consulting) Don Carr (Amec Foster Wheeler)	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: AIR QUALITY		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD proposes to construct, operate and eventually rehabilitate an open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;

- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Air Quality

In 2014, Amec Foster Wheeler completed a study of the potential air quality effects of the Project as it was proposed in support of the Federal Environmental Impact Statement / Final Environmental Assessment Report and the Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The air quality study predicted off-site effects using dispersion modelling, and compared the results to applicable air quality criteria in order to determine whether potential adverse effects on the environment and human health exist.

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. The study considers indicators assessed through the EA, where changing Project effects could have the potential to warrant an update to the conclusions of the EA. This memorandum updates the air quality assessment for the Project. Key differences between the EA, and the Project relevant to air quality are:

- Reductions in key operating parameters, including the processing rate and maximum annual movements of ore, overburden, and mine rock, and the total ore, overburden, and mine rock over the life of the mine;
- a reduction in the footprint of the open pit, mine rock area (MRA), and tailings management facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- realignment of the haul road used to transport mine rock from the open pit to the MRA; and
- the use of fewer and smaller haul trucks to transport materials.

The site layout of the Project places the required mine related facilities in close proximity to the proposed open pit, to the extent practicable, primarily on private, patented lands owned fully and / or jointly by IAMGOLD, and where land use permits have been obtained. The preliminary site plan showing the Project site is shown in Figure 1-1.

The objectives of this air quality effects prediction study for the Project have not changed from the EA and are as follows:

- Identify the key indicators (substances) that are expected to be emitted in significant quantities during the Construction, Operation, Closure and Post-closure phases;
- prepare estimates of the air emissions from the significant sources identified for the various phases;

- employ dispersion modelling to predict the resultant air quality effects on ambient air in the vicinity;
- detail mitigative measures, if required, to reduce emission rates such that resultant off-site air quality effects are below applicable regulatory criteria;
- provide a discussion of the significance of potential air quality effects;
- provide an update to the Greenhouse Gas (GHG) emissions forecast; and
- provide inputs to the Updated Human and Ecological Health Risk Technical Memorandum to support the assessment of potential impacts on First Nations use of fishing, traversing the area and harvesting at key on-site locations. Note that limited access to on-site locations is managed through agreements with the First Nations.

This study presents the findings of a review of the Project conducted with the intent of determining whether there would be any changes in air quality effects for one or more of the key indicators identified that would warrant an update to the conclusions of the EA. A comparison of key parameters that are relevant to potential air quality effects between the Project and the EA are summarized in Table 1-1. In addition to the changes noted, the emissions resulting from the ore processing plant will also decrease with the reduction in processing rate to 36,000 tpd.

Table 1-1: Changes to the Project that Affect Air Emission Rates or Off-Site Effects

Project Metric	EA	The Project	% Change
Processing Rate	60,000 tpd	36,000 tpd	-40%
Maximum Annual Ore Movement	27 Mt	19 Mt	-30%
Maximum Annual Overburden Movement	12 Mt	6 Mt	-50%
Maximum Annual Mine Rock Movement	79 Mt	49 Mt	-38%
Haul Truck Capacity	300 tonnes	220 tonnes	-27%
Number of Haul Trucks	33	27	-18%
Open Pit Surface Expression	2,100,000 m^2	1,450,000 m^2	-31%
TMF Surface Area (Projected)	840 ha	480 ha	-43%

An update to the GHG emissions forecast is provided as Appendix II. With respect to GHGs, the conclusions of the EA have not changed as a result of the changes outlined in the Project Description. Project GHGs are estimated to be 28% lower than those of the EA.

2.0 METHODOLOGY

2.1 Spatial Boundaries

For the air quality assessment, the local study (LSA) area is defined as an area that extends approximately 5 km from the Project emission sources, including a 1 km buffer on either side of the selected transmission line alignment. The local study area has changed from the EA with the relocation of the TMF, smaller open pit footprint and respective downsizing of equipment fleet and stockpiles. The definition of the local study area has remained the same as the EA, but the area is revised accordingly.

The air quality regional study area (RSA) has not changed from the EA and is defined as the area that extends approximately 10 km from the main Project emission sources, as illustrated in Figure 2-1. It is not expected that the effects of the Project would be measurable beyond the regional study area, and the regional study area for the Project is consistent with that of the EA.

2.2 Temporal Boundaries

The temporal boundaries of the EER span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed compared to the EA. The effects assessment indicators previously used and remain applicable include:

- Suspended particulate matter (dust) as total particulate matter ($PM_{tot.}$);
- Suspended particulate matter (dust) as particulate matter (PM_{10});
- Suspended particulate matter (dust) as fine particulate matter ($PM_{2.5}$);
- Sulphur oxides, mainly as sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2);
- Carbon monoxide (CO);
- Arsenic, lead, manganese and other metals associated with gold mining, including calcium, chromium, mercury, magnesium, nickel, titanium and zinc;
- Volatile organic compounds (VOCs); and
- Hydrogen cyanide (HCN).

2.4 Prediction of Effects

2.4.1 Methodology

Wood completed an assessment of the potential air quality effects of the Project in accordance with generally accepted methods. The methods for predicting potential effects for the Project have not changed from the EA except where noted:

- Identification of the significant emissions sources associated with the Project operations phase;
- identification of the key indicators emitted to the atmosphere from the identified sources;
- determination of the baseline ambient air quality conditions in the absence of the Project for each of the key indicators emitted;
- identification of the relevant regulatory air quality standards and criteria, and establish the appropriate assessment criteria for the site in Ontario, noting that for some of the parameters there may be more than one applicable limit depending upon the averaging time;
- estimation of the air emission rates for each of the key indicators using appropriate estimation methods and established data sources;
- preparation of a source summary table that identifies sources at the Project site which may release one or more of the key indicators emitted to the atmosphere in considerable quantities and the corresponding compounds and emission rates;
- **Added:** screening out from further study some emissions to identify a number of contaminants that had very low levels of impacts in the EA for which all emission rates and modelled effects would be lower than those presented in the EA by quantitatively comparing emission rates and reviewing the 2014 dispersion modelling. These indicators will not move forward to dispersion modelling or for further assessment;
- performing the air dispersion modelling using the U.S. Environmental Protection Agency (US EPA) AERMOD model version 12345; and
- **Revised**: comparison of the dispersion modelling output to the assessment criteria, comparing predicted effects on ambient air quality with the corresponding air quality criterion and results from the EA to determine resulting changes in effects assessment.

The predicted effects are considered at the following receptors for the Project:

- The off-site location with the highest effect – the area outside of the Project boundary. The Project boundary is defined as the area inside of which IAMGOLD is able to restrict and control access and is revised from the EA; and
- off-site sensitive points of reception that included eight cottages in the vicinity of the Project, where humans may be present at all times and are unchanged from the EA.

2.4.2 Applicable Criteria Air Quality Criteria

The applicable provincial criteria for the prediction of effects on air quality have not changed from the EA and are provided in Table 2-1.

Table 2-1: Ontario Ambient Air Qualtiy Criteria (AAQC)

Effects Assessment Indicator	AAQC ($\mu g/m^3$)[1]	Averaging Period	Limiting Effect
PM_{tot}	120	24 hr	Visibility
	60	annual	
PM_{10}	50	24 hr	Interim
$PM_{2.5}$	25	24 hr	Health
NO_2	400	1 hr	Health
	200	24 hr	
CO	36,200	1 hr	Health
	15,700	8 hr	
SO_2	275	24 hr	Health and Vegetation
	690	1 hr	
	55	Annual	
Ore Processing Specific Compounds	Various		
Metals	Various		

Note:

1. (MOECC, 2016b).

In addition to the provincial criteria, there are new federal air quality criteria which are detailed in the Canadian Environmental Protection Act. Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter and sulphur dioxide were adopted by the Canadian Council of Ministers of the Environment (CCME) and are currently being phased in; the CAAQS for SO2 and PM2.5 are considered in the assessment (Table 2-2). The CAAQS are not intended for assessment at the fenceline / Project boundary, but are used to characterize air quality where people are living or at other sensitive receptors, and comparison of the modelled 24 hour averages directly to the CAAQS is very conservative as the CAAQS does not pertain to the maximum daily concentration but to the 99th percentile for SO2 and to the 3-year average of the 98th percentile for PM2.5.

Table 2-2: Canadian Ambient Air Quality Standards

Effects Assessment Indicator	CAAQS (µg/m³)[1]			Averaging Period
	2015	2020	2025	
$PM_{2.5}$	28	27	NA	24 hr
	10	8.8	NA	Annual
SO_2	NA	183.4	170.3	1 hr
	NA	13.1	10.5	Annual

Notes:

1. (CCME, 2017).
2. NA – not applicable, CAAQS for SO_2 in effect in 2020, no reduction in CAAQS for $PM_{2.5}$ in 2025.

3.0 PREDICTION OF EFFECTS

3.1 Construction Phase

The 2014 Air Quality Assessment and subsequent technical addendum concluded that construction effects were considered to be appreciably less than potential effects during operations. As such, detailed modelling was not warranted.

Due to the nature of open pit mining, the sources of particulate emissions during construction are similar to those used in pit development and mining during the operations phase; however at reduced levels of activity. The smaller footprint for the open pit and the TMF would further reduce the scale of construction activities and the overburden movements compared with what was presented for the EA.

With respect to road dust and NO_2 emissions from site traffic and roadways, 27 dedicated haul trucks are proposed that would make up to 136 round trips per hour along site roads during the operations phase for 24 hours per day. In the 2014 study, it was estimated that haul trucks would travel a total of 148 round trips per hour during the operations phase, which was compared to eight round trips along the main site access road during construction. During construction, three of the eight trucks would normally be heavy equipment loads and five would be shuttle buses transporting workers to and from site.

The conclusion that the maximum road dust emissions modelled during the operations phase is appreciably higher than during Construction phase road dust remains valid, and Construction phase emissions are expected to be lower than previous estimates due to the smaller footprint of the open pit and other stockpiles and disturbed areas.

Since particulate emissions are proportional to the quantities of material handled and total distances travelled by site vehicles, the resultant emissions and modelled off-site effects for particulate would also be lower during construction than in any of the years when the mine is operational.

For NO_2, blasting in the pit is the dominant influence on the hourly modelling scenario during operations. For the 24-hour average NO_2 modelling scenario, NO_2 emissions from haul trucks and construction equipment in the open pit are the major sources contributing to the maximum modelled off-site effects. As discussed above, since the total quantity of material (ore, overburden, and mine rock) handled on a daily basis during the operations phase is considerably greater than during the Construction phase, the required equipment fleet for construction is smaller, resulting in lower overall NO_2 emissions and lower air quality effects off-site during construction.

3.2 Operations Phase

Project details and site configuration were reviewed and compared with the sources identified for the air quality assessment completed in support of the EA. The changes in production levels, activity rates, and source details that would affect the emission rate estimates and off-site effects are presented in Table 1-1 of Section 1.1.

3.2.1 Key Indicators Screening

3.2.1.1 Particulate Matter

The relocation of the TMF and realignment of the haul roads constituted the most significant change that affected the emission rates of particulate matter and the predicted effects.

The potential changes that are identified as likely to affect the modelled results include:

- Particulate emission rates would decrease for all sources, as shown in Table 3.2, as a result of a smaller TMF footprint, smaller open pit, smaller blasts, and reduced daily material handling and material movements. For the TMF, fugitive dust emissions are estimated using the Australian National Pollutant Inventory factor, the same method used in the EA, based upon the exposed area susceptible to wind erosion. This results in a decrease in dust emissions with the smaller TMF footprint. It should also be noted that most of the dust emissions would generally be confined to the active beach area, or areas that are disturbed by vehicle traffic; therefore the dust management areas assumed for the purposes of this assessment are conservatively large as they consider an area substantially larger than what the beach and active areas would be.
- The relocation of the TMF to the west of the open pit would result in lesser effects at the cottages to the east of the project along Mesomikenda Lake. The effects at the cottages on Schist Lake may also change as the frequency of winds from the TMF towards these cottages would change as a result of the moved TMF.
- The realignment of the haul route from the open pit to the MRA such that is runs along the western side of the open pit would possibly result in increased effects along the southern bound of the IAMGOLD property.

The changes detailed may either increase or decrease the modelled concentrations. Without updating the dispersion modelling to reflect these changes, it is not possible to conclude that the net effects at all receptors is lower or still below criteria, and that the conclusions presented in the EA are still valid. Therefore, all particulate size fractions were carried forward for further assessment.

Table 3-1: Changes to Particulate Emission Rates

Parameter	EA	The Project	% Change
PM_{tot}	119.8	94.5	-27%
PM_{10}	38.7	30.4	-27%
$PM_{2.5}$	7.3	6.1	-19%

Table 3-2: Source Contribution to Particulate Emission Rates

Source	Source Contribution to Overall Project Emissions		
	PM_{tot}	PM_{10}	$PM_{2.5}$
Ore Processing Plant	5%	11%	46%
Mine Rock Area	3%	4%	5%
Open Pit	53%	49%	30%
Haul Roads	34%	28%	14%
Tailings Management Facility	3%	5%	4%
Ore Stockpile	1%	1%	1%
Concrete Batch Plant	1%	1%	1%

3.2.1.2 Key Metals Associated with Gold Mining

Several metal species are present in the processed ore, and are subsequently emitted as trace constituents of the particulate matter. The following were considered in the assessment due to their potential presence in significant concentrations above crustal background, or are generally of interest for most mining projects:

- Arsenic;
- chromium;
- mercury;
- magnesium;
- manganese;
- nickel;
- lead;
- titanium; and
- zinc.

The EA found manganese to be the most significant metal at 53% of the AAQC overall and at 20% of the AAQC at the most effected sensitive receptor. All other modelled metals resulted in less than 8% of their respective AAQC.

Potential increases in the effects of particulate matter would also translate into increases in the effects of these metals, and the metals will therefore be considered further only if particulate concentrations increase for the Project.

3.2.1.3 Nitrogen Dioxide (NO_2)

The primary sources of NO_2 include the open pit and haul trucks travelling along the haul routes.

For NO_2, two averaging times are relevant as there are AAQCs based upon potential effects over a 1-hour and a 24-hour period. The emission rates for the 1-hour averaging time are higher as these are more influenced by blasting in the open pit, while the 24-hour average emission rates take into account the hours where there is no blasting.

The emission rates stated in Table 3-3 are presented as total nitrogen oxide (NO_x) emission rates, as the emission factors and estimation method does not differentiate between the NO_2, nitrogen oxide (NO), and other trace nitrogen oxides present in the exhaust. In order to assess against the AAQC, the total NO_x emission rates are used as the data input in the modelling, which include mainly NO + NO_2 emissions. An US EPA NO_x/NO_2 conversion algorithm is used by the model to predict the resultant NO_2 concentration in the air (NO_2 emitted from stack + NO_2 formed from atmospheric reaction of the NO emissions from the stack). The conversion method accounts for the reaction of the NO emissions with ambient ozone to form NO_2, which is then added to the NO_2 emissions to estimate the resultant NO_2 concentration at a given off-site location. This method requires ambient ozone data, as the conversion is limited by the availability of ozone.

Table 3-3: Changes to Nitrogen Oxide Emission Rates

Parameter	EA	The Project	% Change
NO_x (1-hour averaging time)	199.7 g/s	151.3 g/s	-32%
NO_x (24-hour averaging time)	98.4 g/s	73.6 g/s	-34%

The haul roads and open pit sources account for more than 94% of the total NO_x emissions, as shown in Table 3-4.

Table 3-4: Source Contribution to Nitrogen Oxides Emission Rates

Source	Source Contribution to Overall Project Emissions	
	NO_x (1-hour)	NO_x (24-hour)
Ore Processing Plant	5%	1%

Source	Source Contribution to Overall Project Emissions	
	NO_x (1-hour)	NO_x (24-hour)
Mine Rock Area	1%	3%
Open Pit	79%	65%
Haul Roads	15%	31%

The NO_x emission rates from all sources decreased by more than 30% for the Project. The only notable change to the source configuration is an increased distance traveled by trucks along the realigned haul roads to the MRA, however the haul roads are setback from off-site receptors and a change in the modelled NO_2 effects from the Project is not anticipated.

The assessment for NO_2 prepared for the EA is still considered a conservative prediction of off-site NO_2 effects valid for the Project. No further assessment was carried out for NO_2 for the Project.

3.2.1.4 Other Effects Assessment Indicators

The off-site effects of other key indicators, which include SO_2, CO, VOCs, and hydrogen cyanide, are determined to be equivalent to, or lesser than, previously assessed. The predicted SO_2 effects are also well below the new federal CAAQS.

The assessment for these indicators prepared for the EA may still be considered a conservative prediction of off-site effects, with all effects well below the respective AAQC and lesser than those predicted in the 2014 Study. Therefore, no further assessment was carried out for the Project.

3.2.2 Dispersion Modelling

AERMOD with site-specific meteorological data is used for dispersion modelling of the Project, which is consistent with the version and method used for the EA in the 2014. The following changes to the dispersion models were made to reflect the Project:

- Revised Project boundary;
- relocation of TMF and main haul route;
- updated emission rates; and
- updated open pit parameters.

The three size fractions of particulate matter were the only key effects assessment indicators that triggered an update of the dispersion modelling based upon the potential for increased effects. The results of the updated modelling for particulate matter will also be used in the subsequent discussion of the effects of key metals as these are constituents of the particulate matter.

The update of the dispersion modelling for PM_{tot}, PM_{10}, and $PM_{2.5}$ is completed to determine the Project effects combined with baseline air quality for comparison with applicable criteria and results from the EA. Background levels used to define baseline air quality have not changed from the EA.

The modelled concentrations at all off-site receptors are lower for all particulate size fractions and all averaging times, as presented in Tables 3-5 and 3-6. The modelled concentrations for the metals correspond directly with particulate matter are also lower. Results show occasional exceedances of all particulate size fractions. However, these exceedances for the Project occur in close proximity as for the Project described in the EA. The findings and conclusions of the EA are therefore still valid.

A preliminary assessment of the Project's compliance status with provincial permitting requirements was also conducted. Results in Table 3-7 show the comparison of key compounds with Ontario Regulation 419/05 standards (MOECC 2016b). Notable increases for compounds specific to the ore processing plant are not anticipated for the Project. Since metals are scaled directly from total particulate, and the total particulate concentrations decreased from the preliminary assessment presented in the 2014 Study, it is also expected metals concentrations will decrease. This preliminary assessment is provided for informational purposes only and will be updated during the formal process of pursuing an Environmental Compliance Approval for air.

Dispersion modelling is conducted for receptors within the Project boundary in support of the Updated Human and Ecological Health Risk (HEHR) Technical Memorandum. The results of the modelling are presented in the HEHR assessment.

Table 3-5: Emission Summary Table at Sensitive Receptors

Effects Assessment Indicator	Facility Emission Rate (g/s)	Predicted Ambient Concentration (µg/m³) (Modelled + Baseline)			Ontario AAQC (µg/m³)	Averaging Period	Limiting Effect	% of Criteria
		EA Effect	Project Effect	% Change				
PM_{tot}	114.5	84.5	77.7	-8%	120	24 hr	Visibility	65%
	114.5	26.6	24.0	-10%	60	Annual		40%
PM_{10}	36.0	49.3	44.7	-9%	50	24 hr	Interim[1]	89%
$PM_{2.5}$	6.9	21.8	17.0	-22%	25	24 hr	Health	68%
	6.9	5.2	4.7	-9%	8.8	Annual	Health[2]	53%

Notes:

1. Interim AAQC (MOECC, 2016a).
2. There is no annual AAQC for $PM_{2.5}$, therefore the 2020 CAAQS for $PM_{2.5}$ is used as the criterion.

Table 3-6: Emission Summary Table at All Off-Site Receptors (Maxiumum Location)

Effects Assessment Indicator	Facility Emission Rate (g/s)	Predicted Ambient Concentration (µg/m³) (Modelled + Baseline)			Ontario AAQC (µg/m³)	Averaging Period	Limiting Effect	% of Criteria
		EA Effect	Project Effect	% Change				
PM_{tot}	114.5	235	140	-41%	120	24 hr	Visibility	116%
	114.5	47	30	-36%	60	Annual		50%
PM_{10}	36.0	127	86	-32%	50	24 hr	Interim[1]	173%
$PM_{2.5}$	6.9	41	31	-23%	25	24 hr	Health	125%
	6.9	9	7	-26%	8.8	Annual	Health	79%

Note:

1. Interim AAQC (MOECC, 2016a).

Table 3-7: Emission Summary Table for Provincial Permitting

Compound	Facility Emission Rate (g/s)	Concentration (µg/m³)	Criteria[1] (µg/m³)	Averaging Period	Limiting Effect	% of Criteria
PM_{tot}	91	36	120	24	visibility	30%

Note:

1. (MOECC, 2016b).
2. All other contaminants that will be considered during the provincial permitting process (Environmental Compliance Approval (ECA)) were screened out of the dispersion modelling as the modelled effects were less than those of the EA, and the findings of the EA were that all contaminants were within MOECC Standards for the MOECC to grant ECA approval.

3.3 Closure Phase

Activities in the active Closure phase are similar to those that occur during the Construction phase, and use similar mining equipment. The Dust Best Management Plan (DBMP) will include practices to minimize dust emissions during the active Closure phase (e.g., watering, travel area surface management) and a complaint response plan.

No specific Closure phase air quality assessment is provided in the EER.

3.4 Post-Closure Phase

The Post-closure phase is predominantly a monitoring activity, with occasional repair and maintenance. There is no significant equipment use. No air quality effects are expected from these activities. The only emissions that will continue during the Post-closure phase are gases from the landfill that include VOCs, which were identified as an Effects Assessment Indicator.

There are no changes to the project description that would affect the landfill gas emissions; therefore no update to the previous assessment of landfill gas from an air quality perspective was completed. The previous study found that all VOCs released as constituents of the landfill gas would be significantly below either the respective criterion or the *de minimus* concentration established by the MOECC (MOECC, 2017).

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

The principal air quality elements of concern emitted from the Côté Gold Project site will be dust and associated metals associated with the following sources:

- Road dust associated with haul trucks transporting mine rock and ore from the pit;
- Dust from material handling at overburden, ore and mine rock stockpiles;
- Dust from the primary crusher;
- Dust from the exposed area of the TMF; and
- Dust from mining activities within the open pit (drilling, blasting and loading of haul trucks).

The site fugitive DBMP for the Construction and Operation phase which identifies all potential sources of fugitive dusts associated with the Project, outlines mitigation measures that will be employed to control dust generation, and details the inspection and record keeping required to demonstrate that fugitive dusts are being effectively managed. The DBMP will be consistent with industry best management practices and Ontario MOECC requirements, to ensure that these management practices and active mitigations are effective in mitigating the activities which may generate fugitive dusts.

Dust emissions from roads and mineral stockpiles will be controlled through the application of water sprays. At full production, two water trucks with water sprays and cannons will be at site for this purpose. Alternatively, surfactant applications, such as calcium chloride, will be used to control dust, particularly on roads, provided that such applications are acceptable to the MOECC. Water cannon sprays discharged by mobile trucks will be employed to control dust emissions from stockpiles and aggregate handling activities. If the operations and fugitive dust best management practices plan require further mitigation, dedicated water sprays at active stockpile areas will be employed. At closure, all exposed dust sources will be vegetated and progressive reclamation will be used wherever practicable to better control dust emissions from the mineral waste stockpiles and tailings management area.

All site roadways will be maintained in good condition, with regular inspections and timely repairs completed to minimize the silt loading on the roads. The road maintenance procedures will be incorporated into the DBMP plan.

The facility and emission points will be designed to allow for good atmospheric dispersion, and dust control equipment such as bag houses, bin vents, and water sprays, will be utilized where necessary to prevent excessive emissions at the crusher and process plant.

Blasting also results in significant emissions for particulate and NO_x. NO_x is generated from the blast, but can be minimized by reducing the water penetration of the set charges. The blasting plan will minimize the length of time the blasting material is allowed to sit in a drill hole before blasting. As well, blasting will be limited to a set time on any specific blast day. The time will be developed to ensure optimal emission dispersion and ensure the lowest off-site effects on air quality.

A preventive maintenance program will be employed that encompasses all pollution control equipment, diesel-fired engines (vehicle, equipment, and standby power generating), and all processes with the potential for significant environmental effects.

Air emissions from diesel consumption associated with mobile heavy equipment operations will be controlled through use of:

- Low sulphur diesel;
- equipment meeting Transport Canada off road vehicle emission requirements; and
- scheduled preventive equipment maintenance.

The proposed dust control measures are based on current international best management practices, are predictably effective and are not prone to failure. The DBMP will include opportunities for adaptive management, in which the intensity of the control measures may need to be increased if site inspections and monitoring indicate that current measures are insufficient to prevent offsite dust effects. Use of low sulphur diesel is also predictably effective for reducing sulphur emissions from onsite diesel fuel consumption.

The table below provides the mitigation measures applicable to the EER for the Project and indicates if the mitigation measures have changed or stayed the same from the EA.

Table 4-1: Mitigation Measures – Air Quality

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Construction	Fugitive Dust Emissions	Dust Best Management Plan (DBMP)	The DBMP will ensure effective fugitive dust management to mitigate potential off-site effects of the particulate matter and trace metals present on the particulate. The DBMP will detail the following measures: watering frequency, visual monitoring, inspection, record keeping, responsibility, training, complaint response, and corrective actions. The site will have water trucks with water sprays and cannons; should weather conditions not permit watering, other Ministry of the Environment and Climate Change (MOECC) approved suppressants (such as calcium chloride) will be used. If further mitigation is required at specific locations (e.g., active stockpiles), dedicated water sprays will be employed. Travel surfaces will be maintained to minimize silt (fine material).	Maintain air quality to be compliant with Ontario Regulation 419/05 standards for total suspended particulate (TSP) and metals at off-site receptors.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Construction	Exhaust from generators, trucks and mobile equipment	Engine Maintenance program	A preventive maintenance program will be employed that encompasses all pollution control equipment and diesel-fired engines.	Maintain air quality to be compliant with Ontario AAQC for NO_2, SO_2, CO, and particulate matter at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Construction through Closure	Exhaust from trucks and off-road mobile equipment	Equipment compliant with Transport Canada vehicle emission requirements	Emission reductions achieved through the use of current equipment that complies with Transport Canada's off-road engine emission criteria.	Transport Canada Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32).	The mitigation measure has not changed from the EA.
Air Quality	Construction through Closure	Sulphur dioxide (SO_2) emissions from diesel fuel use	Use of low sulphur fuel	Low sulphur fuels will be used in off-road diesel engines; this will reduce the sulphur dioxide emissions from all sources and the resultant off-site air concentrations.	Environment Canada Sulphur in Diesel Fuel Regulation limiting fuel sulphur content for off-road engines. (SOR/2002-254)	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	Fugitive Dust Emissions	Dust Best Management Plan (DBMP)	The DBMP will ensure effective fugitive dust management to mitigate potential off-site effects of the particulate matter and trace metals present on the particulate. The DBMP will detail the following measures: watering frequency, visual monitoring, inspection, record keeping, responsibility, training, complaint response, and corrective actions. The site will have water trucks with water sprays and cannons; should weather conditions not permit watering, other MOECC approved suppressants (such as calcium chloride) will be used. If further mitigation is required at specific locations (e.g., active stockpiles), dedicated water sprays will be employed. Travel surfaces will be maintained to minimize silt (fine material).	Maintain air quality to be compliant with Ontario Regulation 419/05 standards for TSP and metals at off-site receptors. DBMP will be part of MOECC Environmental Compliance Approval.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	Dust from TMF	Dust Best Management Plan (DBMP)	Controlling dust from the TMF is required to prevent off-site dust. As a large exposed area, control method must prevent potential for dusting to occur.	Maintain air quality to be compliant with Ontario Regulation 419/05 standards for TSP and metals at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Exhaust from generators, trucks and mobile equipment	Engine Maintenance program	A preventive maintenance program will be employed for pollution control equipment and diesel-fired engines.	Maintain air quality to be compliant with Ontario AAQC for NO_2, SO_2, CO, and particulate matter at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Exhaust from trucks and off-road mobile equipment.	Equipment compliant with Transport Canada vehicle emission requirements	Emission reductions achieved through the use of current equipment that complies with Transport Canada's off-road engine emission criteria.	Transport Canada Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32).	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	SO_2 emissions from diesel fuel use	Use of low sulphur fuel	Low sulphur fuels will be used in off-road diesel engines; this will reduce the sulphur dioxide emissions from all sources and the resultant off-site air concentrations.	Environment Canada Sulphur in Diesel Fuel Regulation limiting fuel sulphur content for off-road engines (SOR/2002-254).	The mitigation measure has not changed from the EA.
Air Quality	Operations	Particulate emissions from drilling operations	Control measures provided by equipment supplier	Mitigation measures are required to prevent off-site effects of TSP and metals, through the use of equipment with dust control.	Compliance with Ontario Regulation 419/05 standards for TSP and metals at off-site receptors.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	Particulate emissions and NO_x from open pit blasting	Blasting to occur mid-day based on favourable climatic conditions Follow manufacturer's recommended guidelines regarding water infiltration and time of explosives usage	Blasting will occur when meteorological conditions are such that off-site TSP, metals and NO_x levels are compliant with regulations. NO_x emissions may increase if emulsion is left in boreholes for extended period of time due to infiltration of water.	Compliance with Ontario Regulation 419/05 air quality standards for NO_x, TSP, and metals at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Hydrogen cyanide (HCN) emissions from tailings	Cyanide destruction at the ore processing plant	HCN emissions from TMF are expected to be minimal, as sulphur dioxide will be used to destroy cyanide at the Ore Processing Plant before tailings are released to the TMF.	Compliance with Ontario Regulation 419/05 air quality standard for HCN at off-site receptors.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	Material handling at the ore processing plant	Dust collection systems	Mitigation measures to control dust emissions from crushing (primary and secondary) and reclaim from feed stockpiles are required to prevent off-site effects of TSP and metals. Crushing and reclaim from stockpiles for crushed materials will be controlled with applicable dust control systems. A maintenance plan will ensure that dust control systems are functioning properly.	Compliance with Ontario Regulation 419/05 air quality standards for TSP at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Particulate emissions from lime silo	Dust collection systems	Mitigation measures are required to control dust during lime delivery to the silos to prevent off-site effects of TSP. Lime silo vents are to be controlled by dust control systems. A maintenance plan will ensure dust control systems are functioning properly.	Compliance with Ontario Regulation 419/05 air quality standards for TSP at off-site receptors.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	Emissions from lime slaker	Dust collection systems	Mitigation measures are required to control emissions from the lime slaker to prevent off-site effects of TSP. Emissions from the lime slaker are to be controlled. A maintenance plan will ensure dust control systems are functioning properly.	Compliance with Ontario Regulation 419/05 air quality standard for TSP at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Particulate from dry material handling in ore processing plant (flocculants, copper sulphate)	Dust collection systems	Mitigation measures are required to control emissions from handling and mixing of dry chemicals. Mixing and handling areas are to be controlled. A maintenance plan will ensure dust control systems are functioning properly.	Compliance with Ontario Regulation 419/05 air quality standard for TSP at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Emissions from induction furnace	Dust collection systems	Emissions from the furnace are to be controlled. A maintenance plan will ensure dust control systems are functioning properly.	Compliance with Ontario Regulation 419/05 air quality standard for TSP at off-site receptors.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Operations	SO_2 emissions from cyanide destruction	Closed loop delivery	To control emissions during delivery, SO_2 is to be delivered to the site as a pressurized liquid . Delivery system to include a gas capture system.	Compliance with Ontario Regulation 419/05 air quality standard for SO_2 at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Operations	Emissions from on-site emergency generators	Develop a testing schedule to minimize air quality effects	Mitigation measures are required to control NO_x and TSP emissions from the generators. Testing will be conducted as per established industry protocols.	Maintain air quality to be compliant with Ontario Regulation 419/05 air quality standards for TSP and NO_x at off-site receptors. Testing schedule will be part of MOECC ECA.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Closure	Fugitive Dust Emissions	Dust Best Management Plan (DBMP)	The DBMP will ensure effective fugitive dust management to mitigate potential off-site effects of the particulate matter and trace metals present on the particulate. The DBMP will detail the following measures: watering frequency, visual monitoring, inspection, record keeping, responsibility, training, complaint response, and corrective actions. The site will have water trucks with water sprays and cannons; should weather conditions not permit watering, other MOECC approved suppressants (such as calcium chloride) will be used. Travel surfaces will be maintained to minimize silt (fine material).	Maintain air quality at property line to be compliant with Ontario Regulation 419/05 standards for TSP and metals at off-site receptors.	The mitigation measure has not changed from the EA.

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Air Quality	Closure	Exhaust from generators, trucks and mobile equipment	Engine Maintenance program	A preventive maintenance program will be employed that encompasses all pollution control equipment and diesel-fired engines.	Maintain air quality to be compliant with Ontario AAQC for NO_2, SO_2, CO, and particulate matter at off-site receptors.	The mitigation measure has not changed from the EA.
Air Quality	Closure	Exhaust from trucks and off-road mobile equipment.	Equipment compliant with Transport Canada vehicle emission requirements	Emission reductions achieved through the use of current equipment that complies with Transport Canada's off-road engine emission criteria.	Transport Canada Off-Road Compression -Ig nition Engine Emission Regulations (SOR/2005-32).	The mitigation measure has not changed from the EA.

5.0 MANAGEMENT

IAMGOLD will develop a monitoring plan (as part of their provincial permit requirements) to demonstrate that the predictions from the dispersion models are met. IAMGOLD has made an additional commitment to include appropriately located dust fall jars to assess actual deposition in key areas as part of its monitoring plan. The data will be shared as part of an ongoing communications program with the Indigenous groups to share information related to uses of land and resources in the mine area.

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA. No changes are proposed.

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Table 5-1: Monitoring Measures – Air Quality

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Air Quality	Total Suspended Particulate (TSP)	High Volume (hi-vol) samplers	Ontario Reg.419/05 air quality standard for TSP (24-hr averaging time).	Construction and Operations phases. One sample every 6 days.	Three locations (to be determined) triangulating the site to provide upwind/downwind assessment.	The monitoring measure has not changed from the EA.
Air Quality	Metals	Analysis of hi-vol TSP samples collected (filter)	Ontario Reg.419/05 air quality standards for metals. The metals to be monitored will be identified in the Ambient Monitoring Plan that will be submitted to the Ministry of the Environment and Climate Change (MOECC) prior to initiating the monitoring program.	Construction and Operations phases Select TSP filters (highest loading) to be analysed monthly.	Three locations (to be determined), triangulating the site to provide upwind/downwind assessment.	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Air Quality	NO_x/SO_2	Passive samplers	Screening Level to be established based upon Alberta's proposed Air Monitoring Directive and Ontario's AAQC for other averaging times.	Construction and Operations phases. Monthly samples.	Co-located with the hi-vol samplers.	The monitoring measure has not changed from the EA.

6.0 CONCLUSION

This Updated Air Quality Technical Memorandum was prepared in support of the EER for the IAMGOLD Côté Gold Project. During all phases of the Project, the facility will be operated in accordance with all regulatory requirements. The findings of the air quality assessment were as follows:

- Effects of key indicators for the Project are expected to be equal to or less than effects presented in the EA;
- modelling shows the facility meets MOECC standards for provincial permitting; and,
- all conclusions of the EA remain valid for the Project for air quality.

All mitigation, operational controls and monitoring requirements identified in the EA are still valid and unchanged for the Project.

7.0 REFERENCES

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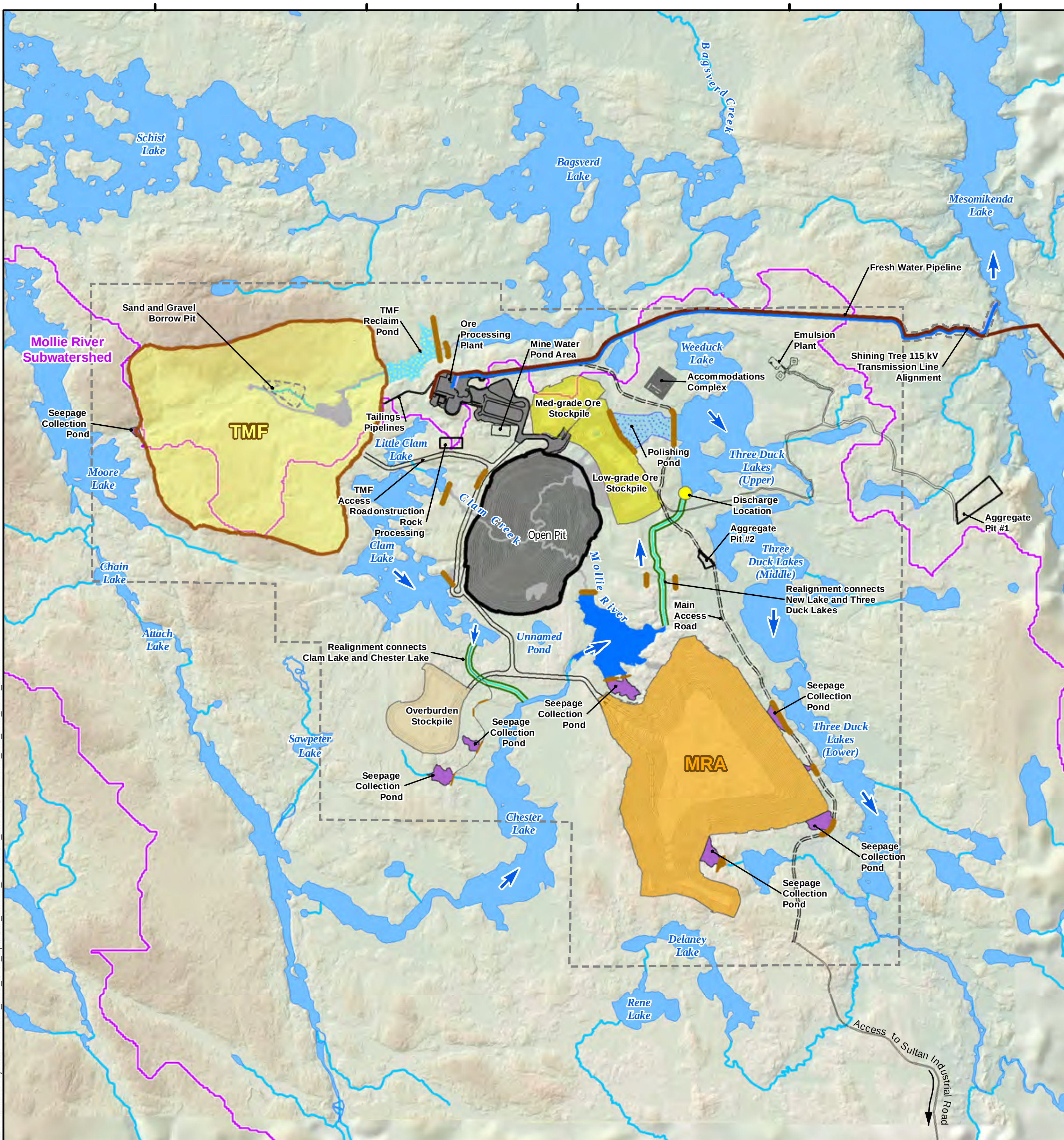
IAMGOLD

8.0 GLOSSARY AND ABBREVIATIONS

AAQC	Ambient Air Quality Criteria
CAAQS	Canadian Ambient Air Quality Standard
CCME	Canadian Council of Ministers of the Environment
CO	carbon monoxide
DBMP	Dust Best Management Plan
EA	Environmental Assessment
ECA	Environmental Compliance Approval
EER	Environmental Effects Review
HCN	hydrogen cyanide
HEHR	Human and Ecological Health Risk
GHGs	greenhouse gases
ha	hectare
km	kilometre
km/h	kilometres per hour
m	metre
m^3	cubic metres
MOECC	Ministry of the Environment and Climate Change
Mt	million tonnes (metric)
NO	nitrogen oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
PM_{tot}	total particulate matter
$PM_{2.5}$, PM_{10}	particles less than 2.5 or 10 micrometers in diameter
SO_2	sulphur dioxide
Tpd	metric tonnes per day
TMF	Tailings Management Facility
TSP	total suspended particulates
VOC	volatile organic compound
$\mu g/m^3$	Micrograms (one-millionth of a gram) per cubic metre
US EPA	United States Environmental Protection Agency

FIGURES



LEGEND

Watercourses
Overprinted Watercourses
Waterbodies
Overprinted Waterbodies
Subwatershed Boundary

Mine Site

Project Boundary
Open Pit
Potential Discharge Location
Facilities
Dam
Main Access Road
Shining Tree 115 kV Transmission Line Alignment
Watercourse Realignment
Proposed Water Flow Direction
Fresh Water Pipeline
Proposed Lake Area
Overburden Stockpile
Ore Stockpile
Proposed Mine Rock Area (MRA)
Proposed Tailings Management Facility (TMF)
TMF Reclaim Pond
Polishing Pond
Seepage Collection Pond
Sand and Gravel Borrow Pit

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N E S W

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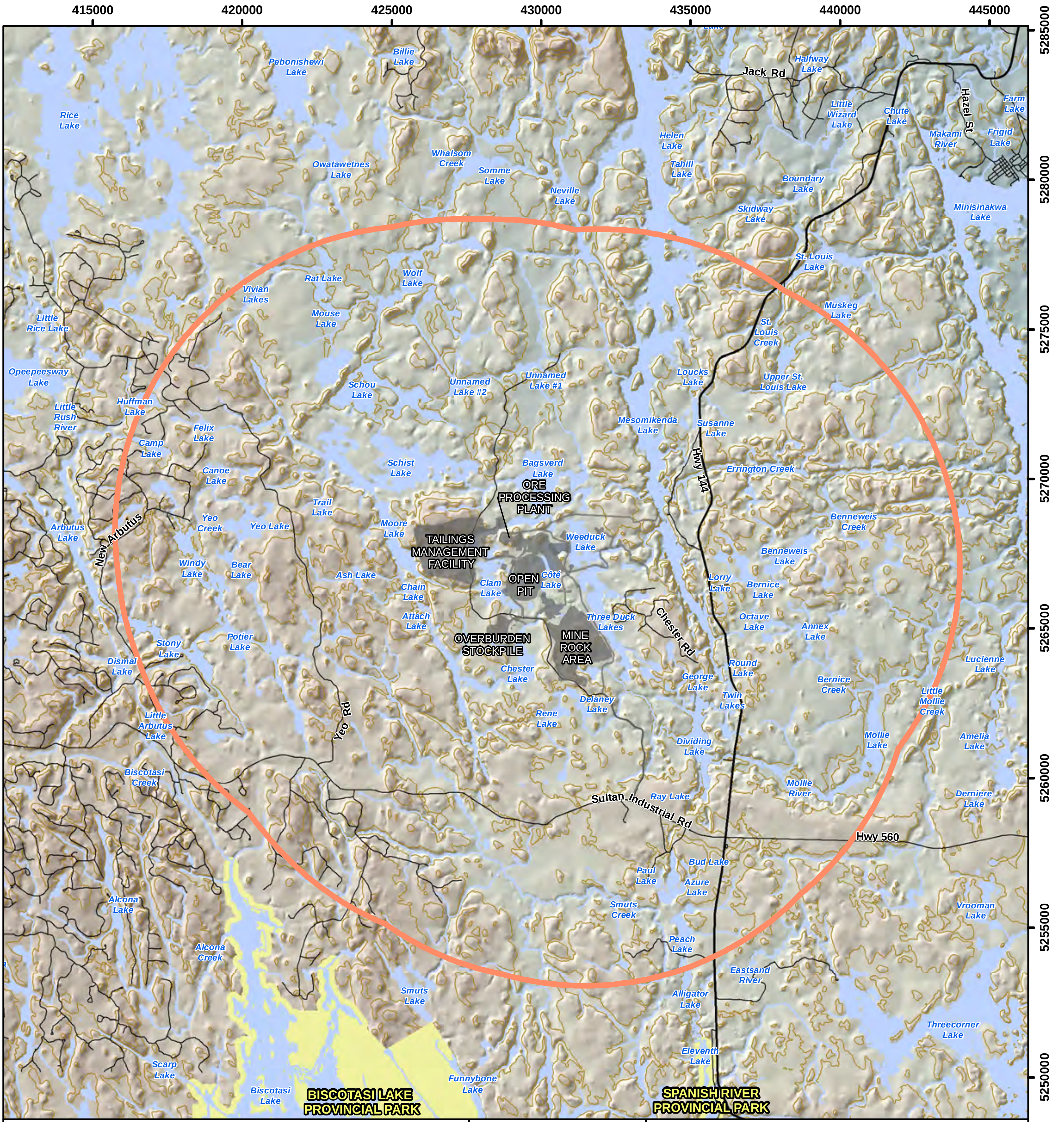
CÔTÉ GOLD PROJECT

Preliminary Site Plan

PROJECT N°: TC170502	**FIGURE: 1-1**
SCALE:1:50,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Air\MXD\Regional_study_area_1.mxd

LEGEND

- Regional Study Area
- Provincial Park
- Highway
- Local Road
- Watercourses
- Waterbodies
- Mine Site Footprint

NOTES:
- Contours and terrain model derived from Ontario Provincial DEM available under LIO, MNRF open data licence.

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CÔTÉ GOLD PROJECT

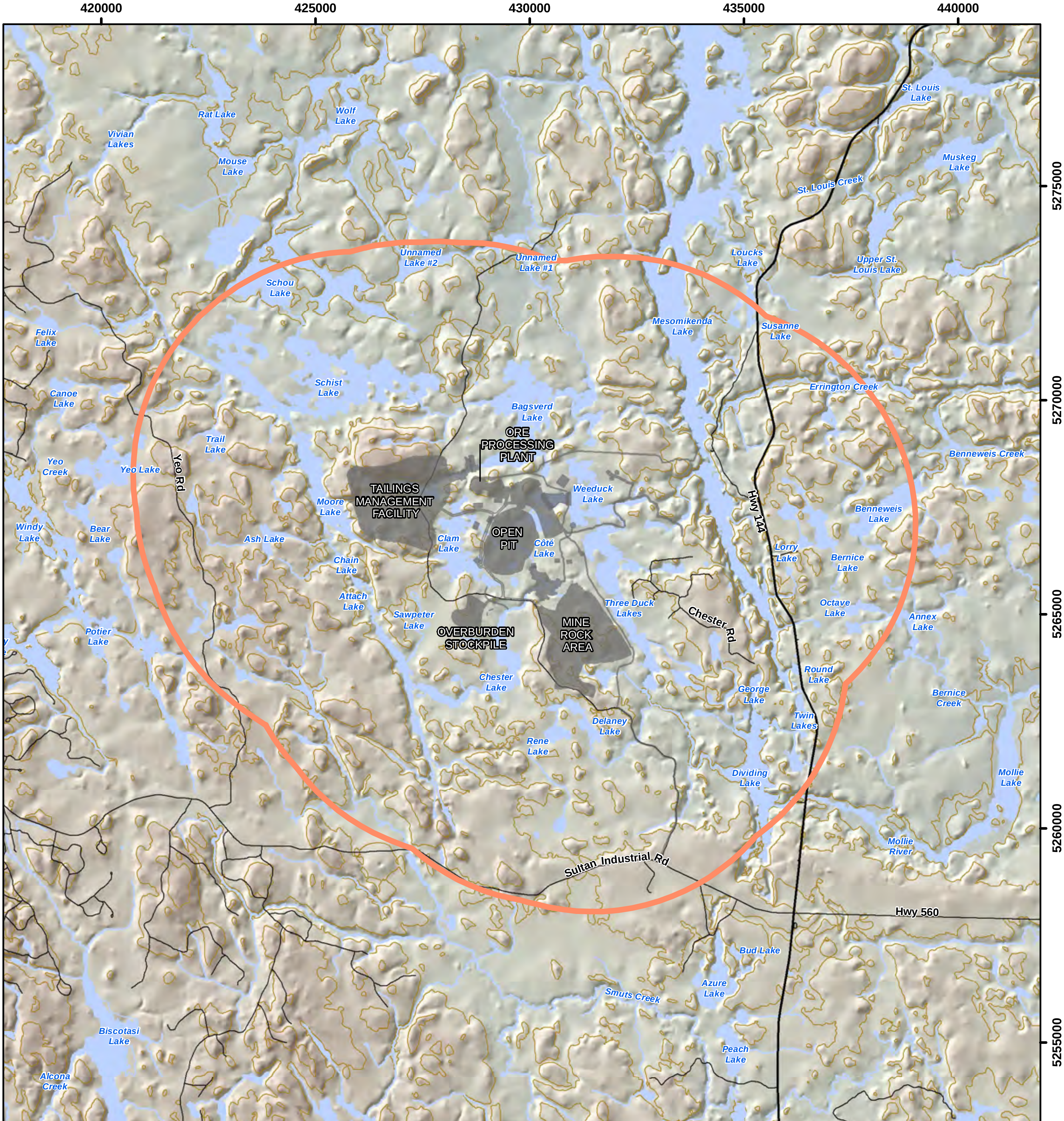
Regional Study Area

Datum: NAD83
Projection: UTM Zone 17N

N W E S

PROJECT N^{o}: TC170502	**FIGURE: 2-1**
SCALE: 1:170,000	DATE: December 2017

0 2 4 6 8 10 Kilometres



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LEGEND

- Local Study Area
- Highway
- Local Road
- Watercourses
- Waterbodies
- Mine Site Footprint

NOTES:
- Contours and terrain model derived from Ontario Provincial DEM available under LIO, MNRF open data licence.

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CÔTÉ GOLD PROJECT

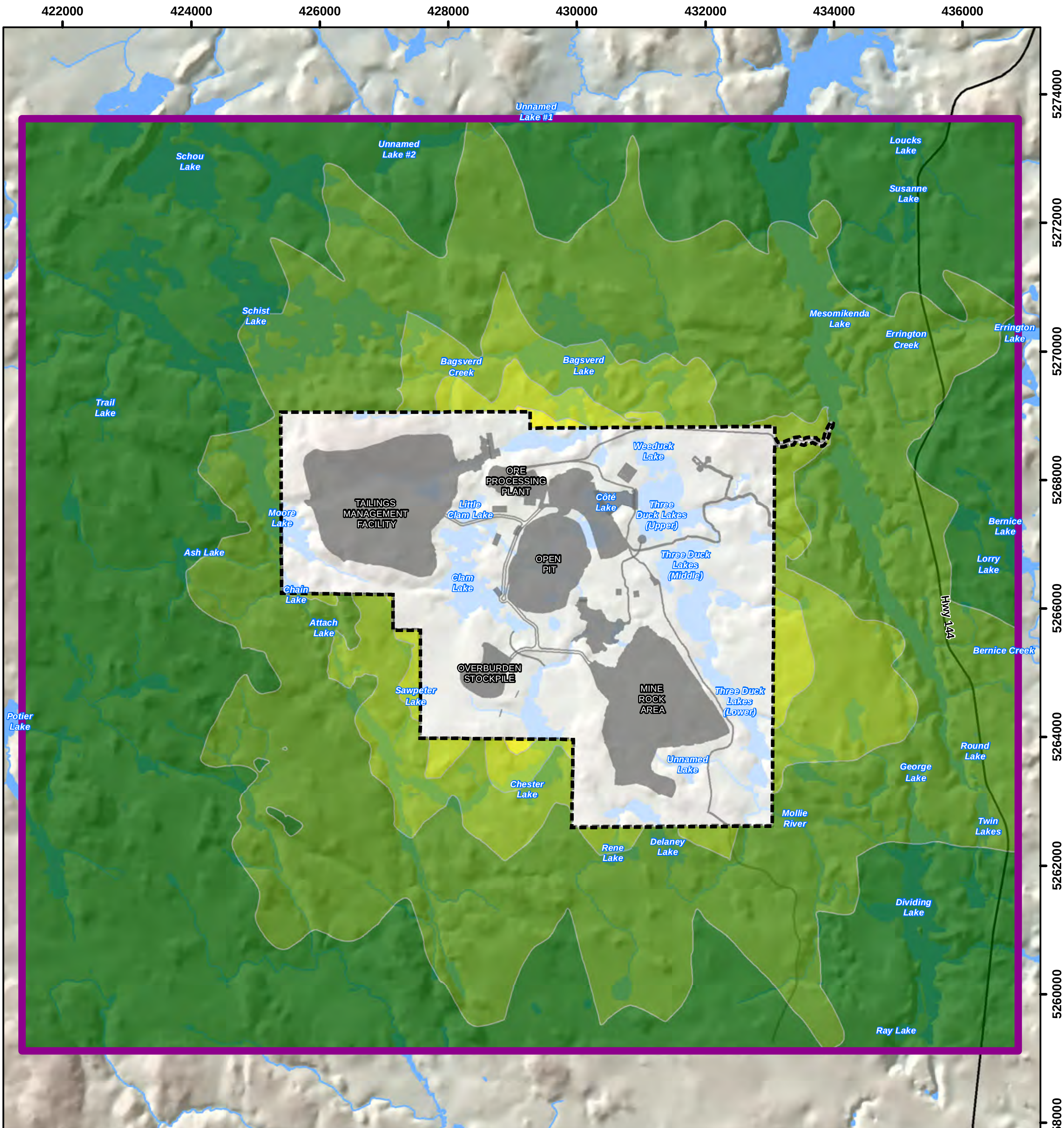
Local Study Area

Datum: NAD83
Projection: UTM Zone 17N

0 2 4 6 8 10 Kilometres

N E S W

PROJECT N°: TC170502	**FIGURE: 2-2**
SCALE: 1:120,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\AirMXD\TSP_24_hr_2.mxd

LEGEND

Concentration (µg/m³)

- 120 - 140
- 100 - 120
- 80 - 100
- 60 - 80
- <60

- **Model Domain Boundary**
- **Mine Site Footprint**
- **Highway**
- **Watercourses**
- **Waterbodies**

0 1 2 3 4 5 Kilometres

NOTES:
- Concentrations presented include background level of 37 µg/m³

Datum: NAD83
Projection: UTM Zone 17N

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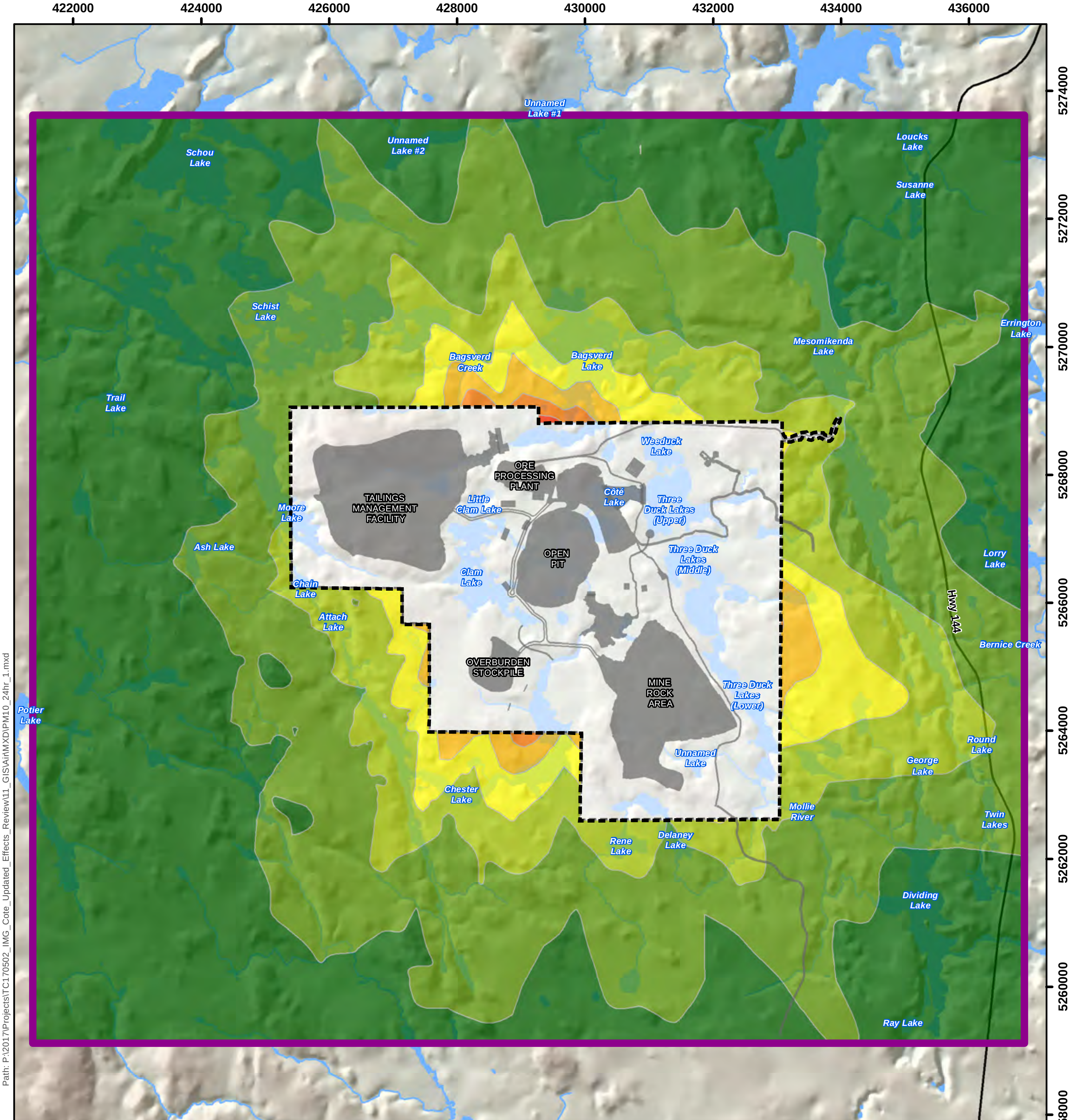
CÔTÉ GOLD PROJECT

PM$_{tot}$ 24 hr Concentration

PROJECT N°: TC170502	**FIGURE: 3-1**
SCALE: 1:80,000	DATE: December 2017



LEGEND

Concentration (µg/m^3)

- 80 - 86
- 70 - 80
- 60 - 70
- 50 - 60
- 40 - 50
- 30 - 40
- <30

- Model Domain Boundary
- Mine Site Footprint
- Highway
- Watercourses
- Waterbodies

0 1 2 3 4 5 Kilometres

NOTES:
- Concentrations presented include background level of 14 µg/m^3

Datum: NAD83
Projection: UTM Zone 17N

N E S W

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CÔTÉ GOLD PROJECT

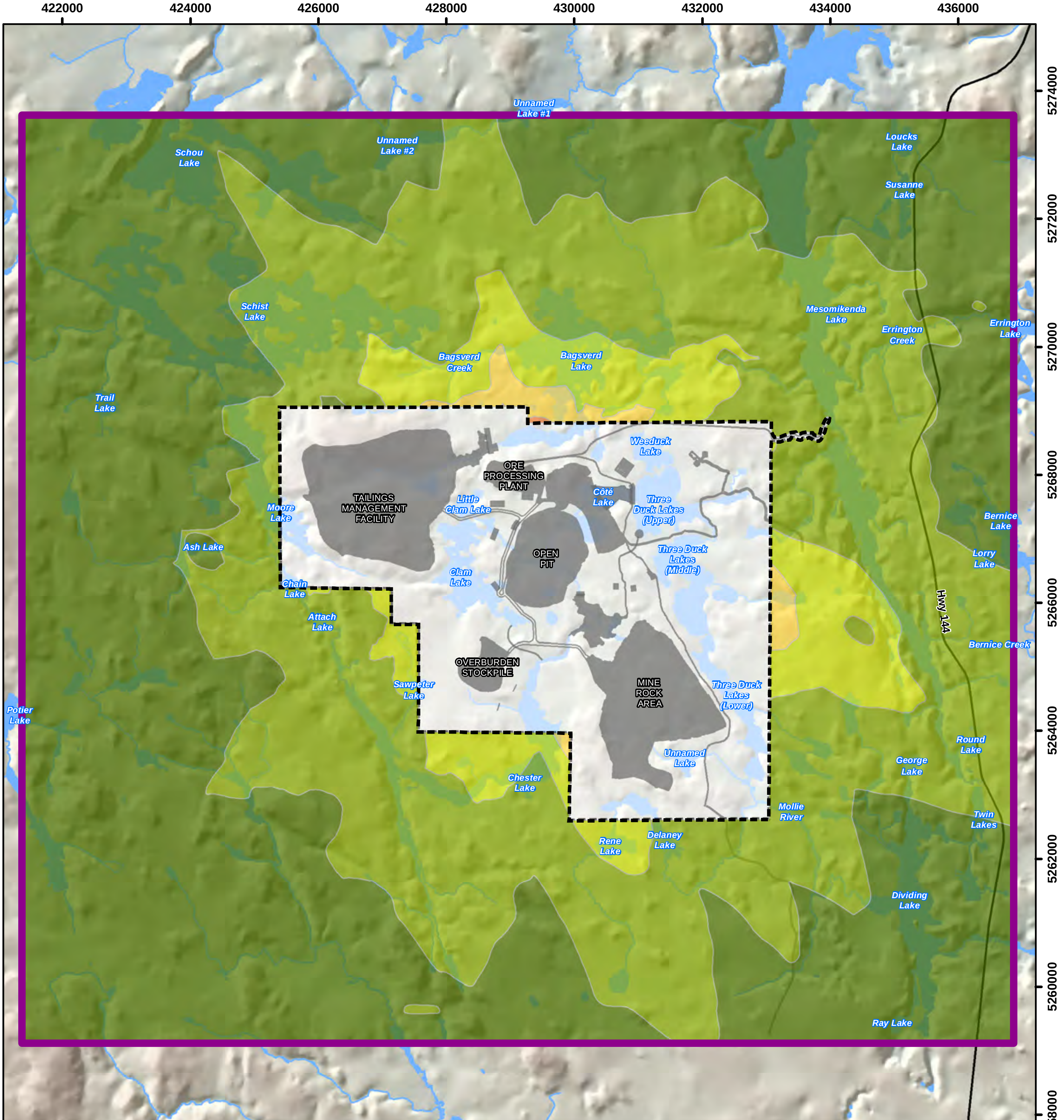
PM_{10} 24 hr Concentration

PROJECT N^o: TC170502

FIGURE: 3-2

SCALE: 1:80,000

DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\AirMXD\PM2pt5_24hr_2.mxd

LEGEND

Concentration (µg/m³)

- 30 - 31
- 25 - 30
- 20 - 25
- 15 - 20
- <15

- Model Domain Boundary
- Mine Site Footprint
- Highway
- Watercourses
- Waterbodies

0 1 2 3 4 5 Kilometres

NOTES:
- Concentrations presented include background level of 10 µg/m³.

Datum: NAD83
Projection: UTM Zone 17N

IAMGOLD CORPORATION

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CÔTÉ GOLD PROJECT

$PM_{2.5}$ 24 hr Concentration

PROJECT N°: TC170502	**FIGURE: 3-3**
SCALE: 1:80,000	DATE: December 2017

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APPENDIX I

EXECUTIVE SUMMARY

In 2014, Amec Foster Wheeler completed a study of the potential air quality effects of the Project in support of the Federal Environmental Impact Statement and the Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The air quality study predicted off-site effects using dispersion modelling, and compared the results to applicable air quality criteria in order to determine whether potential adverse effects on the environment and human health exist

This memorandum updates the air quality assessment for the Project. Key differences between the EA, and the Project relevant to air quality are:

- Reductions in key operating parameters, including the processing rate and maximum annual movements of ore, overburden, and mine rock, and the total ore, overburden, and mine rock over the life of the mine;
- a reduction in the footprint of the open pit, mine rock area (MRA), and tailings management facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- realignment of the haul road used to transport mine rock from the open pit to the mine rock area; and
- the use of fewer and smaller haul trucks to transport materials.

An assessment of the potential air quality effects of the Project was completed in accordance with generally accepted air quality assessment methodologies. The determination of potential air quality effects, in comparison to the predictions of the EA, involved the following steps:

- Identification of the significant emissions sources associated with the Project operations phase;
- identification of the key indicators emitted to the atmosphere from the identified sources;
- determination of the baseline ambient air quality conditions in the absence of the Project for each of the key indicators emitted;
- identification of the relevant regulatory air quality standards and criteria, and establish the appropriate assessment criteria for the site in Ontario, noting that for some of the parameters there may be more than one applicable limit depending upon the averaging time;
- estimation of the air emission rates for each of the key indicators using appropriate estimation methods and established data sources;
- preparation of a source summary table that identifies sources at the Project site which may release one or more of the key indicators emitted to the atmosphere in considerable quantities and the corresponding compounds and emission rates;

- screening out from further study some emissions to identify a number of contaminants that had very low levels of impacts in the EA for which all emission rates and modelled effects would be lower than those presented in the EA by quantitatively comparing emission rates and reviewing the 2014 dispersion modelling. These indicators will not move forward to dispersion modelling or for further assessment;
- performing the air dispersion modelling using the U.S. Environmental Protection Agency (US EPA) AERMOD model; and
- comparison of the dispersion modelling output to the assessment criteria, comparing predicted effects on ambient air quality with the corresponding air quality criterion and results from the EA to determine resulting changes in effects assessment.

The predicted effects were considered at the following receptors for the Project:

- The off-site location with the highest effect – the area outside of the Project boundary. The Project boundary is defined as the area inside of which IAMGOLD is able to restrict and control access and is revised from the EA; and
- off-site sensitive points of reception, which included eight cottages in the vicinity of the Project, where humans may be present at all times and are unchanged from the EA.

Study Area

The air quality regional study area has not changed from the EA and is defined as an area that extends approximately 10 kilometres (km) from the main Project emission sources, as illustrated in Figure 2-1. It is not expected that the effects of the Project would be measurable beyond the regional study area, and the regional study area for the Project is consistent with that of the submitted Project (EA).

The local study area generally corresponds to the area in the vicinity of the Project where most the air quality effects of the Project are expected to occur, and can be predicted or measured with a reasonable degree of accuracy. For the air quality assessment, the local study area is defined as an area that extends approximately 5 km from the main Project emission sources. Since some of the major components of the Project, including the TMF, are relocated from the submitted Project (EA), the local study area was revised accordingly (see Figure 2-2). The local study area also includes a 1 km buffer on either side of the selected transmission line alignment.

Air Quality Baseline

The existing atmospheric conditions were described in the air quality baseline study prepared for the EA. There are no anthropogenic sources of air emissions near the Project site other than cottages in the region, and the regional study area is similar throughout with an absence of large urban centres and industrial sources. As a result, the air quality in the regional study area is deemed good, with some influences from long range transport, vegetation (pollen) or natural forest fires. The climate in the regional study area may be described as humid continental, with warm and often hot summers and long, cold, snowy winters. The predominant wind direction is from the north (winter) or south (summer) and the average wind speed in this region ranges from 9.8 km/h to 13.5 km/h.

Construction Phase

The 2014 Air Quality Assessment and subsequent technical addendum concluded that construction effects were considered to be appreciably less than potential effects during operations. As such, detailed modelling was not warranted. Activities carried out during the Construction phase use similar mining equipment as the operations phase, and particulate matter (dust) is the major emission. Construction emissions will be managed through a dust best management plan (DBMP). The DBMP will include practices to minimize dust emissions (e.g., watering, travel area surface management) and a complaint response plan. Construction phase effects will be less, and of shorter duration than those predicted for the operational phase. As a result, the effects prediction considered the sources of air emissions that are associated with the operations phase of the Project. Air quality effects associated with transmission line construction will be limited to heavy equipment operation during the short-term Construction phase; therefore, no air quality prediction specific to transmission line construction was undertaken.

Operations Phase

The following emission sources were identified for the Project and included in the dispersion modelling:

- Emissions from blasting;
- material handling in the open pit;
- dust from crushing;
- road dust emissions (re-entrained dust);
- dust from managing mine rock, ore and overburden; and
- exhaust from back-up power generation.

In addition, air emissions from gold processing (for example hydrogen cyanide (HCN) and sulphur dioxide (SO2)) were also modelled. Nitrogen oxide (NOx) emissions occur from the blasting, combustion of propane for process plant heating, and from the testing of back-up generators.

The following changes to the assessment were made to reflect the Project:

- Revised Project boundary;
- relocation of TMF and main haul route; and

- updated emission rates based upon reduced mining and ore processing rates, material movements, TMF footprint, and changes to the open pit.

The modelling output is depicted in Figures 3-1 to 3-3, with the predicted ambient concentration isopleths (lines of equal concentration) for PMtot, PM10, PM2.5 (maximum 24-hour).

The shapes of the isopleths indicate the location of effects, which vary with direction and distance, as a result of source locations, meteorological conditions and receptor elevation. The model considers the effect of topography on dispersion; therefore, nearby receptors at elevated heights typically have higher concentrations than receptors at the same distance from a source but located at lower elevation.

The prediction of air quality determined that particulate matter levels for TSP, PM10, and PM2.5 exceeded Ambient Air Quality Criteria (AAQC) in a small area proximate to the Project site boundary, which is consistent with the findings of the EA, however, the predicted effects have decreased for all particle size fractions, and there were no exceedances of the criteria or standards at the cottages in the vicinity of the Project that were identified as sensitive receptors.

All other air quality assessment indicators were determined to be below the AAQCs and CAAQS in all cases, and the predicted effects for the Project are lower than those of the submitted Project (EA).

The Project also meets all air quality standards to allow the Ontario Ministry of Environment and Climate Change (MOECC) to grant approval in the form of an Environmental Compliance Approval.

Project effects on air quality are, for the most part, expected to be limited to the local study area. There are no other projects located in proximity to the Project that would result in cumulative effects on air quality.

Closure Phase

Activities in the active Closure phase are similar to those that occur during the Construction phase, and use similar mining equipment. The DBMP will include practices to minimize dust emissions during the active Closure phase (e.g., watering, travel area surface management) and a complaint response plan.

No specific closure phase air quality assessment was completed.

Post-Closure Phase

The Post-closure phase is predominantly a monitoring activity, with occasional repair and maintenance. There is no significant equipment use. No air quality effects are expected from these activities. The only emissions that will continue during the Post-closure phase are gases from the landfill that include VOCs, which were identified as an Effects Assessment Indicator.

There are no changes to the project description that would affect the landfill gas emissions; therefore no update to the previous assessment of landfill gas from an air quality perspective was completed.

Greenhouse Gas Assessment

An update to the Greenhouse Gas (GHG) assessment was completed to reflect the reduction in mine fleet fuel use, purchased electricity, and blasting for the Project.

The findings of the GHG assessment are as follows:

- The majority (97%) of Project GHG emissions are the result of mine fleet fuel combustion and purchased electricity;
- the GHG emissions for the Project are expected to be notably less than effects presented in the EA (28% lower over life of Project);
- the GHG emissions from the Project are very minor in comparison to the overall Canadian and Ontario GHG inventories; and
- IAMGOLD will prepare an annual inventory of GHG Emissions, and will comply with all relevant GHG reporting and management legislation and with IAMGOLD corporate sustainability programs.

The input data used to estimate the emissions is based on current operating assumptions and forecasts, and may differ from the actual emissions in any given year.

All mitigation, operational controls and monitoring requirements identified in the EA are still valid and unchanged for the Project.

Mitigation and Monitoring

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

IAMGOLD will develop a monitoring plan to ensure the air concentrations are below the AAQC and relevant air quality standards; this monitoring is expected to be part of the provincial permit requirements.

The mitigation measures and monitoring pertaining to the protection of ambient air quality outlined in the EA are unchanged for the EER.

APPENDIX II

GREENHOUSE GAS EMISSIONS FORECAST

UPDATED TECHNICAL MEMORANDUM: AIR QUALITY

GHG Emissions Forecast

In 2014, Amec Foster Wheeler completed a Greenhouse Gas Assessment in support of the EA.

The objective of the assessment is to prepare a forecast of the annual GHG emissions using a recognized GHG Protocol; the GHG Protocol (WBCSD/WRI 2004) adopted by the Global Reporting Initiative (GRI) was used.

The mine fleet and purchased electricity are the predominant sources of GHGs, with more than 97% of the site GHGs attributable to these sources. The remaining 3% of the GHG releases were from blasting, landfilling, propane combustion, and the combustion of diesel fuel in the stationary generators. The estimated GHG emissions are compared to the overall Ontario and Canadian GHG inventories, with the conclusion that GHG emissions from the Project would contribute a very minor amount to these inventories.

The objectives of GHG assessment for the Project have not changed from the EA.

A comparison of key parameters that are relevant to the comparison of GHG emissions between the Project and submitted Project (EA) are summarized in Table AII-1.

Table AII-1: Changes to the Project that Affect GHG Emissions

Project Metric	Project (October 2017)	Submitted Project (EA) (December 2014)	% Change
Total Material Movements	755 Mt	938 Mt	-19%
Total Diesel Fuel Use	505,181 kL	590,535 kL	-14%
Purchased Electricity	7,505,000 MWh	11,918,000 MWh	-37%

METHOD

Spatial and Temporal Boundaries

In contrast to the spatial boundary established for the air quality assessment, an organizational boundary for GHG quantification is used that defines which sources are included in the assessment. There are no changes to the organization boundary set from the EA, which included Scope 1 Direct Emissions, Scope 2 Indirect Emissions (purchased electricity), but excluded Scope 3 Other Indirect Emissions.

The temporal boundaries of the GHG Assessment spans all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

Effects Assessment Indicators

For GHG assessments, the indicator is the total GHG emissions in tonnes of CO2-equivalents (CO_2e), which is a unit of measure used to allow the addition of, or the comparison between, gases that have different global warming potentials (GWPs). Since many GHGs exist and their GWPs vary, the emissions are added in a common unit, CO_2e. To express GHG emissions in units of CO_2e, the quantity of a given GHG (expressed in units of mass) is multiplied by its global warming potential.

GHG EMISSIONS FORECAST

Method

Amec Foster Wheeler completed an assessment of the potential air quality effects of the Project in accordance with generally accepted methods and GHG Protocol. The methods for estimating GHG emissions from the source categories for the Project have not changed from the EA except as noted:

- The global warming potentials for methane (CH_4) and nitrous oxide (N_20) are updated to the 100-year GWPs published by Environment and Climate Change Canada (ECCC) in 2015, which differ from those used by the MOECC to align with the Western Climate Initiative (WCI) partners.

Construction Phase

The 2014 Air Quality Assessment and subsequent technical addendum concluded that construction effects were considered to be appreciably less than potential effects during operations. This was true for GHG emissions as well.

Given that the same sources are associated with GHG emissions during Construction and Operations, and that the total GHG emissions during construction are notably lower, the assessment and discussion of GHG emissions during the Construction phase are integrated into the Operations Phase discussion.

Operations Phase

The GHG emissions forecast is updated to reflect changes in the key parameters from the submitted Project (EA) (mine fleet fuel use, blasting, purchased electricity). The changes in production levels, activity rates, and source details that would affect the GHG emissions are presented in Table 1-1 of Section 1.1.

The maximum annual emissions for the Project are estimated to be 166,387 tonnes CO2e in Year 12 of the Project; this is a reduction of 42% from the maximum year for the submitted Project (EA), as shown in Figure AII-1. The Construction phase is shown as Years -1 and -2 in this figure.

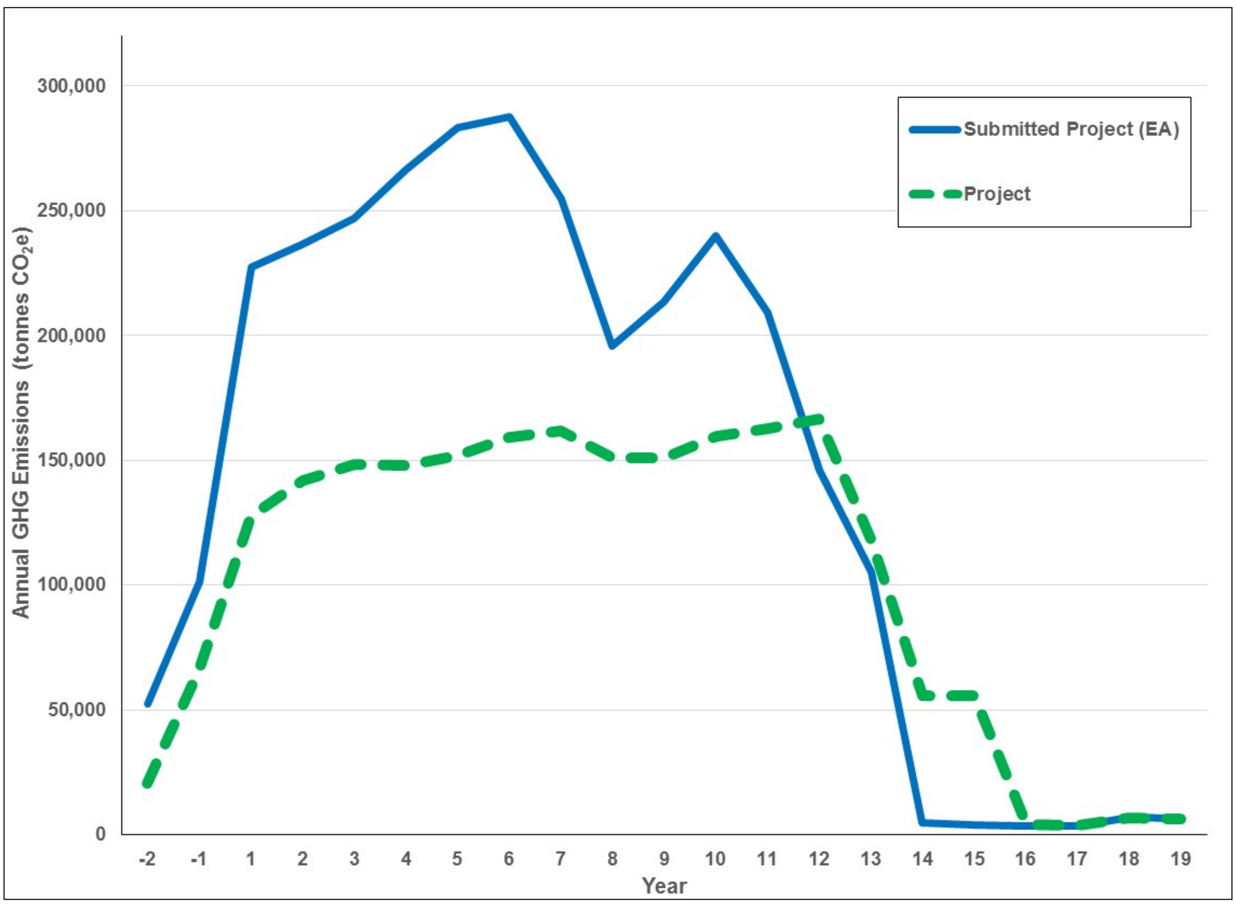

Figure AII-1: Annual GHG Emissions for Project and Submitted Project (EA)

The total Project GHG emissions for the Project are determined to be 2,227 kilo-tonnes CO2e based upon production and activity forecasts, which is 28% lower than the submitted Project (EA) GHG emissions.

The total annual GHG emissions are not appreciable when compared to the Canadian or Ontario GHG targets set for 2020 and 2030; the 2020 Canadian target is 17% below the 2005 baseline level of 738 megatonnes (Mt) (ECCC 2017) or 612 Mt and the Ontario target for that year is 155 Mt.

The predominant GHG emission sources are the mine fleet (fuel combustion) and purchased electricity, as shown in Figures AII-2 and AII-3, at 97% of the total GHG emissions which is slightly lower than their contribution of 98% in the EA. Blasting and landfill gases are each less than 2% of the total. Propane heating and generator operation are less than 1% of the total.

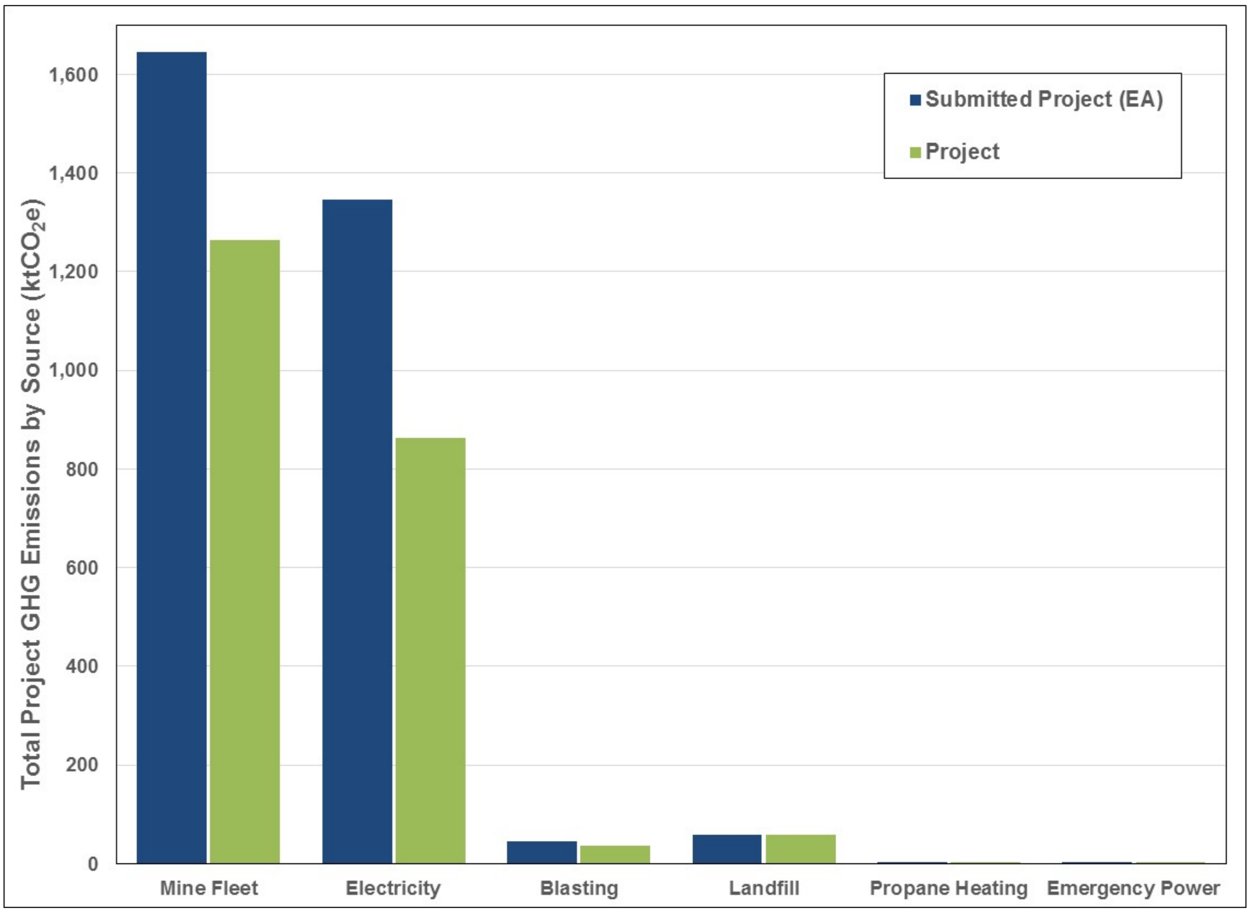

Figure AII-2: Source Contribution to Project GHG Emissions

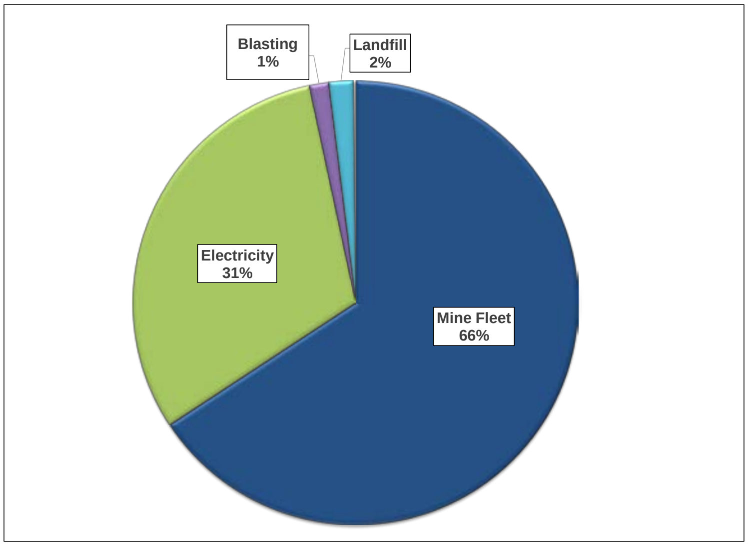

Figure AII-3: Source Contribution to Project GHG Emissions

Closure Phase

The landfill gases are found to contribute only 3% to the Project GHG inventory, therefore no update to the previous assessment of landfill gases from a GHG perspective is completed.

Post-Closure Phase

The only emissions that will continue during the Post-closure phase are gases from the landfill that include methane and CO2. There are no changes to the project description that would notably affect the landfill gas emissions. The landfill gases are found to contribute only 3% to the Project GHG inventory, therefore no update to the previous assessment of landfill gases from a GHG perspective is completed.

MITIGATION MEASURES

The Project GHG direct emissions are primarily due to mine fleet and blasting, mitigation measures would be related to these two activities, as follows:

- Mining equipment and vehicles will be regularly maintained and serviced to maximize operational efficiency;
- the use of lower emission equipment and fuels will be investigated;
- the distances vehicles travel on site will be minimized to the extent possible by mine planning;
- energy consumption will be monitored and GHG emissions calculated annually to identify opportunities for reduction; and

- optimizing blasting operations to minimize re-handling of material.

The mitigation measures are unchanged from submitted Project (EA) to the Project.

MANAGEMENT

IAMGOLD will develop a GHG tracking and reporting program in order to comply with legislative requirements and corporate sustainability programs. The management approach is unchanged from the EA.

CONCLUSION

This Appendix to the Updated Air Quality Technical Memorandum was prepared in support of the EER for the IAMGOLD Côté Gold Project. During all phases of the Project, the facility will be operated in accordance with all regulatory requirements. The findings of the GHG assessment are as follows:

- The GHG emissions for the Project are expected to be equal to be notably less than effects presented in the EA;
- the GHG emissions from the Project are very minor in comparison to the overall Canadian and Ontario GHG inventories; and
- IAMGOLD will prepare an annual inventory of GHG Emissions, and will comply with all relevant GHG reporting and management legislation.

It should be noted that input data used to estimate the emissions is based on current operating assumptions and forecasts, and may differ from the actual emissions in any given year.

All mitigation, operational controls and monitoring requirements identified in the EA are still valid and unchanged for the Project.

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Table AII-1:GHG Summary Table

GWP	
CH_4	25
N_2O	298

	Category	Parameter	Units	Total Project	Maximum Year	Emission Factor	Year								
							Construction		Operations						
							-2	-1	1	2	3	4	5	6	7
Submitted Project (EA)	Mining Equipment	Fuel Consumption	kL	590,535	64,622		14,062	26,995	44,085	46,540	50,187	57,150	63,102	64,622	52,786
Submitted Project (EA)	Mining Equipment	CO_2 Emission	tonnes	1,572,595	172,088	2663 kg/kL	37,447	71,889	117,398	123,935	133,648	152,190	168,041	172,088	140,570
Submitted Project (EA)	Mining Equipment	CH_4 Emission (as CO_2eq)	tonnes	1,964	215	0.133 kg/kL	47	90	147	155	167	190	210	215	176
Submitted Project (EA)	Mining Equipment	N_2O Emission (as CO_2eq)	tonnes	70,392	7,703	0.400 kg/kL	1,676	3,218	5,255	5,548	5,982	6,812	7,522	7,703	6,292
Submitted Project (EA)	Mining Equipment	Diesel Equipment and Vehicles - Total CO_2eq	tonnes	1,644,950	180,005		39,170	75,196	122,800	129,638	139,797	159,193	175,772	180,005	147,038
Submitted Project (EA)	Electricity	Purchased Electricity	MWh	11,918,000	915,000		0	5000	915,000	915,000	915,000	915,000	915,000	915,000	915,000
Submitted Project (EA)	Electricity	Total CO_2eq	tonnes	1,310,980	100,650	110 kg/MWh	0	550	100650	100650	100650	100650	100650	100650	100650
Submitted Project (EA)	Electricity	Electricity (diesel generators)	MWh	38,200	24,300		13900	24300							
Submitted Project (EA)	Electricity	Total CO_2eq	tonnes	36,290	23,085	0.95 t/MWh	13205	23085							
Submitted Project (EA)	Electricity	Electricity - Total CO_2eq	tonnes	1,347,270	123,735		13,205	23,635	100,650	100,650	100,650	100,650	100,650	100,650	100,650
Submitted Project (EA)	Blasting	Total material from pit	kilotonnes	938,116	98,105			45,801	64,151	96,747	98,040	98,105	97,970	96,718	92,034
Submitted Project (EA)	Blasting	Blasts/yr	#	2,493	261	376.3 kt/blast		122	170	257	261	261	260	257	245
Submitted Project (EA)	Blasting	Emulsion	tonnes	281,435	29,431	112,887 kg/blast		13740	19245	29024	29412	29431	29391	29015	27610
Submitted Project (EA)	Blasting	Blast - Total CO_2eq	tonnes	46,011	4,812	0.163 tCO2/tANFO		2246	3146	4745	4809	4812	4805	4744	4514
Submitted Project (EA)	Landfill	Waste Deposited	tonnes	37,179	15,000			2772	2772	1109	1109	1109	1109	1109	1109
Submitted Project (EA)	Landfill	CO_2 Emission	tonnes	36	4			0	0	1	1	1	1	1	1
Submitted Project (EA)	Landfill	CH_4 Emission (as CO_2eq)	tonnes	57,551	6,500			0	598	1173	1366	1552	1730	1902	2066
Submitted Project (EA)	Landfill	Landfill - Total CO_2eq	tonnes	57,587	6,504			0	598	1173	1367	1553	1731	1903	2068
Submitted Project (EA)	Propane Heating	Propane Heating (Process, Buildings)	1,000,000 L/yr	57	3		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Submitted Project (EA)	Propane Heating	CO_2 Emission	tonnes	85	4	1.51 g/L	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Submitted Project (EA)	Propane Heating	CH_4 Emission (as CO_2eq)	tonnes	34	2	0.024 g/L	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Submitted Project (EA)	Propane Heating	N_2O Emission (as CO_2eq)	tonnes	1,825	87	0.108 g/L	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9
Submitted Project (EA)	Propane Heating	Propane Heating - Total CO_2eq	tonnes	1,944	93		92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6
Submitted Project (EA)	Emergency Power	Emergency Diesel Generators	L/year	1,409	67		67	67	67	67	67	67	67	67	67
Submitted Project (EA)	Emergency Power	CO_2 Emission	tonnes	3,751	179	2663 kg/kL	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6
Submitted Project (EA)	Emergency Power	CH_4 Emission (as CO_2eq)	tonnes	5	0	0.133 kg/kL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Submitted Project (EA)	Emergency Power	N_2O Emission (as CO_2eq)	tonnes	168	8	0.400 kg/kL	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Submitted Project (EA)	Emergency Power	Diesel Gensets - Total CO_2eq	tonnes	3,924	187		186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8
Submitted Project (EA)		Submitted Project (EA) Total GHG as CO_2eq	tonnes	3,101,686	287,581		52,654	101,357	227,474	236,486	246,902	266,486	283,238	287,581	254,549

Table AII-1:GHG Summary Table

GWP	
CH_4	25
N_2O	298

	Category	Parameter	Units	Total Project	Maximum Year	Emission Factor	Year								
							Construction		Operations						
							-2	-1	1	2	3	4	5	6	7
Project	Mining Equipment	Fuel Consumption	kL	505,181	39,299		2,559	14,493	25,943	30,877	33,148	32,985	34,217	36,830	37,899
Project	Mining Equipment	CO_2 Emission	tonnes	1,345,297	104,654	2663 kg/kL	6,816	38,595	69,085	82,226	88,273	87,839	91,120	98,078	100,924
Project	Mining Equipment	CH_4 Emission (as CO_2eq)	tonnes	1,680	131	0.133 kg/kL	9	48	86	103	110	110	114	122	126
Project	Mining Equipment	N_2O Emission (as CO_2eq)	tonnes	60,218	4,684	0.400 kg/kL	305	1,728	3,092	3,681	3,951	3,932	4,079	4,390	4,518
Project	Mining Equipment	Diesel Equipment and Vehicles - Total CO_2eq	tonnes	1,264,331	109,469		7,129	40,371	72,264	86,009	92,335	91,881	95,312	102,590	105,568
Project	Electricity	Purchased Electricity	MWh	7,505,000	468,000		0	5000	468,000	468,000	468,000	468,000	468,000	468,000	468,000
Project	Electricity	Total CO_2eq	tonnes	826,210	51,480	110 kg/MWh	0	550	51480	51480	51480	51480	51480	51480	51480
Project	Electricity	Electricity (diesel generators)	MWh	38,200	24,300		13900	24300							
Project	Electricity	Total CO_2eq	tonnes	36,290	23,085	0.95 t/MWh	13205	23085							
Project	Electricity	Electricity - Total CO_2eq	tonnes	862,500	74,565		13,205	23,635	51,480	51,480	51,480	51,480	51,480	51,480	51,480
Project	Blasting	Total material from pit	kilotonnes	755,234	60,437		2,689	37,257	60,437	60,240	59,948	60,019	60,012	58,111	52,706
Project	Blasting	Blasts/yr	#	2,007	161	376.3 kt/blast	7	99	161	160	159	160	159	154	140
Project	Blasting	Emulsion	tonnes	226,570	18,131	112,887 kg/blast	807	11177	18131	18072	17985	18006	18004	17433	15812
Project	Blasting	Blast - Total CO_2eq	tonnes	37,042	2,964	0.163 tCO2/tANFO	132	1827	2964	2955	2940	2944	2943	2850	2585
Project	Landfill	Waste Deposited	tonnes	37,179	15,000			2772	2772	1109	1109	1109	1109	1109	1109
Project	Landfill	CO_2 Emission	tonnes	36	4			0	0	1	1	1	1	1	1
Project	Landfill	CH_4 Emission (as CO_2eq)	tonnes	57,551	6,500			0	598	1173	1366	1552	1730	1902	2066
Project	Landfill	Landfill - Total CO_2eq	tonnes	57,587	6,504			0	598	1173	1367	1553	1731	1903	2068
Project	Propane Heating	Propane Heating (Process, Buildings)	0	57	3		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Project	Propane Heating	CO_2 Emission	tonnes	85	4	1.51 g/L	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Project	Propane Heating	CH_4 Emission (as CO_2eq)	tonnes	34	2	0.024 g/L	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Project	Propane Heating	N_2O Emission (as CO_2eq)	tonnes	1,825	87	0.108 g/L	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9
Project	Propane Heating	Propane Heating - Total CO_2eq	tonnes	1,944	93		92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6
Project	Emergency Power	Emergency Diesel Generators	kL/year	1,409	67		67	67	67	67	67	67	67	67	67
Project	Emergency Power	CO_2 Emission	tonnes	3,751	179	2663 kg/kL	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6
Project	Emergency Power	CH_4 Emission (as CO_2eq)	tonnes	5	0	0.133 kg/kL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Project	Emergency Power	N_2O Emission (as CO_2eq)	tonnes	168	8	0.400 kg/kL	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Project	Emergency Power	Diesel Gensets - Total CO_2eq	tonnes	3,924	187		186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8
Project		Project Total GHG as CO_2eq	tonnes	2,227,328	166,387		20,746	66,113	127,586	141,897	148,401	148,137	151,746	159,103	161,980

Comparison of Submitted Project (EA) and Current Project (ERR) GHG Emissions

	Parameter	Units	Total Project CO_2eq	Maximum Year CO_2eq	Maximum Year	Annual GHG Emissions as CO_2eq								
Submitted Project (EA)	Submitted Project (EA) Total GHG as CO_2eq	tonnes	3,101,686	287,581	6	52,654	101,357	227,474	236,486	246,902	266,486	283,238	287,581	254,549
Project	Project Total GHG as CO_2eq	tonnes	2,227,328	166,387	12	20,746	66,113	127,586	141,897	148,401	148,137	151,746	159,103	161,980
	% Reduction	%	28%	42%										

Table AII-1:GHG Summary Table

	Category	Parameter	Units	Year												
				Operations										Closure		
				8	9	10	11	12	13	14	15	16	17	18	19	20
Submitted Project (EA)	Mining Equipment	Fuel Consumption	kL	32,025	38,752	48,311	36,994	14,643	281							
Submitted Project (EA)	Mining Equipment	CO_2 Emission	tonnes	85,284	103,196	128,653	98,516	38,993	747							
Submitted Project (EA)	Mining Equipment	CH_4 Emission (as CO_2eq)	tonnes	106	129	161	123	49	1							
Submitted Project (EA)	Mining Equipment	N_2O Emission (as CO_2eq)	tonnes	3,817	4,619	5,759	4,410	1,745	33							
Submitted Project (EA)	Mining Equipment	Diesel Equipment and Vehicles - Total CO_2eq	tonnes	89,208	107,944	134,572	103,049	40,788	782							
Submitted Project (EA)	Electricity	Purchased Electricity	MWh	915,000	915,000	915,000	915,000	915,000	915,000	12,000	6,000					
Submitted Project (EA)	Electricity	Total CO_2eq	tonnes	100650	100650	100650	100650	100650	100650	1320	660					
Submitted Project (EA)	Electricity	Electricity (diesel generators)	MWh													
Submitted Project (EA)	Electricity	Total CO_2eq	tonnes													
Submitted Project (EA)	Electricity	Electricity - Total CO_2eq	tonnes	100,650	100,650	100,650	100,650	100,650	100,650	1,320	660					
Submitted Project (EA)	Blasting	Total material from pit	kilotonnes	68,390	44,655	42,359	48,823	33,642	10,682							
Submitted Project (EA)	Blasting	Blasts/yr	#	182	119	113	130	89	28							
Submitted Project (EA)	Blasting	Emulsion	tonnes	20517	13397	12708	14647	10093	3205							
Submitted Project (EA)	Blasting	Blast - Total CO_2eq	tonnes	3354	2190	2078	2395	1650	524							
Submitted Project (EA)	Landfill	Waste Deposited	tonnes	1109	1109	1109	1109	1109	1109	1109	1109	1109	15000			
Submitted Project (EA)	Landfill	CO_2 Emission	tonnes	1	1	2	2	2	2	2	2	2	2	4	4	4
Submitted Project (EA)	Landfill	CH_4 Emission (as CO_2eq)	tonnes	2225	2377	2523	2663	2798	2927	3052	3172	3286	3397	6500	6245	6000
Submitted Project (EA)	Landfill	Landfill - Total CO_2eq	tonnes	2226	2378	2524	2665	2800	2929	3054	3174	3289	3399	6504	6249	6004
Submitted Project (EA)	Propane Heating	Propane Heating (Process, Buildings)	1,000,000 L/yr	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	
Submitted Project (EA)	Propane Heating	CO_2 Emission	tonnes	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	
Submitted Project (EA)	Propane Heating	CH_4 Emission (as CO_2eq)	tonnes	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	
Submitted Project (EA)	Propane Heating	N_2O Emission (as CO_2eq)	tonnes	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	
Submitted Project (EA)	Propane Heating	Propane Heating - Total CO_2eq	tonnes	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	
Submitted Project (EA)	Emergency Power	Emergency Diesel Generators	L/year	67	67	67	67	67	67	67	67	67	67	67	67	
Submitted Project (EA)	Emergency Power	CO_2 Emission	tonnes	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	
Submitted Project (EA)	Emergency Power	CH_4 Emission (as CO_2eq)	tonnes	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Submitted Project (EA)	Emergency Power	N_2O Emission (as CO_2eq)	tonnes	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Submitted Project (EA)	Emergency Power	Diesel Gensets - Total CO_2eq	tonnes	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	
Submitted Project (EA)		Submitted Project (EA) Total GHG as CO_2eq	tonnes	195,717	213,441	240,103	209,037	146,167	105,164	4,653	4,113	3,568	3,678	6,784	6,528	6,004

Table AII-1:GHG Summary Table

	Category	Parameter	Units	Year												
				Operations										Closure		
				8	9	10	11	12	13	14	15	16	17	18	19	20
Project	Mining Equipment	Fuel Consumption	kL	34,019	33,914	37,044	38,102	39,299	22,564	16,127	16,311	15,053	3,797			
Project	Mining Equipment	CO_2 Emission	tonnes	90,593	90,312	98,649	101,466	104,654	60,087	42,947	43,436	40,085	10,111			
Project	Mining Equipment	CH_4 Emission (as CO_2eq)	tonnes	113	113	123	127	131	75	54	54	50	13			
Project	Mining Equipment	N_2O Emission (as CO_2eq)	tonnes	4,055	4,042	4,416	4,542	4,684	2,690	1,922	1,944	1,794	453			
Project	Mining Equipment	Diesel Equipment and Vehicles - Total CO_2eq	tonnes	94,762	94,467	103,188	106,135	109,469	62,852							
Project	Electricity	Purchased Electricity	MWh	468,000	468,000	468,000	468,000	468,000	468,000	468,000	468,000	468,000	12,000	6,000		
Project	Electricity	Total CO_2eq	tonnes	51480	51480	51480	51480	51480	51480	51480	51480	51480	1320	660		
Project	Electricity	Electricity (diesel generators)	MWh													
Project	Electricity	Total CO_2eq	tonnes													
Project	Electricity	Electricity - Total CO_2eq	tonnes	51,480	51,480	51,480	51,480	51,480	51,480	51,480	51,480					
Project	Blasting	Total material from pit	kilotonnes	49,533	49,312	45,985	46,425	48,090	22,915	15,086	14,262	12,206				
Project	Blasting	Blasts/yr	#	132	131	122	123	128	61	40	38	32				
Project	Blasting	Emulsion	tonnes	14860	14794	13795	13928	14427	6874	4526	4279	3662				
Project	Blasting	Blast - Total CO_2eq	tonnes	2429	2419	2255	2277	2359	1124	740	700	599				
Project	Landfill	Waste Deposited	tonnes	1109	1109	1109	1109	1109	1109	1109	1109	1109	15000	0	0	0
Project	Landfill	CO_2 Emission	tonnes	1	1	2	2	2	2	2	2	2	2	4	4	4
Project	Landfill	CH_4 Emission (as CO_2eq)	tonnes	2225	2377	2523	2663	2798	2927	3052	3172	3286	3397	6500	6245	6000
Project	Landfill	Landfill - Total CO_2eq	tonnes	2226	2378	2524	2665	2800	2929	3054	3174	3289	3399	6504	6249	6004
Project	Propane Heating	Propane Heating (Process, Buildings)	0	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	
Project	Propane Heating	CO_2 Emission	tonnes	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	
Project	Propane Heating	CH_4 Emission (as CO_2eq)	tonnes	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	
Project	Propane Heating	N_2O Emission (as CO_2eq)	tonnes	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	86.9	
Project	Propane Heating	Propane Heating - Total CO_2eq	tonnes	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	
Project	Emergency Power	Emergency Diesel Generators	kL/year	67	67	67	67	67	67	67	67	67	67	67	67	
Project	Emergency Power	CO_2 Emission	tonnes	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	178.6	
Project	Emergency Power	CH_4 Emission (as CO_2eq)	tonnes	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Project	Emergency Power	N_2O Emission (as CO_2eq)	tonnes	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	
Project	Emergency Power	Diesel Gensets - Total CO_2eq	tonnes	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	186.8	
Project		Project Total GHG as CO_2eq	tonnes	151,176	151,023	159,727	162,836	166,387	118,664	55,553	55,632	4,167	3,678	6,784	6,528	6,004

Comparison of Submitted Project (EA) and Current Project (ERR) GHG Emissions

		Units	Annual GHG Emissions as CO_2eq												
Submitted Project (EA)	Submitted Project (EA) Total GHG as CO_2eq	tonnes	195,717	213,441	240,103	209,037	146,167	105,164	4,653	4,113	3,568	3,678	6,784	6,528	6,004
Project	Project Total GHG as CO_2eq	tonnes	151,176	151,023	159,727	162,836	166,387	118,664	55,553	55,632	4,167	3,678	6,784	6,528	6,004
	% Reduction	%													

IAMGOLD

B-3: Updated Technical Memorandum: Noise and Vibration

Memorandum

To:	Steven Woolfenden	**From:**	Mohammed Salim, Buddy Ledger
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Stephan Theben (SLR Consulting) Debbie Dyck, Don Carr (Amec Foster Wheeler)	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: NOISE AND VIBRATION		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;

- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Noise and Vibration

Amec Foster Wheeler completed a technical study in 2014 of the potential noise and vibration effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The noise and vibration study (see Côté Gold Project Noise and Vibration Technical Support Document) included the prediction of noise levels at off site receptors using modelling, and a comparison of the results to applicable noise criteria in order to determine whether potential adverse effects exist.

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an EER. Additional modelling has been conducted and this study presents the findings of a review of changes to the anticipated Project effects, as they pertain to noise and vibration. The study considers indicators assessed through the EA, where changing the Project effects could have the potential to warrant an update to the conclusions of the EA.

Changes to the proposed Project that are relevant to potential noise and vibration effects include:

- Reduced mining equipment fleet for reduced processing capacity from 60,000 tonnes/day (tpd) to 36,000 tpd;
- reduced Project footprint from 1,700 ha (17 km^2) to 1,050 ha (10.5 km^2);
- relocation of Tailings Management Facility (TMF) from north of the open pit to the west; and
- change in mine fleet equipment selection.

The Project site plan is shown in Figure 1.

Baseline noise levels were measured and reported in the EA. A daytime noise level of 44 A-weighted decibels (dBA) loudness equivalent (L_{eq}) (1hour (hr)), and nighttime noise level of 34 dBA L_{eq} (1hr) was reported for the Project.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The noise and vibration study areas (both local and regional) have been condensed as the Project footprint is reduced in the Project design. However, the original noise and vibration study areas remain valid and the points of reception (PORs) within the regional study area (as in the EA) have been considered in this effects review.

2.2 Temporal Boundaries

The temporal boundaries of the EER remain as those provided in the EA, and will span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed compared to those presented in the EA. The effects assessment indicators previously used and still applicable include:

- Daytime Noise Level;
- nighttime Noise Level;
- blasting Noise Level; and
- blasting Vibration Level.

2.4 Prediction of Effects

The modelling mythology and the receptors considered in this study remain the same as those used in the original study for the EA. The points of reception considered in this study are listed in Table 2-1.

Table 2-1: Points of Reception

Receptor Description	Receptor ID	UTM X-Coordinate[1]	UTM Y-Coordinate[1]
Cottage Residential Site	POR1	420,455	5,268,836
Cottage Residential Site	POR2	422,756	5,270,608
Cottage Residential Site	POR3	424,509	5,272,995
Cottage Residential Site	POR4	425,268	5,270,202
Cottage Residential Site	POR5	426,120	5,277,325
Cottage Residential Site	POR6	427,190	5,270,757
Cottage Residential Site	POR8	427,946	5,281,356

Receptor Description	Receptor ID	UTM X-Coordinate[1]	UTM Y-Coordinate[1]
Cottage Residential Site	POR9	433,115	5,273,945
Cottage Residential Site	POR10	433,567	5,280,206
Cottage Residential Site	POR11	433,734	5,283,384
Cottage Residential Site	POR12	433,968	5,269,586
Cottage Residential Site	POR13	438,861	5,265,090
Cottage Residential Site	POR15	439,555	5,276,019
Recreation Access Point	POR16	434,274	5,269,574
Recreation Access Point	POR17	434,396	5,257,593
Recreation Access Point	POR18	435,242	5,272,650
Recreation Access Point	POR19	438,150	5,276,474
Recreation Access Point	POR20	435,996	5,260,512
Recreation Access Point	POR21	436,805	5,266,498
Recreation Access Point	POR22	434,600	5,254,261
Tourist Establishment Area	POR23	435,685	5,259,744
Tourist Establishment Area	POR24	438,706	5,274,551
Tourist Establishment Area	POR25	443,197	5,269,688
Cottage Residential Area	POR27	434,343	5,278,895
Cottage Residential Area	POR28	433,553	5,278,145
Cottage Residential Area	POR29	433,605	5,276,770
Cottage Residential Area	POR30	434,151	5,275,717
Cottage Residential Area	POR31	434,180	5,270,514

(1) The coordinates are in Zone 17T (NAD83).
UTM: Universal Transverse Mercator

3.0 PREDICTION OF EFFECTS

The Project noise effects from the Construction and Operation phases are predicted for the receptors and compared with the results reported in the EA.

3.1 Construction Phase

The main construction activities are modelled at the open pit, Mine Rock Area (MRA) and TMF areas and therefore, equipment anticipated at these locations along with the truck routes have been considered in the assessment. Construction noise source locations are shown in Figure 2.

3.1.1 Daytime Noise Level

Daytime noise levels were determined based on the predictable worst case operation of all construction equipment operating simultaneously. Two aggregate pits (Aggregate Pit #1 – west of Mesomikenda Lake, and Aggregate Pit #2 – west of Middle Three Duck Lake) were included in the daytime construction noise assessment. See Figure 1 for aggregate pit locations. The daytime construction noise effects have been predicted at the sensitive receptors within the regional study area. The predicted daytime construction noise levels are presented in Table 3-1 along with those values reported in the EA for comparison.

Table 3-1: Daytime Construction Noise Levels at Sensitive Receptors

Receptor ID	EA Daytime Construction Noise Level at Receptor (dBA)	Project Daytime Construction Noise Level at Receptor (dBA)	Change in Noise Levels (dB)
POR1	31	32	1
POR2	34	35	1
POR3	36	34	-2
POR4	38	40	2
POR5	34	29	-5
POR6	44	41	-3
POR8	30	25	-5
POR9	42	33	-9
POR10	31	26	-5
POR11	27	19	-8
POR12	43	40	-3
POR13	34	33	-1
POR15	30	27	-3
POR16	41	39	-2
POR17	31	31	0
POR18	38	33	-5
POR19	31	27	-4
POR20	33	33	0
POR21	38	37	-1
POR22	26	27	1
POR23	32	32	0

Receptor ID	EA Daytime Construction Noise Level at Receptor (dBA)	Project Daytime Construction Noise Level at Receptor (dBA)	Change in Noise Levels (dB)
POR24	32	28	-4
POR25	29	27	-2
POR27	32	27	-5
POR28	33	28	-5
POR29	35	29	-6
POR30	37	31	-6
POR31	42	38	-4

Predicted noise levels at the majority of the receptors are less than or equal to the levels reported in the EA, with the following exceptions POR1, POR 2, POR 4, and POR 22. The Construction phase daytime noise levels in the regional and local study areas are predicted to be below the daytime baseline noise level of 44 dBA and also meet the Ministry of the Environment and Climate Change (MOECC) Noise Pollution Control (NPC)-300 noise criteria of 45 dBA .

The Project daytime construction noise contours are shown in Figure 3.

3.1.2 Nighttime Noise Level

Nighttime noise levels were determined based on the predictable worst case operation of all construction equipment, except aggregate pits, operating simultaneously. The aggregate pits are expected to operate during daytime only. The predicted nighttime construction noise levels are presented in Table 3-2 along with those values reported in the EA for comparison.

Table 3-2: Nighttime Construction Noise Levels at Sensitive Receptors

Receptor ID	EA Nighttime Construction Noise Level at Receptor (dBA)	Project Nighttime Construction Noise Level at Receptor (dBA)	Change in Noise Levels (dB)
POR1	30	32	2
POR2	34	**35**	1
POR3	**36**	33	-3
POR4	**38**	**40**	2
POR5	33	29	-4
POR6	**44**	**40**	-4
POR8	29	25	-4
POR9	**42**	32	-10
POR10	30	25	-5
POR11	26	17	-9
POR12	**39**	**36**	-3
POR13	30	31	1

Receptor ID	EA Nighttime Construction Noise Level at Receptor (dBA)	Project Nighttime Construction Noise Level at Receptor (dBA)	Change in Noise Levels (dB)
POR15	29	26	-3
POR16	**38**	**35**	-3
POR17	28	30	2
POR18	**36**	31	-5
POR19	30	26	-4
POR20	30	32	2
POR21	33	33	0
POR22	24	27	3
POR23	30	32	2
POR24	30	27	-3
POR25	26	25	-1
POR27	31	26	-5
POR28	33	27	-6
POR29	**35**	28	-7
POR30	**36**	29	-7
POR31	**40**	**35**	-5

Bold numbers indicate noise levels higher than nighttime ambient noise baseline (34 dBA).

Predicted noise levels at the majority of the receptors are less than or equal to the levels reported in the EA, with the following exceptions POR1, POR2, POR4, POR13, POR17, POR20, POR22, POR23. The Construction phase nighttime noise levels for most of the receptors in the regional and local study areas are predicted to be below the nighttime baseline level of 34 dBA. The predicted nighttime noise levels are within the MOECC nighttime criteria limit of 40 dBA. However, nighttime construction noise levels will likely be audible at a number of receptor locations.

The Project nighttime construction noise contours are shown in Figure 4.

3.1.3 Blasting Noise Level

Blasting noise related to construction is assessed separately from standard construction noise. Construction blasting is expected at the TMF and open pit. Noise from the Project construction blasting is assessed based on the maximum charge size of 250 kilogram (kg) per delay and distance to the receptor. The closest distances to each sensitive receptor from either of these components has been identified and considered for this assessment. The predicted noise levels are provided in Table 3-3 along with the levels reported in the EA for comparison.

Table 3-3: Construction Blasting Noise Levels at Sensitive Receptors

Receptor ID	EA Construction Blasting Noise Level at Receptor (Linear decibels (dBL))	Project Construction Blasting Noise Level at Receptor (Linear decibels (dBL))	Change in Blasting Noise Levels (dB)
POR1	109	111	2
POR2	111	113	2
POR3	112	112	0
POR4	113	116	3
POR5	111	109	-2
POR6	118	115	-3
POR8	110	108	-2
POR9	112	110	-2
POR10	111	108	-3
POR11	109	107	-2
POR12	114	112	-2
POR13	110	110	0
POR15	111	108	-3
POR16	114	112	-2
POR17	110	111	1
POR18	112	110	-2
POR19	109	108	-1
POR20	111	111	0
POR21	111	111	0
POR22	109	109	0
POR23	111	111	0
POR24	110	108	-2
POR25	108	108	0
POR27	111	108	-3
POR28	112	108	-4
POR29	113	109	-4
POR30	114	109	-5
POR31	115	111	-4

Predicted blasting noise levels from construction blasting are less than or equal to those reported in the EA at the majority of the receptors. However, noise levels from construction blasting are expected to increase by 1-3 dB at four receptors; POR1, POR2; POR4 and POR17. The predicted construction blast noise levels at all of the receptor locations are within the criteria limit of 120 dBL set out in MOECC NPC-119.

3.1.4 Blasting Vibration Level

Vibration from the Project construction blasting is assessed based on the maximum charge size of 250 kg per delay and distance to the receptor. Construction blasting is expected at the TMF and open pit. The closest distances to each sensitive receptor from either of these components have been used for this assessment. The predicted vibration levels from construction blasting are provided in Table 3-4 along with the levels reported in the EA for comparison.

Table 3-4: Construction Blasting Vibration Levels at Sensitive Receptors

Receptor ID	EA Construction Blasting Vibration Level at Receptor (Peak Particle Velocity (PPV), millimetre per second (mm/s)))	Project Construction Blasting Vibration Level at Receptor (Peak Particle Velocity (PPV), millimetre per second (mm/s))	% Change in Vibration Level
POR1	0.05	0.12	140
POR2	0.11	0.20	82
POR3	0.17	0.14	-18
POR4	0.21	0.64	205
POR5	0.12	0.05	-58
POR6	1.03	0.50	-51
POR8	0.07	0.03	-57
POR9	0.17	0.07	-59
POR10	0.09	0.03	-67
POR11	0.04	0.02	-50
POR12	0.31	0.14	-55
POR13	0.07	0.08	14
POR15	0.09	0.03	-67
POR16	0.31	0.14	-55
POR17	0.08	0.09	13
POR18	0.17	0.07	-59
POR19	0.06	0.03	-50
POR20	0.11	0.12	9
POR21	0.11	0.12	9
POR22	0.05	0.05	0
POR23	0.11	0.11	0
POR24	0.08	0.04	-50
POR25	0.03	0.03	0
POR27	0.11	0.03	-73
POR28	0.16	0.04	-75
POR29	0.21	0.04	-81
POR30	0.36	0.05	-86
POR31	0.50	0.12	-76

Predicted blasting vibration levels from construction blasting less than or equal to those reported in the EA at most of the receptors. However, vibration levels from construction blasting are expected to increase by 0.01-0.43 mm/s at seven receptors; POR1, POR2, POR4, POR13, POR17, POR20 and POR21.

Predicted construction blasting vibration levels at all receptor locations are well below the MOECC NPC-119 cautionary vibration limit of 10 mm/s PPV, and are not considered to be high enough to cause damage to buildings at the sensitive receptor locations.

3.2 Operations Phase

Operational noise has been modelled and assessed for two operating scenarios as was done in the original study for the EA - Year 1 and Year 7, which have different equipment usage, open pit depth and stockpiling barrier effects. No noise mitigation measures have been considered for the Operations phase of the Project. Operational noise source locations for Year 1 and Year 7 are shown in Figures 5 and 6, respectively.

3.2.1 Daytime Noise Level

Daytime noise levels for Year 1 and Year 7 operation scenarios were determined based on the predictable worst case operation of the equipment. The predicted daytime operational noise levels for Year 1 and Year 7 are presented in Table 3-5 along with those values reported in the EA for comparison.

Table 3-5: Daytime Operational Noise Levels at Sensitive Receptors

Receptor ID	Year 1 Daytime Operational Noise Level at Receptor			Year 7 Daytime Operational Noise Level at Receptor		
	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)
POR1	33	32	-1	34	31	-3
POR2	35	34	-1	35	32	-3
POR3	35	34	-1	38	35	-3
POR4	39	38	-1	40	37	-3
POR5	31	30	-1	35	31	-4
POR6	41	41	0	43	41	-2
POR8	27	27	0	31	28	-3
POR9	35	34	-1	38	35	-3
POR10	28	28	0	29	26	-3
POR11	20	20	0	24	21	-3
POR12	40	41	1	41	38	-3
POR13	34	34	0	37	34	-3
POR15	29	28	-1	33	29	-4
POR16	39	40	1	40	37	-3
POR17	33	32	-1	31	30	-1
POR18	34	34	0	39	35	-4
POR19	29	28	-1	28	26	-2
POR20	35	34	-1	37	33	-4
POR21	37	38	1	39	36	-3
POR22	30	29	-1	34	28	-6
POR23	34	34	0	37	33	-4
POR24	30	30	0	34	30	-4
POR25	29	28	-1	29	27	-2
POR27	29	29	0	33	30	-3
POR28	30	29	-1	32	29	-3
POR29	31	31	0	34	31	-3

Receptor ID	Year 1 Daytime Operational Noise Level at Receptor			Year 7 Daytime Operational Noise Level at Receptor		
	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)
POR30	32	32	0	36	33	-3
POR31	39	39	0	40	37	-3

Predicted daytime noise levels at the receptors are less than or equal to the levels reported in the EA, except at POR12 and POR16 for Year 1. Operational noise levels increased by 1 dB at POR12 and POR16 for Year 1. However, the levels are about 3 dB lower than the levels reported in the EA for Year 7. Daytime operational noise levels for both Year 1 and Year 7 are predicted to be below the daytime baseline level of 44 dBA and also meet the MOECC NPC-300 noise criteria of 45 dBA.

The Project daytime operational noise contours are shown in Figures 7 and 8.

3.2.2 Nighttime Noise Level

Nighttime noise levels for Year 1 and Year 7 operational scenarios were determined based on the predictable worst case equipment operation during the nighttime period. The predicted nighttime operational noise levels for Year 1 and Year 7 are presented in Table 3-6 along with those values reported in the EA for comparison.

Table 3-6: Nighttime Operational Noise Levels at Sensitive Receptors

Receptor ID	Year 1 Nighttime Operational Noise Level at Receptor			Year 7 Nighttime Operational Noise Level at Receptor		
	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)
POR1	32	32	0	31	31	0
POR2	34	33	-1	32	32	0
POR3	34	33	-1	**36**	34	-2
POR4	**38**	**37**	-1	**37**	**37**	0
POR5	30	29	-1	33	31	-2
POR6	**40**	**39**	-1	**40**	**40**	0
POR8	26	26	0	29	27	-2
POR9	34	33	-1	**35**	34	-1
POR10	27	27	0	26	26	0
POR11	19	17	-2	22	21	-1
POR12	**39**	**38**	-1	**39**	**38**	-1
POR13	33	33	0	**35**	34	-1
POR15	28	27	-1	31	29	-2
POR16	**38**	**37**	-1	**38**	**37**	-1

Receptor ID	Year 1 Nighttime Operational Noise Level at Receptor			Year 7 Nighttime Operational Noise Level at Receptor		
	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)	EA Noise Level (dBA)	Project Noise Level (dBA)	Change in Noise level (dB)
POR17	31	32	1	29	30	1
POR18	33	33	0	**37**	34	-3
POR19	28	27	-1	26	26	0
POR20	33	34	1	34	33	-1
POR21	**35**	**35**	0	**37**	**36**	-1
POR22	28	29	1	31	28	-3
POR23	33	33	0	**35**	33	-2
POR24	29	29	0	31	30	-1
POR25	27	27	0	27	27	0
POR27	28	28	0	31	29	-2
POR28	29	28	-1	29	29	0
POR29	30	30	0	32	31	-1
POR30	31	31	0	34	32	-2
POR31	**37**	**37**	0	**38**	**37**	-1

Bolded values indicate that the levels are over the baseline.

Predicted nighttime operational noise levels at the receptors are less than or equal to levels reported in the EA, except at POR 17, POR 20 and POR 22 for Year 1. Operational noise levels increased by 1 dB at POR 17, POR 20 and POR 22 for Year 1.

The predicted levels are about 1-3 dB lower or the same as the levels reported in the EA for Year 7, except at POR 17. Nighttime operational noise level is increased by 1 dB at POR 17 for Year 7. Predicted nighttime operational noise levels for both Year 1 and Year 7 are at or below the nighttime baseline level of 34 dBA for most of the receptors. Operational noise levels are expected to meet nighttime criteria limit of 40 dBA at all receptors for both Year 1 and Year 7.

The Project nighttime operational noise contours are shown in Figures 9 and 10.

3.2.3 Blasting Noise and Vibration Levels

Noise and vibration levels from Project operation blasting assessed for the receptors remain the same as reported in the EA as there are no changes to the pit location and/or to the proposed explosive charge per delay loadings.

3.3 Closure Phase

3.3.1 Daytime and Nighttime Noise Level

Daytime noise levels associated with the Closure phase of the Project are expected to be lower than the effects for the Construction phase. To be conservative as considered in the EA study, it is assumed that daytime noise effects during closure are identical to the Construction phase effects. Therefore, a detailed noise assessment of the closure phase is not considered.

No nighttime activities are expected during the Closure phase of the project. The conclusions with respect to closure noise effects reported in the EA remain valid.

3.3.2 Blasting Noise and Vibration Levels

No blasting activities are expected to occur during the Closure phase, as reported in the original study supporting the EA.

3.4 Post-Closure Phase

3.4.1 Daytime and Nighttime Noise Level

Daytime noise effects are not considered in the Post-closure phase, as the vast majority of the noise sources will be decommissioned during the Closure phase. However, some pumping and limited vehicle traffic will continue for several years during the Post-closure phase. To be conservative, it is assumed that daytime noise effects during the first years of the Post-closure phase will be less than the Closure phase noise effects. Once pumping ceases, noise levels are expected to revert to current baseline conditions.

No nighttime activities are expected during the Post-closure phase of the project. The conclusions with respect to Post-closure noise effects reported in the EA remain valid.

3.4.2 Blasting Noise and Vibration Levels

No blasting activities are expected to occur during the Post-closure phase, as reported in the original study supporting the EA.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

The table below provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA. In instances where measures are no longer applicable, they have been removed with reasons provided.

Table 4-1: Mitigation Measures – Noise and Vibration

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Noise and Vibration	Construction	Construction blasting noise at the receptors.	Charge size of construction blasting outside of the open pit boundary will be such that the objectives of NPC-119 will be achieved.	Minimum separation distance of 1.25 km between blast location and nearest receptor to be maintained. If blast size exceeds 250 kg per delay and/or if the minimum separation is less than 1.25 km, IAMGOLD will prepare a blast noise study to achieve objectives of NPC-119.	NPC-119 noise limit of 120 dBL.	The mitigation measure has not changed from the EA.
Noise and Vibration	Construction	Construction blasting vibration at the receptors.	Charge size of construction blasting outside of the open pit boundary will be such that the objectives of NPC-119 will be achieved.	Minimum separation distance of 1.25 km between blast location and nearest receptor to be maintained. If blast size exceeds 250 kg per delay and/or if the minimum separation is less than 1.25 km, IAMGOLD will prepare a blast noise study to achieve objectives of NPC-119.	NPC-119 vibration (PPV) limit of 10 mm/s.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Noise and Vibration	Construction	Construction noise.	1 km setback distances to be kept at the Project site between the construction location and the receptors.	1 km setback distances to be maintained between the construction location and the receptors. If construction occurs closer to the receptors (e.g., waterways, road realignments), IAMGOLD to prepare a construction noise study for the particular activity.	N/A	The mitigation measure has not changed from the EA.
Noise and Vibration	Construction	Construction Equipment Noise Limits	Construction equipment not to exceed noise levels specified in NPC-115 and NPC-118	Ensure equipment used for construction meet the guideline limits.	Achieve objectives of NPC-115 and NPC-118 construction equipment noise limits.	The mitigation measure has not changed from the EA.
Noise and Vibration	Construction and Operations	Operational blasting noise at the receptors.	Blasting charge size in the open pit is planned to be in compliance with NPC-119.	Blasting charge sizes used in the open pit will be 536 kg per delay or smaller. If it exceeds 536 kg per delay, IAMGOLD will prepare a blast noise study to show compliance with NPC-119.	Compliance with NPC-119 noise limit of 120 dBL.	The mitigation measure has not changed from the EA.
Noise and Vibration	Construction and Operations	Operational blasting vibration at the receptors.	Blasting charge size in the open pit is planned to be in compliance with NPC-119.	Blasting charge sizes used in the open pit will be 536 kg per delay or smaller. If it exceeds 536 kg per delay, IAMGOLD will prepare a blast vibration study to show compliance with NPC-119.	Compliance with NPC-119 vibration (PPV) limit of 10 mm/s.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Noise and Vibration	Operations	Operational noise at the receptors.	Site equipment will be operated to meet NPC-300 operational noise limits. Alternatively, to meet NPC-300 night-time criteria, sensitive receptors may be purchased.	Some equipment (air track drill, track dozer) may be limited to daytime operation. Haul truck traffic limitations for night time operations may be applied.	Compliance with NPC-300 for operational noise limit of 45 dBA during daytime and 40 dBA during night-time.	Mitigation measure no longer applicable. Nighttime operation restriction is no longer required as the predicted sound levels meet the nighttime criteria limit. The change in site layout and reduced production rate helped to lower noise impact at the receptors. Purchase of noise sensitive receptors may not be required as the project noise impacts at the receptors are predicted to be within the limits.

5.0 MANAGEMENT

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA.

Table 5-1: Monitoring Measures – Noise and Vibration

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Noise and Vibration	A-weighted decibels (dBA), construction noise	Noise Monitor	NPC-103	Construction through Closure. Noise to be monitored for a minimum period of 1 week at any receptor closer than 1 km from the construction activity. Noise monitor to record hourly sound levels, over 24/7 period, during the monitoring period.	When construction is within 1 km of any sensitive noise receptor defined within the regional study area. When a group of receptors fall within the 1 km range of construction activity, the closest receptor can be taken as the representative location for monitoring, if it is shown to have the highest exposure to construction noise for a group of receptors.	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Noise and Vibration	A-weighted decibels (dBA), operations noise	Noise Monitor	NPC-103	Construction through Closure. Noise level to be monitored at the closest receptor location (<1 km) at least once per year between the initial operation period (Year 1) and mid-operation period (Year 7) to confirm NPC-300 criteria are not exceeded. Noise monitor to record hourly sound levels for a minimum period of 1 week.	Specific sensitive receptors to be determined within the study area based on operations at that time. Typically, the closest sensitive receptor to the operational noise can be used to represent a group of receptors.	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Noise and Vibration	Decibels (dBL), construction or operational blasting noise	Noise Monitor	NPC-103, NPC-119	Construction through Closure. Noise level to be monitored at the closest receptor location (<1 km) at least once per year during blasting operations. Noise monitor to be setup to record noise levels for each blast. Noise monitor to record instantaneous sound levels, during the blasting period.	Specific sensitive receptors to be determined within the study area based on blasting at that time. Typically, the closest sensitive receptor to the blast noise can be used to represent a group of receptors.	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Noise and Vibration	Vibration Levels (PPV), construction or operational vibration	Vibration monitor	NPC-103, NPC-119	Construction and Operations. PPV to be monitored at the closest receptor location (<1 km) at least once in a year during blasting operations. Vibration monitors to be setup to record PPV for each blast. Vibration monitor to record instantaneous blast vibration levels during the blasting period.	Specific sensitive receptors to be determined within the study area based on blasting at that time. Typically, the closest sensitive receptor to the blast vibration can be used to represent a group of receptors.	The monitoring measure has not changed from the EA.

6.0 CONCLUSION

For the Construction phase, it is expected that daytime noise levels from Project activities will be below baseline ambient noise levels at receptor locations. Nighttime noise levels may exceed baseline ambient noise levels at some receptor locations. However, daytime and nighttime construction noise levels at the modelled receptors are within the MOECC criteria limits. Blasting noise levels are expected to meet applicable MOECC guidelines. Blasting vibration levels are not expected to damage structures or exceed the criteria limit.

For the Operations phase, it is expected that daytime noise levels at receptor locations will be below baseline ambient noise levels. Nighttime noise levels may exceed baseline ambient noise levels at some receptor locations. However, daytime and nighttime operational noise levels at the receptors are expected to be within the MOECC criteria limits. Blasting noise levels will exceed baseline ambient noise but will meet applicable MOECC guidelines. Blasting vibration levels may be perceptible to some receptor locations but they are not expected to damage structures or exceed the criteria limit.

During the Closure phase, the noise effects are expected to be lower than the effects for the Construction phase. To be conservative, it is assumed that noise effects during closure are identical to the Construction phase effects. No activities are planned to occur at nighttime. No vibration effects are anticipated as no blasting activities are planned.

Noise and vibration effects are not considered in the Post-closure phase, as the vast majority of the noise sources will be decommissioned during the Closure phase. To be conservative, it is assumed that daytime noise effects during the first years of the Post-closure will be less than the Closure phase noise effects. Once pumping ceases, noise levels are expected to revert to current baseline conditions. No activities are planned to occur at nighttime. No vibration effects are anticipated as no blasting activities are planned.

Nighttime operation restriction as proposed in the EA is no longer required as the predicted sound levels are within the nighttime criteria limit. The change in site layout and reduced production rate helped to lower noise effects at the receptors. Therefore, purchase of noise sensitive receptors may not be required as the Project noise impacts at the receptors are predicted to be within the limits.

The noise and vibration monitoring plan has not been changed from the EA. IAMGOLD intends to monitor noise and vibration during the Construction and Operations phases to provide ongoing oversight on noise and vibration effects from the Project.

7.0 REFERENCES

Amec Foster Wheeler, 2013. Côté Gold Project Noise Baseline Report.

Amec Foster Wheeler, 2014. Côté Gold Project Technical Support Document: Noise and Vibration.

MOECC, 1977. Ministry of Environment and Climate Change, 1977. NPC-103 Measurement Procedure, published under the Model Municipal Noise Control Bylaw.

MOECC, 1979. Ministry of Environment and Climate Change, 1979. NPC-118 Motorized Conveyances.

MOECC, 1981. Ministry of Environment and Climate Change, 1981. NPC-115 Construction Equipment.

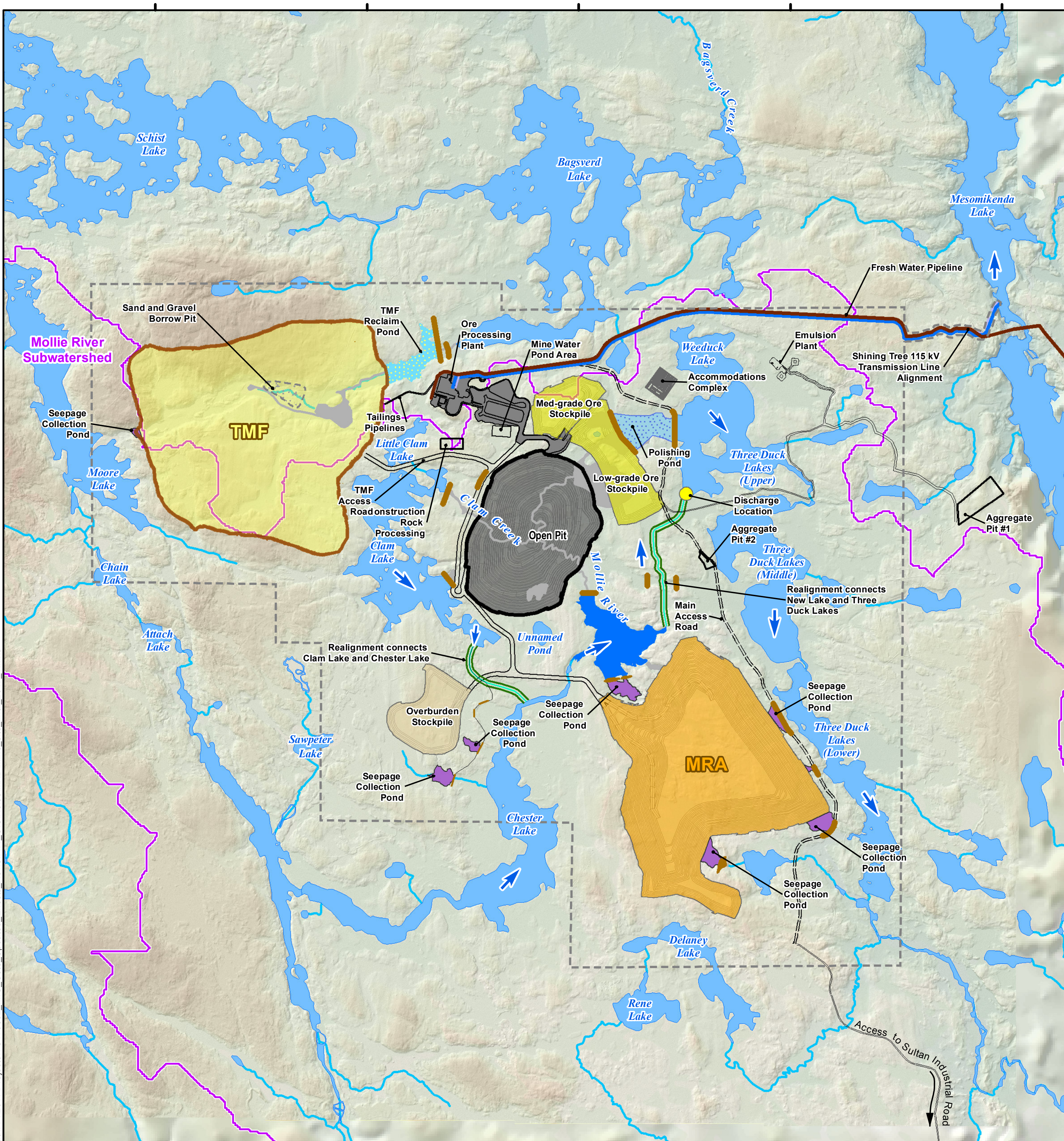
MOECC, 1982. Ministry of Environment and Climate Change, 1982. NPC-119 Blasting.

MOECC, 2013. Ministry of Environment and Climate Change, 2013. NPC-300 Environmental Noise Guideline for Stationary and Transportation Sources – Approval and Planning

8.0 GLOSSARY AND ABBREVIATIONS

dBA	A-weighted decibels
dBL	Linear decibels
EA	Environmental Assessment
EER	Environmental Effects Review
ha	hectare
kg	Kilogram
km	kilometre
Leq	loudness equivalent
mm/s	millimetre per second
MOECC	Ministry of the Environment and Climate Change
MRA	Mine Rock Area
NPC	Noise Pollution Control
POR	Point of Reception
PPV	Peak Particle Velocity
Tpd	metric tonnes per day
TMF	Tailings Management Facility
UTM	Universal Transverse Mercator

FIGURES



LEGEND

- Watercourses
- Overprinted Watercourses
- Waterbodies
- Overprinted Waterbodies
- Subwatershed Boundary

Mine Site

- Project Boundary
- Open Pit
- Potential Discharge Location
- Facilities
- Dam
- Main Access Road
- Shining Tree 115 kV Transmission Line Alignment
- Watercourse Realignment
- Proposed Water Flow Direction
- Fresh Water Pipeline
- Proposed Lake Area
- Overburden Stockpile
- Ore Stockpile
- Proposed Mine Rock Area (MRA)
- Proposed Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Polishing Pond
- Seepage Collection Pond
- Sand and Gravel Borrow Pit

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N E S W

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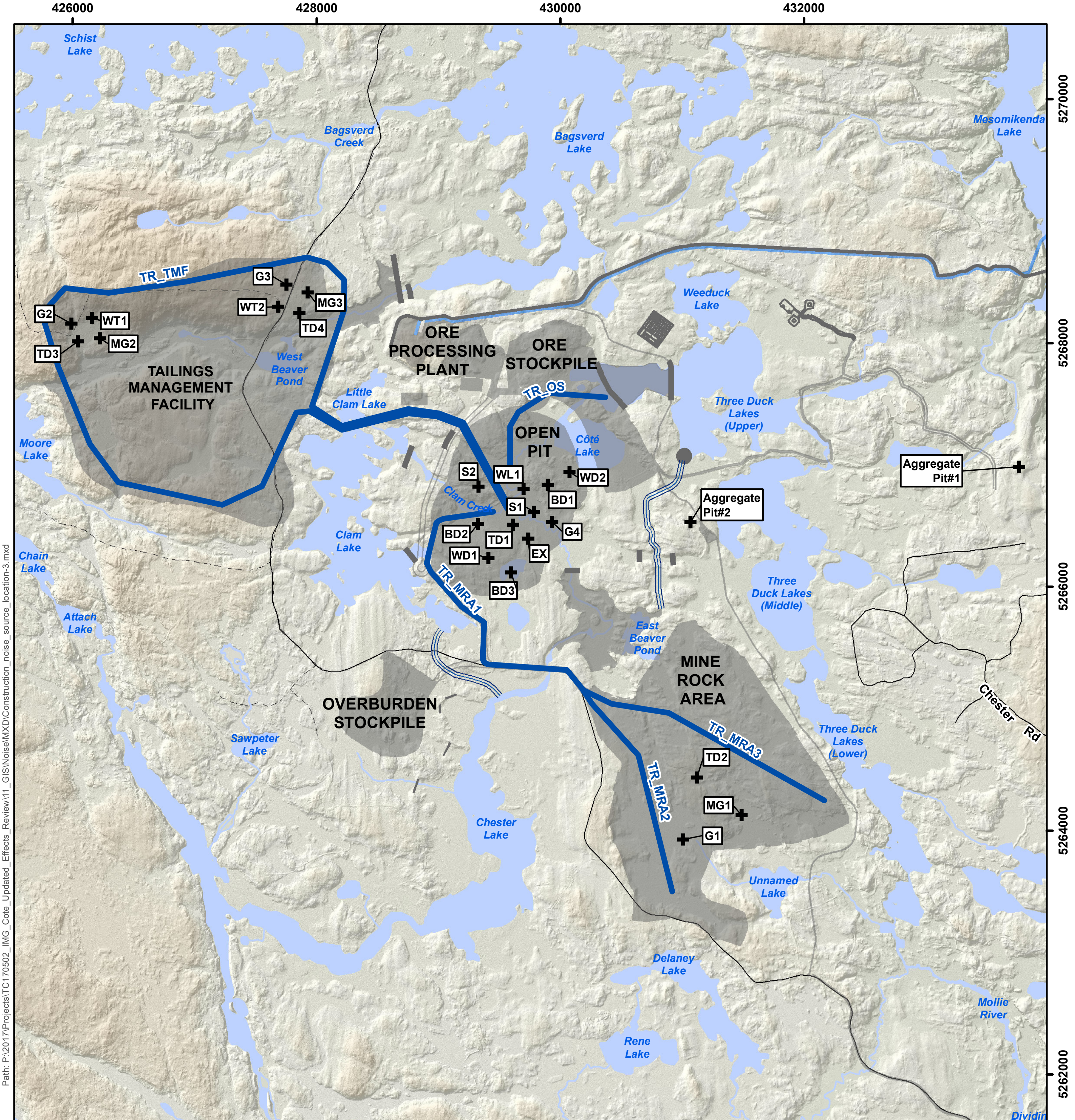
CÔTÉ GOLD PROJECT

Preliminary Site Plan

PROJECT N°: TC170502	FIGURE: 1
SCALE:1:50,000	DATE: December 2017



LEGEND

- ✚ Noise Source
- Noise Contour Line
- Mine Site Footprint

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

0 0.5 1 1.5 2 2.5 3 Kilometres

N S E W

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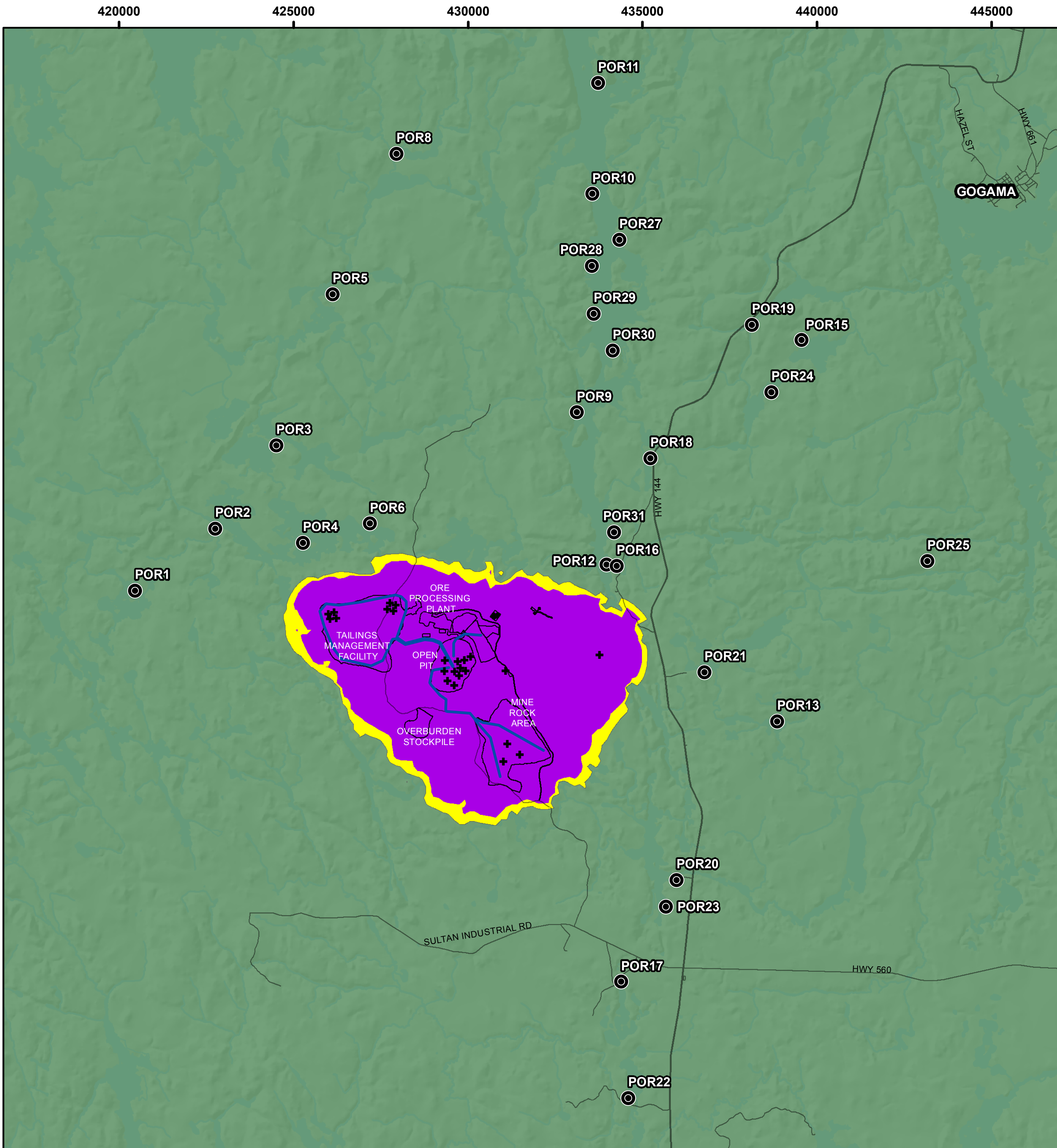
CÔTÉ GOLD PROJECT

Construction Noise Source Location

PROJECT N^{o}: TC170502	**FIGURE: 2**
SCALE: 1:42,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Daytime_construction_noise_contours_3.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 45 dBA
- 44 - 45 dBA
- < 44 dBA
- Mine Site Footprint

0 2 4 6 8 10 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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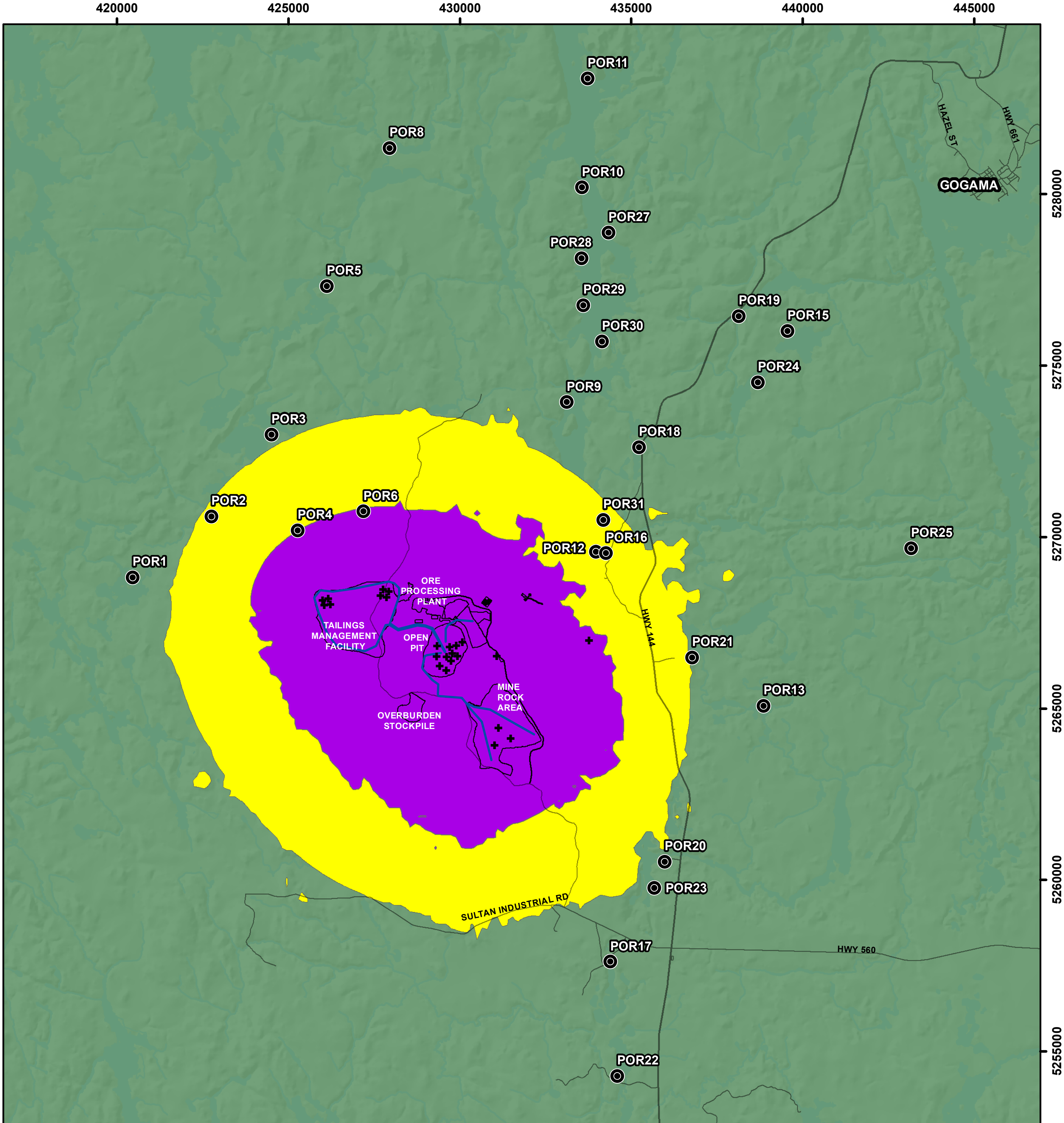
CÔTÉ GOLD PROJECT

Daytime Construction Noise Contours

PROJECT N°: TC170502	**FIGURE: 3**
SCALE: 1:150,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Construction_nighttime_contours_3.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 40 dBA
- 34 - 40 dBA
- < 34 dBA
- Mine Site Footprint

0 2 4 6 8 10 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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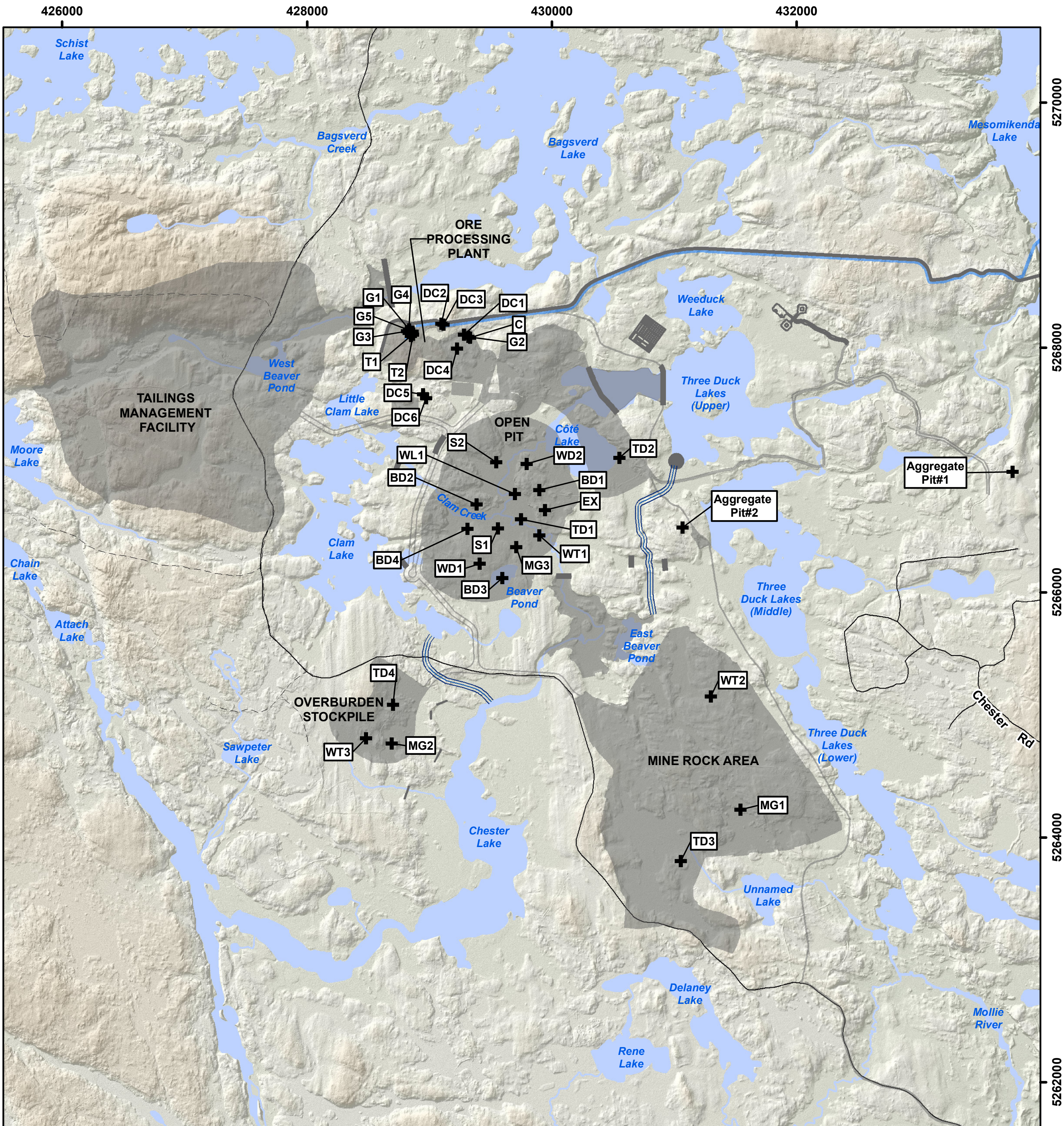
CÔTÉ GOLD PROJECT

Nighttime Construction Noise Contours

PROJECT N^{o}: TC170502	FIGURE: 4
SCALE: 1:150,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Year1_Op_Noise_Sources_2.mxd

LEGEND

- ✚ Noise Source Location
- Noise Contour Line
- Mine Site Footprint

0 0.5 1 1.5 2 2.5 3 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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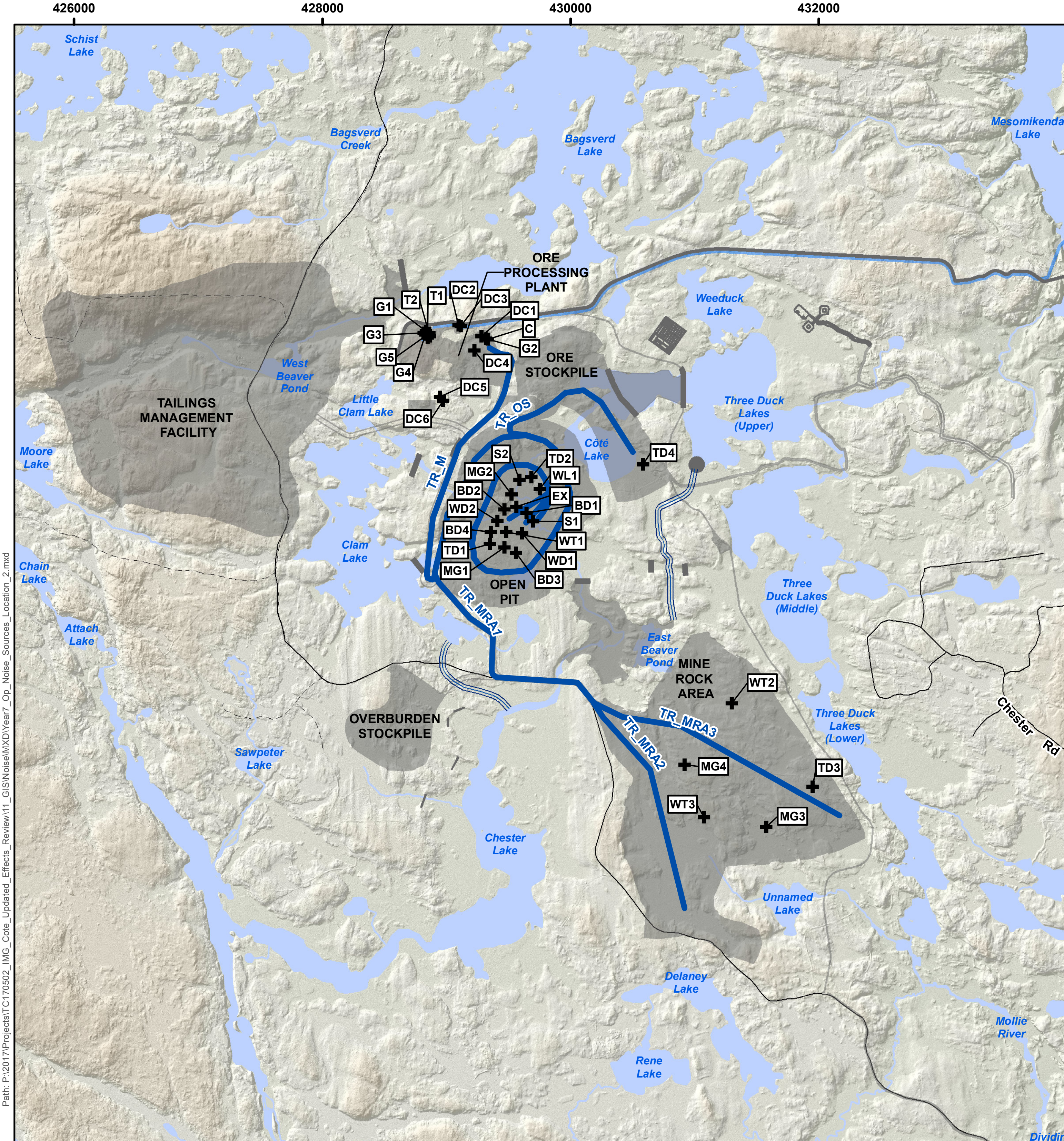
CÔTÉ GOLD PROJECT

Year 1 Operational Noise Source Location

PROJECT N°: TC170502	**FIGURE: 5**
SCALE: 1:42,000	DATE: December 2017



LEGEND

- ✚ Noise Source
- Noise Contour Line
- Mine Site Footprint

0 0.5 1 1.5 2 2.5 3 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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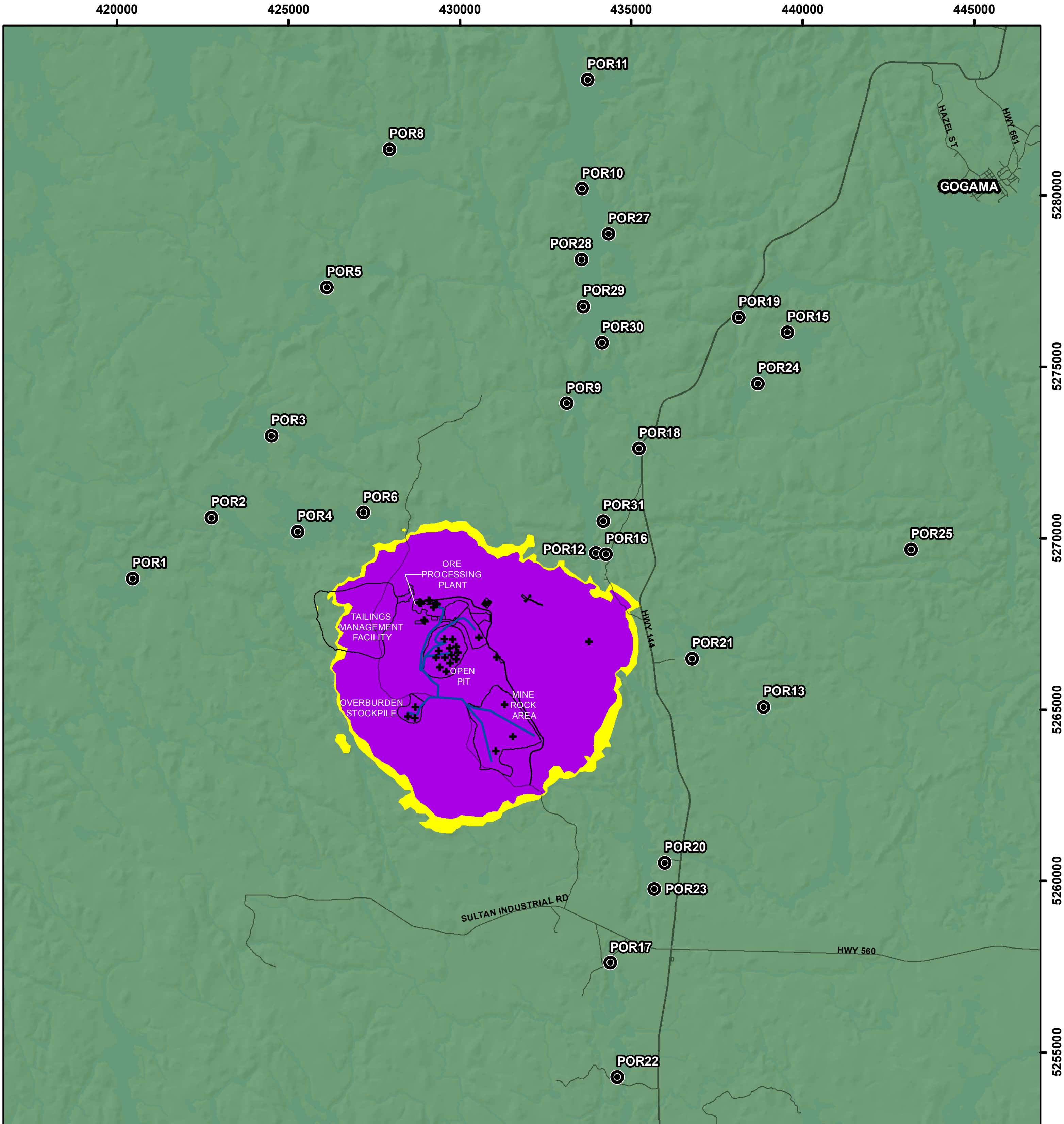
CÔTÉ GOLD PROJECT

Year 7 Operational Noise Source Location

PROJECT N°: TC170502	FIGURE: 6
SCALE: 1:42,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Year1_Op_Noise_Daytime_2.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 45 dBA
- 44 - 45 dBA
- < 44 dBA
- Mine Site Footprint

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

0 2 4 6 8 10 Kilometres

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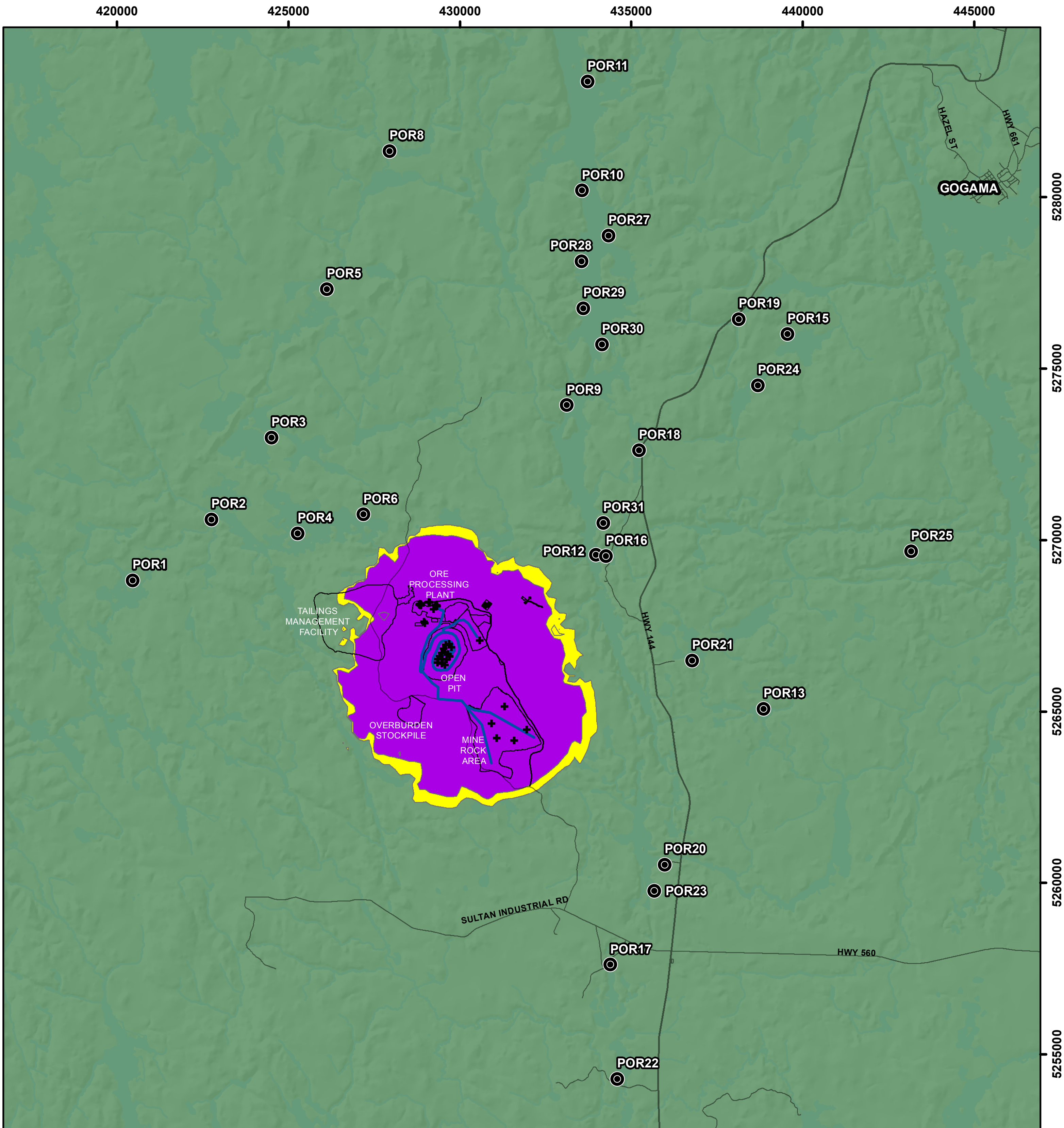
CÔTÉ GOLD PROJECT

Year 1 Daytime Operational Noise Contours

PROJECT N°: TC170502	**FIGURE: 7**
SCALE: 1:150,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Year7_Op_Noise_Daytime_2.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 45 dBA
- 44 - 45 dBA
- < 44 dBA
- Mine Site Footprint

0 2 4 6 8 10 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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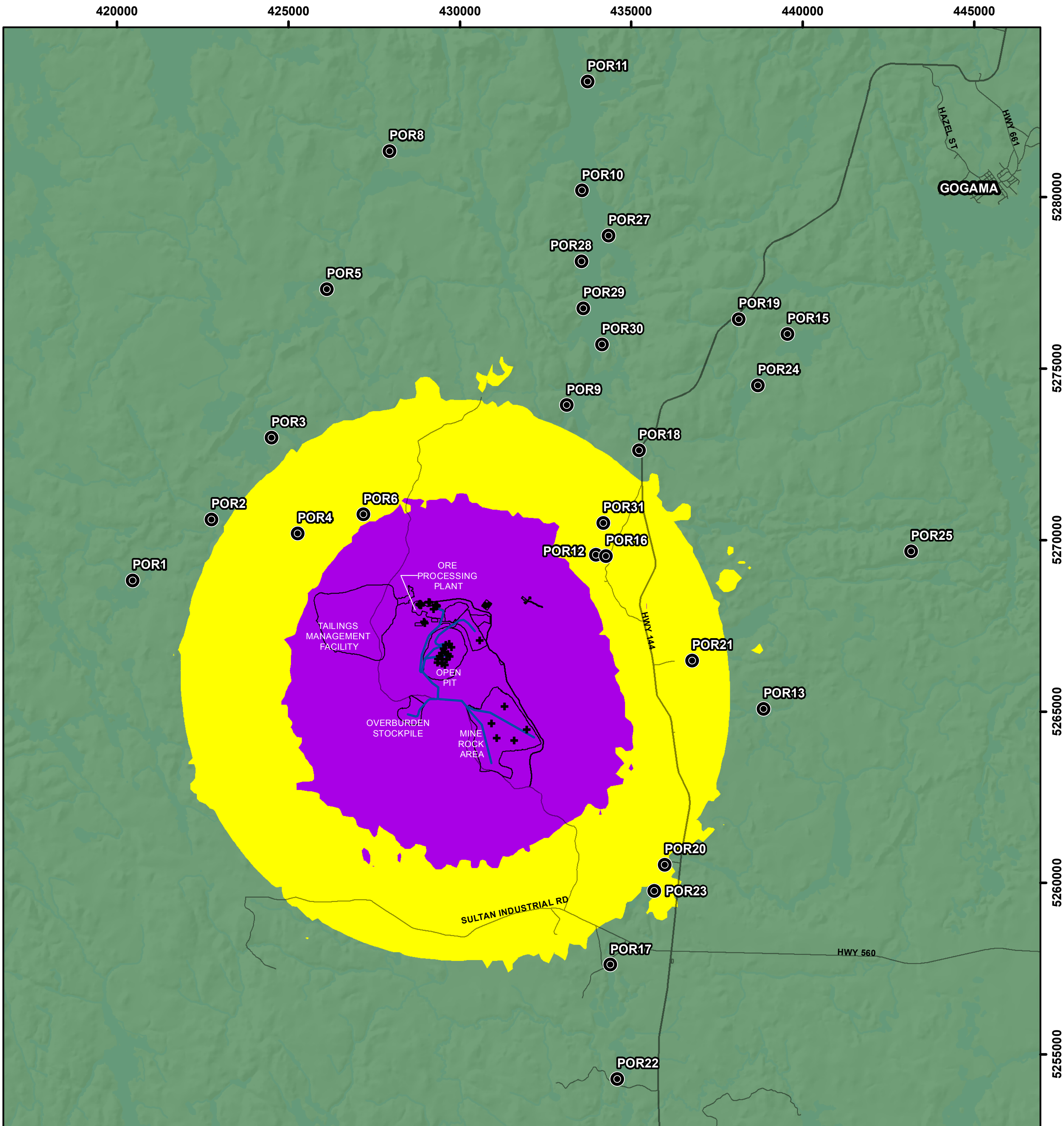
CÔTÉ GOLD PROJECT

Year 7 Daytime Operational Noise Contours

PROJECT N^{o}: TC170502	**FIGURE: 8**
SCALE: 1:150,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Year1_Op_Noise_Nighttime_2.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 40 dBA
- 34 - 40 dBA
- < 34 dBA
- Mine Site Footprint

0 2 4 6 8 10 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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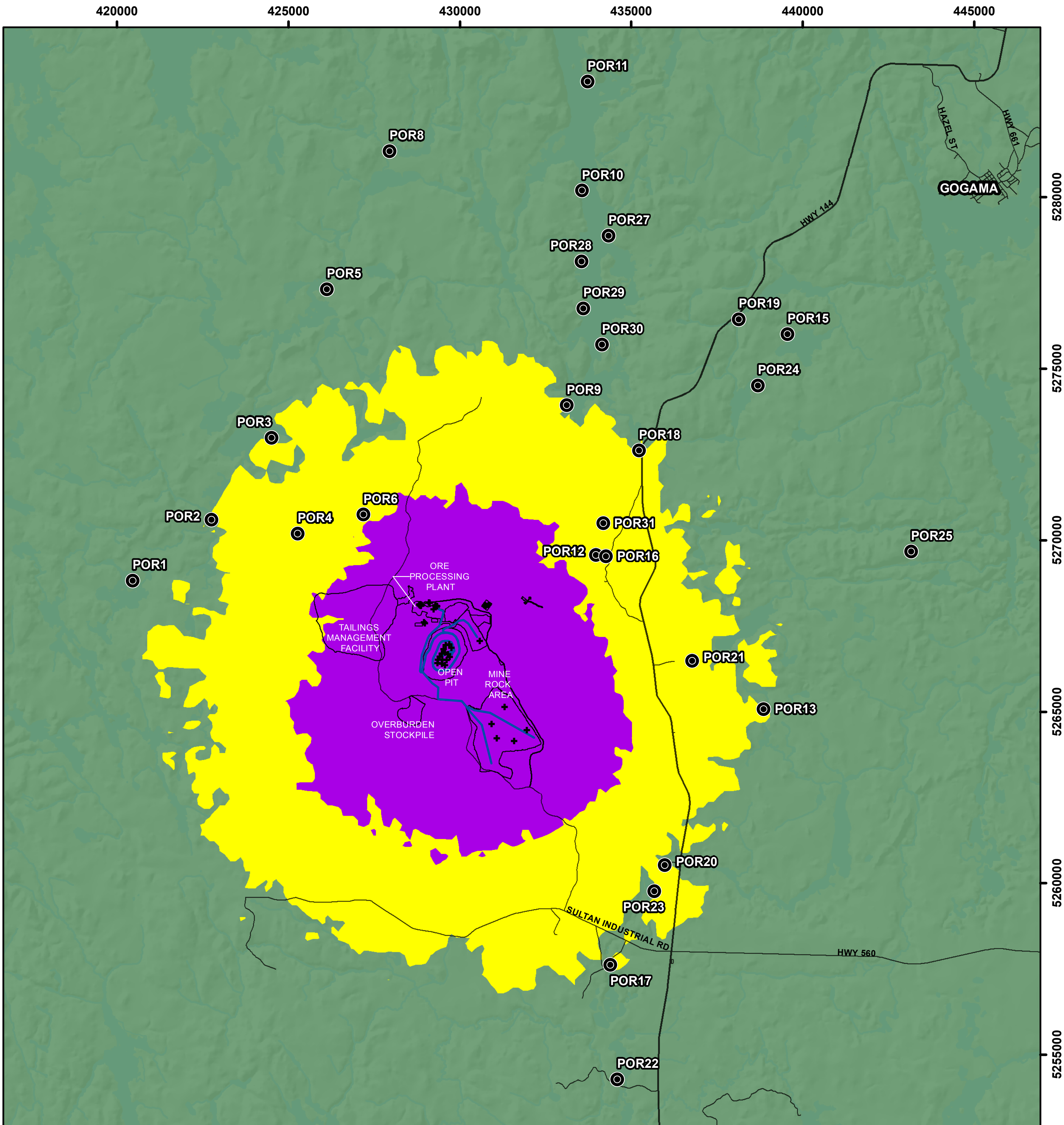
CÔTÉ GOLD PROJECT

Year 1 Nighttime Operational Noise Contours

PROJECT N°: TC170502	**FIGURE: 9**
SCALE: 1:150,000	DATE: December 2017



Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Noise\MXD\Year7_Op_Noise_Nighttime_2.mxd

LEGEND

- Receptor
- Point Noise Sources
- Line Noise Sources
- > 40 dBA
- 34 - 40 dBA
- < 34 dBA
- Mine Site Footprint

0 2 4 6 8 10 Kilometres

NOTES:

Datum: NAD83
Projection: UTM Zone 17N

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CÔTÉ GOLD PROJECT

Year 7 Nighttime
Operational Noise Contours

PROJECT N°: TC170502	**FIGURE: 10**
SCALE: 1:150,000	DATE: December 2017

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APPENDIX I

EXECUTIVE SUMMARY

Amec Foster Wheeler has completed this technical memorandum for the Côté Gold Project with the aim of predicting the Project noise and vibration effects on surrounding sensitive receptors. It is completed to support the Environmental Effects Review for the Project. A summary of these effects for each Project phase is provided below.

The noise and vibration regional study area is defined as the area that extends approximately 10 km from the main Project noise sources. The local study area has been defined as a 5 km region from the main Project noise sources. It is not expected that the noise and vibration effects of the Project would be measurable, audible (for noise) or perceptible (for vibration) beyond the regional study area. Sensitive receptors have been defined for this memorandum within the regional study area. Receptors include residential cottages, recreational access points and tourist establishment areas. Noise and vibration effects have been predicted at each of these receptors.

A baseline data collection program was conducted to gather current noise levels near the Project site. Results of the baseline data collection indicate measured ambient noise levels at the representative location of 44 dBA L_{eq} (1hr) during the daytime (07:00 – 19:00), and 34 dBA L_{eq} (1hr) during nighttime (19:00 – 07:00).

Guidelines and regulatory requirements applied in the prediction of noise and vibration effects include the following:

- Noise:
  - NPC-115 (Ministry of the Environment and Climate Change (MOECC), 1981) and NPC-118 (MOECC, 1979) apply to noise effects from construction equipment;
  - NPC-119 (MOECC, 1982) applies to noise effects from blasting;
  - NPC-300 (MOECC, 2013) applies to noise effects from Project operations.
- Vibration:
  - NPC-119 (MOECC, 1982) applies to vibration effects from blasting; and
  - ISO 2631-2 (ISO, 1985) provides guidance on perceptibility of blast vibration at receptor locations.

Noise

Noise levels, for both the Construction and Operations phases, have been assessed using the A-weighted noise scale (dBA). The A-weighted noise scale is used for the prediction of effects as it is adjusted to reflect human hearing.

Noise levels have been assessed over a time period of one hour, using the energy equivalent noise level (Leq) as required by the applicable guidelines (NPC-300; MOECC 2013). Noise levels are modelled for daytime (07:00 – 19:00) and nighttime (19:00 – 07:00) separately as the operation scenarios and the criteria for these periods are different. Noise from the Construction and Operations phases have been modelled using an acoustic software program (Cadna/A), a computerized version of the ISO 9613 environmental noise propagation algorithm. The predicted noise levels for both Construction and Operations phases are assessed against both NPC-300 guideline limits for compliance, and are compared to the ambient noise levels in the area to determine the change in ambient noise with the Project.

Blasting noise levels have been assessed on a linear noise scale (dBL), which is consistent with the applicable noise guidelines (NPC-119; MOECC, 1982). Blasting noise has been predicted at sensitive receptors using MOECC Blasting Noise and Vibration Model (NPC-119; MOECC, 1982).

Vibration

Vibration levels from blasting are assessed based on the maximum peak particle velocity (PPV, mm/s), which is consistent with the applicable guidelines (NPC-119). Blasting vibration has been predicted using MOECC Blasting Noise and Vibration Model (NPC-119).

Prediction of Effects

The prediction of noise and vibration effects considers noise and vibration effects to surrounding sensitive receptors, and considers the MOECC's noise and vibration guidelines.

No noise mitigation measures have been considered for the Project. However, equipment noise levels are not to exceed those noted in Appendix II.

For the Construction phase, it is expected that daytime noise levels at receptor locations will be below baseline ambient noise levels. Nighttime noise levels may exceed baseline ambient noise levels at some receptor locations. However, daytime and nighttime construction noise levels at the modelled receptors are within the MOECC criteria limits. Blasting noise levels are expected to meet applicable MOECC guidelines. Blasting vibration levels are not expected to damage structures or exceed the criteria limit.

For the Operations phase, it is expected that daytime noise levels at receptor locations will be below baseline ambient noise levels. Nighttime noise levels may exceed baseline ambient noise levels at some receptor locations. However, daytime and nighttime operational noise levels at the receptors are expected to be within the MOECC criteria limits. Blasting noise levels are expected to meet applicable MOECC guidelines. Blasting vibration levels are not expected to damage structures or exceed the criteria limit.

During the Closure phase, the noise effects are expected to be lower than the effects for the Construction phase. To be conservative, it is assumed that noise effects during closure are identical to the Construction phase effects. No activities are planned to occur at nighttime. No vibration effects are anticipated as no blasting activities are planned.

Noise and vibration effects have not been explicitly modelled for the Post-closure phase, as the vast majority of the noise sources will be decommissioned during the Closure phase. To be conservative, it is assumed that daytime noise effects during the first years of the Post-closure will be less than the Closure phase noise effects. Once pumping ceases, noise levels are expected to revert to current baseline conditions. No activities are planned to occur at nighttime. No vibration effects are anticipated as no blasting activities are planned.

Nighttime operation restriction as proposed in the EA is no longer required as the predicted sound levels are within the nighttime criteria limit. The change in site layout and reduced production rate helped to lower noise effects at the receptors. Therefore, purchase of noise sensitive receptors may not be required as the Project noise impact at the receptors is predicted to be within the limits.

The noise and vibration monitoring plan has not been changed from the EA. IAMGOLD intends to monitor noise and vibration during the Construction and Operations phases to provide ongoing oversight on noise and vibration effects from the Project.

APPENDIX II

EQUIPMENT NOISE DATA

Table II-1: Equipment Noise Data

Source ID	Source Description	Sound Power Level (dBA)
APIT1	Aggregate Pit Idling Truck 1	109
APIT2	Aggregate Pit Idling Truck 2	109
APPC1	Aggregate Pit Primary Crusher 1	119
APPC2	Aggregate Pit Primary Crusher 2	119
APS1	Aggregate Pit Screen 1	116
APS2	Aggregate Pit Screen 2	116
APSC1	Aggregate Pit Secondary Crusher 1	115
APSC2	Aggregate Pit Secondary Crusher 2	115
APWL1	Aggregate Pit Wheel loader 1	119
APWL2	Aggregate Pit Wheel loader 2	119
BD1	Blast Hole Drill 1	118
BD2	Blast Hole Drill 2	118
BD3	Blast Hole Drill 3	118
BD4	Blast Hole Drill 4	118
C	Crusher	116
DC1	Dust Collector 1	109
DC2	Dust Collector 2	109
DC3	Dust Collector 3	109
DC4	Dust Collector 4	109
DC5	Dust Collector 5	109
DC6	Dust Collector 6	109
EX	Excavator (Caterpillar 330)	105
G1	Generator 1	117
G2	Generator 2	117
G3	Generator 3	117
G4	Generator 4	117
G5	Generator 5	117
MG1	Motor Grader 1	111
MG2	Motor Grader 2	111
MG3	Motor Grader 3	111
S1	Diesel Drive Shovel 1	118
S2	Diesel Drive Shovel 2	118
T1	Substation Transformer 1	113
T2	Substation Transformer 2	113
TD1	Track Dozer 1	119
TD2	Track Dozer 2	119
TD3	Track Dozer 3	119
TD4	Track Dozer 4	119
WD1	Wheel Dozer 1	111
WD2	Wheel Dozer 2	111
WL1	Wheel loader 1	119
WT1	Water Truck 1	109
WT2	Water Truck2	109
WT3	Water Truck3	109
TR1	MRA and Ore Hauling Truck	120
TR2	Overburden Truck	109

IAMGOLD

B-4: Updated Technical Memorandum: Hydrogeology

Memorandum

To:	Steve Woolfenden	**From:**	Karen Besemann, Steve Kaufman
Company:	IAMGOLD Corporation		Golder Associates Ltd.
cc:	Stephan Theben (SLR Consulting)	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: HYDROGEOLOGY		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Golder Associates and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;

- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Hydrogeology

Golder Associates completed a technical study in 2014 of the potential hydrogeological effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). This Updated Hydrogeology Technical Memorandum (Memorandum) comprises an Appendix of the EER of the IAMGOLD Project.

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. This Memorandum outlines predicted effects on hydrogeology based on the revised Project Description with focus only on the components that have been changed and that have the potential to affect the hydrogeological environment. The results of this hydrogeological review have been incorporated into the effects review for the hydrology, water quality and aquatic biology.

Only components of the Project Description that have changed since the EA was submitted are being assessed in this Memorandum. These include:

- Excavation and dewatering of a smaller open pit mine covering approximately 145 hectares (ha) (originally 210 ha) with a final depth of approximately 550 m (unchanged).
- Development of a smaller MRA covering an area of approximately 300 ha (originally 400 ha) for stockpiling mine rock, and associated perimeter seepage collection facilities.
- Development and operation of a new TMF location that is smaller in area than the TMF proposed in the EA (480 ha compared to 840 ha) and using a thickened tailings deposition method as opposed to the conventional slurry method presented in the EA.

The TMF construction also includes associated perimeter seepage collection facilities. No other changes to the Project Description are considered to result in changes to the Technical Support Document for Hydrogeology in the EA.

The locations of the primary Project components are provided on Figure 2-1.

2.0 METHODOLOGY

The prediction of Project related effects on hydrogeology includes the following tasks, which are further described in following sections:

- Identify the Project interactions with the hydrogeology environment.
- Define the spatial and temporal boundaries over which the effects prediction is to be conducted.
- Select effects prediction indicators that are representative of hydrogeology.
- Characterize the existing hydrogeological conditions of the area.
- Predict changes in groundwater levels / flows.

2.1 Spatial Boundaries

The hydrogeological study areas define the spatial boundaries within which the physical works and activities of the Project could potentially affect hydrogeology. One study area has been selected for the prediction of Project related effects on the hydrogeology, the Local Study Area (LSA). This area is described in the following section. Effects on hydrogeology are not expected to extend beyond the watersheds encompassed by the LSA and therefore, as was the case in the EA, a Regional Study Area has not been defined for hydrogeology for this EER.

2.1.1 Local Study Area

The Hydrogeology LSA is shown on Figure 2-1 and is unchanged from the EA. The LSA extends beyond the nearest lakes to a distance of about 3 km to the east, south and west from the area of mine, MRA and TMF, and extends more than 15 km to the north of the TMF.

2.2 Temporal Boundaries

Project activities and the areas over which these activities are to be conducted vary throughout the Project. Thus the effects of Project related activities also vary throughout the Project phases. In general, effects on the hydrogeological environment are expected to be greatest at the end of mining when the open pit has reached its maximum depth and the TMF and MRA have reached their maximum extents.

The temporal boundaries of the EER remain as those provided in the EA and for hydrogeology were considered for the following project phases:

- Construction;
- Operations;
- Closure; and
- Post-closure.

During the Construction phase, realignment dams and surface water channels will be constructed and pumping will be initiated to drain Côté Lake. Pumping from seepage collection facilities and the open pit will be initiated as these structures are developed and pumping will continue thereafter, through to at least the end of the Operations Phase. The largest potential effects on groundwater levels will be at the end of mine life when the pit has reached its ultimate depth of 550 m. Pumping from the open pit will be discontinued at mine closure. Pumping at the seepage collection ponds may continue into Post-closure until the water quality is deemed suitable. In Post-closure, groundwater levels will recover over time reaching equilibrium levels that approximate pre-mining conditions, except locally at realignment structures that are to remain in place.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed when compared to the EA. The effects assessment indicator previously used and still applicable is:

- Groundwater Levels (Water Table)

Although seepage through constructed features is discussed as part of the Hydrogeology EER, the effects of seepage will be assessed as part of the Water Quality effects and no Effects Assessment Indicators for seepage are proposed herein.

2.4 Prediction of Effects

A three-dimensional (3D) groundwater flow model was constructed in MODFLOW for the EA based on the conceptual understanding of the hydrogeology developed from the baseline characterisation. Details of the model construction, boundary conditions, assumptions and results of simulations performed, including sensitivity analyses, are provided in the Project Groundwater Model Report included in the EA.

The model incorporated the open pit, the MRA and associated seepage collection ponds, as well as the dams located at the perimeter of the open pit and the water course realignments.

The 3D model did not include the previously planned TMF and seepage from the TMF which was assessed using a 2Dimensional model.

Model simulations for the 3D model were completed for the existing conditions based on the Project layout in the EA. This model was modified to incorporate Construction phase activities, comprising the water course realignments and dams located in the vicinity of the open pit, as well as the dewatering of Côté Lake. Simulations were then completed and predictions were developed for effects associated with the Construction Phase activities. The model was further modified to incorporate Operations phase activities comprising the staged deepening of the open pit and the full footprint of the MRA and associated seepage collection ponds. Simulations were then completed and predictions developed for effects associated with the Operations Phase.

Effects predictions were developed qualitatively for the Closure / Post-closure phases of the Project.

The model results were also used to predict changes in groundwater discharge to adjacent lakes; with this information being considered in the effects prediction for Hydrology. The model results were also used to predict groundwater inflows during excavation of the open pit.

3.0 EXISTING CONDITIONS

3.1 General Setting

The existing conditions for the much of the site were previously described in the EA and are not re-stated here. Additional baseline hydrogeological information however has been collected in the area of the revised TMF footprint. Specifically, Amec Foster Wheeler carried out a geotechnical and hydrogeological field program at the proposed TMF location to support the Pre-Feasibility design and in turn the EER in the fall of 2016. The information below includes summary of that field investigation (Amec Foster Wheeler, 2017).

3.2 Regional Quaternary Geology

Mapping completed by the Ontario Survey and Geological Survey indicates that the Quaternary geology at the Project site is predominately bedrock covered with shallow outwash sediment and till with occasional glaciofluvial deposits. Overburden deposits were generally observed in the low-lying areas with bedrock at surface or a thin veneer of till overlying bedrock at topographic highs.

The overburden geology in the area of the TMF, where present, consists mainly of outwash deposits of silt to sand with largely varying gradations, in some locations underlain by till, and sand and gravel glaciofluvial deposits.

The Quaternary geology units identified in the project area are outlined as follows:

- **Organic deposits:** peat, muck; generally deposited in depressions where lack of aeration prevents decomposition of organic matter.
- **Outwash and or till:** sand, silt to gravelly sand; generally planar surface deposited by meltwater beyond the ice margin in the beds of braided streams and in shallow, restricted portions of glacial lakes.
- **Glaciofluvial sediments:** sand and gravel; deposited by melt-water in contact with glacial ice.

3.3 Bedrock Geology

The Project site is situated in the Swayze Greenstone Belt within the southwestern extension of the Abitibi greenstone belt of the Superior Province. The Swayze Greenstone Belt includes a diversity of extrusive and intrusive rock types. Compositions of rock types range from ultramafic through felsic, as well as both chemical and clastic sedimentary rocks. Igneous rocks mainly consist of both volcanic and plutonic rocks.

Bedrock in the area of the planned open pit is comprised principally of tonalite, diorite, breccias, diabase dykes and mafic dykes. The tonalite rock type is the host for the gold deposit and the diorite forms a series of lenses within the deposit. The breccias consist of both tonalite and diorite developed at the contacts and is thought to be associated with the disseminated gold mineralization.

3.4 Field Investigation

A field investigation was completed in the vicinity of the proposed TMF in the Fall of 2016. The field investigations included the drilling of 16 boreholes / piezometer installations throughout the TMF footprint. At many of the borehole locations, nested monitoring piezometers were installed in order to assess hydraulic properties of the various overburden units and bedrock at varying depths. Falling head tests were completed when possible in these piezometers. Coring into bedrock was continued until 2 consecutive runs of competent bedrock was achieved; where competent bedrock for geotechnical holes was defined as having a Rock Quality Designation greater than 60%. Packer testing was performed in the hydrogeological boreholes to assess bedrock hydraulic conductivity with depth.

In addition to the drilling, a total of 13 test pits were completed at the TMF in locations of thick overburden or near low-lying swamp areas.

3.4.1 Overburden Geology at the TMF

The overburden geology in the area of the TMF consists mainly of outwash deposits of silt to sand with largely varying gradations, in some locations underlain by till, and sand and gravel glaciofluvial deposits. Based upon the 2016 Field Investigation Report (Amec Foster Wheeler, 2017), the stratigraphy in the TMF area consisted of the following:

- **Surface Layer**: Generally organics, 0 to 2 m thick, with overlying peat moss at wetland locations. Organics increased to thicknesses from 2 to 5 m in low lying areas near watercourses or bogs.
- **Second Layer**: Outwash deposits ranging in composition from sand to silt and directly underlying the organics of thickness varying from 0.2 to 3.4 m. Silt (outwash or till), normally 2 to 4 m thick, was encountered either directly overlying bedrock or glaciofluvial sand and gravel. These deposits were found to contain organic matter, including wood fragments and freshwater shell remnants. The fine sand deposits were found at the southwest portion of the site near Moore Lake, and were observed directly above bedrock.
- **Third Layer**: Glaciofluvial sand and gravel deposits along old stream beds at locations of deep overburden, overlying bedrock. The deposits, where present, varied in thickness from 1 to 6 m and were found only below well graded silt.

3.4.2 Hydraulic Response Testing Results

Both packer testing and slug testing were completed by Amec Foster Wheeler during the field investigation for determination of hydraulic conductivities (“k” values) at various depths within bedrock and overburden (Amec Foster Wheeler, 2017). Tables 1 and 2 provide interpreted slug and packer results, respectively, along with the corresponding locations and interval of analysis. Packer testing was employed at the hydrogeological holes completed within low density fractured bedrock. Following piezometer installation, falling head slug testing was completed at monitoring well installations. Slug testing was carried out using five-gallon buckets of water; filled at various natural water sources around the site, poured manually within each pipe. Data was captured using both a Solinst data logger and by taking manual measurements using a water level tape. A number of locations where it was difficult to build hydraulic head due to rapid draining, produced “k” values which exceed those suggested for slug testing. These locations were identified and their interpreted “k” values are therefore considered to provide an upper boundary of permeability, rather than a precise value. Data gathered was analyzed using the Bouwer and Rice (1976) method for unconfined aquifers.

3.4.3 Overburden Hydraulic Conductivity

Overburden hydraulic conductivities are from screened intervals of piezometer / monitoring wells in the TMF area. In total, seven falling head tests were carried out at screened intervals within overburden. Results are briefly summarized below:

- Gravel: 5×10^{-6} meters per second (m/s);
- Silt / Organics: 1×10^{-7} m/s;
- Silt: 3×10^{-6} m/s;
- Gravelly Silt / Organics: >2×10^{-6} m/s;
- Organics: >1×10^{-5} m/s;
- Silt and Sand (TMF Centre): 1×10^{-5} m/s; and
- Silt and Sand / Bedrock Interface (TMF South Dam): >3×10^{-5} m/s.

3.4.4 Bedrock Hydraulic Conductivity

Bedrock hydraulic conductivity estimates were obtained from both packer testing in open drillholes and falling head tests in installed monitoring wells. In general, hydraulic conductivity results for bedrock range from 2×10^{-05} m/s to 9×10^{-07} m/s with a general trend of decreasing hydraulic conductivity with depth.

4.0 PREDICTION OF EFFECTS

4.1 Construction Phase

4.1.1 Predicted Changes in Groundwater Levels

Predicted changes to groundwater levels for Construction Phase activities are limited to the immediate area of the realignment structures and excavated channels and do not differ from those predicted in the EA. Groundwater levels will also decline in the proposed Open Pit area as overburden is excavated in preparation for mining. These water level changes are and effects thereof were incorporated into the 3D model for the Open Pit development in the EA and remain unchanged.

4.2 Operations Phase

4.2.1 Predicted Changes in Groundwater Levels

The Project Open Pit has a footprint of 145 ha in comparison to the EA Open Pit of 210 ha. The depth of the Open Pit remains at 550 m. The extent of the Open Pit in comparison to the one shown in the EA is shown in the EER Project Description. Given that the footprint of the pit has reduced and is within the originally proposed extent for which the 3D model was constructed to predict water level drawdowns, the effects predicted for the EA are anticipated to be similar, and likely conservative, for the Project layout.

The 3D model also predicted seepage through the dams in the vicinity of the Open Pit to assess flow reduction in the nearby surface water bodies. As the open pit is deepened over the life of mine, groundwater that previously discharged to nearby lakes is progressively redirected to the open pit, resulting in decreased inflow to these lakes. In addition, leakage from the bottom of the lakes also contributes to pit inflows, thus decreasing the net groundwater inflow to the lakes. As indicated above, given that the updated Open Pit is smaller than the Open Pit assessed previously, the estimates completed for the originally proposed Open Pit are considered conservative and valid.

4.3 Closure Phase & Post- Closure Phase

4.3.1 Predicted Changes in Groundwater Levels

At closure, pumping activities in the open pit will be terminated and the water level in the open pit will begin to rise in response to pumping from collection facilities, direct precipitation inputs and groundwater inflow. Groundwater levels will rise over the area affected by the Project. During Post-closure, when the open pit is filled and re-connected to the surface water flow system, groundwater levels will continue to rise and over time will approximate pre-mining conditions.

4.3.2 Other Predicted Effects

While not considered an environmental assessment indicator for hydrogeology, high level seepage volumes from the TMF and MRA have been estimated in order to provide this information to the Water Quality Effects Assessment.

Feasibility level design is currently underway for the updated TMF and MRA. The TMF is designed with a series of seepage collection ponds (SCPs), ditches (SCDs) and localized seepage interception trenches (SITs) which are collectively referred to as seepage collection system (SCS), along it's perimeter to collect seepage (Amec Foster Wheeler, 2017b). The intercepted seepage in the SCS will be pumped back to the TMF and reclaim pond. The main SCP will be located at the north-east side of the TMF, adjacent to Bagsverd Lake. The SCP level will be maintained such that it is slightly lower than Bagsverd Lake in order to create a hydraulic gradient toward the SCP.

At the current stage of the project, the SCP dam crests, SCD and SIT invert elevations have not yet been finalized. This is scheduled to be completed as part of the Feasibility Study currently underway. As part of the Feasibility Study, an updated 3D Groundwater model is also being completed to refine seepage estimates and assess capture efficiency of the proposed seepage collection systems.

For the purposes of advancing the EER and recognizing that the engineering studies and groundwater modelling will be on-going, seepage by-pass volumes have been estimated for the TMF and MRA and have been incorporated into the Water Quality Modelling and Effects Prediction. These estimates will be refined as the Feasibility Study and Hydrogeological Modelling are completed.

5.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

The list below provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA.

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Table 5-1: Mitigation Measures – Hydrogeology

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Hydrogeology	Design	Inflows to open pit	Perimeter dam construction	Construction of perimeter dams in low lying areas along Clam Lake and the outflow of Chester Lake to minimize inflows to the open pit.	Lakes and Rivers Improvement Act	The mitigation measure has not changed from the EA.
Hydrogeology	Design	Inflows to open pit	Surface water realignments	Surface water realignments to minimize risks associated with surface water features in close proximity to an open pit.	Lakes and Rivers Improvement Act	The mitigation measure has not changed from the EA.
Hydrogeology	Design	Mine rock management	Engineered facilities to manage mine rock	Construction of engineered facilities to store mine rock (MRA), low-grade ore (low-grade stockpile) and tailings (TMF).	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Hydrogeology	Design	Mine rock seepage	Engineered facilities to manage seepage	Construction of engineered water management systems to collect runoff and seepage from the MRA, lowgrade stockpile, TMF, and polishing pond.	Ontario Water Resources Act Environmental Compliance Approval, Metal Mining Effluent Regulations	The mitigation measure has not changed from the EA.
Redundant measures						
Hydrogeology	Design	-	-	Contact and process water contained within the SCS at the TMF will be pumped back into the TMF and reclaim pond.	-	The mitigation measure has not changed from the EA and is redundant with “Engineered facilities to manage seepage”.
Hydrogeology	Design	-	-	Construction of erosion and sediment control measures to promote settling of sediments and mitigate the migration of suspended solids into nearby surface water features.	-	The mitigation measure has not changed from the EA and is covered under Hydrology.

6.0 MANAGEMENT

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA.

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Table 6-1: Monitoring Measures – Hydrogeology

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrogeology	Groundwater levels around the open pit	Monitoring wells instrumented with data loggers to obtain continuous records of groundwater levels along with quarterly manual depth to groundwater measurements.	Good Industry Practice	Construction through Closure phases. Water level transducers will be set to record on a half-hourly basis. Manual measurements will occur quarterly.	Deep groundwater monitoring well nests at select locations around the perimeter of the open pit.	The monitoring measure has not changed from the EA.
Hydrogeology	Groundwater monitoring	Installation of well nests, if necessary, adjacent to select hydrological monitoring stations, which allows determination of interactions between groundwater and surface water.	Good Industry Practice	Construction through Closure phases. Manual measurements will occur quarterly.	At select hydrological monitoring stations.	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrogeology	Groundwater levels around the MRA and TMF	Monitoring wells instrumented with data loggers to obtain continuous records of groundwater levels along with quarterly manual depth to groundwater measurements.	Good Industry Practice	Construction through Closure phases. Water level transducers will be set to record on a half-hourly basis. Manual measurements will occur quarterly.	Up to 15 existing well locations and up to 10 new well locations around the perimeter of the MRA and TMF.	The monitoring measure has not changed from the EA.
Hydrogeology	Groundwater levels in vicinity of surface water features to assess interactions between groundwater and surface water	Monitoring wells instrumented with data loggers to obtain continuous records of groundwater levels along with quarterly manual depth to groundwater measurements.	Good Industry Practice	Construction through Closure phases. Water level transducers will be set to record on a half-hourly basis. Manual measurements will occur quarterly.	Monitoring well nests adjacent to select hydrological monitoring stations.	The monitoring measure has not changed from the EA.

7.0 CONCLUSION

Based upon the results of the studies and the effects assessment completed, the following conclusions are presented for the hydrogeological environment:

- The Project will affect the hydrogeological environment principally through the: construction of dams and realignments surface water channels, excavation of an open pit mine, and the development of the MRA and TMF.
- Groundwater levels have been identified as an effects assessment indicator. Changes in groundwater levels, as may result from Project activities, could affect: the quantity of groundwater discharge to local lakes and streams, and dry season flows. Additionally, such changes in groundwater levels could also affect aquatic habitat in the receiving streams.
- Predictions of the groundwater level effects of Construction and Operations phase activities have been developed as part of the EA through the use of a 3D groundwater flow model. This model was constructed based on the conceptual hydrogeological model developed from investigations conducted at the site and covers an area that extends beyond local watersheds.
- Given that the new proposed pit area is smaller than that presented in the EA and that the new Open Pit is encompassed within the Open Pit area used in the EA, groundwater level effects are anticipated to be similar to those predicted in the EA.
- Mitigation measures and management through monitoring of water levels and groundwater quality downstream of the Project infrastructure will further confirm the ongoing stability of the hydrogeological system as the project advances.

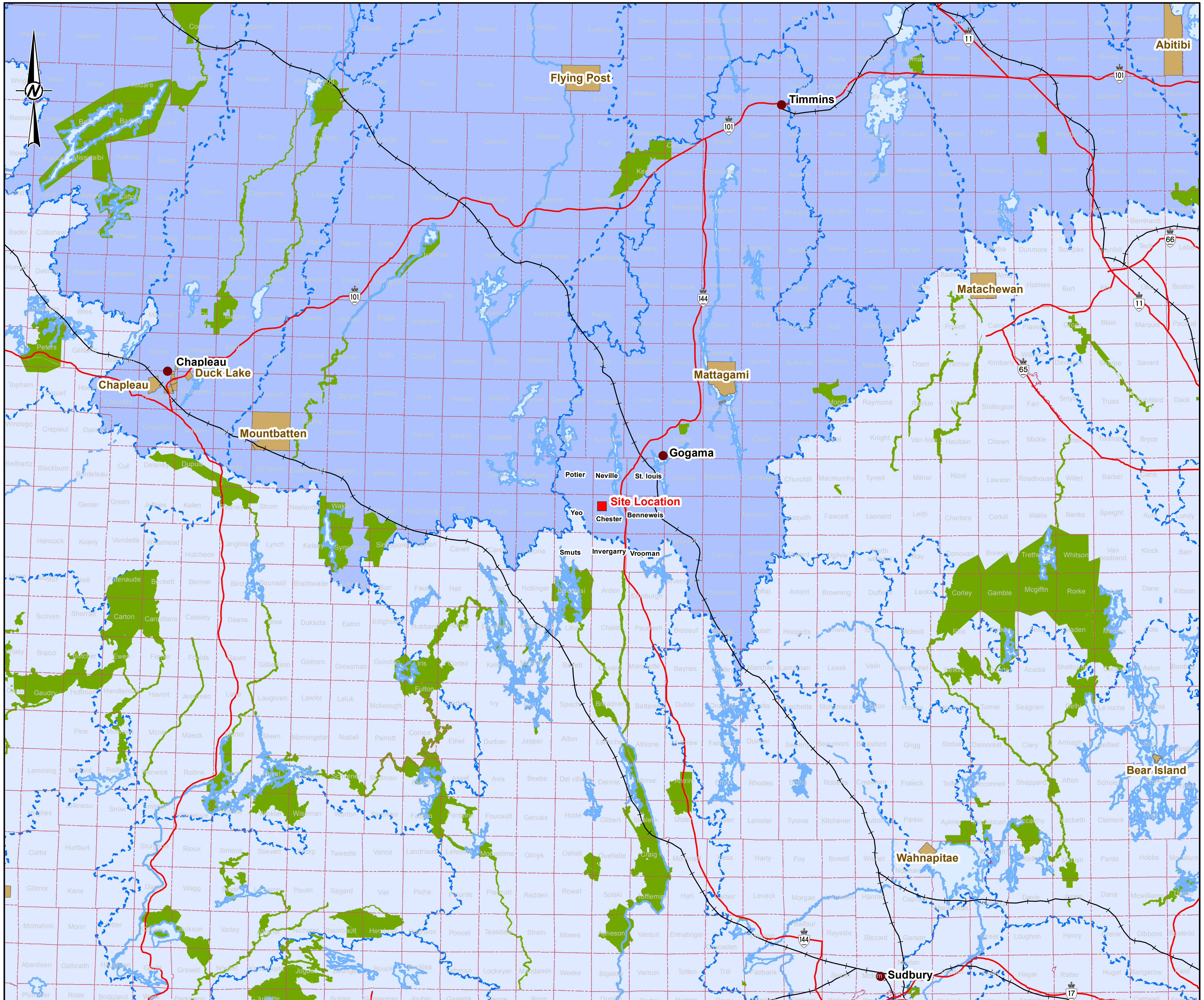
8.0 REFERENCES

Amec Foster Wheeler Environment & Infrastructure. 2017. Geotechnical and Hydrogeological Investigations Côté Gold Project, Pre-feasibility Study. Doc. 191659-000-DT30-RPT-0001-B, February 2017.

9.0 GLOSSARY AND ABBREVIATIONS

3D	Three-dimensional
EA	Environmental Assessment
EER	Environmental Effects Review
ha	hectare
IAMGOLD	IAMGOLD Corporation
km	kilometre
kV	kilovolt
LSA	Local Study Area
m	metre
m/s	meters per second
MODFLOW	Modular Finite-Difference Groundwater Flow Model
MRA	Mine Rock Areas
SCD	Ditches
SCP	Seepage Collection Ponds
SCS	Seepage Collection System
SIT	Seepage Interception Trenches

FIGURES

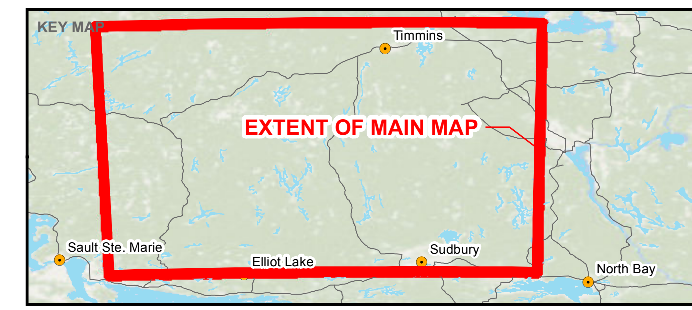


LEGEND

- Site Location
- Major Roads
- Railway
- Community
- First Nations Community
- Townships
- Provincial Park
- Waterbody

Primary Watersheds

- Hudson Bay
- Great Lakes



NOTES

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CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECT REVIEW - HYDROGEOLOGY
CÔTÉ GOLD PROJECT

TITLE
PROJECT LOCATION

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-11
PREPARED	RRD
DESIGN	--
REVIEW	KAB
APPROVED	SK

PROJECT No.	CONTROL	Rev.	FIGURE
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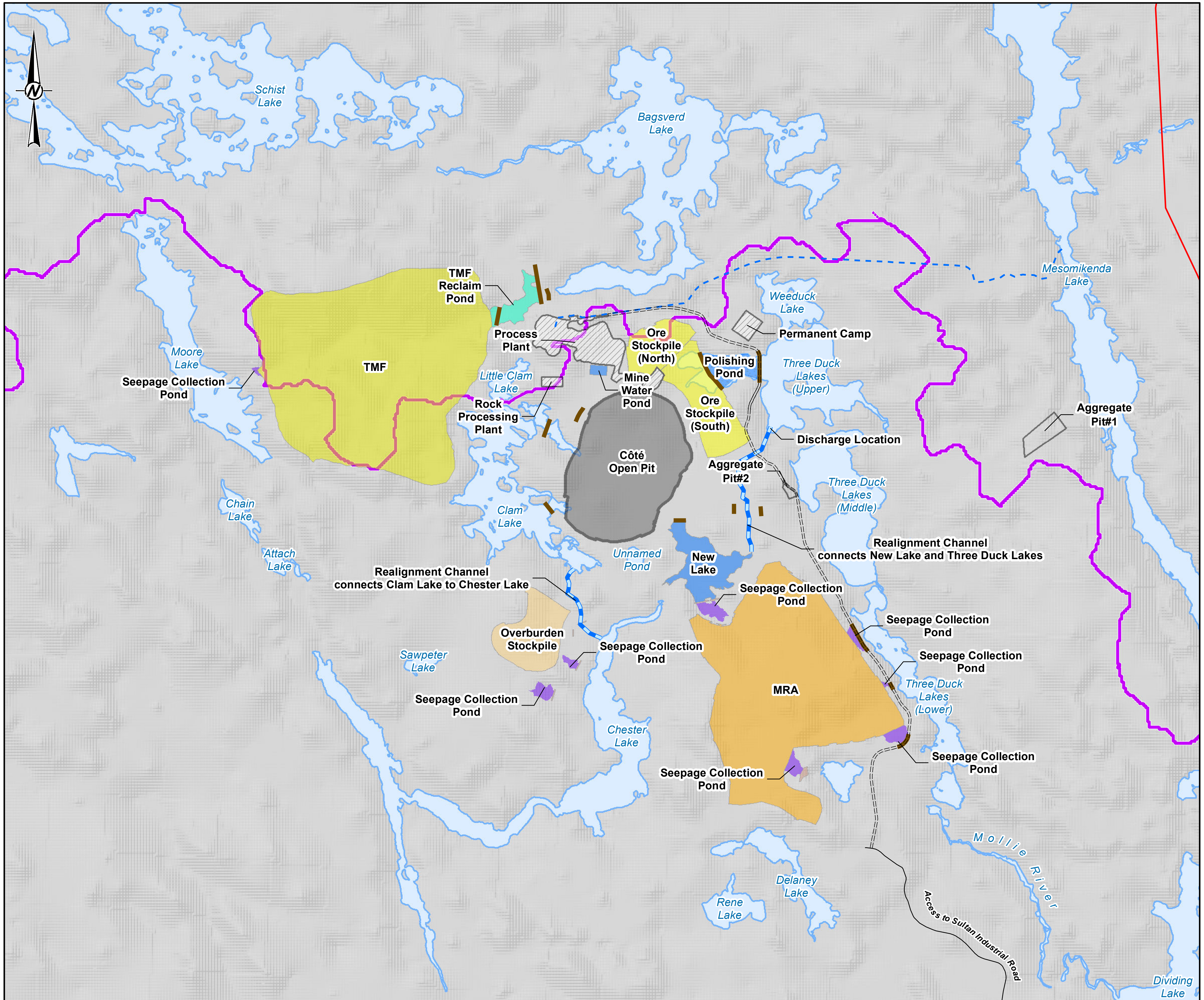

LEGEND

- Major Roads
- Roads
- Main Access Road
- Mollie River Watershed
- Waterbodies

Proposed Infrastructure

- Aggregate Pit
- Dam
- Infrastructure
- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Seepage Collection Pond
- Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Water
- Dam
- Fresh Water Pipeline
- Realignment Channel

NOTES

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CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECT REVIEW - HYDROGEOLOGY
CÔTÉ GOLD PROJECT

TITLE
SITE PLAN

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-11
PREPARED	RRD
DESIGN	--
REVIEW	KAB
APPROVED	SK

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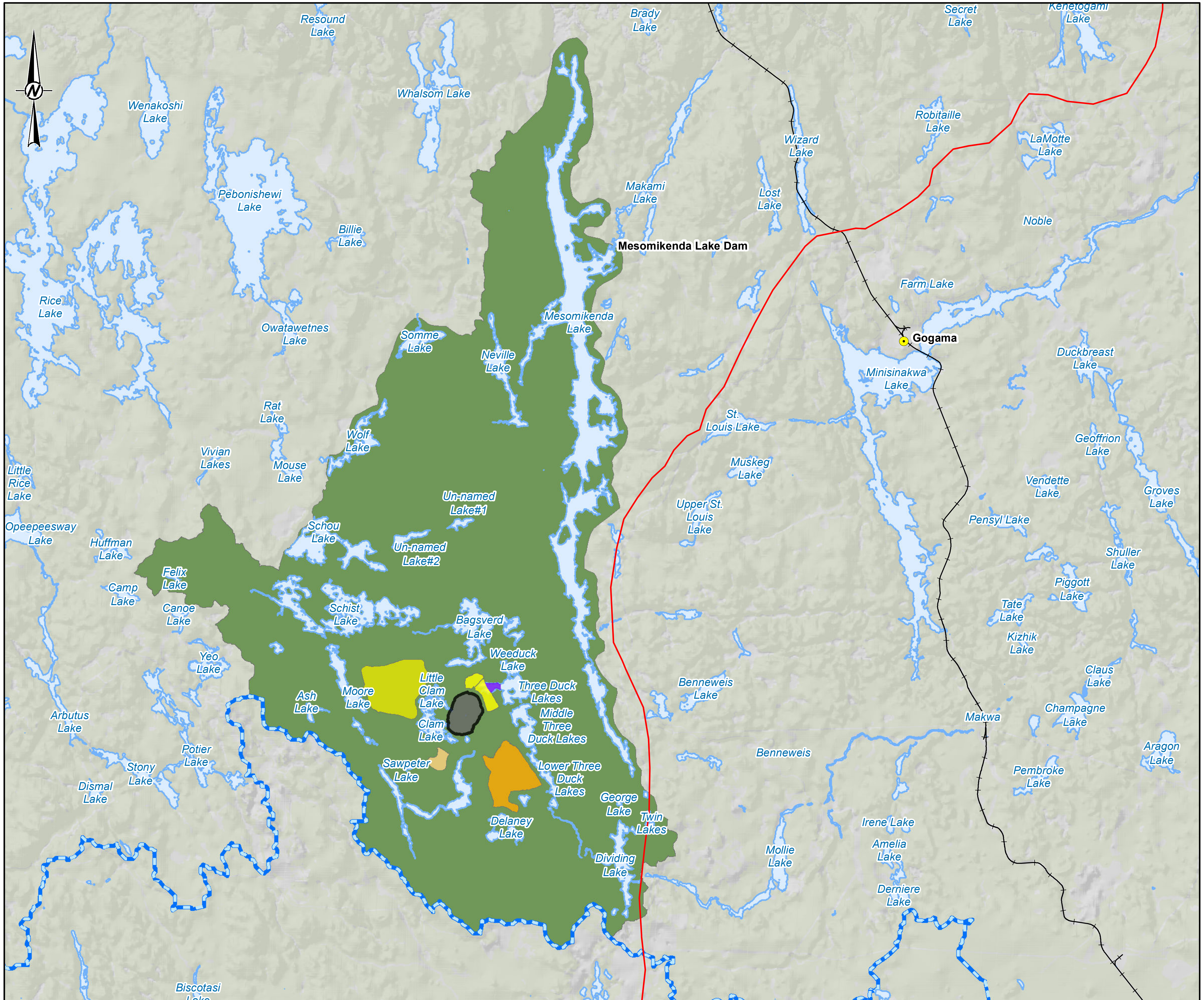

LEGEND

- Regional Communities
- Major Roads
- Railway
- Waterbodies
- Hydrogeology Local Study Area (LSA)
- Great Lakes / James Bay Watershed Divide

Proposed Infrastructure

- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1789673/4000

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CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECT REVIEW - HYDROGEOLOGY
CÔTÉ GOLD PROJECT

TITLE
HYDROGEOLOGY LOCAL STUDY AREA

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-11
PREPARED	RRD
DESIGN	--
REVIEW	KAB
APPROVED	SK

PROJECT No.	CONTROL	Rev.	FIGURE
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APPENDIX I
EXECUTIVE SUMMARY

IAMGOLD Corporation (IAMGOLD) intends to develop and operate an open pit gold mine and associated facilities and infrastructure in northern Ontario approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury; this mining project is referred to as the Côté Gold Project (the Project). The landscape is characterized with an extensive tree cover and subdued topography, and is dominated by numerous lakes, streams and wetlands along with extensive bedrock outcrops; typical of northern Ontario. The area has experienced limited historical mining and current activities include forestry, mine exploration and some recreational activities.

Golder Associates completed a technical study in 2014 of the potential hydrogeological effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report. Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an Environmental Effects Review. This Memorandum outlines predicted effects on hydrogeology based on the revised Project Description with focus only on the components that have been changed and that have the potential to affect the hydrogeological environment. Only components of the Project Description that have changed since the EA was submitted are being assessed in this Memorandum. These include:

- Excavation and dewatering of a smaller open pit mine covering approximately 145 ha (originally 210 ha) with a final depth of approximately 550 m (unchanged).
- Development of a smaller MRA covering an area of approximately 300 ha (originally 400 ha) for stockpiling mine rock, and associated perimeter seepage collection facilities.
- Development and operation of a new TMF location that is smaller in area than the original (480 ha compared to 840 ha) and using a thickened tailings deposition method as opposed to the original conventional slurry method.

Groundwater levels have been identified as an effects assessment indicator. Project activities, primarily groundwater pumping from the open pit, will result in potential changes in groundwater levels that could affect the quantity of groundwater discharge to local lakes and streams, dry season stream flows, aquatic habitat and sources of drinking water.

A Local Study Area (LSA) has been defined for the purpose of completing a prediction of the effects on groundwater levels. The LSA extends beyond the sub-watersheds in which the Project facilities and infrastructure are to be located, and extends to the watershed divide between the Great Lakes and James Bay watersheds that lies about 3.5 km southwest of the Project.

Investigations have been conducted since 2012 in order to characterize subsurface conditions. This program has included the drilling of over 175 boreholes, including deep angled boreholes within the footprint of the open pit. Groundwater monitoring wells (single and nested) were installed and test pits excavated. Slug testing and packer testing have been conducted to develop estimates of the hydraulic conductivity of various overburden materials, at a range of depths below the bedrock surface. Laboratory analysis of the grain size distribution of soil samples have also been used to develop estimates of overburden materials.

A 3-dimensional groundwater flow model was developed for the EA and is used to complete a prediction of effects on groundwater levels associated with the Construction and Operations phase activities, while for the Closure and Post-closure phases, the prediction of effects has been developed qualitatively.

The Project Open Pit has a footprint of 145 hectares (ha) in comparison to the originally proposed Open Pit of 210 ha. The depth of the Open Pit remains at 550 m. The extent of the Open Pit in comparison to the one shown in the EA is shown in the EER Project Description. Given that the footprint of the pit has reduced and is within the originally proposed extent for which the 3-D model was constructed to predict water level drawdowns, the effects predicted for the EA are anticipated to be similar, and likely conservative, for the Project layout.

The 3D model also predicted seepage through the dams in the vicinity of the Open Pit to assess flow reduction in the nearby surface water bodies. As the open pit is deepened over the life of mine, groundwater that previously discharged to nearby lakes is progressively redirected to the open pit, resulting in decreased inflow to these lakes. In addition, leakage from the bottom of the lakes also contributes to pit inflows, thus decreasing the net groundwater inflow to the lakes. As indicated above, given that the updated Open Pit is smaller than the Open Pit assessed previously, the estimates completed for the originally proposed Open Pit are considered valid.

Several inherent mitigation measures have been included in the design of the Project, and have been considered in the prediction of effects. These are further outlined in the Memorandum.

A monitoring program has been developed to continue the collection of data required to assess changes in groundwater levels prior to and during Project implementation (Construction, Operations and Closure). Specific commitments for conducting this monitoring program are identified in this Memorandum.

Annually the results of this groundwater level monitoring program will be integrated with the results obtained from the other disciplines and assessed in consideration of ongoing operational activities, as well as Closure.

IAMGOLD

B-5: Updated Technical Memorandum: Hydrology and Climate

Memorandum

To:	Steve Woolfenden	**From:**	Steve Kaufman, Karen Besemann
Company:	IAMGOLD Corporation		Golder Associates Ltd.
cc:	Stephan Theben (SLR Consulting)	**Date:**	May 1, 2018 (revised September 6, 2018)
Subject:	**CÔTÉ GOLD PROJECT ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: HYDROLOGY AND CLIMATE		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment (EA) Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD are proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'

This updated technical memorandum has been prepared by Golder Associates and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;

- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Hydrology and Climate

Golder Associates completed a technical study in 2013 of the potential hydrological and climate effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). In order to directly compare potential changes to the hydrological system to the EA, the climate, lake and river information as previously reported was not substantially altered to those inputs and assumptions as described in the Project EA Report Technical Document: Hydrology (Golder 2013).

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an EER. This Memorandum outlines the updates to the hydrology and climate predictions related to the optimization of the Project which incorporates the revised footprint of the Project and to compare and contrast the previous effects assessment on the water quantity in the subject watersheds. Changes to the conceptual and numerical model of the hydrological system were limited to:

- Additions of watersheds where infrastructure footprints overprinted new areas;
- revisions to existing and/or addition of watersheds to accommodate changes to infrastructure footprints such as the Open Pit, Tailings Management Facility (TMF), Mine Rock Area (MRA), ore and overburden Stockpiles, and the ore processing plant;
- revisions to surface water flow pathways to account for changes in the channel re-alignment strategy;
- revisions to operational (process and site) water flow rates and directions; and
- revisions to closure concepts.

Changes to watershed areas and infrastructure footprints are further detailed herein; revisions to seepage flows are discussed in the Updated Hydrogeology Technical Memorandum.

1.2 Hydrological and Climatological Setting

The Project site is located at the headwaters of the Mattagami River system, just north of the watershed divide that separates the James Bay watershed from the Great Lakes watershed (Figure 1-1). Downstream of the Project site, the Mattagami River flows for approximately 420 km to a confluence with Moose River, which subsequently flows to James Bay. The

Mattagami River is a managed river system that includes approximately 18 dams and power generating stations that fall under the Mattagami River Water Management Plan.

A number of lakes, connected by relatively short streams, are present in the vicinity of the Project site (Figure 1-2). The Mollie River, fed by Chester and Clam Lakes to the west, flows eastward through the open pit footprint and connects Côté Lake to the Three Duck Lakes system. To the north of the open pit footprint, Bagsverd Lake drains northward through Bagsverd Creek and eventually discharges into Mesomikenda Lake to the east. Other than Mesomikenda Lake, which is greater than 50 m deep in some locations, lakes are typically shallow (<10 m average depth) with bedrock-lined shorelines.

Active regional climate monitoring locations are located in the vicinity of the Project Site in Timmins (north of the Project site), Chapleau (northwest of the Project site), Sudbury (south of the Project site) and North Bay (southeast of the Project site). Based on information collected at these locations, the climate of the Project site is characterized by cold winters (-10˚C to -35˚C) and warm summers (10˚C to 35˚C). Mean annual precipitation for the region is approximately 800 mm to 900 mm, of which approximately 30 to 40% falls as snow (EC 2013). Mean annual evaporation is in the range of 400 mm to 600 mm (MNR 1984). In 2012, a climate monitoring station was installed at the project site and collects data on precipitation, air temperature and wind and will supplement information collected from the longer term regional climate stations.

2.0 METHODOLOGY

2.1 Spatial Boundaries

2.1.1 Local Study Area

The Local Study Area (LSA) is comprised of an area beyond the location of the physical works and activities within which effects may occur as a result of the Project. For hydrology, the LSA is defined by lakes and watersheds in the vicinity and downstream of the Project infrastructure.

The hydrology LSA extends to the nearest watershed boundary beyond the proposed infrastructure, open pit, MRA and TMF. The LSA is bound by the following features:

- The Great Lakes/James Bay watershed divide along the south.
- The Moore Lake and Schist lake watershed divides to the west.
- Mesomikenda Lake to the east.
- The Somme River system to the north and northwest.

The hydrology LSA is shown on Figure 2-1 and is increased to the west when compared to the EA as a result of the revised footprint of the TMF.

2.1.2 Regional Study Area

The Regional Study Area (RSA) for hydrology was extended downstream of the Project to the confluence of the Mollie River and the Mesomikenda Lake outflow. These waterways both ultimately discharge to Minisinakwa Lake near the community of Gogama and subsequently to the Mattagami River. The Mattagami River is a controlled river system with approximately 18 dams along its length which provide flood control and power generation. A Water Survey of Canada water level gauge exists at Minisinakwa Lake Dam, and the total watershed area upstream of this monitoring point was defined as the RSA. The hydrology RSA is shown in Figure 2-2.

2.2 Temporal Boundaries

The temporal boundaries of the EER remain as those provided in the EA, and will span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed compared to the EA. The effects assessment indicators previously used and still applicable include:

- Change in surface water flow

2.4 Prediction of Effects

The potential change in surface water flow was predicted through the modification of the previously developed GoldSim hydrological model. The model was revised to incorporate:

- Watersheds (natural or influenced by infrastructure components);
- seepage pathways through constructed features such as the TMF and MRA; and
- the reconfigured watercourse realignments.

Model simulations were completed for the current hydrological regime (the Existing Conditions; Figure 2-3) and these results were subsequently compared to simulated surface water flow produced during the Construction, Operations, Closure and Post-closure phases.

Model results were presented for an average annual precipitation climate condition, as well as 1:25-year wet and 1:10-year dry annual precipitation climate conditions. These climate conditions were considered representative of the range of annual climate conditions that may be encountered at the Project site for the life of the mine (approximately 15 years). As per EA correspondence and response documents, the climate from the1:10-year dry year was not substantially different from the statistical 1:25-year dry year and as such the dry year from the EA was carried to this analysis in order to directly compare results from the EA and EER.

2.5 Construction Phase

Changes to surface water flow during the Construction Phase will be limited to those associated with the development of the watercourse realignments. The construction of these features will facilitate the lowering of water levels in Côté Lake for open pit development. However, these features will be designed to manage expected and severe flow events and as such are not assessed separately from the potential effects that could arise during the Operations Phase.

2.6 Operations Phase

Predicted changes to surface water flows were estimated with the Project footprint at its maximum extent (i.e., full development). Watersheds delineated for the Operations Phase of the Project are displayed on Figure 2-4.

2.6.1 Change in Surface Water Flow

With the planned water management concepts (for on-site water management and realignments) incorporated into the water balance model, estimated change (%) from Existing Conditions in average annual surface water flow are presented in Table 2-1. Estimated magnitude of surface water flow changes are provided in Appendix II.

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Table 2-1: Simulated Change in Surface Water Flow – Operations Phase

Watershed	Location	Percent Change from Existing Conditions (average annual surface water flow)			Influence
		Wet Climate Condition	Average Climate Condition	Dry Climate Condition	
Mollie River	Moore Lake	-7	-7	-7	Watershed Reconfiguration (TMF Development)
Mollie River	Chain Lake	-3	-3	-3	Upstream Watershed Reconfiguration
Mollie River	Attach Lake	-3	-3	-2	Upstream Watershed Reconfiguration
Mollie River	Ash Lake	0	0	0	n/a
Mollie River	Sawpeter Lake	-2	-2	-2	Watershed Reconfiguration (TMF Development)
Mollie River	Chester Lake	0	+1	-3	Upstream Watershed Reconfiguration
Mollie River	Little Clam Lake	-13	-16	-13	Watershed Reconfiguration (TMF Development)
Mollie River	Clam Lake	-11	-5	-7	Watershed Reconfiguration (TMF Development)
Mollie River	Weeduck Lake	0	0	-2	Watershed Reconfiguration (Processing Plant Development)
Mollie River	Three Duck Lakes (Upper)	+11	+10	+13	Connection to Realignment and Treated Effluent Outflow
Mollie River	Three Duck Lakes (Lower)	+6	+6	+9	Upstream Connection to Realignment and Treated Effluent Outflow
Mollie River	Delaney Lake	0	0	0	Watershed Reconfiguration (MRA Development)
Mollie River	Dividing Lake	+2	+2	+4	Upstream Connection to Realignment and Treated Effluent Outflow

Watershed	Location	Percent Change from Existing Conditions (average annual surface water flow)			Influence
		Wet Climate Condition	Average Climate Condition	Dry Climate Condition	
Mesomikenda Lake	Bagsverd Lake	-10	-10	-12	Watershed Reconfiguration (TMF Development)
Mesomikenda Lake	Schist Lake	+1	0	+1	Watershed Reconfiguration (TMF Development)
Mesomikenda Lake	Bagsverd Creek Outflow	-5	-5	-6	Upstream Watershed Reconfiguration
Mesomikenda Lake	Mesomikenda Lake	-1	-1	-1	Upstream Watershed Reconfiguration

Changes in surface water flow were influenced primarily by two factors; i) the reconfiguration (addition or removal) of watershed area through the development of realignment channels, realignment dams and/or infrastructure (e.g., TMF, MRA, open pit) footprints and/or ii) the connection of waterways to realignment channels and treated effluent discharge from the Polishing Pond.

For each climate scenario, the predicted change to average annual surface water flow was typically less than 10% through the Project site watersheds. Estimated decreases in surface water flow of greater than 10% were typically associated with localized change to project infrastructure footprints (e.g., Little Clam Lake, Bagsverd Lake and Clam Lake). Increases to surface water flow through the Three Duck Lakes system (up to 13%) was primarily due to treated effluent discharge.

For the Operations Phase, predicted change to annual average surface water flow was less than 5% by the flow outlets of the LSA at Mesomikenda Lake and Dividing Lake.

2.7 Post-Closure Stage I Phase

At the Post-closure Stage I Phase, realignment features remain in place and water level in the Côté open pit will rise in response to precipitation inputs, runoff, groundwater inflow and active pumping of the MRA, TMF and various seepage collection ponds. The end of the Post-closure Stage I Phase is roughly delineated by the completion of the filling of the Côté open pit. During this phase, no treated effluent is planned to be discharged to upper basin of Three Duck Lakes.

2.7.1 Surface Water Flow

With the incorporation of the planned water management concepts (for on-site water management and watercourse realignments) incorporated into the water balance model, estimated change (%) from Existing Conditions in average annual surface water flow are presented in Table 2-2. Predicted magnitude change of annual average discharge estimates are provided in Attachment I.

Table 2-2: Simulated Change in Surface Water Flow – Post-Closure Stage I Phase

Watershed	Location	Percent Change from Existing Conditions			Influence
		Wet Climate Condition	Average Climate Condition	Dry Climate Condition	
Mollie River	Moore Lake	-7	-7	-7	Watershed Reconfiguration (TMF Development)
Mollie River	Chain Lake	-3	-3	-3	Upstream Watershed Reconfiguration
Mollie River	Attach Lake	-3	-3	-2	Upstream Watershed Reconfiguration
Mollie River	Ash Lake	0	0	0	n/a
Mollie River	Sawpeter Lake	-2	-2	-2	Watershed Reconfiguration (TMF Development)
Mollie River	Chester Lake	+6	+5	+2	Upstream Watershed Reconfiguration
Mollie River	Little Clam Lake	-13	-16	-13	Watershed Reconfiguration (TMF Development)
Mollie River	Clam Lake	+14	+8	+18	Watershed Reconfiguration (TMF Development)
Mollie River	Weeduck Lake	0	0	-2	Watershed Reconfiguration (Processing Plant Development)
Mollie River	Three Duck Lakes (Upper)	-13	-14	-15	Connection to Realignment and Decommissioned Treated Effluent Outflow
Mollie River	Three Duck Lakes (Lower)	-14	-14	-14	Upstream Connection to Realignment and Decommissioned Treated Effluent Outflow
Mollie River	Delaney Lake	-1	-1	-1	Watershed Reconfiguration (MRA Development)
Mollie River	Dividing Lake	-10	-11	-11	Upstream Connection to Realignment and Decommissioned Treated Effluent Outflow

Watershed	Location	Percent Change from Existing Conditions			Influence
		Wet Climate Condition	Average Climate Condition	Dry Climate Condition	
Mesomikenda Lake	Bagsverd Lake	-9	-9	-11	Watershed Reconfiguration (TMF Development)
Mesomikenda Lake	Schist Lake	+1	+1	+1	Watershed Reconfiguration (TMF Development)
Mesomikenda Lake	Bagsverd Creek Outflow	-4	-5	-5	Upstream Watershed Reconfiguration
Mesomikenda Lake	Mesomikenda Lake	-1	-1	-1	Upstream Watershed Reconfiguration

In general, changes to surface water flow for the Post-closure Stage I Phase were predicted to be similar to the operations phase, a result of the realignment features remaining in place and active management of the MRA collection ponds to flood the open pit. Surface water flow decreases of up to 15% were predicted through the Three Duck Lakes, a result of the cessation of effluent discharge in the upper basin while the open pit is filling.

2.8 Post-Closure Phase

In the Post-closure Stage II Phase, water level will have recovered in the Côté Pit to an elevation sufficient to cause overflow (and reconnection) of the Pit Lake to the upper basin of Three Duck Lakes. With acceptable water quality, the various collection ponds will overflow to local surface water bodies and no active pumping is planned to occur on the site. The decommissioning of the realignment features will result in watersheds that more closely resemble those of existing conditions.

2.8.1 Surface Water Flow

Estimated average annual surface water flow changes in the Post-closure Stage II Phase from Existing Conditions are presented in Table 2-3. Predicted magnitude change of annual average surface water flow are provided in Appendix II.

Table 2-3: Simulated Change in Surface Water Flow – Post-Closure Stage II Phase

Watershed	Location	Percent Change from Existing Conditions (average annual surface water flow)			Influence
		Wet Climate Condition	Average Climate Condition	Dry Climate Condition	
Mollie River	Moore Lake	-7	-7	-7	Watershed Reconfiguration (TMF Development)
Mollie River	Chain Lake	-3	-3	-3	Upstream Watershed Reconfiguration
Mollie River	Attach Lake	-3	-3	-2	Upstream Watershed Reconfiguration
Mollie River	Ash Lake	0	0	0	n/a
Mollie River	Sawpeter Lake	-2	-2	-2	Watershed Reconfiguration (TMF Development)
Mollie River	Chester Lake	-2	-2	-1	Upstream Watershed Reconfiguration
Mollie River	Little Clam Lake	-13	-12	-13	Watershed Reconfiguration (TMF Development)
Mollie River	Clam Lake	+10	+5	+13	Watershed Reconfiguration (TMF Development)
Mollie River	Weeduck Lake	0	0	-2	Watershed Reconfiguration (Processing Plant Development)
Mollie River	Three Duck Lakes (Upper)	+5	+4	+5	Connection to Cote Lake Outflow
Mollie River	Three Duck Lakes (Lower)	+3	+3	+5	Connection to Cote Lake Outflow
Mollie River	Delaney Lake	0	0	0	Watershed Reconfiguration (MRA Development)
Mollie River	Dividing Lake	+3	+3	+4	Upstream Connection to Realignment and Treated Effluent Outflow
Mesomikenda Lake	Bagsverd Lake	-5	-5	-6	Watershed Reconfiguration (TMF Development)

Watershed	Location	Percent Change from Existing Conditions (average annual surface water flow)			Influence
Mesomikenda Lake	Schist Lake	+1	+1	+1	Watershed Reconfiguration (TMF Development)
Mesomikenda Lake	Bagsverd Creek Outflow	-2	-3	-3	Upstream Watershed Reconfiguration
Mesomikenda Lake	Mesomikenda Lake	0	0	0	Upstream Watershed Reconfiguration

For the simulated climate conditions, surface water flow changes in Post-closure were estimated to be 10% or less compared to Existing Conditions, suggesting a long-term return to the natural flow regime at the Project site. Greater than 10% surface water flow changes are predicted at Clam Lake and Little Clam Lake, and are a result of watershed area change and seepage at the rehabilitated TMF and rehabilitation and resulting runoff from the rehabilitated Overburden Stockpile area.

2.9 Other Predicted Effects

While not considered as an EA indicator, an estimate of the time to flood the Côté open pit was completed. This provided an approximate timeline for the period between the Post-closure Stage I Phase and the Post-closure Stage II Phase.

The assessment considered runoff to, and precipitation on, the open pit as well as groundwater inflow and is strongly influenced by the water management strategy to pump collection ponds at the MRA, TMF and other collection facilities to the open pit. With these water budget components considered, the open pit will flood in approximately 25 years.

3.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

The prediction of surface water flow effects was completed based on several inherent mitigation measures that have been included in the design of the Project. These include:

- Engineered facilities will be constructed to store mine rock (MRA), ore and tailings (TMF).
- Engineered water management systems will be constructed to collect runoff and seepage from the MRA, ore stockpiles, TMF, and Overburden Stockpile during the Operations Phase and the Post-closure Stage I Phase.
- Engineered realignment channels will be constructed to convey the range of flows that can be reasonably expected over the projected life of mine or life of realignment feature as applicable.
- Erosion and sediment control measures will be constructed to promote settling of sediments and mitigate the migration of suspended solids into nearby surface water features.

Table 3-1 provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA.

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Table 3-1: Mitigation Measures – Hydrology and Climate

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Hydrology and Climate	Operations through to post-closure	Realignment of surface water flows.	Realignment channels and dams.	Realignment channels and dams will be designed to convey the range of flows and water levels reasonably expected over the Project life. Realignment dams will be constructed to allow excavation of the open pit and construction of the TMF.	*Lakes and Rivers Improvement Act*, (LRIA), *Fisheries Act, Navigation Protection Act*	The mitigation measure has not changed from the EA.

4.0 MANAGEMENT

Table 4-1 below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA.

In instances where measures are no longer applicable, they have been removed with reasons provided.

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Table 4-1: Monitoring Measures – Hydrology and Climate

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrology and Climate	Surface water level (lakes and streams)	Automatic water level recorder (transducer) along with manual staff gauge measurements.	Good Industry Practice	Construction through closure phases. Water level transducers will be set to record on a half-hourly basis. Manual staff gauge measurements will occur quarterly and will be surveyed to a geodetic datum annually.	Selected existing locations*, additional new stations in waterways and realignments surrounding the infrastructure footprint.	The monitoring measure has not changed from the EA
Hydrology and Climate	Streamflow (lake outflows and streams)	Standard velocity-area stream current methodology.	Environment Canada (1981) Hydrometric Field Manual – Measurement of Streamflow	Construction through closure phases. Initially quarterly, frequency may be reduced as natural variability is addressed.	Selected existing locations*, additional new stations in waterways and realignments surrounding the infrastructure footprint.	The monitoring measure has not changed from the EA

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrology and Climate	Meteorological parameters including air temperature, relative humidity, wind speed, wind direction, solar radiation and total precipitation.	Meteorological sampling equipment located on 10 m tower.	Environment Canada (1992) Atmospheric Environment Service (AES) Guidelines for Co-operative Climatological Autostations	Construction through closure phases. Parameters will be recorded on an hourly-time interval, data downloaded quarterly.	Continue sampling at the current location.	The monitoring measure has not changed from the EA
Hydrology and Climate	Water usage from freshwater sources	Flow meter capable of recording instantaneous and total daily volume.	Ontario *Water Resources Act* (Section 34)	Operations phase Daily	Mesomikenda Lake or other freshwater source.	The monitoring measure has not changed from the EA
Hydrology and Climate	Discharge to the environment	Flow meter or calibrated flow conveyance feature capable of providing instantaneous and total daily volume.	Ontario *Water Resources Act* (Section 53)	Operations phase Daily	Polishing pond outlet.	The monitoring measure has not changed from the EA
Hydrology and Climate	Water transfer	Flow meter capable of recording instantaneous and total daily volume.	Good Industry Practice	Operations phase Daily	MRA collection ponds, mine water pond, reclaim pond, polishing pond.	The monitoring measure has not changed from the EA

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrology and Climate	Reservoir Water Levels	Manual staff gauges or automatic water level sensors.	Good Industry Practice	Operations phase Monthly	MRA collection ponds, mine water pond, reclaim pond, polishing pond.	The monitoring measure has not changed from the EA
Hydrology and Climate	Environment Canada Mollie River Streamflow station	Desktop review using available records from Environment Canada.	Good Industry Practice	Construction through closure phases. Monthly review, annual summary.	Mollie River Streamflow gauging station.	The monitoring measure has not changed from the EA
Hydrology and Climate	Water Levels at Ontario Power Generation (OPG) Mesomikenda Lake Dam	Desktop review using available records from OPG.	Good Industry Practice	Construction through closure phases. Annual review and summary.	Mesomikenda Lake dam	The monitoring measure has not changed from the EA

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Hydrology and Climate	In-stream Characteristics	Water samples for total suspended solids will be manually sampled and submitted for laboratory analysis. Measurement of stream cross sections for channel geometry. Installation of erosion pin in stream bank and disturbance rods in streambed for sediment erosion / accumulation. Aerial or photographic analysis to assess stream meander.	Good Industry Practice	Construction to closure phases. Twice annually, during the spring melt and low flow conditions, to be initiated prior to realignment construction.	Reach of Bagsverd Creek downstream of Un-named Lake #1 and upstream of Neville Lake.	Monitoring measure no longer applicable. Potential effects on Bagsverd Creek mitigated by project footprint reconfiguration.

* Existing locations may require upgrades or improvements for long term monitoring

5.0 CONCLUSION

The Project will potentially affect the hydrological environment principally through the: construction of the excavation of an open pit mine and the development of the waste and material storage areas. These changes to watershed areas will be partially offset by the construction of realignment channels that are intended to maintain flow paths and flow magnitudes similar to those currently observed.

The revised hydrological modelling has simulated wet, dry and average climate conditions and has incorporated the revised Project footprint over the course of the Operations and Post-Closure phases of the project. The magnitude of surface water flow change for each of the project phases was typically less than 10% change from existing flows, and limited in spatial extent.

Mitigation measures and management through monitoring of water usage will further confirm the ongoing stability of the hydrological system as the Project advances.

6.0 REFERENCES

Golder Associates (Golder) 2014. Côté Gold Project, Environmental Assessment Report, Technical Support Document: Hydrology Version R2, Project: 13-1192-0021.

7.0 GLOSSARY AND ABBREVIATIONS

EA	Environmental Assessment
EER	Environmental Effects Review
ha	hectare
km	kilometre
LSA	Local Study Area
m	metre
mm	millimetre
MNR	Ministry of Natural Resources
MRA	Mine Rock Areas
RSA	Regional Study Area
TMF	Tailings Management Facility
°C	degrees Celsius

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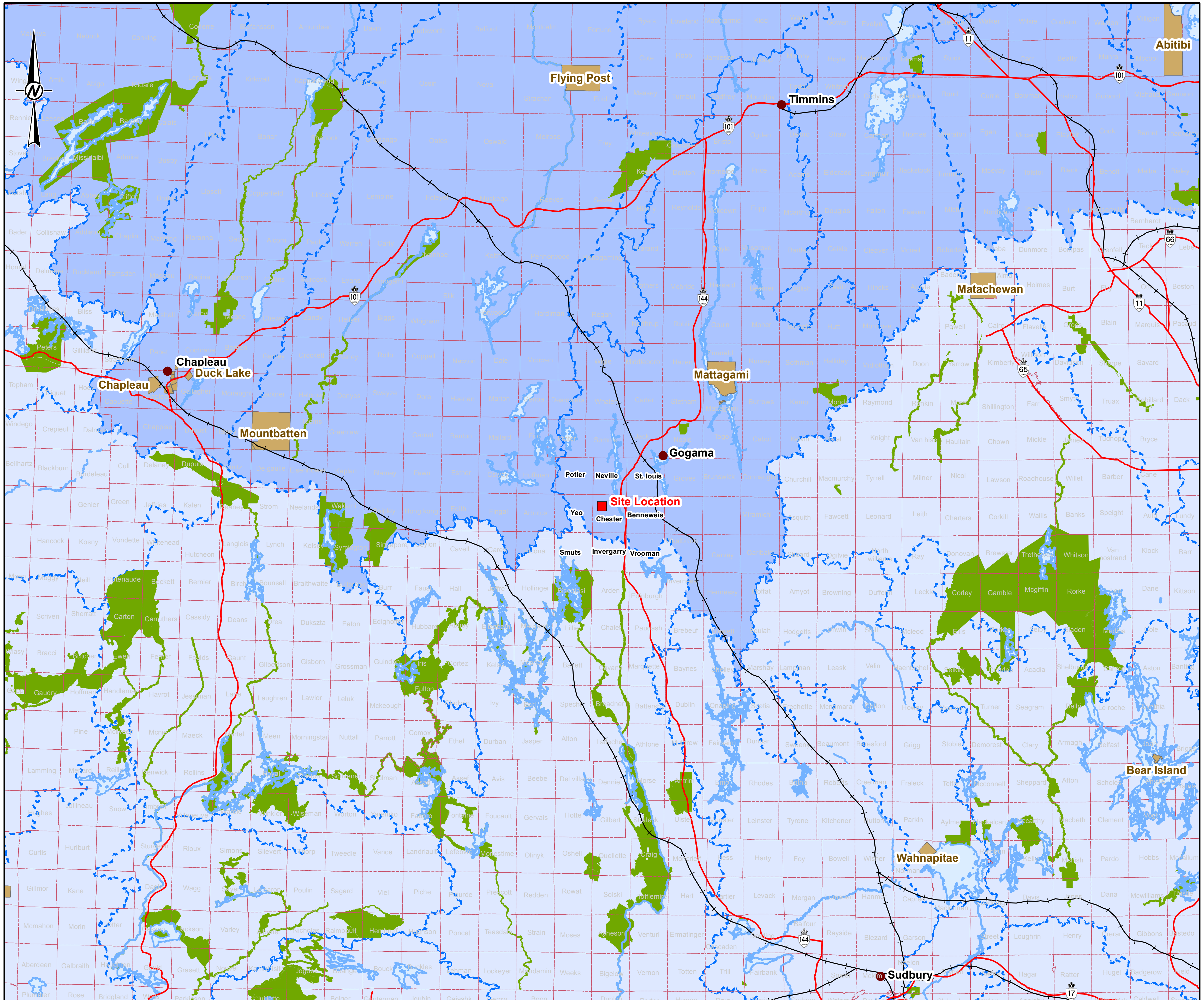
FIGURES

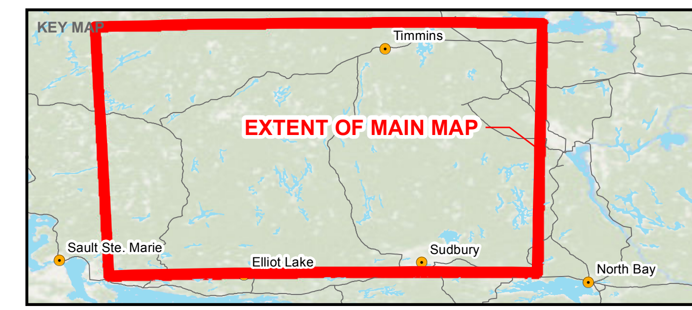


LEGEND

- Site Location
- Major Roads
- Railway
- Community
- First Nations Community
- Townships
- Provincial Park
- Waterbody

Primary Watersheds

- Hudson Bay
- Great Lakes



NOTES

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CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTÉ GOLD PROJECT

TITLE
PROJECT LOCATION

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-04
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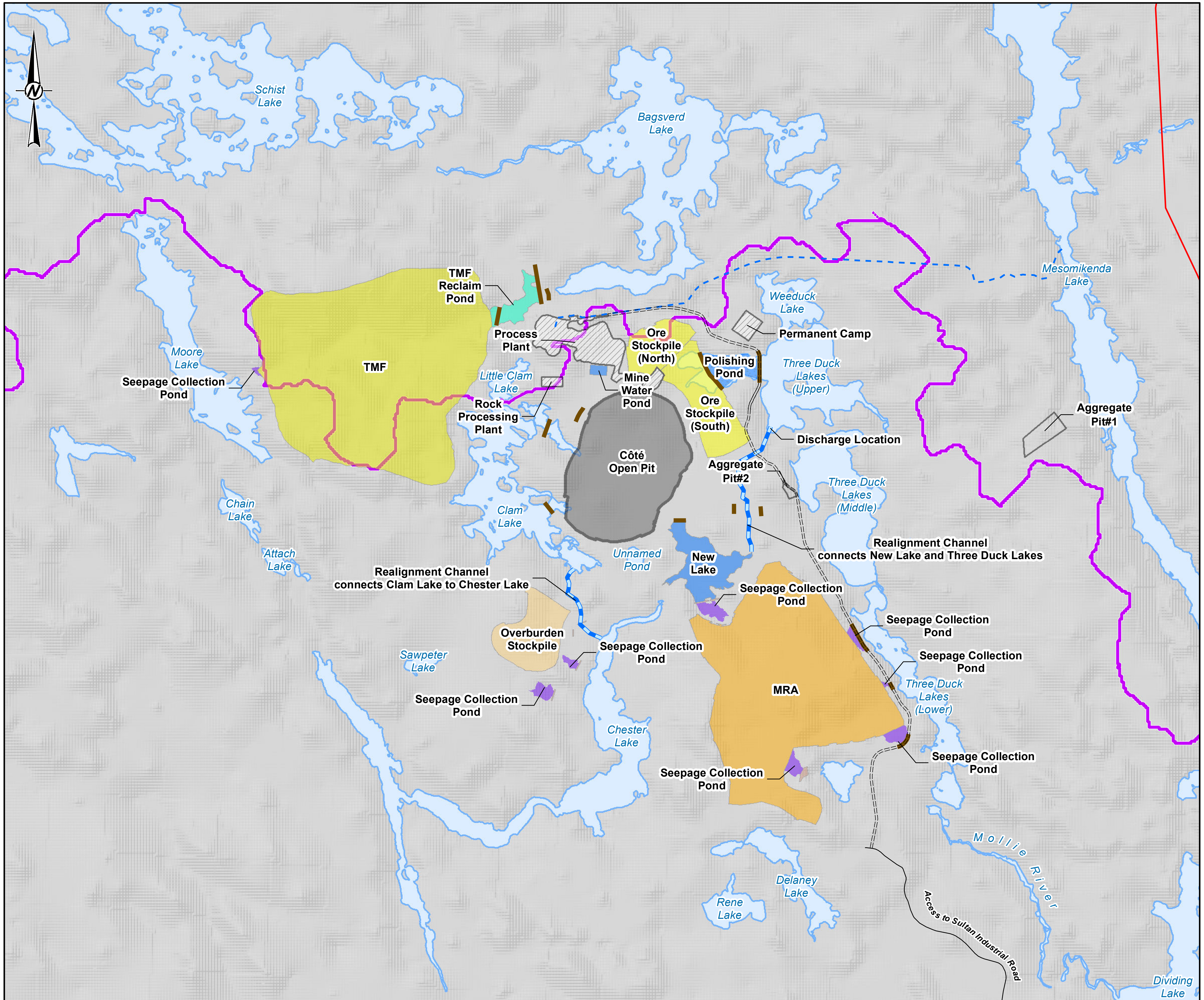

LEGEND

- Major Roads
- Roads
- Main Access Road
- Mollie River Watershed
- Waterbodies

Proposed Infrastructure

- Aggregate Pit
- Dam
- Infrastructure
- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Seepage Collection Pond
- Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Water
- Dam
- Fresh Water Pipeline
- Realignment Channel

NOTES

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PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTÉ GOLD PROJECT

TITLE
SITE PLAN

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-04
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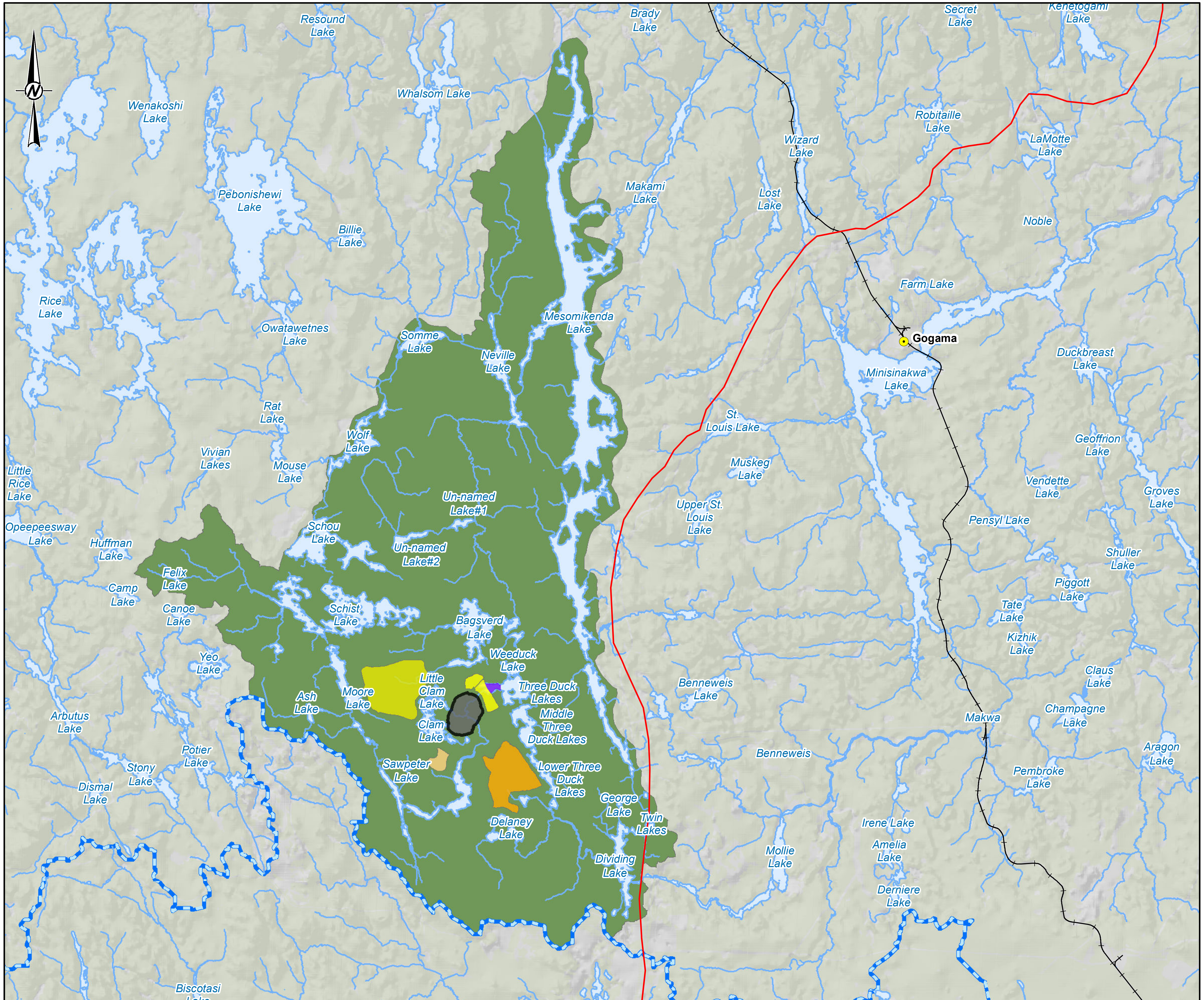

LEGEND

- Regional Communities
- Major Roads
- Railway
- Waterbodies
- Hydrogeology Local Study Area (LSA)
- Great Lakes / James Bay Watershed Divide

Proposed Infracture

- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)

NOTES

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PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTÉ GOLD PROJECT

TITLE
HYDROLOGY LOCAL STUDY AREA

CONSULTANT
Golder Associates

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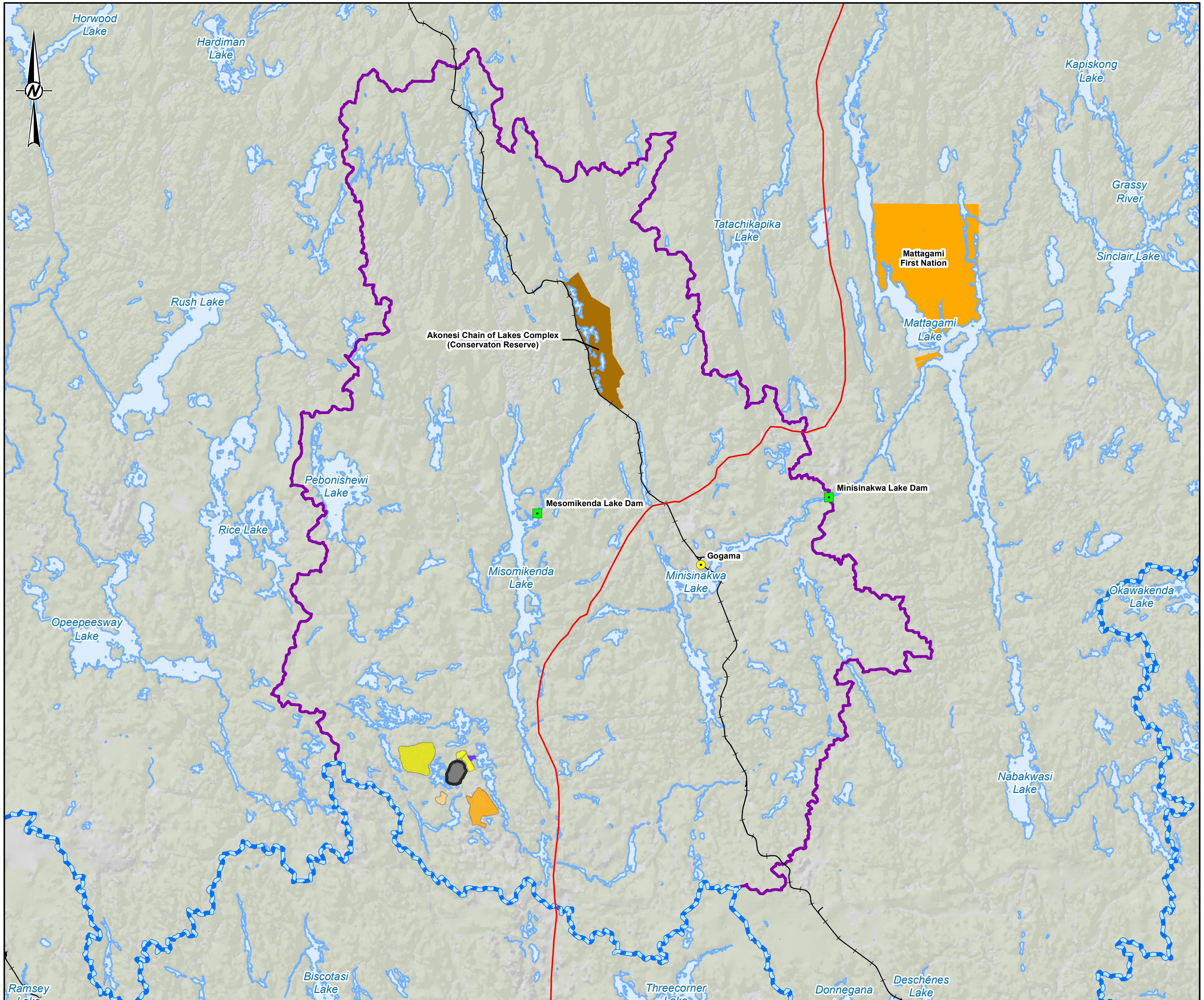

LEGEND

- Regional Communities
- First Nation Reserve
- Major Roads
- Railway
- Dams
- Conservation Reserve (Regulated)
- Waterbodies
- Great Lakes / James Bay Watershed Divide

Proposed Infrastructure

- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)

NOTES

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REFERENCE

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COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

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METRES
SCALE 1:260,000

DRAFT

CLIENT
IAMGOLD CORPORATION

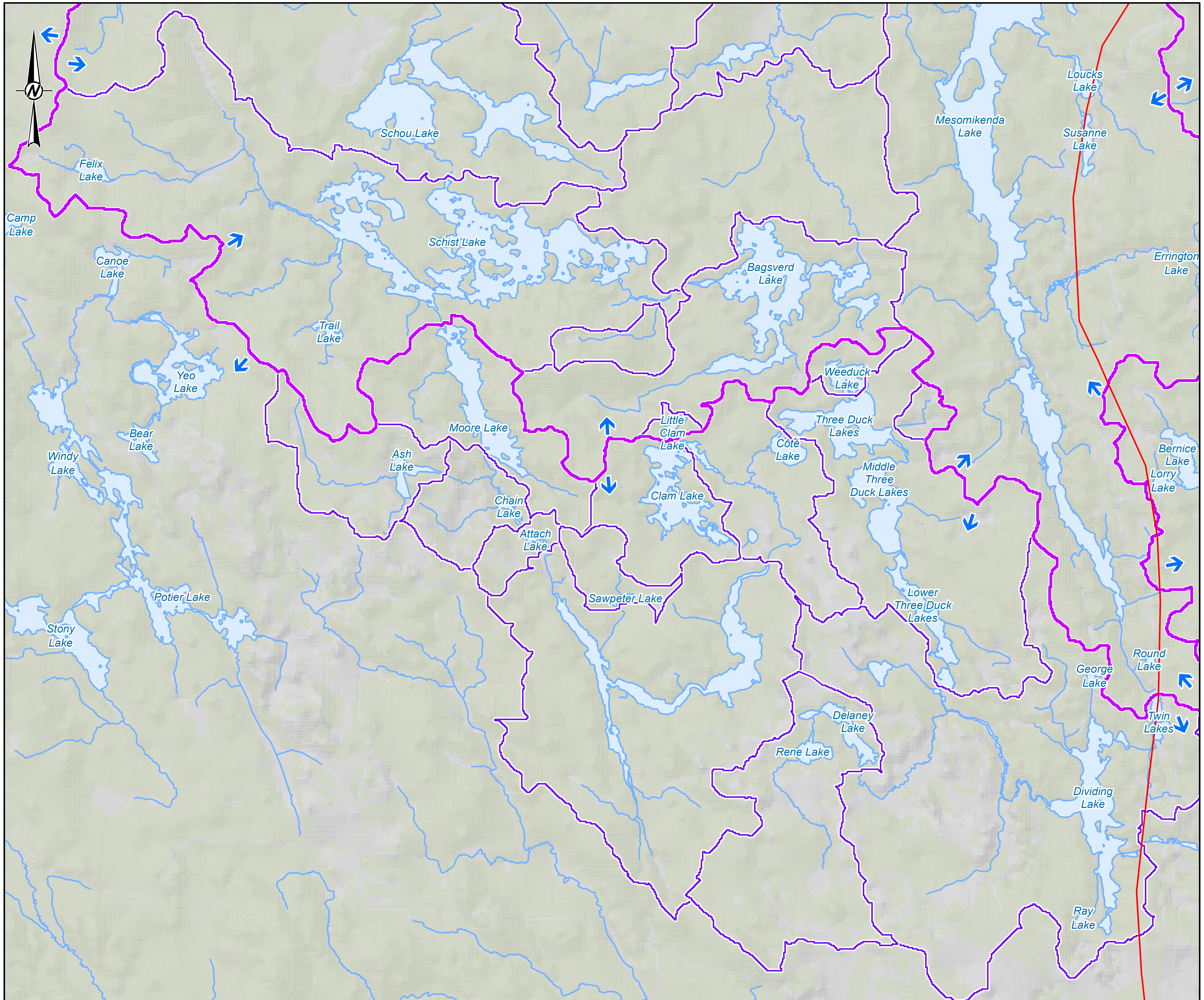
PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTÉ GOLD PROJECT

TITLE
HYDROLOGY REGIONAL STUDY AREA

CONSULTANT

YYYY-MM-DD	2018-01-04
PREPARED	RRD
DESIGN	--
REVIEW	SF
APPROVED	SK

PROJECT No.	CONTROL	Rev.	FIGURE
1789673	0003	A	2-2



LEGEND

- Major Roads
- Waterbodies
- Waterflow Direction
- Existing Watersheds

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1789673/1000

REFERENCE

BASE DATA - ATLAS OF CANADA,
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HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

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METRES

SCALE 1:65,000

DRAFT

CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTÉ GOLD PROJECT

TITLE
EXISTING WATERSHEDS

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-05
PREPARED	RRD
DESIGN	--
REVIEW	SF
APPROVED	SK

PROJECT No.	CONTROL	Rev.	FIGURE
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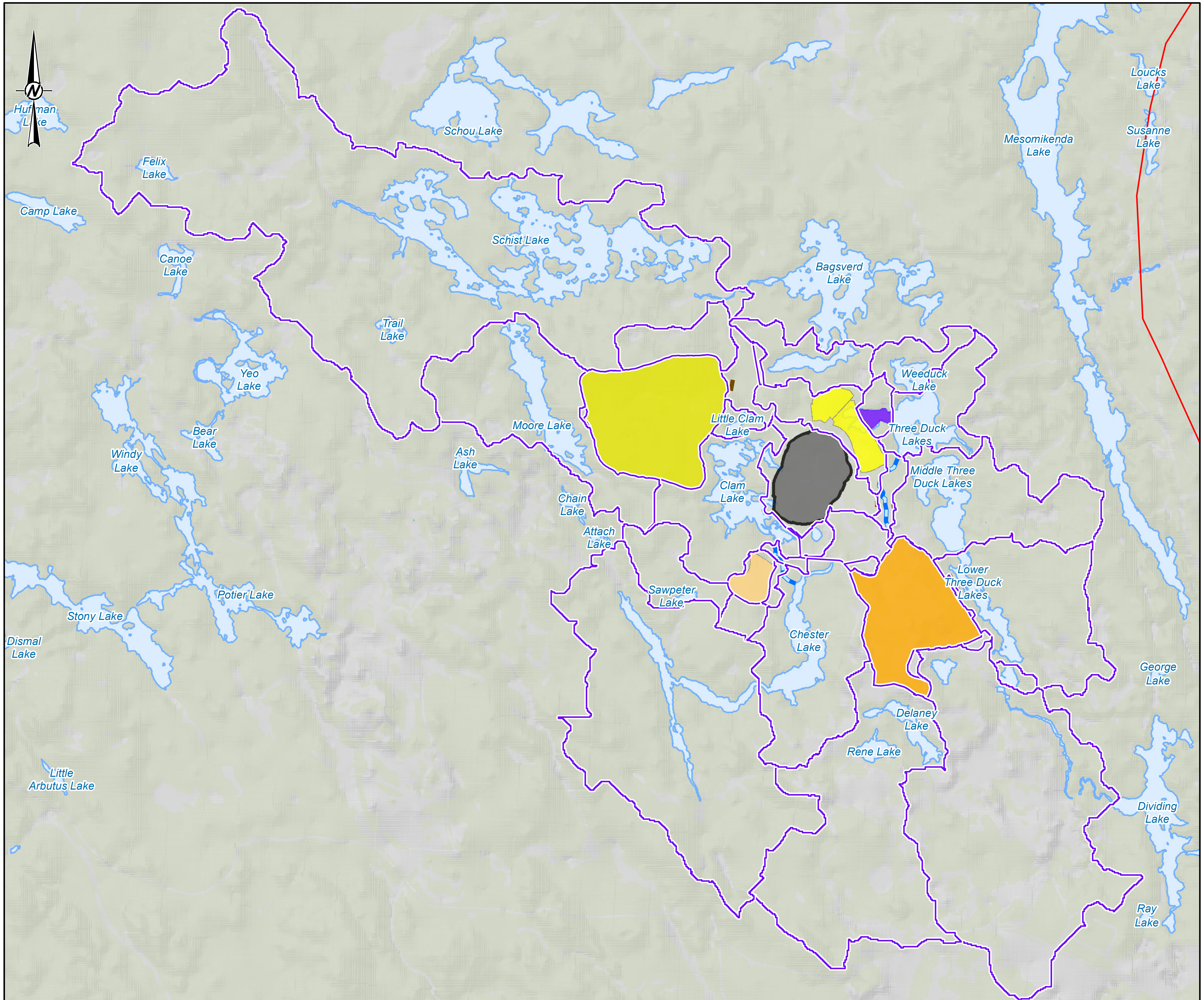

LEGEND

- Major Roads
- Waterbody
- Operational Phase Watersheds

Proposed Infrastructure

- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)
- Realignment Channel
- Dam

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1789673/1000

REFERENCE

BASE DATA - ATLAS OF CANADA,
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HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

0 650 1,300 2,600
METRES
SCALE 1:65,000

DRAFT

CLIENT
IAMGOLD CORPORATION

PROJECT
ENVIRONMENTAL EFFECTS REVIEW - HYDROLOGY
CÔTE GOLD PROJECT

TITLE
OPERATIONAL PHASE WATERSHEDS

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-01-05
PREPARED	RRD
DESIGN	--
REVIEW	SF
APPROVED	SK

PROJECT No.	CONTROL	Rev.	FIGURE
1789673	0003	A	2-4

IAMGOLD

APPENDIX I
EXECUTIVE SUMMARY

IAMGOLD Corporation (IAMGOLD) intends to develop and operate an open pit gold mine and associated facilities and infrastructure in northern Ontario approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury; this mining project is referred to as the Côté Gold Project (the Project). The landscape is characterized with an extensive tree cover and subdued topography, and is dominated by numerous lakes, streams and wetlands along with extensive bedrock outcrops; typical of northern Ontario. The area has experienced limited historical mining and current activities include forestry, mine exploration and some recreational activities.

Golder Associates completed a technical study in 2013 & 2014 of the potential hydrological and climate effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). In order to directly compare potential changes to the hydrological system to the EA, the climate, lake and river information as previously reported was not substantially altered to those inputs and assumptions as described in the Project EA Report Technical Document: Hydrology (Golder 2013).

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an EER. This Memorandum outlines the updates to the hydrology and climate predictions related to the optimization of the Project which incorporates the revised footprint of the Project and to compare and contrast the previous effects assessment on the water quantity in the subject watersheds. Changes to the conceptual and numerical model of the hydrological system were limited to:

- Additions of watersheds where infrastructure footprints overprinted new areas.
- Revisions to existing and/or addition of watersheds to accommodate changes to infrastructure footprints such as the Open Pit, Tailings Management Facility (TMF), Mine Rock Area (MRA), ore and overburden Stockpiles, and the ore processing plant.
- Revisions to surface water flow pathways to account for changes in the channel re-alignment strategy.
- Revisions to operational (process and site) water flow rates and directions.
- Revisions to closure concepts.

The effects assessment indicator for this discipline was selected as change in surface water flow. The potential change in surface water flow was predicted through the modification of the previously developed GoldSim hydrological model.

The hydrology Local Study Area (LSA) was defined by lakes and watersheds in the vicinity and downstream of the Project infrastructure. The LSA for hydrology is bound by the following features:

- The Great Lakes/James Bay watershed divide along the south.
- The Moore Lake and Schist lake watershed divides to the west.

- Mesomikenda Lake to the east.
- The Somme River system to the north and northwest.

The Regional Study Area (RSA) for hydrology extended the LSA boundary to the downstream confluence of the Mollie River and the Mesomikenda Lake outflow.

Hydrological modelling has been updated and revised to assess the potential change to surface water flow as a result of the project during Operations, Closure and Post-Closure. These simulated surface water flows were compared to the existing conditions at the Project site for an average, wet and dry year.

In general, the potential changes to surface water flows were influenced by two factors; i) the reconfiguration (addition or removal) of watershed area through the development of realignment channels, realignment dams and/or infrastructure footprints such as the Tailings Management Facility and/or ii) the connection of waterways to realignment channels and treated effluent discharge from the Polishing Pond.

Annual changes to surface water flow were simulated to be generally in the 5 to 10% range during Operations, Closure and Post-closure; with up to ±16% change in limited hydrological extent, such as cases where watershed reconfiguration at headwater lakes occurred or process water inflows are planned.

Several inherent mitigation measures have been included in the design of the Project, and have been considered in the prediction of effects. Further, monitoring and management measures have been developed to continue the collection of data required to assess changes in groundwater levels prior to and during Project implementation (i.e., Construction, Operations, Closure and Post-closure).

IAMGOLD

APPENDIX II
SIMULATED SURFACE WATER FLOW CHANGE
HYDROLOGICAL MODEL OUTPUT

SUMMARY OUTPUT - CÔTÉ GOLD - OPERATIONS PHASE					
AVERAGE YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Operations Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	4,730	4,420	-7	n/a
Mollie River	Chain Lake	9,910	9,580	-3	n/a
Mollie River	Attach Lake	10,800	10,480	-3	n/a
Mollie River	Ash Lake	3,190	3,190	0	n/a
Mollie River	Sawpeter Lake	1,230	1,200	-2	n/a
Mollie River	Chester Lake	29,910	30,310	1	-2
Mollie River	Little Clam Lake	250	210	-16	>100
Mollie River	Clam Lake	3,420	3,240	-5	>100
Mollie River	Weeduck Lake	770	770	0	>100
Mollie River	Three Duck Lake (Upper)	40,920	45,110	10	n/a
Mollie River	Three Duck Lakes (Lower)	48,590	51,650	6	-4
Mollie River	Delaney Lake	7,590	7,540	-1	0
Mollie River	Dividing Lake	78,480	80,160	2	-4
Mesomikenda	Bagsverd Lake	34,360	30,960	-10	-13
Mesomikenda	Schist Lake	23,750	23,860	0	0
Mesomikenda	Bagsverd Creek	68,800	65,390	-5	-20
Mesomikenda	Mesomikenda Lake	500,870	497,690	-1	-2
n/a indicates location not previously assessed due to site configuration					
WET YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Operations Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	5,560	5,150	-7	n/a
Mollie River	Chain Lake	12,080	11,730	-3	n/a
Mollie River	Attach Lake	13,230	12,890	-3	n/a
Mollie River	Ash Lake	3,900	3,900	0	n/a
Mollie River	Sawpeter Lake	1,520	1,490	-2	n/a
Mollie River	Chester Lake	37,750	37,930	0	-3
Mollie River	Little Clam Lake	320	280	-13	>100
Mollie River	Clam Lake	4,050	3,610	-11	>100
Mollie River	Weeduck Lake	810	810	0	>100
Mollie River	Three Duck Lake (Upper)	51,740	57,230	11	n/a
Mollie River	Three Duck Lakes (Lower)	62,130	65,780	6	-3
Mollie River	Delaney Lake	9,690	9,280	-4	0
Mollie River	Dividing Lake	101,270	102,800	2	-3
Mesomikenda	Bagsverd Lake	42,600	38,390	-10	-14
Mesomikenda	Schist Lake	28,560	28,760	1	0
Mesomikenda	Bagsverd Creek	85,830	81,640	-5	-19
Mesomikenda	Mesomikenda Lake	617,490	613,890	-1	-2
n/a indicates location not previously assessed due to site configuration					
DRY YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Operations Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	2,830	2,620	-7	n/a
Mollie River	Chain Lake	6,690	6,510	-3	n/a
Mollie River	Attach Lake	7,390	7,220	-2	n/a
Mollie River	Ash Lake	2,190	2,190	0	n/a
Mollie River	Sawpeter Lake	930	910	-2	n/a
Mollie River	Chester Lake	22,510	21,930	-3	-2
Mollie River	Little Clam Lake	160	140	-13	>100
Mollie River	Clam Lake	2,160	2,010	-7	>100
Mollie River	Weeduck Lake	470	460	-2	>100
Mollie River	Three Duck Lake (Upper)	30,010	33,800	13	n/a
Mollie River	Three Duck Lakes (Lower)	35,390	38,690	9	-2
Mollie River	Delaney Lake	5,690	5,570	-2	0
Mollie River	Dividing Lake	58,220	60,290	4	-3
Mesomikenda	Bagsverd Lake	22,950	20,140	-12	-16
Mesomikenda	Schist Lake	15,350	15,490	1	0
Mesomikenda	Bagsverd Creek	49,530	46,750	-6	-21
Mesomikenda	Mesomikenda Lake	360,850	358,590	-1	-3
n/a indicates location not previously assessed due to site configuration					

SUMMARY OUTPUT - CÔTÉ GOLD - CLOSURE PHASE					
AVERAGE YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	4,730	4,420	-7	n/a
Mollie River	Chain Lake	9,910	9,580	-3	n/a
Mollie River	Attach Lake	10,800	10,480	-3	n/a
Mollie River	Ash Lake	3,190	3,190	0	n/a
Mollie River	Sawpeter Lake	1,230	1,200	-2	n/a
Mollie River	Chester Lake	29,910	31,410	5	-2
Mollie River	Little Clam Lake	250	210	-16	>100
Mollie River	Clam Lake	3,420	3,680	8	>100
Mollie River	Weeduck Lake	770	770	0	>100
Mollie River	Three Duck Lake (Upper)	40,920	35,250	-14	n/a
Mollie River	Three Duck Lakes (Lower)	48,590	41,700	-14	-4
Mollie River	Delaney Lake	7,590	7,510	-1	0
Mollie River	Dividing Lake	78,480	70,170	-11	-4
Mesomikenda	Bagsverd Lake	34,360	31,230	-9	-13
Mesomikenda	Schist Lake	23,750	23,880	1	0
Mesomikenda	Bagsverd Creek	68,800	65,660	-5	-20
Mesomikenda	Mesomikenda Lake	500,870	497,890	-1	-2
n/a indicates location not previously assessed due to site configuration					

WET YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	5,560	5,150	-7	n/a
Mollie River	Chain Lake	12,080	11,730	-3	n/a
Mollie River	Attach Lake	13,230	12,890	-3	n/a
Mollie River	Ash Lake	3,900	3,900	0	n/a
Mollie River	Sawpeter Lake	1,520	1,490	-2	n/a
Mollie River	Chester Lake	37,750	39,890	6	-3
Mollie River	Little Clam Lake	320	280	-13	>100
Mollie River	Clam Lake	4,050	4,630	14	>100
Mollie River	Weeduck Lake	810	810	0	>100
Mollie River	Three Duck Lake (Upper)	51,740	45,010	-13	n/a
Mollie River	Three Duck Lakes (Lower)	62,130	53,490	-14	-3
Mollie River	Delaney Lake	9,690	9,240	-5	0
Mollie River	Dividing Lake	101,270	90,450	-11	-3
Mesomikenda	Bagsverd Lake	42,600	38,790	-9	-14
Mesomikenda	Schist Lake	28,560	28,760	1	0
Mesomikenda	Bagsverd Creek	85,830	82,040	-4	-19
Mesomikenda	Mesomikenda Lake	617,490	614,280	-1	-2
n/a indicates location not previously assessed due to site configuration					

DRY YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	2,830	2,620	-7	n/a
Mollie River	Chain Lake	6,690	6,510	-3	n/a
Mollie River	Attach Lake	7,390	7,220	-2	n/a
Mollie River	Ash Lake	2,190	2,190	0	n/a
Mollie River	Sawpeter Lake	930	910	-2	n/a
Mollie River	Chester Lake	22,510	23,040	2	-2
Mollie River	Little Clam Lake	160	140	-13	>100
Mollie River	Clam Lake	2,160	2,550	18	>100
Mollie River	Weeduck Lake	470	460	-2	>100
Mollie River	Three Duck Lake (Upper)	30,010	25,510	-15	n/a
Mollie River	Three Duck Lakes (Lower)	35,390	30,320	-14	-2
Mollie River	Delaney Lake	5,690	5,540	-3	0
Mollie River	Dividing Lake	58,220	51,890	-11	-3
Mesomikenda	Bagsverd Lake	22,950	20,360	-11	-16
Mesomikenda	Schist Lake	15,350	15,490	1	0
Mesomikenda	Bagsverd Creek	49,530	46,970	-5	-21
Mesomikenda	Mesomikenda Lake	360,850	358,790	-1	-3
n/a indicates location not previously assessed due to site configuration					

APPENDIX II
SIMULATED SURFACE WATER FLOW CHANGE

SUMMARY OUTPUT - CÔTÉ GOLD - POST CLOSURE PHASE					
AVERAGE YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Post Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	4,730	4,420	-7	n/a
Mollie River	Chain Lake	9,910	9,580	-3	n/a
Mollie River	Attach Lake	10,800	10,480	-3	n/a
Mollie River	Ash Lake	3,190	3,190	0	n/a
Mollie River	Sawpeter Lake	1,230	1,200	-2	n/a
Mollie River	Chester Lake	29,910	29,480	-1	-2
Mollie River	Little Clam Lake	250	220	-12	>100
Mollie River	Clam Lake	3,420	3,590	5	>100
Mollie River	Weeduck Lake	770	770	0	>100
Mollie River	Three Duck Lake (Upper)	40,920	42,750	4	n/a
Mollie River	Three Duck Lakes (Lower)	48,590	49,960	3	-4
Mollie River	Delaney Lake	7,590	7,560	0	0
Mollie River	Dividing Lake	78,480	80,520	3	-4
Mesomikenda	Bagsverd Lake	34,360	32,580	-5	-13
Mesomikenda	Schist Lake	23,750	23,880	1	0
Mesomikenda	Bagsverd Creek	68,800	67,020	-3	-20
Mesomikenda	Mesomikenda Lake	500,870	499,200	0	-2
n/a indicates location not previously assessed due to site configuration					
WET YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Post Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	5,560	5,150	-7	n/a
Mollie River	Chain Lake	12,080	11,730	-3	n/a
Mollie River	Attach Lake	13,230	12,890	-3	n/a
Mollie River	Ash Lake	3,900	3,900	0	n/a
Mollie River	Sawpeter Lake	1,520	1,490	-2	n/a
Mollie River	Chester Lake	37,750	37,090	-2	-3
Mollie River	Little Clam Lake	320	280	-13	>100
Mollie River	Clam Lake	4,050	4,440	10	>100
Mollie River	Weeduck Lake	810	810	0	>100
Mollie River	Three Duck Lake (Upper)	51,740	54,400	5	n/a
Mollie River	Three Duck Lakes (Lower)	62,130	64,030	3	-3
Mollie River	Delaney Lake	9,690	9,680	0	0
Mollie River	Dividing Lake	101,270	104,120	3	-3
Mesomikenda	Bagsverd Lake	42,600	40,460	-5	-14
Mesomikenda	Schist Lake	28,560	28,760	1	0
Mesomikenda	Bagsverd Creek	85,830	83,710	-2	-19
Mesomikenda	Mesomikenda Lake	617,490	615,950	0	-2
n/a indicates location not previously assessed due to site configuration					
DRY YEAR MODELLED SURFACE WATER FLOW					
		SURFACE WATER FLOW (average annual, m^3/day)			
Watershed	Waterbody Name	Existing Conditions	Post Closure Phase	Change (%)	Change (%, EA)
Mollie River	Moore Lake	2,830	2,620	-7	n/a
Mollie River	Chain Lake	6,690	6,510	-3	n/a
Mollie River	Attach Lake	7,390	7,220	-2	n/a
Mollie River	Ash Lake	2,190	2,190	0	n/a
Mollie River	Sawpeter Lake	930	910	-2	n/a
Mollie River	Chester Lake	22,510	22,260	-1	-2
Mollie River	Little Clam Lake	160	140	-13	>100
Mollie River	Clam Lake	2,160	2,450	13	>100
Mollie River	Weeduck Lake	470	460	-2	>100
Mollie River	Three Duck Lake (Upper)	30,010	31,600	5	n/a
Mollie River	Three Duck Lakes (Lower)	35,390	37,070	5	-2
Mollie River	Delaney Lake	5,690	5,670	0	0
Mollie River	Dividing Lake	58,220	60,520	4	-3
Mesomikenda	Bagsverd Lake	22,950	21,500	-6	-16
Mesomikenda	Schist Lake	15,350	15,490	1	0
Mesomikenda	Bagsverd Creek	49,530	48,110	-3	-21
Mesomikenda	Mesomikenda Lake	360,850	359,840	0	-3
n/a indicates location not previously assessed due to site configuration					

IAMGOLD

B-6: Updated Technical Memorandum: Water Quality

Memorandum

To:	Steve Woolfenden	**From:**	Natalie Korczak and Mike Gunsinger
Company:	IAMGOLD Corporation		Golder Associates
cc:	Karen Besemann (Golder)	**Date:**	May 1, 2018 (revised September 10, 2018)
Subject:	**CÔTÉ GOLD PROJECT ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: WATER QUALITY		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment (EA) Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD are proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Golder Associates and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;

- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Water Quality

Golder Associates completed a technical study of the potential water quality effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an EER. This Updated Technical Memorandum presents the predicted water quality effects associated with the Project incorporating the revised project description. The predicted water quality effects are based on results simulated using modified versions of the EA water quality models, which have been updated to reflect the reconfigured Project. The Project Site location is shown on Figure 1-1, and the Project Site and layout is shown on Figure 1-2.

Modifications made to the water quality models to reflect the Project reconfiguration are as follows:

- Revisions to infrastructure footprints and layout, such as the open pit, Tailings Management Facility (TMF), mine rock area (MRA), ore stockpiles, discharge location and the processing plant.
- Revisions to the mine plan, including mine rock and ore stockpile volumes.
- Addition of surface water features where infrastructure footprints extended into new areas of the watershed.
- Revisions to the baseline water quality inputs to reflect new or additional baseline data collected since the submission of the EA.
- Revisions to closure concepts.
- Incorporation of the updated water balance for each of the Project phases modelled as part of the water quality effects review.

Modifications to the water balance models, which were incorporated into the water quality models, are described in the Updated Hydrology and Climate Technical Memorandum.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The Local Study Area (LSA) includes an area beyond the location of the physical works and activities within which effects have the potential to occur as a result of the Project. For water quality, the LSA is defined by lakes and watersheds in the vicinity and downstream of the Project infrastructure. The LSA boundary encompasses the lakes that are included as part of the water quality baseline and prediction of potential effects. As the water quality predictions are dependent on the flow of water, the Water Quality LSA is coincident with the Hydrology LSA. The water quality LSA is shown on Figure 2-1.

The LSA extends to the nearest watershed boundary beyond the proposed infrastructure, open pit, MRA and TMF. Due to the revised location of the TMF, the western boundary of the LSA was extended westward relative to the LSA presented in the EA. The LSA is bound by the following features:

- The Great Lakes / James Bay watershed divide along the south.
- The Moore Lake and Schist lake watershed divides to the west.
- Mesomikenda Lake to the east.
- The Somme River system to the north and northwest.

Consistent with the EA, regional effects to water quality are considered to be immaterial and a Regional Study Area (RSA) has not been defined for the water quality component of the EER.

2.2 Temporal Boundaries

The temporal boundaries of the EER remain as those provided in the EA, and will span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed compared to the EA. The following effects assessment indicator was used in the EA and is still valid:

- Change in surface water quality.

For the purposes of the effects predictions for the water quality in the surface water receivers, the simulated concentrations of the above listed parameters are compared to the upper limit of existing conditions (95th percentile baseline concentrations). It should be noted that the 95th percentile baseline concentrations were updated to reflect the additional baseline data collected since submission of the EA.

The criteria used in the EER for the purposes of evaluating the water quality model results are the same Water Quality Guidelines that were used in the EA.

2.4 Prediction of Effects

The water quality effects predictions were completed using a modified GoldSim water quality model to estimate the water quality at key site components and potential changes to the water quality of the receiving and downstream environments. The approach to the modelled prediction of effects along with climate scenarios is consistent with those applied in the EA.

Predicted effects on receiving environment surface water quality were modelled at the locations presented in Table 2-1. For each watershed, the locations on Table 2-1 below are ordered from upstream to downstream.

Table 2-1: Prediction of Water Quality Effects Locations.

Location	Rationale for Selection
Mollie River Watershed	
Moore Lake	Located adjacent to the TMF
Chester Lake	Located adjacent to the MRA, downstream of Moore Lake
Little Clam Lake	Located adjacent to the TMF
Clam Lake	Located adjacent to the TMF, downstream of Little Clam Lake
New Lake	Located adjacent to the MRA, downstream of Chester Lake (1)
Three Duck Lakes (upper)	Receiver of treated effluent (2), downstream of New Lake (1), downstream of Côté Pit Lake (3)
Three Duck Lakes (middle)	Located adjacent to the MRA, downstream of Three Duck Lakes (upper)
Three Duck Lakes (lower)	Located adjacent to the MRA, downstream of Three Duck Lake (middle)
Delaney Lake	Located adjacent to the MRA
Dividing Lake	Located downstream of Three Duck Lakes (lower) and Delaney Lake, most-downstream end of the Mollie River Watershed
Mesomikenda Lake Watershed	
Unnamed Lake #6 (Tributary to Schist Lake Outflow)	Located adjacent to the TMF
Bagsverd Lake (south)	Located adjacent to the TMF and Reclaim Pond
Bagsverd Lake	Located downstream of Schist Lake Mixed Outflow and Bagsverd Lake (south)
Neville Lake	Located downstream of Bagsverd Creek
Mesomikenda Lake (upper)	Located downstream of Neville Lake, most-downstream end of the

Location	Rationale for Selection
	Mesomikenda Lake Watershed

Notes:

(1) During Operations phase and Post-closure phase stage I only; during the Post-closure phase (stage II) the realignment features are decommissioned and New Lake is reverted to a river system.

(2) During Operations phase only.

(3) Downstream of Côté Pit Lake during Post-closure phase stage II only.

3.0 PREDICTION OF EFFECTS

Consistent with the EA, the prediction of water quality effects was completed for the Construction, Operations, Closure and Post-closure phases of the Project using a combination of qualitative analyses and numerical modelling. The effects predictions for the Construction phase were evaluated qualitatively, since the water quality concerns during this phase are largely related to earth works and the control of suspended sediment. A numerical model was used to estimate the water quality at key site components and potential changes to the quality of the receiving and downstream surface water environment during the Operations phase. These water quality model results were also conservatively applied to the Closure phase, as improvements to water quality due to closure work would be largely realized sometime after the start of the Closure phase. The models were also used to predict water quality effects during stage I and II of the Post-closure phase.

The predictions of potential effects for each Project phase, as determined by the qualitative analysis and numerical modelling, are presented in the following sections.

3.1 Construction Phase

During the Construction phase, the Project activities will consist of the development of site infrastructure and associated facilities prior to initiation of open pit mining. Project components, such as the MRA or TMF, are therefore not expected to be developed sufficiently to influence site water quality. However, a key water quality consideration related to construction is erosion and transport of suspended solids into the adjacent surface water features due to earthwork and other activities that will disturb soil. The implementation of Best Management Practices (BMPs) for the control of erosion and sediment transport during construction will consist of: contingency planning, monitoring, erosion control measures, runoff management, sediment control measures, and maintenance. The BMPs for erosion and sediment control are therefore expected to mitigate releases of suspended solids to the adjacent surface water bodies and to limit potential changes to total suspended solids concentrations. Examples of BMPs for erosion and sediment control are listed in Section 4.0.

The BMPs for sediment and erosion control will continue to be used during the Operations, Closure and Post-closure phases, as required. Overall, the water quality of the surface water receivers during the Construction phase is expected to remain within the range of concentrations observed under existing conditions.

3.2 Operations Phase

3.2.1 Mollie River Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mollie River Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mollie River Watershed during the Operations phase, the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mollie River Watershed, including Moore Lake, Clam Lake, Chester Lake, Three Duck Lakes, and Dividing Lake; the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (total), ammonia (un-ionized), antimony, barium, calcium, cobalt, molybdenum, nickel, nitrate, potassium, sodium, strontium, sulphate and vanadium.
- Concentrations of total and free cyanide are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in all lakes in the Mollie River Watershed except Delaney Lake, which does not receive (or is not downstream of a lake that receives) seepage that bypasses the TMF seepage collection system. The concentrations of free cyanide are less than the Water Quality Guideline.
- During average and 1:25-wet year conditions, model predictions suggest that concentrations of arsenic in Three Duck Lakes (upper) and Three Duck Lakes (middle) will occur at concentrations that are less than the Water Quality Guideline. However, during the 1:25-dry year conditions, concentrations of arsenic are predicted to be intermittently greater than the Water Quality Guideline (i.e., 6 months of the 1:25-dry year in Three Duck Lakes [upper] and 3 months of the 1:25-dry year in Three Duck Lakes [middle]). The maximum predicted monthly average arsenic concentrations in Three Duck Lakes (upper) (0.0071 mg/L) and Three Duck Lakes (middle) (0.0058 mg/L) are only slightly higher than the Water Quality Guideline of 0.005 mg/L. The concentrations of arsenic in Three Duck Lakes (lower) are less than the Water Quality Guideline under all three climate conditions. For clarity, the minimum and maximum monthly average arsenic concentrations in Three Duck Lakes (upper / middle / lower) under the three modelled climate conditions are summarized in Table 3-1.

Table 3-1: Predicted Monthly Average Arsenic Concentrations in Three Duck Lakes (Upper, Middle, and Lower Basins).

Climate Condition	Three Duck Lakes (Upper)		Three Duck Lakes (Middle)		Three Duck Lakes (Lower)	
	Minimum Monthly Average Arsenic (mg/L)	Maximum Monthly Average Arsenic (mg/L)	Minimum Monthly Average Arsenic (mg/L)	Maximum Monthly Average Arsenic (mg/L)	Minimum Monthly Average Arsenic (mg/L)	Maximum Monthly Average Arsenic (mg/L)
Average	0.0027	0.0043	0.0029	0.0042	0.0034	0.0037
1:25-year Wet	0.0026	0.0041	0.0028	0.0039	0.0033	0.0037
1:25-Year Dry	0.0035	**0.0071**	0.0038	**0.0058**	0.0037	0.0042

Notes:
Bold shading indicates a predicted concentration greater than the Water Quality Guideline of 0.005 mg/L, which, for the purposes of the EER, is a compilation of the most recent of the Provincial Water Quality Objectives or Canadian Water Quality Guidelines (for arsenic, the most recent guideline is the Canadian Water Quality Guideline).

- Concentrations of aluminum and iron are predicted to be intermittently or continuously greater than the Water Quality Guideline in most lakes in the Mollie River Watershed; noting that the 95th percentile baseline concentrations for these parameters are greater than Water Quality Guideline, and as such the predicted aluminum and iron concentrations in the lakes are less than the 95th percentile concentration.
- No other parameters that were modelled are predicted to be greater than the Water Quality Guidelines in the Mollie River Watershed.

3.2.2 Mesomikenda Lake Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mesomikenda Lake Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mesomikenda Lake Watershed during the Operations phase, the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mesomikenda Lake Watershed, including Bagsverd Lake, Neville Lake and Mesomikenda Lake (upper basin); the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (un-ionized), antimony, cobalt, cyanide (total), molybdenum, nickel, nitrate, sulphate and vanadium.
- Concentrations of total cyanide are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in all lakes in the Mesomikenda Lake Watershed (receiving or downstream of a lake that receives seepage that bypasses the

TMF seepage collection). The concentrations of free cyanide are less than the Water Quality Guideline.

- Concentrations of aluminum are predicted to be intermittently or continuously greater than the Water Quality Guideline in most lakes in the Mesomikenda Lake Watershed; noting that the 95th percentile baseline concentrations for aluminum is greater than Water Quality Guideline, and as such, the predicted aluminum concentrations in the lakes are less than the 95th percentile baseline concentration.
- No other parameters are predicted to occur at concentrations greater than the Water Quality Guidelines in the Mesomikenda Lake Watershed.

3.3 Closure Phase

The Closure phase will consist of decommissioning and rehabilitation works in accordance with the closure concept presented in the Project Description. Similar to the Construction phase, a key water quality consideration related to closure is erosion and transport of suspended solids into the adjacent surface water features due to earthworks and other activities that will disturb soil. BMPs for control of erosion and sediment transport will be implemented during closure. These BMPs will minimize the potential for erosion and mitigate any potential increases to total suspended solids in the surface water receivers.

For the purposes of the water quality effects predictions for the Closure phase, the water quality model results for the Operations phase were applied to the Closure phase. For the locations in the Mollie River watershed, applying the Operations phase model results for the Closure phase are conservative, as the treated effluent is no longer being discharged to the environment from the polishing pond. As the predicted effects to water quality dissipate, due to discharge of treated effluent, the water quality at the modelled locations in the Mollie River Watershed is expected to improve over time relative to the predictions for the Operations phase. For the locations in the Mesomikenda Lake Watershed, applying the operations model results are reasonable, as the sources of mass load during the Closure phase will not change considerably from operations.

3.4 Post-Closure Phase

3.4.1 Post-Closure Phase Stage I

The water quality model for the Operations phase was modified to model the Post-closure phase in accordance with the closure concept presented in the Project Description. During post-closure (stage I), realignment features remain in place and the water level in the open pit will rise in response to precipitation inputs, runoff, groundwater inflow and active pumping of the MRA, TMF and various seepage collection ponds. The end of the Post-closure phase (stage I) is roughly delineated by the completion of the filling of the open pit (approximately 25 years after closure as described in the Updated Hydrology Technical Memorandum).

3.4.1.1 Mollie River Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mollie River Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mollie River Watershed during the Post-closure phase (stage I), the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mollie River Watershed, including Moore Lake, Clam Lake, Chester Lake, Three Duck Lakes, and Dividing Lake; the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (total), ammonia (un-ionized), antimony, barium, calcium, cobalt, molybdenum, nickel, nitrate, potassium, sodium, strontium, sulphate and vanadium concentrations are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations.
- Concentrations of total and free cyanide are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mollie River Watershed that receive or are downstream of a lake in the that receives seepage that bypasses the TMF seepage collection; noting that it is assumed that seepage from the TMF will continue to contain cyanide during this Post-closure phase (stage I). The concentrations of free cyanide are less than the Water Quality Guideline.
- Concentrations of aluminum and iron are predicted to be intermittently or continuously greater than the Water Quality Guideline in most lakes in the Mollie River Watershed, noting that the 95th percentile baseline concentrations for these parameters are greater than Water Quality Guideline, and as such, the predicted aluminum and iron concentrations in the lakes are less than the 95th percentile baseline concentration. No other parameters are predicted to occur at concentrations greater than the Water Quality Guidelines in the Mollie River Watershed.

3.4.1.2 Mesomikenda Lake Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mesomikenda Lake Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mesomikenda Lake Watershed during the Post-closure phase (stage I), the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the

Mesomikenda Lake Watershed, including Bagsverd Lake, Neville Lake and Mesomikenda Lake (upper bas in); the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (un-ionized), antimony, cobalt, cyanide (total), molybdenum, nickel, nitrate, sulphate and vanadium concentrations are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations.

- Concentrations of total cyanide are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in all lakes in the Mesomikenda Lake Watershed that receive or are downstream of a lake that receives seepage that bypasses the TMF seepage collection; noting that it is assumed that seepage from the TMF will continue to contain cyanide during this Post-closure phase (stage I).
- Concentrations of aluminum are predicted to be intermittently or continuously greater than the Water Quality Guideline in most lakes in the Mesomikenda Lake Watershed, noting that the 95th percentile baseline concentration for aluminum is greater than Water Quality Guideline and as such, the predicted aluminum concentrations in the lakes are less than the 95th percentile baseline concentration.
- No other parameters are predicted to occur at concentrations greater than the Water Quality Guidelines in the Mesomikenda Lake Watershed.

3.4.2 Post-Closure Phase Stage II

The water quality model concept for the Post-closure phase stage II is based on modifications to the stage I model, which account for the changes to the Project site hydrology and rehabilitation measures. In the Post-closure phase (stage II), the water level will have recovered in the Côté Pit to an elevation sufficient to cause overflow (and reconnection) of the pit lake to the upper basin of Three Duck Lakes. The decommissioning of the realignment features will result in watersheds that more closely resemble those of existing conditions.

3.4.2.1 Mollie River Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mollie River Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mollie River Watershed during the Post-closure phase (stage II), the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mollie River Watershed, including Moore Lake, Clam Lake, Chester Lake, and Three Duck Lakes; the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (un-ionized), antimony, barium, cobalt, molybdenum, nickel, nitrate, potassium, sodium, sulphate and vanadium concentrations are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations.

- Concentrations of aluminum and iron are predicted to be intermittently or continuously greater than the Water Quality Guideline in most lakes in the Mollie River Watershed, noting that the 95th percentile baseline concentrations for these parameters are greater than Water Quality Guideline and as such, the predicted aluminum and iron concentrations in the lakes are less than the 95th percentile baseline concentration.
- No other parameters are predicted to occur at concentrations greater than the Water Quality Guidelines at any locations in the Mollie River Watershed.

3.4.2.2 Mesomikenda Lake Watershed

The minimum and maximum monthly average concentrations taken from the results of average, 1:25-year dry and 1:25-year wet conditions for the locations in the Mesomikenda Lake Watershed are compared to the 95th percentile baseline concentrations and Water Quality Guidelines in Appendix II.

Based on the predicted monthly average concentrations in the Mesomikenda Lake Watershed during the Post-closure phase (stage II), the key results are as follows:

- Concentrations of some parameters are predicted to be intermittently or continuously greater than the 95th percentile baseline concentrations in most lakes in the Mesomikenda Lake Watershed, including Bagsverd Lake, Neville Lake and Mesomikenda Lake (upper bas in); the parameters that are intermittently or continuously greater than the 95th percentile baseline concentrations include: ammonia (un-ionized), antimony, cobalt, molybdenum, nickel, nitrate, and vanadium.
- No other parameters are predicted to occur at concentrations greater than the Water Quality Guidelines in the Mesomikenda Lake Watershed.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

Table 4-1 provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA.

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Table 4-1: Mitigation Measures – Water Quality

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Construction through Post-closure	Discharge of total suspended solids due to soil erosion and transport of sediments from disturbed areas, and potential increases in total suspended solids concentrations within surface water receivers.	Best Management Practices (BMPs) and engineering designs to limit soil erosion and mobilization / transport of sediments from disturbed areas.	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 armouring, use of natural vegetation buffers, vegetation of disturbed soil, and runoff controls (i.e., sediment fencing and small check dams). During Post-closure, erosion and sediment control would be focused on monitoring the success of closure activities.	Total suspended solids discharge limits: Metal Mining Effluent Regulations (MMER), and Ontario Regulation 560/94, Effluent Monitoring and Effluent Limits – Metal Mining Sector. Total suspended solids (and turbidity) water quality guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life and Provincial Water Quality Objectives.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Operations	Potential influence of process water and seepage / runoff from TMF on receiving environment water quality.	Treatment of process water; construction and operation of engineered water management systems to collect runoff and seepage from the TMF; reclaim water returned (or recycled) to the process plant; use of liners on starter tailings dams to limit seepage losses during the early years of operations.	Process water will be treated at the ore processing plant for cyanide, cyanide destruction constituents, as required, prior to discharge into the TMF. Seepage and runoff will be collected at collection ponds around the perimeter of the TMF and pumped to the TMF reclaim pond. Water in the reclaim pond will be recycled back to the ore processing plant, with no water from the reclaim pond being discharged to the environment through the polishing pond under normal flow conditions.	Effluent discharge requirements under: Metal Mining Effluent Regulations (MMER), and Ontario Regulation 560/94, Effluent Monitoring and Effluent Limits – Metal Mining Sector. Water quality guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life and Provincial Water Quality Objectives.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Operations and Closure	Potential influence of seepage / runoff from MRA, low-grade stockpile and open pit on receiving environment water quality.	Construction and operation of engineered water management systems to collect runoff and seepage; monitoring and treatment of effluent, as required.	Open pit inflow and runoff will be collected in the open pit sump. Seepage and runoff from the MRA and from the low-grade stockpile will be collected in ponds. During the Operations phase, water collected by these facilities will be pumped to the polishing pond. The excess water in the polishing pond, which will be monitored for water quality, is discharged to the environment.	Effluent discharge requirements under: Metal Mining Effluent Regulations (MMER), and Ontario Regulation 560/94, Effluent Monitoring and Effluent Limits – Metal Mining Sector. Water quality guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life and Provincial Water Quality Objectives.	The mitigation measure has not changed from the EA.

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Operations	Potential influence of explosives residuals in mine rock, low-grade ore and open pit on receiving environment water quality (i.e., ammonia and nitrate).	BMPs for explosives use.	Implementation of BMPs during blasting to reduce the blast waste rate and mass of residual explosives present in the open pit, mine rock, low-grade ore and dam construction material.	Water quality guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life and Provincial Water Quality Objectives.	The mitigation measure has not changed from the EA.
Water Quality	Operations	Potential influence of sewage on receiving environment water quality.	Treatment of sewage.	Sewage will be treated to a quality that meets federal and provincial legislative requirements before discharge to the environment.	Effluent discharge requirements under: Wastewater Systems Effluent Regulations, and Ontario *Water Resources Act* (Section 53)	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Operations through Post-closure	Potential impact of landfill leachate from solid domestic and industrial waste on groundwater quality.	Management of solid domestic and industrial waste in a permitted landfill, including the use of BMPs; monitoring of groundwater quality; remedial action, as required.	Solid domestic and industrial waste will be placed into a landfill that will be operated in accordance with federal and provincial legislative requirements, and BMPs, including mitigation, monitoring, remedial action, and closure plans, will be integrated into the operation and closure of the landfill.	Ontario Regulation 232/98	The mitigation measure has not changed from the EA.
Water Quality	Operations through Post-closure	Acid rock drainage from the MRA potentially affecting effluent quality	Inclusion of PAG rock within the bulk of the MRA.	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.	n/a	The mitigation measure has not changed from the EA.
Water Quality	Construction through Closure	Acid rock drainage from onsite roads	Use of non-acid generating materials for road construction purposes.	IAMGOLD will sample mine rock to ensure only non-acid generating materials are used for construction purposes.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Water Quality	Post-closure phase (Stage II)	Potential influence of seepage/run off from MRA and Côté Pit Lake on receiving environment water quality.	Monitoring and, if determined to be required, water collection and treatment.	Seepage and runoff from the MRA and water in the open pit will be monitored prior to Post-closure phase (Stage II). If the monitoring determines that the water quality is not suitable for discharge to the environment, then collection and treatment measures will be implemented accordingly.	Water quality guidelines: Canadian Water Quality Guidelines for the Protection of Aquatic Life and Provincial Water Quality Objectives.	The mitigation measure has not changed from the EA.

5.0 MANAGEMENT

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA.

Table 5-1: Monitoring Measures – Water Quality

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Water Quality	Surface water quality samples will be analyzed for various general chemistry, metals, ions, nutrients, cyanide species, a radionuclide, organic parameters, and total 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.	Surface water grab sample collection using in-field filtering and preservation, as required. 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.	Provincial Water Quality Objectives (PWQO) and Canadian Water Quality Guidelines (CWQG), with laboratory detection limits suitable for comparison to these guidelines. *Metal Mining Effluent Regulations* (MMER) and Ontario Regulation 560/94. Concentrations in mine-exposed areas will also be compared to baseline and reference area values.	Sampling events will be conducted during all Project phases at a frequency sufficient to detect changes in water quality; the frequency will depend on the station location and will aim to capture a range of flow conditions, as required. The frequency of effluent monitoring will meet federal and provincial effluent discharge requirements.	Project site components: open pit sump, seepage collection ponds, mine water pond, reclaim pond, polishing pond and domestic sewage effluent outlets as appropriate to the mine phase. Surface water receivers: Moore Lake, Chester Lake, Little Clam Lake, Clam Lake, Three Duck Lakes (upper, middle and lower basins), Mollie River between Three Duck Lakes and Dividing Lake, Dividing Lake, Bagsverd Lake, Unnamed Lake #6, Schist Lake, Neville Lake, Mesomikenda Lake (upper basin) and downstream from the local study area (downstream from Mesomikenda Lake and Dividing Lake). Samples will also be collected in appropriate reference areas.	Monitoring measure updated. Surface water receivers to be monitored have been updated from the EA to reflect the EER project description.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Water Quality	Groundwater quality samples will be analyzed for various general chemistry, major ions, metals nutrients, cyanide species and organic parameters. A complete parameter list is attached below. 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.	Groundwater sample collection using pumping techniques and in-field filtering and preservation, as required. Quality assurance / quality control samples such as blind duplicates, trip blanks, field blanks and filter blanks will be collected during each sampling round.	Ontario Drinking Water Standards (ODWS**),** PWQO and CWQG, with laboratory detection limits suitable for comparison to these guidelines. MMER and Ontario Regulation 560/94	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. The frequency of effluent monitoring will meet federal and provincial effluent discharge requirements.	Groundwater monitoring wells around the MRA, ore stockpiles, and TMF, polishing pond and landfill (if constructed).	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Water Quality	Sediment quality samples will be analyzed for major ions, metals, nutrients (total nitrogen, total phosphorus), carbonate, organic carbon, sulphate, sulphide, particle size, total cyanide, total 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.	Sampling method will be consistent with that described for the aquatic monitoring program (i.e., grab or core sample).	Ontario's Provincial Sediment Quality Objectives (PSQO) and the Canadian Sediment Quality Guidelines (CSQG). Concentrations in mine-exposed areas will also be compared to baseline and reference area values.	Sampling events will be conducted at a frequency sufficient to detect changes in sediment quality, and harmonized with the Environmental Effects Monitoring (EEM) as practicable.	Lakes where changes to water quality are expected. Harmonized with EEM as practicable.	The monitoring measure has not changed from the EA.

6.0 CONCLUSION

The revised water quality modelling has simulated wet, dry and average climate conditions and has incorporated the EER revised Project description. Potential effects to water quality during the Construction and Closure phases are discussed qualitatively, whereas potential effects to water quality were predicted using a numerical model for the Operations and Post-closure phases.

The key conclusions of the EER on water quality are as follows:

- During the Construction phase, the Project components are not expected to be developed sufficiently to influence site water quality; therefore, with the implementation of BMPs for sediment and erosion control, the water quality of the modelled surface water receivers is expected to remain within the range of concentrations observed under existing conditions.
- During the Operations, Closure and Post-closure phase (stage I), monthly average concentrations of some major ions, metals and cyanide are predicted to be continuously to intermittently greater than the 95th percentile baseline concentrations in the Mollie River Watershed and Mesomikenda Lake Watershed.
- Monthly average concentrations during all Project phases, with the exception of arsenic in Three Duck Lakes (upper) and Three Duck Lakes (middle) under the 1:25-dry year climate condition only, are predicted to be below the Water Quality Guidelines. Although maximum monthly average arsenic concentrations are predicted to be greater than the Water Quality Guideline, any potential related effects are immaterial because the concentrations that are predicted to be greater than the Water Quality Guidelines are: 1) only slightly above the Water Quality Guideline, even at the highest predicted monthly average concentration; 2) limited to Three Duck Lakes (upper) and Three Duck Lakes (middle) and therefore limited in geographic extent; 3) limited to only the months of June through November in Three Duck Lakes (upper) and September through November in Three Duck Lakes (middle), and therefore limited in duration and not continuous; and 4) limited to the 1:25-year dry climate condition and therefore very limited in frequency.

The prediction of water quality effects was completed based on several inherent mitigation measures that have been included in the design of the Project. Monitoring programs pertinent to water quality will be implemented during the Construction, Operations, Closure and Post-closure phases of the Project. The purpose of the monitoring program is to confirm the results of the effects predictions presented herein, and to provide a basis for future decision making regarding the environmental management of the Project.

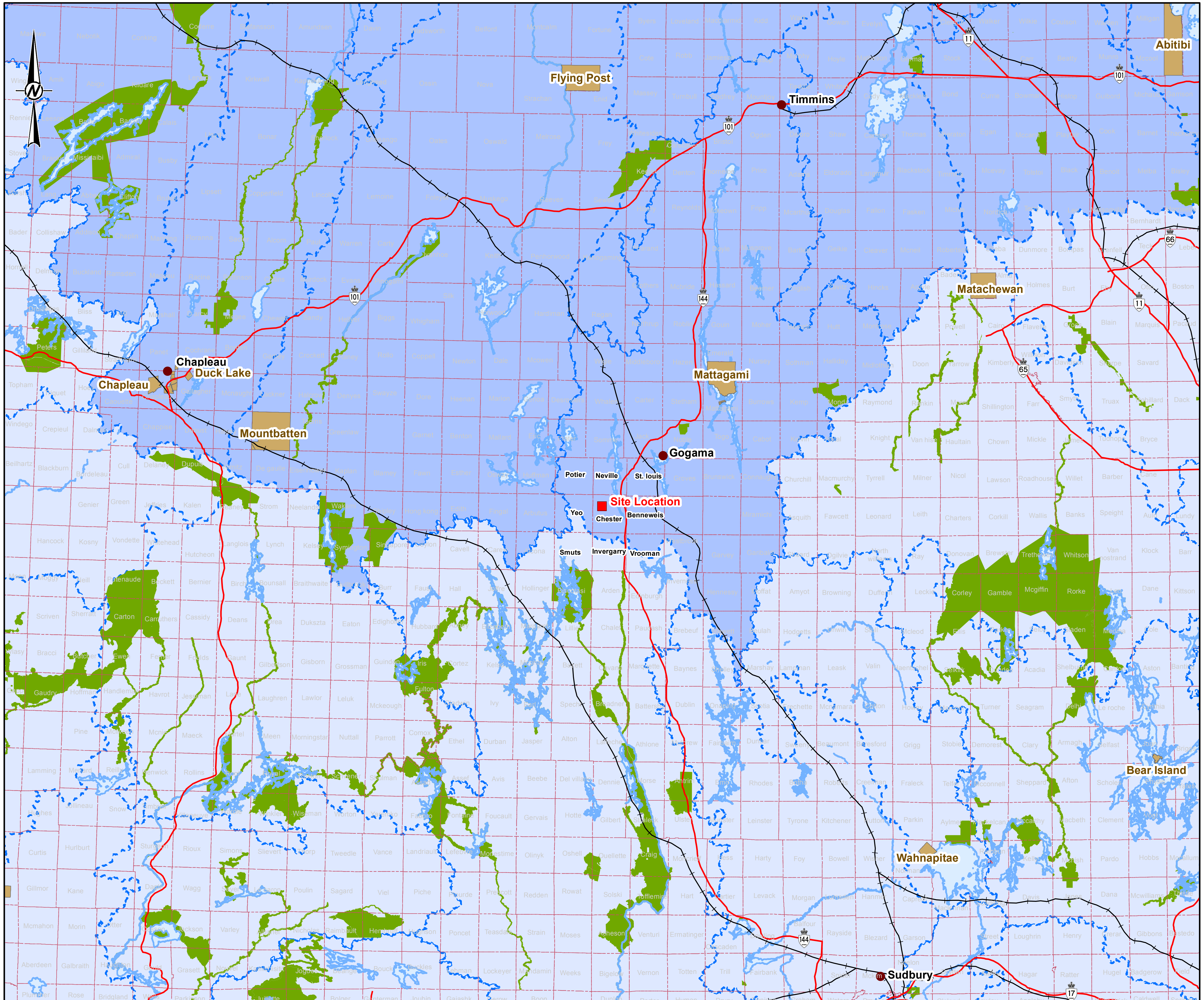
The updated water quality assessment demonstrates that the predicted effects for the Project are similar or reduced compared to the EA. The effluent discharge location has been moved from Neville Lake to Three Duck Lakes (Upper), which provides the benefit of eliminating any potential effects that nutrient loading would have on dissolved oxygen depletion in Mesomikenda Lake. Furthermore, the TMF has been moved into the Mollie River Watershed.

Therefore, almost all of the effluent that enters the surface water receiving environment, whether it be through discharge from the polishing pond or via seepage, is contained within the Mollie River Watershed. These changes allow for more focused monitoring and management of effluent, and mitigation measures can be more easily implemented (if determined to be needed) in comparison to the EA.

7.0 GLOSSARY AND ABBREVIATIONS

BMP	Best Management Practice
EA	Environmental Assessment
EER	Environmental Effects Review
km	Kilometre
LSA	Local Study Area
mg/L	milligrams per litre
MRA	Mine Rock Area
RSA	Regional Study Area
TMF	Tailings Management Facility

FIGURES

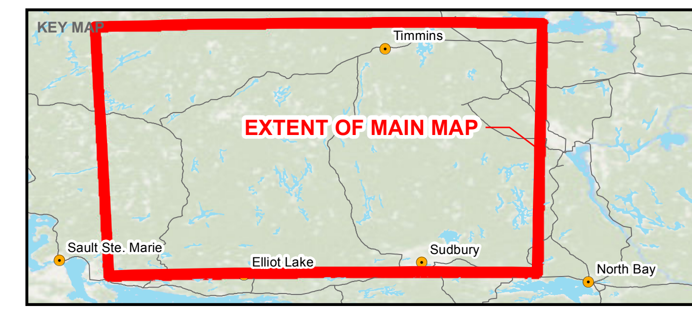


LEGEND

- Site Location
- Major Roads
- Railway
- Community
- First Nations Community
- Townships
- Provincial Park
- Waterbody

Primary Watersheds

- Hudson Bay
- Great Lakes



NOTES

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REFERENCE

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HTTPS://WWW.ONTARIO.CA/GOVERNMENT/OPEN-GOVERNMENT-LICENCE-ONTARIO
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

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METRES
SCALE 1:1,000,000

DRAFT

CLIENT
IAMGOLD CORPORATION

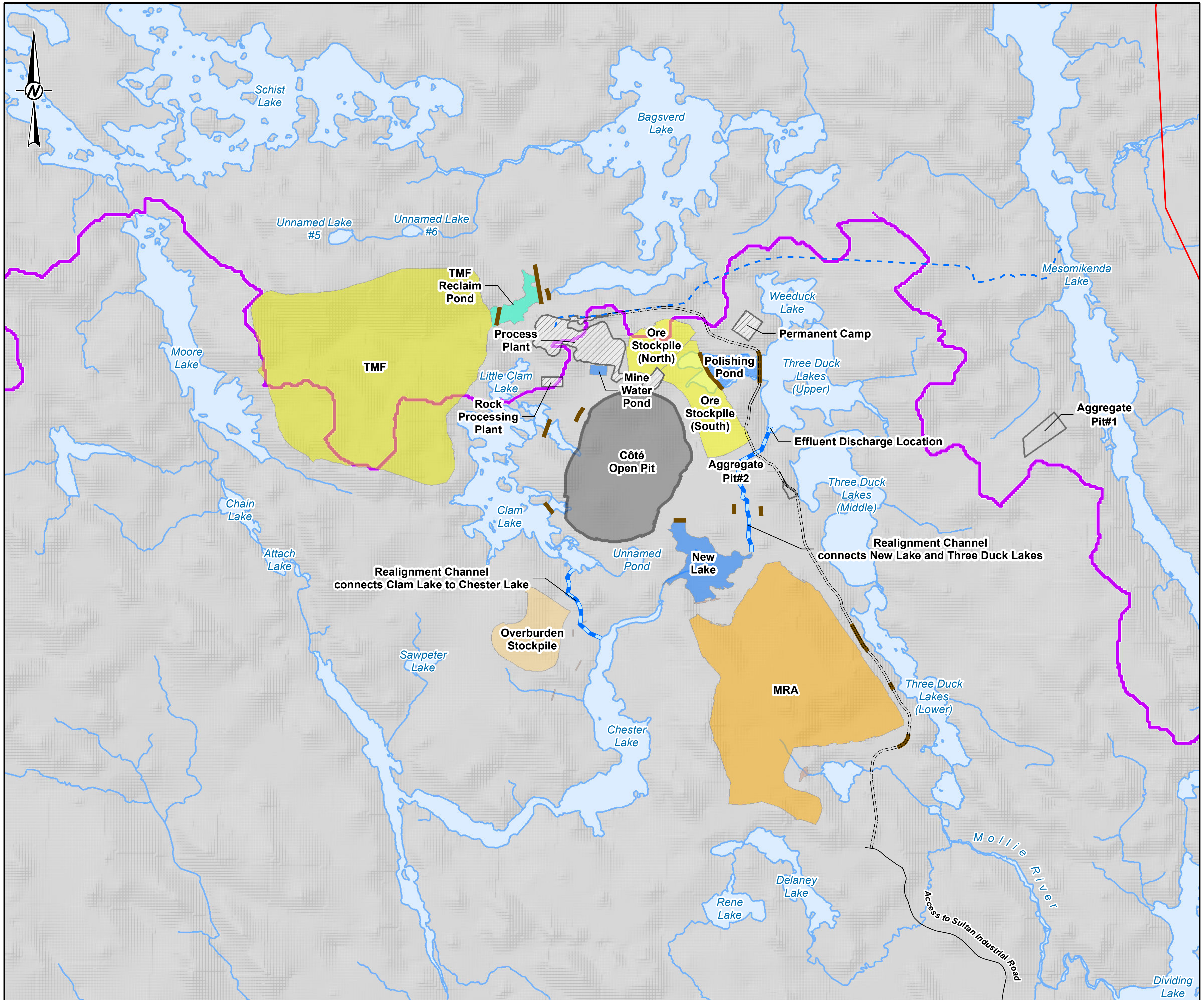
PROJECT
ENVIRONMENTAL EFFECT REVIEW - WATER QUALITY
CÔTÉ GOLD PROJECT

TITLE
PROJECT LOCATION

CONSULTANT

YYYY-MM-DD	2018-01-11
PREPARED	RRD
DESIGN	--
REVIEW	NK
APPROVED	MRG

PROJECT No.	CONTROL	Rev.	FIGURE
1789673	0005	A	1-1



LEGEND

- Major Roads
- Roads
- Main Access Road
- Mollie River Watershed
- Waterbodies
- <all other values>

Proposed Infrastructure

- Aggregate Pit
- Infrastructure
- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Water
- Dam
- Fresh Water Pipeline
- Realignment Channel

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1789673/2000

REFERENCE

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COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

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METRES
SCALE 1:40,000

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IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECT REVIEW - WATER QUALITY
CÔTÉ GOLD PROJECT

TITLE
SITE PLAN

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-17
PREPARED	RRD
DESIGN	--
REVIEW	NK
APPROVED	MRG

PROJECT No.	CONTROL	Rev.	FIGURE
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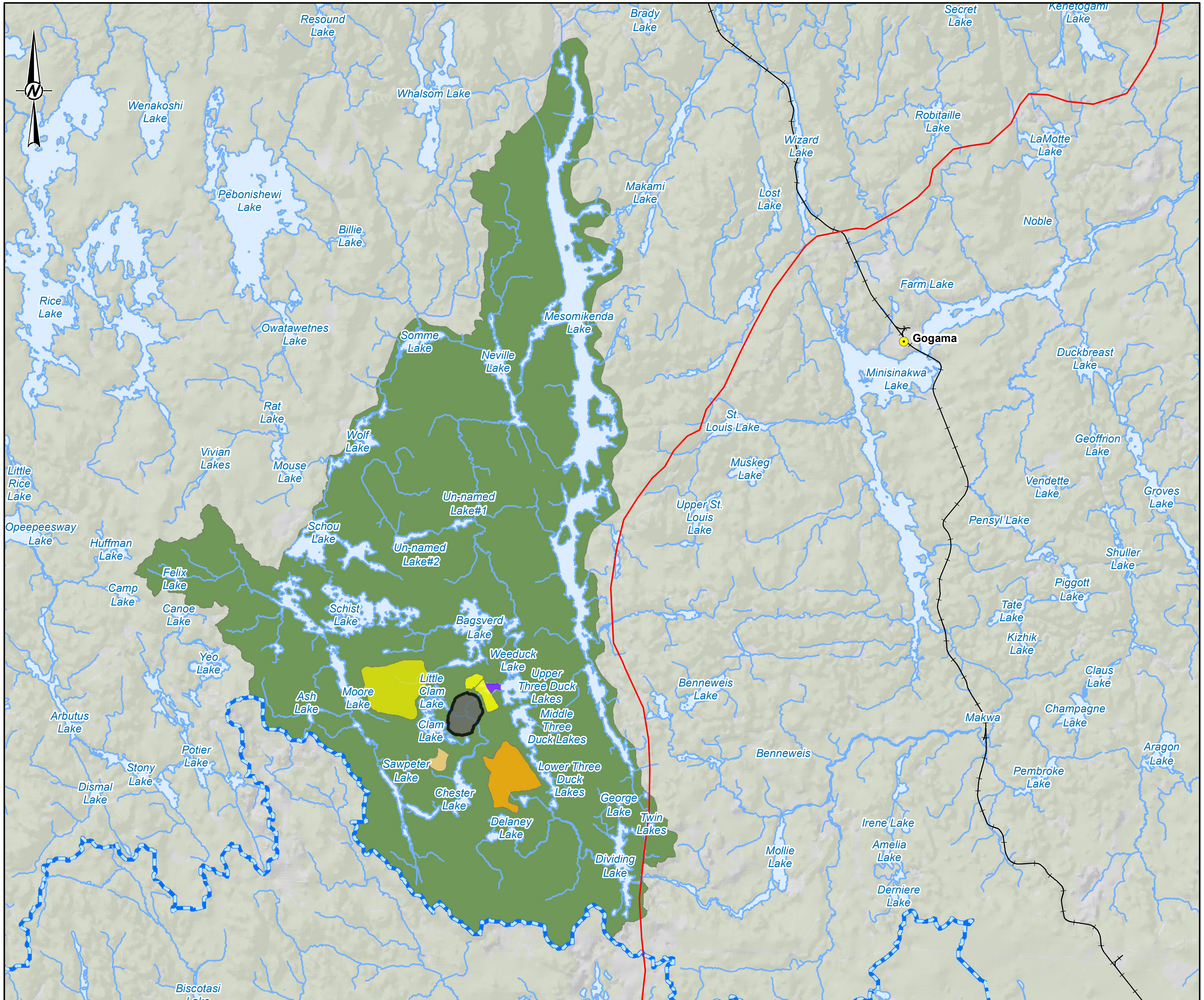

LEGEND

- Regional Communities
- Major Roads
- Railway
- Waterbodies
- Hydrogeology Local Study Area (LSA)
- Great Lakes / James Bay Watershed Divide

Proposed Infracture

- Mine Rock Area (MRA)
- Open Pit
- Ore Stockpile
- Overburden Stockpile
- Polishing Pond
- Tailings Management Facility (TMF)

NOTES

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT NO. 1789673/2000

REFERENCE

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COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

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METRES

SCALE 1:145,000

DRAFT

CLIENT
IAMGOLD CORPORATION

IAMGOLD

PROJECT
ENVIRONMENTAL EFFECT REVIEW - WATER QUALITY
CÔTÉ GOLD PROJECT

TITLE
WATER QUALITY LOCAL STUDY AREA

CONSULTANT

Golder Associates

YYYY-MM-DD	2018-01-16
PREPARED	RRD
DESIGN	--
REVIEW	NK
APPROVED	MRG

PROJECT No.	CONTROL	Rev.	FIGURE
1789673	0005	A	2-1

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

IAMGOLD

APPENDIX I
EXECUTIVE SUMMARY

IAMGOLD Corporation (IAMGOLD) intends to develop and operate an open pit gold mine and associated facilities and infrastructure in northern Ontario approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury; this mining project is referred to as the Côté Gold Project (the Project). The landscape is characterized with an extensive tree cover and subdued topography, and is dominated by numerous lakes, streams and wetlands along with extensive bedrock outcrops; typical of northern Ontario. The area has experienced limited historical mining and current activities include forestry, mine exploration and some recreational activities.

Golder Associates completed a technical study in 2013 & 2014 of the potential water quality effects of the Project for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment (EA) Report. Based on an evolving Project design, IAMGOLD has elected to evaluate changes in Project effects through an Environmental Effects Review. This Updated Technical Memorandum presents the predicted water quality effects associated with the Project incorporating the revised project description. The predicted water quality effects are based on results simulated using modified versions of the EA water quality models, which have been updated to reflect the reconfigured Project in accordance with the modified water balance described in the Updated Hydrology Technical Memorandum. Modifications made to the water quality models to reflect the Project reconfiguration are as follows:

- Revisions to infrastructure footprints and layouts, such as the open pit, Tailings Management Facility (TMF), mine rock area (MRA), ore stockpiles, discharge location and the processing plant.
- Revisions to the mine plan, including mine rock and ore stockpile volumes.
- Addition of surface water features where infrastructure footprints extended into new areas of the watershed.
- Revisions to the baseline water quality inputs to reflect new or additional baseline data collected since the submission of the EA.
- Revisions to closure concepts.
- Incorporation of the updated water balance for each of the Project phases modelled as part of the water quality effects review.

The effects assessment indicator for this discipline was selected as change in surface water quality. The potential change in surface water quality was predicted through the modification of the previously developed GoldSim water quality models.

The water quality Local Study Area (LSA) was defined by lakes and watersheds in the vicinity and downstream of the Project infrastructure. The LSA for hydrology is bound by the following features:

- The Great Lakes/James Bay watershed divide along the south.
- The Moore Lake and Schist lake watershed divides to the west.
- Mesomikenda Lake to the east.
- The Somme River system to the north and northwest.

The water quality effects predictions were completed using a modified GoldSim water quality model to estimate the water quality at key site components and potential changes to the water quality of the receiving and downstream environments during Operations, Closure and Post-closure. The approach to the modelled prediction of effects, along with climate scenarios, is consistent with those applied in the EA. The criteria used in the EER for the purposes of evaluating the water quality model results are the same Water Quality Guidelines that were used in the EA.

During Operations, Closure and Post-closure stage I, monthly average concentrations of some major ions, metals and cyanide are predicted to be continuously to intermittently greater than baseline concentrations (expressed as the 95th percentile) in some lakes in the Mollie River Watershed and Mesomikenda Lake Watershed. Lakes in the Mollie River Watershed that are predicted to have concentrations greater than the 95th percentile concentrations are Moore Lake, Clam Lake, Little Clam Lake, Chester Lake, New Lake, Three Duck Lakes, Delaney Lake and Dividing Lake . Lakes in the Mesomikenda Lake Watershed that are predicted to have concentrations greater than the 95th percentile concentrations are Bagsverd Lake, Neville Lake, and Mesomikenda Lake (upper basin only). The concentrations of major ions, metals and cyanide are predicted to be below the water quality guidelines.

Concentrations of most analytes meet water quality guidelines, apart from arsenic, which is expected to exceed the interim PWQO in Three Duck Lake (Upper and Middle) in some months during a 1:25-dry year event.

Several inherent mitigation measures have been included in the design of the Project, and have been considered in the prediction of effects. Further, monitoring and management measures have been developed to continue the collection of data required to assess changes in water quality during Project implementation (i.e., Construction, Operations, Closure and Post-closure).

The updated water quality assessment demonstrates that the predicted effects for the Project are similar or reduced compared to the EA. The effluent discharge location has been moved from Neville Lake to Three Duck Lakes (Upper), which provides the benefit of eliminating any potential effects that nutrient loading would have on dissolved oxygen depletion in

Mesomikenda Lake. Furthermore, the TMF has been moved into the Mollie River Watershed. Therefore, almost all of the effluent that enters the surface water receiving environment, whether it be through discharge from the polishing pond or via seepage, is contained within the Mollie River Watershed. These changes allow for more focused monitoring and management of effluent, and mitigation measures can be more easily implemented (if determined to be needed) in comparison to the EA.

APPENDIX II
WATER QUALITY MODEL RESULTS

APPENDIX II
WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, OPERATIONS PHASE - MOLLIE RIVER WATERSHED
CÔTÉ GOLD PROJECT

Parameter	Units	95th Baseline Concentration	Water Quality Guidelines (1)	MOLLIE RIVER WATERSHED																			
				Moore Lake		Chester Lake		Little Clam Lake		Clam Lake		New Lake		Three Duck Lakes (Upper)		Three Duck Lakes (Middle)		Three Duck Lakes (Lower)		Delaney Lake		Dividing Lake	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.10	0.11	0.073	0.11	0.094	0.14	0.096	0.12	0.066	0.10	0.057	0.087	0.059	0.078	0.065	0.071	0.059	0.12	0.067	0.069
Ammonia (Total)	mg/L	0.15	6.98	**0.34**	**0.40**	0.12	**0.21**	**0.19**	**0.33**	**0.22**	**0.31**	0.11	**0.20**	**0.27**	**0.89**	**0.30**	**0.76**	**0.41**	**0.56**	0.047	0.094	**0.31**	**0.40**
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.000022	**0.00092**	0.000010	**0.00039**	0.000016	**0.00065**	0.000016	**0.00067**	0.0000079	**0.00034**	**0.00018**	**0.0023**	**0.00021**	**0.0014**	**0.00019**	**0.0015**	0.0000053	**0.00016**	**0.00016**	**0.0011**
Antimony	mg/L	0.0005	0.02	**0.00077**	**0.00083**	**0.00062**	**0.00090**	**0.00078**	**0.0011**	**0.00079**	**0.0010**	**0.00057**	**0.00088**	**0.00096**	**0.0027**	**0.00103**	**0.0022**	**0.0012**	**0.0016**	**0.00054**	**0.0011**	**0.0011**	**0.0012**
Arsenic	mg/L	0.003	0.005	0.0021	0.0022	0.0018	0.0025	0.0022	**0.0031**	0.0022	0.0027	0.0016	0.0025	0.0026	***0.0071***	0.0028	***0.0058***	**0.0033**	**0.0042**	0.0016	**0.0030**	0.0030	**0.0032**
Barium	mg/L	0.007	1.0	**0.0073**	**0.0078**	0.0060	**0.0086**	**0.0075**	**0.011**	**0.0076**	**0.0094**	0.0055	**0.0085**	**0.0071**	**0.015**	**0.0071**	**0.013**	**0.0079**	**0.0096**	0.0052	**0.010**	**0.0075**	**0.0080**
Boron	mg/L	0.01	1.5	0.0071	0.0076	0.0059	0.0086	0.0074	**0.011**	0.0075	0.0092	0.0054	0.0084	0.0066	**0.011**	0.0064	0.010	0.0068	0.0078	0.0052	**0.010**	0.0067	0.0070
Cadmium	mg/L	0.00003	0.000047	0.000018	0.000019	0.000015	0.000022	0.000019	0.000027	0.000019	0.000023	0.000014	0.000021	0.000017	**0.000030**	0.000017	0.000026	0.000018	0.000021	0.000013	0.000026	0.000018	0.000018
Calcium	mg/L	11	-	11	**12**	8.6	**13**	11	**16**	11	**14**	8.0	**12**	**15**	**47**	**16**	**39**	**20**	**27**	7.3	**14**	**17**	**19**
Chloride	mg/L	4.8	120	1.7	1.8	1.2	1.8	1.6	2.3	1.6	2.1	1.1	1.8	1.5	2.8	1.5	2.4	1.6	1.9	1.0	2.0	1.5	1.6
Cobalt	mg/L	0.00025	0.0025	**0.00049**	**0.00054**	**0.00034**	**0.00052**	**0.00045**	**0.00066**	**0.00046**	**0.00059**	**0.00031**	**0.00050**	**0.00037**	**0.00061**	**0.00037**	**0.00052**	**0.00038**	**0.00044**	**0.00028**	**0.00054**	**0.00037**	**0.00039**
Copper	mg/L	0.003	0.005	**0.0039**	**0.0044**	0.0017	0.0029	0.0026	**0.0042**	0.0029	**0.0039**	0.0016	0.0028	0.0021	**0.0044**	0.0021	**0.0036**	0.0023	0.0028	0.0010	0.0020	0.0020	0.0022
Cyanide (Total) (2)	mg/L	0.001	-	**0.016**	**0.019**	**0.0045**	**0.0090**	**0.0082**	**0.015**	**0.0098**	**0.014**	**0.0041**	**0.0086**	**0.0022**	**0.0051**	**0.0023**	**0.0039**	**0.0030**	**0.0033**	-	-	**0.0025**	**0.0026**
Cyanide (Free) (2)	mg/L	0.001	0.0098	**0.0040**	**0.0047**	**0.0011**	**0.0023**	**0.0021**	**0.0036**	**0.0025**	**0.0035**	**0.0010**	**0.0022**	0.00052	**0.0013**	0.00057	0.00096	0.00073	0.00083	-	-	0.00061	0.00066
Iron	mg/L	0.49	0.3	0.31	0.33	0.25	0.36	0.31	0.45	0.31	0.39	0.22	0.35	0.21	0.27	0.21	0.24	0.22	0.23	0.21	0.41	0.22	0.23
Lead	mg/L	0.0005	0.003	0.00046	0.00050	0.00039	**0.00056**	0.00048	**0.00069**	0.00049	**0.00060**	0.00035	**0.00055**	0.00037	**0.00051**	0.00036	0.00045	0.00038	0.00041	0.00034	**0.00066**	0.00038	0.00040
Magnesium	mg/L	2.0	-	1.8	2.0	1.5	**2.2**	1.9	**2.7**	1.9	**2.4**	1.4	**2.1**	1.6	**2.8**	1.6	**2.4**	1.7	1.9	1.3	**2.6**	1.7	1.7
Manganese	mg/L	0.120	0.7	0.077	0.083	0.065	0.094	0.081	0.12	0.082	0.10	0.060	0.092	0.072	**0.12**	0.070	0.10	0.075	0.085	0.057	0.11	0.073	0.077
Molybdenum	mg/L	0.001	0.073	**0.0024**	**0.0027**	**0.0014**	**0.0022**	**0.0019**	**0.0029**	**0.0020**	**0.0026**	**0.0013**	**0.0021**	**0.0019**	**0.0064**	**0.0019**	**0.0052**	**0.0024**	**0.0033**	**0.0010**	**0.0020**	**0.0022**	**0.0024**
Nickel	mg/L	0.0015	0.025	**0.0022**	**0.0023**	**0.0018**	**0.0026**	**0.0023**	**0.0032**	**0.0023**	**0.0028**	**0.0016**	**0.0026**	**0.0017**	**0.0024**	**0.0017**	**0.0021**	**0.0018**	**0.0019**	**0.0016**	**0.0031**	**0.0018**	**0.0019**
Nitrate	mg/L	0.17	13	**0.48**	**0.51**	**0.41**	**0.58**	**0.50**	**0.72**	**0.51**	**0.63**	**0.38**	**0.71**	**1.0**	**3.5**	**1.1**	**3.0**	**1.6**	**2.2**	**0.36**	**0.70**	**1.3**	**1.6**
Phosphorus (Total)	mg/L	0.041	0.02	0.016	0.017	0.013	0.019	0.016	0.023	0.017	0.020	0.012	0.019	0.013	0.037	0.013	0.031	0.017	0.022	0.012	0.023	0.017	0.018
Potassium	mg/L	0.52	373	**1.1**	**1.2**	0.51	**0.84**	**0.75**	**1.18**	**0.81**	**1.1**	0.47	**0.81**	**0.87**	**2.7**	**0.95**	**2.2**	**1.2**	**1.5**	0.33	**0.65**	**1.0**	**1.1**
Sodium	mg/L	2.6	-	**15**	**18**	**4.4**	**8.7**	**7.9**	**14**	**9.4**	**13**	**3.9**	**8.3**	**2.8**	**5.3**	**2.9**	**4.2**	**3.2**	**3.6**	1.2	2.2	**2.7**	**2.9**
Strontium	mg/L	0.024	-	0.024	**0.026**	0.019	**0.027**	0.024	**0.034**	**0.024**	**0.030**	0.017	**0.027**	**0.029**	**0.081**	**0.031**	**0.066**	**0.037**	**0.047**	0.016	**0.031**	**0.032**	**0.035**
Sulphate	mg/L	4.1	218	**33**	**39**	**10**	**19**	**18**	**31**	**21**	**30**	**9.0**	**19**	**7.2**	**12**	**7.3**	**11**	**7.9**	**8.8**	2.9	**5.6**	**6.5**	**7.1**
Uranium	mg/L	0.002	0.015	0.0015	0.0016	0.0012	0.0017	0.0015	**0.0021**	0.0015	0.0019	0.00110	0.0017	0.0020	**0.0060**	**0.0022**	**0.0049**	**0.0026**	**0.0034**	0.0010	**0.0020**	**0.0023**	**0.0025**
Vanadium	mg/L	0.001	0.006	**0.0014**	**0.0015**	**0.0012**	**0.0017**	**0.0015**	**0.0021**	**0.0015**	**0.0018**	**0.00109**	**0.0017**	**0.0015**	**0.0031**	**0.0015**	**0.0026**	**0.0017**	**0.0020**	**0.0010**	**0.0020**	**0.0016**	**0.0017**
Zinc	mg/L	0.021	0.02	0.0080	0.0086	0.0068	0.0097	0.0084	0.012	0.0085	0.010	0.0062	0.010	0.0080	0.016	0.0080	0.013	0.0087	0.010	0.0059	0.012	0.0083	0.0088

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

(2) Total and free cyanide are not predicted for Delaney Lake, as it does not receive seepage from the Tailings Management Facility (TMF) or inflow from an upstream lake that receives TMF seepage.

APPENDIX II
WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, OPERATIONS PHASE - MESOMIKENDA LAKE WATERSHED CÔTÉ GOLD PROJECT

Parameter	Units	95th Baseline Concentration	Water Quality Guidelines (1)	MESOMIKENDA LAKE WATERSHED									
				Unnamed Lake #6 (Tributary to Schist Lake Outflow)		Bagsverd Lake (South)		Bagsverd Lake		Neville Lake		Mesomikenda Lake (Upper Basin)	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.062	0.081	0.079	0.12	0.080	0.10	0.071	0.087	0.061	0.065
Ammonia (Total)	mg/L	0.15	6.98	0.11	**0.37**	0.07	0.11	0.12	**0.17**	0.062	0.073	0.051	0.055
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.000018	**0.00080**	0.0000058	**0.00023**	0.0000086	**0.00036**	0.0000043	**0.00017**	0.0000033	**0.00013**
Antimony	mg/L	0.0005	0.02	**0.00053**	**0.00057**	**0.00071**	**0.0010**	**0.00069**	**0.00089**	**0.00064**	**0.00078**	**0.00055**	**0.00058**
Arsenic	mg/L	0.003	0.005	0.0015	0.0015	0.0020	0.0030	0.0020	0.0025	0.0018	0.0023	0.0016	0.0017
Barium	mg/L	0.007	1.0	0.0051	0.0054	0.0068	**0.010**	0.0066	**0.0085**	0.0061	**0.0075**	0.0053	0.0056
Boron	mg/L	0.01	1.5	0.0050	0.0052	0.0068	0.0098	0.0066	0.0084	0.0061	0.0075	0.0053	0.0056
Cadmium	mg/L	0.00003	0.000047	0.000013	0.000013	0.000018	0.000025	0.000017	0.000022	0.000016	0.000020	0.000014	0.000014
Calcium	mg/L	11	-	7.4	8.6	10	**14**	9.5	**12**	8.7	11	7.5	7.9
Chloride	mg/L	4.8	120	1.1	1.4	1.3	2.0	1.4	1.8	1.2	1.5	1.0	1.1
Cobalt	mg/L	0.00025	0.0025	**0.00030**	**0.00041**	**0.00037**	**0.00054**	**0.00038**	**0.00049**	**0.00033**	**0.00041**	**0.00029**	**0.00030**
Copper	mg/L	0.003	0.005	0.0016	**0.0039**	0.0015	0.0022	0.0019	0.0025	0.0013	0.0015	0.0011	0.0012
Cyanide (Total)	mg/L	0.001	-	**0.0045**	**0.018**	**0.0019**	**0.0029**	**0.0047**	**0.0065**	**0.0015**	**0.0022**	**0.0013**	**0.0014**
Cyanide (Free)	mg/L	0.001	0.0098	**0.0011**	**0.0046**	0.00049	0.00078	**0.0012**	**0.0016**	0.00039	0.00055	0.00032	0.00034
Iron	mg/L	0.49	0.3	0.21	0.23	0.28	0.40	0.27	0.35	0.25	0.31	0.22	0.23
Lead	mg/L	0.0005	0.003	0.00033	0.00033	0.00045	**0.00065**	0.00043	**0.00055**	0.00040	0.00049	0.00035	0.00037
Magnesium	mg/L	2.0	-	1.3	1.3	1.7	**2.5**	1.7	**2.2**	1.6	1.9	1.3	1.4
Manganese	mg/L	0.120	0.7	0.055	0.055	0.075	0.11	0.073	0.093	0.068	0.083	0.059	0.062
Molybdenum	mg/L	0.001	0.073	**0.0012**	**0.0022**	**0.0014**	**0.0020**	**0.0015**	**0.0020**	**0.0012**	**0.0015**	**0.0011**	**0.0011**
Nickel	mg/L	0.0015	0.025	**0.0015**	**0.0016**	**0.0021**	**0.0030**	**0.0020**	**0.0026**	**0.0019**	**0.0023**	**0.0016**	**0.0017**
Nitrate	mg/L	0.17	13	**0.34**	**0.34**	**0.47**	**0.68**	**0.45**	**0.58**	**0.42**	**0.52**	**0.36**	**0.38**
Phosphorus (Total)	mg/L	0.041	0.02	0.011	0.011	0.015	0.022	0.015	0.019	0.014	0.017	0.012	0.013
Potassium	mg/L	0.52	373	0.46	**1.0**	0.46	**0.68**	**0.56**	**0.73**	0.42	0.49	0.34	0.36
Sodium	mg/L	2.6	-	**4.4**	**17**	2.1	**3.3**	**4.6**	**6.3**	1.6	2.2	1.3	1.4
Strontium	mg/L	0.024	-	0.016	0.018	0.021	**0.031**	0.021	**0.027**	0.019	0.023	0.016	0.017
Sulphate	mg/L	4.1	218	**9.9**	**38**	**5.0**	**7.8**	**10**	**14**	4.1	**5.3**	3.3	3.6
Uranium	mg/L	0.002	0.015	0.0010	0.0011	0.0014	0.0020	0.0013	0.0017	0.0012	0.0015	0.0011	0.0011
Vanadium	mg/L	0.001	0.006	**0.0010**	**0.0010**	**0.0014**	**0.0020**	**0.0013**	**0.0017**	**0.0012**	**0.0015**	**0.0011**	**0.0011**
Zinc	mg/L	0.021	0.02	0.0057	0.0058	0.0078	0.011	0.0075	0.010	0.0070	0.0086	0.0060	0.0064

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

APPENDIX II

WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, POST CLOSURE PHASE STAGE I - MOLLIE RIVER WATERSHED

CÔTÉ GOLD PROJECT

Parameter	Units	95th Baseline Concentration	Water Quality Guidelines (1)	MOLLIE RIVER WATERSHED																			
				Moore Lake		Chester Lake		Little Clam Lake		Clam Lake		New Lake		Three Duck Lakes (Upper)		Three Duck Lakes (Middle)		Three Duck Lakes (Lower)		Delaney Lake		Dividing Lake	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.10	0.11	0.072	0.10	0.094	0.14	0.089	0.11	0.065	0.10	0.067	0.089	0.067	0.083	0.069	0.072	0.059	0.12	0.069	0.072
Ammonia (Total)	mg/L	0.15	6.98	**0.34**	**0.40**	0.11	**0.20**	**0.19**	**0.33**	**0.19**	**0.26**	0.10	**0.19**	0.10	**0.15**	0.10	0.13	0.10	0.10	0.047	0.091	0.081	0.087
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.000022	**0.00092**	0.0000092	**0.00037**	0.000016	**0.00065**	0.000014	**0.00057**	0.0000072	**0.00032**	0.0000072	**0.0003**	0.0000066	**0.0003**	0.0000062	**0.0002**	0.0000043	**0.00015**	0.0000053	**0.00021**
Antimony	mg/L	0.0005	0.02	**0.00077**	**0.00083**	**0.00062**	**0.00088**	**0.00078**	**0.0011**	**0.00074**	**0.00091**	**0.00057**	**0.00086**	**0.00059**	**0.00078**	**0.00058**	**0.00073**	**0.00061**	**0.00065**	**0.00054**	**0.0011**	**0.00063**	**0.00066**
Arsenic	mg/L	0.003	0.005	0.0021	0.0022	0.0018	0.0025	0.0022	**0.0031**	0.0021	0.0025	0.0016	0.0024	0.0017	0.0022	0.0017	0.0021	0.0017	0.0018	0.0016	**0.0030**	0.0018	0.0019
Barium	mg/L	0.007	1.0	**0.0073**	**0.0078**	0.0059	**0.0084**	**0.0075**	**0.011**	**0.0071**	**0.0087**	0.0054	**0.0082**	0.0056	**0.0074**	0.0056	0.0069	0.0058	0.0061	0.0052	**0.010**	0.0059	0.0061
Boron	mg/L	0.01	1.5	0.0071	0.0076	0.0059	0.0083	0.0074	**0.011**	0.0070	0.009	0.0054	0.0081	0.0055	0.007	0.0055	0.007	0.0058	0.0060	0.0052	**0.010**	0.0059	0.0061
Cadmium	mg/L	0.00003	0.000047	0.000018	0.000019	0.000015	0.000021	0.000019	0.000027	0.000018	0.000022	0.000014	0.000021	0.000014	0.000019	0.000014	0.000018	0.000015	0.000016	0.000013	0.000026	0.000015	0.000016
Calcium	mg/L	11	-	11	**12**	8.5	**12**	11	**16**	10	**13**	7.9	**12**	8.1	11	8.0	10	8.5	9.0	7.3	**14**	8.6	9.1
Chloride	mg/L	4.8	120	1.7	1.8	1.2	1.8	1.6	2.3	1.5	1.9	1.12	1.7	1.1	1.5	1.1	1.4	1.2	1.2	1.0	2.0	1.2	1.2
Cobalt	mg/L	0.00025	0.0025	**0.00049**	**0.00054**	**0.00034**	**0.00050**	**0.00045**	**0.00066**	**0.00043**	**0.00054**	**0.00031**	**0.00048**	**0.00032**	**0.00043**	**0.00032**	**0.00039**	**0.00033**	**0.00034**	**0.00028**	**0.00054**	**0.00033**	**0.00034**
Copper	mg/L	0.003	0.005	**0.0039**	**0.0044**	0.0017	0.0028	0.0026	**0.0042**	0.0025	**0.0034**	0.0016	0.0027	0.0016	0.0022	0.0015	0.0020	0.0016	0.0017	0.0010	0.0020	0.0015	0.0015
Cyanide (Total) (2)	mg/L	0.001	-	**0.016**	**0.019**	**0.0044**	**0.0083**	**0.0082**	**0.015**	**0.0082**	**0.012**	**0.0039**	**0.0079**	**0.0039**	**0.0060**	**0.0037**	**0.0050**	**0.0035**	**0.0038**	-	-	**0.0027**	**0.0030**
Cyanide (Free) (2)	mg/L	0.001	0.0098	**0.0040**	**0.0047**	**0.00109**	**0.0021**	**0.0021**	**0.0036**	**0.0021**	**0.0029**	0.00098	**0.00198**	0.000980	**0.00150**	0.00093	**0.00126**	0.00088	0.00096	-	-	0.00068	0.00074
Iron	mg/L	0.49	0.3	0.31	0.33	0.24	0.35	0.31	0.45	0.29	0.36	0.22	0.34	0.23	0.30	0.23	0.28	0.24	0.25	0.21	0.41	0.24	0.25
Lead	mg/L	0.0005	0.003	0.00046	0.00050	0.00039	**0.00054**	0.00048	**0.00069**	0.00046	**0.00056**	0.00035	**0.00053**	0.00036	0.00048	0.00036	0.00045	0.00038	0.00039	0.00034	**0.00066**	0.00038	0.00040
Magnesium	mg/L	2.0	-	1.8	2.0	1.5	**2.1**	1.9	**2.7**	1.8	**2.2**	1.4	**2.1**	1.4	1.9	1.4	1.7	1.5	1.5	1.3	**2.6**	1.5	1.5
Manganese	mg/L	0.120	0.7	0.077	0.083	0.065	0.091	0.081	0.12	0.077	0.09	0.059	0.089	0.061	0.08	0.061	0.08	0.064	0.067	0.057	0.11	0.065	0.067
Molybdenum	mg/L	0.001	0.073	**0.0024**	**0.0027**	**0.0014**	**0.0021**	**0.0019**	**0.0029**	**0.0018**	**0.0024**	**0.0013**	**0.0020**	**0.0013**	**0.0017**	**0.0013**	**0.0016**	**0.0013**	**0.0014**	**0.0010**	**0.0020**	**0.0013**	**0.0013**
Nickel	mg/L	0.0015	0.025	**0.0022**	**0.0023**	**0.0018**	**0.0025**	**0.0023**	**0.0032**	**0.0021**	**0.0026**	**0.0016**	**0.0025**	**0.0017**	**0.0022**	**0.0017**	**0.0021**	**0.0018**	**0.0018**	**0.0016**	**0.0031**	**0.0018**	**0.0018**
Nitrate	mg/L	0.17	13	**0.48**	**0.51**	**0.40**	**0.57**	**0.50**	**0.72**	**0.48**	**0.58**	**0.37**	**0.55**	**0.38**	**0.50**	**0.38**	**0.46**	**0.39**	**0.41**	**0.35**	**0.69**	**0.40**	**0.41**
Phosphorus (Total)	mg/L	0.041	0.02	0.016	0.017	0.013	0.019	0.016	0.023	0.016	0.019	0.012	0.018	0.013	0.017	0.012	0.016	0.013	0.014	0.012	0.023	0.014	0.014
Potassium	mg/L	0.52	373	**1.1**	**1.2**	0.50	**0.80**	**0.75**	**1.2**	**0.72**	**1.0**	0.46	**0.77**	0.47	**0.66**	0.46	**0.60**	0.48	0.51	0.33	**0.65**	0.45	0.48
Sodium	mg/L	2.6	-	**15**	**18**	**4.3**	**8.0**	**7.9**	**14**	**7.9**	**11**	**3.8**	**7.6**	**3.8**	**5.8**	**3.6**	**4.9**	**3.5**	**3.7**	1.2	2.2	**2.7**	**3.0**
Strontium	mg/L	0.024	-	0.024	**0.026**	0.019	**0.027**	0.024	**0.034**	0.023	**0.028**	0.017	**0.026**	0.018	0.023	0.018	0.022	0.018	0.019	0.016	**0.031**	0.019	0.020
Sulphate	mg/L	4.1	218	**33**	**39**	**9.7**	**18**	**18**	**31**	**18**	**25**	**8.7**	**17**	**8.7**	**13**	**8.3**	**11**	**8.0**	**8.6**	2.9	**5.6**	**6.4**	**6.9**
Uranium	mg/L	0.002	0.015	0.0015	0.0016	0.0012	0.0017	0.0015	**0.0021**	0.0014	0.0017	0.00109	0.0016	0.0011	0.0015	0.0011	0.0014	0.0012	0.0013	0.0010	**0.0020**	0.0012	0.0013
Vanadium	mg/L	0.001	0.006	**0.0014**	**0.0015**	**0.0012**	**0.0017**	**0.0015**	**0.0021**	**0.0014**	**0.0017**	**0.00108**	**0.0016**	**0.0011**	**0.0015**	**0.0011**	**0.0014**	**0.0012**	**0.0012**	**0.0010**	**0.0020**	**0.0012**	**0.0012**
Zinc	mg/L	0.021	0.02	0.0080	0.0086	0.0067	0.0094	0.0084	0.012	0.0079	0.010	0.0061	0.0092	0.0063	0.0084	0.0063	0.0078	0.0066	0.0069	0.0059	0.011	0.0067	0.0069

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

(2) Total and free cyanide are not predicted for Delaney Lake, as it does not receive seepage from the Tailings Management Facility (TMF) or inflow from an upstream lake that receives TMF seepage.

APPENDIX II

WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, POST-CLOSURE PHASE STAGE I - MESOMIKENDA LAKE WATERSHED

CÔTÉ GOLD PROJECT

Parameter	Units	95th Baseline Concentration	Water Quality Guidelines (1)	MESOMIKENDA LAKE WATERSHED									
				Unnamed Lake #6 (Tributary to Schist Lake Outflow)		Bagsverd Lake (South)		Bagsverd Lake		Neville Lake		Mesomikenda Lake (Upper Basin)	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.062	0.081	0.074	0.10	0.080	0.10	0.071	0.087	0.061	0.065
Ammonia (Total)	mg/L	0.15	6.98	0.11	**0.37**	0.062	0.091	0.12	**0.17**	0.062	0.073	0.051	0.055
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.000018	**0.00080**	0.0000047	**0.00019**	0.000009	**0.00036**	0.000004	**0.00017**	0.0000033	**0.00013**
Antimony	mg/L	0.0005	0.02	**0.00053**	**0.00057**	**0.00066**	**0.0009**	**0.00069**	**0.00089**	**0.00064**	**0.00078**	**0.00055**	**0.00058**
Arsenic	mg/L	0.003	0.005	0.0015	0.0015	0.0019	0.0027	0.0020	0.0025	0.0018	0.0023	0.0016	0.0017
Barium	mg/L	0.007	1.0	0.0051	0.0054	0.0064	**0.0091**	0.0066	**0.0085**	0.0061	**0.0075**	0.0053	0.0056
Boron	mg/L	0.01	1.5	0.0050	0.0052	0.0064	0.0091	0.0066	0.0084	0.0061	0.0075	0.0053	0.0056
Cadmium	mg/L	0.00003	0.000047	0.000013	0.000013	0.000017	0.000023	0.000017	0.000022	0.000016	0.000020	0.000014	0.000014
Calcium	mg/L	11	-	7.4	8.6	9.0	**13**	9.5	**12**	8.7	11	7.5	7.9
Chloride	mg/L	4.8	120	1.1	1.4	1.3	1.8	1.4	1.8	1.2	1.5	1.0	1.1
Cobalt	mg/L	0.00025	0.0025	**0.00030**	**0.00041**	**0.00035**	**0.00049**	**0.00038**	**0.00049**	**0.00033**	**0.00041**	**0.00029**	**0.00030**
Copper	mg/L	0.003	0.005	0.0016	**0.0039**	0.0013	0.0019	0.0019	0.0025	0.0013	0.0015	0.0011	0.0012
Cyanide (Total)	mg/L	0.001	-	**0.0045**	**0.018**	**0.0015**	**0.0022**	**0.0047**	**0.0065**	**0.0015**	**0.0022**	**0.0013**	**0.0014**
Cyanide (Free)	mg/L	0.001	0.0098	**0.0011**	**0.0046**	0.00039	0.00058	**0.0012**	**0.0016**	0.00039	0.00055	0.00032	0.00034
Iron	mg/L	0.49	0.3	0.21	0.23	0.26	0.37	0.27	0.35	0.25	0.31	0.22	0.23
Lead	mg/L	0.0005	0.003	0.00033	0.00033	0.00042	**0.00059**	0.00043	**0.00055**	0.00040	0.00049	0.00035	0.00037
Magnesium	mg/L	2.0	-	1.3	1.3	1.6	**2.3**	1.7	**2.2**	1.6	1.9	1.3	1.4
Manganese	mg/L	0.120	0.7	0.055	0.055	0.071	0.10	0.073	0.093	0.068	0.083	0.059	0.062
Molybdenum	mg/L	0.001	0.073	**0.0012**	**0.0022**	**0.0013**	**0.0018**	**0.0015**	**0.0020**	**0.0012**	**0.0015**	**0.0011**	**0.0011**
Nickel	mg/L	0.0015	0.025	**0.0015**	**0.0016**	**0.0020**	**0.0028**	**0.0020**	**0.0026**	**0.0019**	**0.0023**	**0.0016**	**0.0017**
Nitrate	mg/L	0.17	13	**0.34**	**0.34**	**0.44**	**0.62**	**0.45**	**0.58**	**0.42**	**0.52**	**0.36**	**0.38**
Phosphorus (Total)	mg/L	0.041	0.02	0.011	0.011	0.014	0.020	0.015	0.019	0.014	0.017	0.012	0.013
Potassium	mg/L	0.52	373	0.46	**1.0**	0.42	**0.60**	**0.56**	**0.73**	0.42	0.49	0.34	0.36
Sodium	mg/L	2.6	-	**4.4**	**17**	1.6	2.5	**4.6**	**6.3**	1.6	2.2	1.3	1.4
Strontium	mg/L	0.024	-	0.016	0.018	0.020	**0.028**	0.021	**0.027**	0.019	0.023	0.016	0.017
Sulphate	mg/L	4.1	218	**9.9**	**38**	4.0	**6.0**	**10**	**14**	4.0	**5.3**	3.3	3.6
Uranium	mg/L	0.002	0.015	0.0010	0.0011	0.0013	0.0018	0.0013	0.0017	0.0012	0.0015	0.0011	0.0011
Vanadium	mg/L	0.001	0.006	**0.0010**	**0.0010**	**0.0013**	**0.0018**	**0.0013**	**0.0017**	**0.0012**	**0.0015**	**0.0011**	**0.0011**
Zinc	mg/L	0.021	0.02	0.0057	0.0058	0.0073	0.010	0.0075	0.010	0.0070	0.0086	0.0060	0.0064

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

APPENDIX II
WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, POST-CLOSURE PHASE STAGE II - MOLLIE RIVER WATERSHED
CÔTÉ GOLD PROJECT

Parameter	Units	95^{th} Baseline Concentration	Water Quality Guidelines (1)	MOLLIE RIVER WATERSHED																			
				Moore Lake		Chester Lake		Little Clam Lake		Clam Lake		Côté Lake (Pit Lake)		Three Duck Lakes (Upper)		Three Duck Lakes (Middle)		Three Duck Lakes (Lower)		Delaney Lake		Dividing Lake	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.091	0.10	0.066	0.085	0.089	0.13	0.086	0.11	0.072	0.074	0.072	0.094	0.071	0.081	0.072	0.076	0.059	0.12	0.070	0.073
Ammonia (Total)	mg/L	0.15	6.98	0.063	0.067	0.050	0.064	0.066	0.094	0.063	0.077	0.055	0.057	0.055	0.072	0.055	0.062	0.055	0.058	0.047	0.091	0.054	0.056
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.0000040	**0.00016**	0.0000036	**0.00014**	0.0000050	**0.00019**	0.0000044	**0.00017**	0.0000035	**0.00014**	0.0000040	**0.00016**	0.0000037	**0.00014**	0.0000035	**0.00014**	0.0000043	**0.00015**	0.0000035	**0.00014**
Antimony	mg/L	0.0005	0.02	**0.00076**	**0.00081**	**0.00058**	**0.00075**	**0.00078**	**0.0011**	**0.00074**	**0.00091**	**0.00065**	**0.00067**	**0.00065**	**0.00084**	**0.00064**	**0.00073**	**0.00065**	**0.00069**	**0.00054**	**0.0010**	**0.00064**	**0.00067**
Arsenic	mg/L	0.003	0.005	0.0021	0.0022	0.0017	0.0021	0.0022	**0.0031**	0.0021	0.0026	0.0019	0.0019	0.0019	0.0024	0.0018	0.0021	0.0019	0.0020	0.0015	**0.0030**	0.0018	0.0019
Barium	mg/L	0.007	1.0	**0.0072**	**0.0077**	0.0056	**0.0071**	**0.0074**	**0.011**	**0.0071**	**0.0087**	0.0062	0.0063	0.0062	**0.0080**	0.0061	0.0069	0.0062	0.0065	0.0052	**0.010**	0.0061	0.0063
Boron	mg/L	0.01	1.5	0.0071	0.0076	0.0055	0.0071	0.0074	**0.010**	0.0071	0.009	0.0061	0.0063	0.0061	0.008	0.0061	0.007	0.0061	0.0065	0.0052	**0.010**	0.0060	0.0063
Cadmium	mg/L	0.00003	0.000047	0.000018	0.000019	0.000014	0.000018	0.000019	0.000027	0.000018	0.000022	0.000016	0.000016	0.000016	0.000021	0.000016	0.000018	0.000016	0.000017	0.000013	0.000026	0.000016	0.000016
Calcium	mg/L	11	-	**12**	**13**	8.1	10.6	11	**16**	11	**13**	9.1	9.4	9.1	**12**	8.9	10	9.0	9.6	7.3	**14**	8.9	9.3
Chloride	mg/L	4.8	120	1.5	1.6	1.1	1.4	1.5	2.2	1.4	1.8	1.2	1.3	1.2	1.6	1.2	1.4	1.2	1.3	1.0	2.0	1.2	1.3
Cobalt	mg/L	0.00025	0.0025	**0.00044**	**0.00047**	**0.00031**	**0.00040**	**0.00042**	**0.00061**	**0.00041**	**0.00050**	**0.00034**	**0.00035**	**0.00034**	**0.00044**	**0.00034**	**0.00038**	**0.00034**	**0.00036**	**0.00028**	**0.00054**	**0.00033**	**0.00034**
Copper	mg/L	0.003	0.005	0.0026	0.0029	0.0013	0.0018	0.0020	**0.0031**	0.0020	0.0026	0.0015	0.0015	0.0014	0.0019	0.0014	0.0016	0.0014	0.0015	0.0010	0.0020	0.0013	0.0014
Cyanide (Total) (2)	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (Free) (2)	mg/L	0.001	0.0098	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.49	0.3	0.30	0.32	0.23	0.29	0.30	0.43	0.29	0.36	0.25	0.26	0.25	0.33	0.25	0.28	0.25	0.26	0.21	0.41	0.24	0.26
Lead	mg/L	0.0005	0.003	0.00046	0.00049	0.00036	0.00046	0.00048	**0.00068**	0.00046	**0.00056**	0.00040	0.00041	0.00040	**0.00052**	0.00040	0.00045	0.00040	0.00042	0.00034	**0.00066**	0.00039	0.00041
Magnesium	mg/L	2.0	-	1.8	2.0	1.4	1.8	1.9	**2.7**	1.8	**2.2**	1.6	1.6	1.6	**2.0**	1.5	1.8	1.6	1.7	1.3	**2.6**	1.5	1.6
Manganese	mg/L	0.120	0.7	0.077	0.083	0.061	0.078	0.081	0.12	0.078	0.09	0.068	0.070	0.068	0.09	0.067	0.08	0.068	0.072	0.057	0.11	0.067	0.070
Molybdenum	mg/L	0.001	0.073	**0.0020**	**0.0022**	**0.0012**	**0.0016**	**0.0017**	**0.0025**	**0.0017**	**0.0021**	**0.0013**	**0.0014**	**0.0013**	**0.0017**	**0.0013**	**0.0015**	**0.0013**	**0.0014**	**0.0010**	**0.0020**	**0.0012**	**0.0013**
Nickel	mg/L	0.0015	0.025	**0.0022**	**0.0023**	**0.0017**	**0.0022**	**0.0022**	**0.0032**	**0.0022**	**0.0026**	**0.0019**	**0.0019**	**0.0019**	**0.0024**	**0.0019**	**0.0021**	**0.0019**	**0.0020**	**0.0016**	**0.0031**	**0.0018**	**0.0019**
Nitrate	mg/L	0.17	13	**0.48**	**0.51**	**0.38**	**0.48**	**0.50**	**0.71**	**0.48**	**0.59**	**0.42**	**0.43**	**0.42**	**0.55**	**0.42**	**0.47**	**0.42**	**0.44**	**0.35**	**0.69**	**0.41**	**0.43**
Phosphorus (Total)	mg/L	0.041	0.02	0.016	0.017	0.012	0.016	0.016	0.023	0.016	0.019	0.014	0.014	0.014	0.018	0.014	0.02	0.014	0.015	0.012	0.023	0.013	0.014
Potassium	mg/L	0.52	373	**0.79**	**0.88**	0.41	**0.57**	**0.63**	**0.96**	**0.61**	**0.8**	0.46	0.48	0.45	**0.59**	0.45	**0.52**	0.45	0.48	0.33	**0.65**	0.43	0.45
Sodium	mg/L	2.6	-	**8.5**	**9.9**	2.4	**3.9**	**4.8**	**8.2**	**4.9**	**6.8**	**2.7**	**2.8**	2.5	**3.3**	2.4	**2.9**	2.4	2.6	1.2	2.2	2.0	2.2
Strontium	mg/L	0.024	-	**0.024**	**0.026**	0.018	0.023	0.024	**0.034**	0.023	**0.028**	0.020	0.020	0.019	**0.025**	0.019	0.022	0.019	0.021	0.016	**0.031**	0.019	0.020
Sulphate	mg/L	4.1	218	**20**	**23**	**5.9**	**9.4**	**12**	**20**	**12**	**16**	**6.5**	**6.8**	**6.1**	**8.1**	**5.9**	**7.0**	**5.8**	**6.2**	2.9	**5.6**	**4.9**	**5.3**
Uranium	mg/L	0.002	0.015	0.0014	0.0015	0.0011	0.0014	0.0015	**0.0021**	0.0014	0.0017	0.00124	0.0013	0.0012	0.0016	0.0012	0.0014	0.0012	0.0013	0.0010	**0.0020**	0.0012	0.0013
Vanadium	mg/L	0.001	0.006	**0.0014**	**0.0015**	**0.0011**	**0.0014**	**0.0015**	**0.0021**	**0.0014**	**0.0017**	**0.00123**	**0.0013**	**0.0012**	**0.0016**	**0.0012**	**0.0014**	**0.0012**	**0.0013**	**0.0010**	**0.0020**	**0.0012**	**0.0013**
Zinc	mg/L	0.021	0.02	0.0080	0.0086	0.0063	0.0081	0.0084	0.012	0.0080	0.010	0.0070	0.0072	0.0070	0.0091	0.0069	0.0079	0.0070	0.0074	0.0059	0.011	0.0069	0.0072

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

(2) Total and free cyanide are not predicted for Mollie River Watershed locations during post-closure phase stage II, as there is assumed not to be a source of cyanide to this system decades after closure of the Project site.

APPENDIX II

WATER QUALITY MODELING RESULTS: MONTHLY AVERAGE CONCENTRATIONS, POST-CLOSURE PHASE STAGE II - MESOMIKENDA LAKE WATERSHED

CÔTÉ GOLD PROJECT

Parameter	Units	95th Baseline Concentration	Water Quality Guidelines (1)	MESOMIKENDA LAKE WATERSHED									
				Unnamed Lake #5 (Tributary to Schist Lake Outflow)		Bagsverd Lake (South)		Bagsverd Lake		Neville Lake		Mesomikenda Lake (Upper Basin)	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum	mg/L	0.14	0.075	0.060	0.071	0.064	0.086	0.077	0.10	0.071	0.087	0.061	0.065
Ammonia (Total)	mg/L	0.15	6.98	0.044	0.045	0.050	0.067	0.058	0.075	0.055	0.068	0.048	0.051
Ammonia (Un-ionized)	mg/L	0.0001	0.019	0.0000028	**0.00011**	0.0000037	**0.00015**	0.0000042	**0.00016**	0.0000040	**0.00016**	0.0000031	**0.00012**
Antimony	mg/L	0.0005	0.02	**0.00053**	**0.00056**	**0.00058**	**0.00077**	**0.00068**	**0.00087**	**0.00064**	**0.00078**	**0.00055**	**0.00058**
Arsenic	mg/L	0.003	0.005	0.0015	0.0015	0.0017	0.0022	0.0019	0.0025	0.0018	0.0023	0.0016	0.0017
Barium	mg/L	0.007	1.0	0.0051	0.0053	0.0056	**0.0074**	0.0065	**0.0084**	0.0061	**0.0075**	0.0053	0.0056
Boron	mg/L	0.01	1.5	0.0050	0.0051	0.0056	0.0074	0.0065	0.0083	0.0061	0.0075	0.0053	0.0056
Cadmium	mg/L	0.00003	0.000047	0.000013	0.000013	0.000014	0.000019	0.000017	0.000021	0.000016	0.000020	0.000014	0.000014
Calcium	mg/L	11	-	7.6	9.7	7.8	10	9.6	**12**	8.7	11	7.5	7.9
Chloride	mg/L	4.8	120	1.0	1.2	1.1	1.5	1.3	1.7	1.2	1.5	1.0	1.1
Cobalt	mg/L	0.00025	0.0025	**0.00028**	**0.00035**	**0.00030**	**0.00040**	**0.00036**	**0.00047**	**0.00033**	**0.00041**	**0.00029**	**0.00030**
Copper	mg/L	0.003	0.005	0.0013	0.0026	0.0011	0.0015	0.0016	0.0020	0.0013	0.0015	0.0011	0.0011
Cyanide (Total) (2)	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-
Cyanide (Free) (2)	mg/L	0.001	0.0098	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.49	0.3	0.21	0.22	0.23	0.30	0.27	0.34	0.25	0.31	0.22	0.23
Lead	mg/L	0.0005	0.003	0.00033	0.00033	0.00037	0.00049	0.00043	**0.00055**	0.00040	0.00049	0.00035	0.00037
Magnesium	mg/L	2.0	-	1.3	1.3	1.4	1.9	1.7	**2.1**	1.6	1.9	1.3	1.4
Manganese	mg/L	0.120	0.7	0.055	0.055	0.062	0.082	0.072	0.092	0.068	0.083	0.059	0.062
Molybdenum	mg/L	0.001	0.073	**0.0011**	**0.0017**	**0.0011**	**0.0015**	**0.0014**	**0.0018**	**0.0012**	**0.0015**	**0.0010**	**0.0011**
Nickel	mg/L	0.0015	0.025	**0.0015**	**0.0016**	**0.0017**	**0.0023**	**0.0020**	**0.0025**	**0.0019**	**0.0023**	**0.0016**	**0.0017**
Nitrate	mg/L	0.17	13	**0.34**	**0.34**	**0.38**	**0.51**	**0.44**	**0.57**	**0.42**	**0.52**	**0.36**	**0.38**
Phosphorus (Total)	mg/L	0.041	0.02	0.011	0.011	0.013	0.017	0.015	0.019	0.014	0.017	0.012	0.013
Potassium	mg/L	0.52	373	0.41	**0.77**	0.36	0.48	0.49	**0.64**	0.40	0.48	0.34	0.36
Sodium	mg/L	2.6	-	**2.9**	**10**	1.3	1.8	**3.0**	**4.0**	1.5	1.8	1.3	1.3
Strontium	mg/L	0.024	-	0.016	0.019	0.017	0.023	0.021	**0.026**	0.019	0.023	0.016	0.017
Sulphate	mg/L	4.1	218	**6.9**	**24**	3.2	**4.4**	**7.1**	**10**	3.8	**4.5**	3.1	3.4
Uranium	mg/L	0.002	0.015	0.0010	0.0011	0.0011	0.0015	0.0013	0.0017	0.0012	0.0015	0.0011	0.0011
Vanadium	mg/L	0.001	0.006	**0.0010**	**0.0010**	**0.0011**	**0.0015**	**0.0013**	**0.0017**	**0.0012**	**0.0015**	**0.0011**	**0.0011**
Zinc	mg/L	0.021	0.02	0.0057	0.0058	0.0063	0.0085	0.0074	0.009	0.0070	0.0086	0.0060	0.0064

Notes:

Minimum (Min) and maximum (Max) monthly average concentrations are in mg/L. The minimum and maximum monthly average concentrations are taken from the results of the average, 1:25-year dry and 1:25-year wet climate conditions.

Monthly average concentrations greater than the 95th percentile baseline concentrations are denoted in bold, and monthly average concentrations greater than the 95th percentile baseline concentration and Water Quality Guidelines are denoted in bold italics.

(1) Derived a single set of Water Quality Guidelines equal to the most recent of the PWQO or CWQG (or the BCMOE guideline for parameters without a PWQO or CWQG), with the exception of cyanide, which has a site-specific guideline.

(2) Total and free cyanide are not predicted for Mesomikenda Lake Watershed locations during post-closure phase stage II, as there is assumed not to be a source of cyanide to this system decades after closure of the Project site.

B-7: Updated Technical Memorandum: Terrestrial Biology

Memorandum

To:	Steven Woolfenden	**From:**	Matt Evans
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Stephan Theben (SLR Consulting) Don Carr (Amec Foster Wheeler)	**Date:**	May 1, 2018 (revised September 4, 2018)
Subject:	**CÔTÉ GOLD PROJECT ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: TERRESTRIAL BIOLOGY		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Aquatic Biology;

- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Terrestrial Biology

Extensive terrestrial biology baseline surveys were completed by Amec Foster Wheeler and Golder Associates in 2012 and 2013 (Amec Foster Wheeler, 2013; Golder, 2013) for the proposed mine site and transmission line alignments (TLA), for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA').

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. The study considers indicators assessed through the EA, where changing Project effects could have the potential to warrant an update to the conclusions of the EA.

Changes to the Project that are relevant to potential terrestrial biology effects include:

- Relocation of Tailings Management Facility (TMF) from north of the open pit to the west;
- establishment of an overburden stockpile south of the open pit;
- use of the Shining Tree TLA; and
- reduced Project footprint from 1,700 ha (17 km^2) to 1,050 ha (10.5 km^2).

Additional baseline environmental studies were needed to supplement existing baseline information and provide site-specific data to address changes to the TMF location and the chosen TLA. Amec Foster Wheeler, conducted the additional baseline studies in 2017 (2017 study area shown in Figure 1) to evaluate and document the terrestrial natural resources present within the proposed TMF and overburden stockpile footprints, and to provide supplemental aerial survey information for the chosen TLA. The 2017 baseline studies were designed to:

- Establish the presence of natural areas identified as having significant or unique natural heritage features including earth and life science areas of natural and scientific interest, provincial and national parks, conservation areas, international biological program sites, nature reserves, provincially significant wetlands and other unevaluated wetlands;

- inventory vegetation species and communities found in the local and regional study areas;
- inventory terrestrial wildlife present through field surveys targeting multiple guilds of wildlife, including breeding diurnal landbirds, breeding nocturnal landbirds, marsh breeding birds, mammals (including bats), amphibians, reptiles and insects;
- document the presence of any plant and wildlife Species at Risk (SAR) and provincially rare species;
- document the presence of any significant wildlife habitat (SWH) in the form of seasonal concentration areas, specialized habitats, habitats of species of conservation concern and animal movement corridors;
- establish indices of abundance and trends in seasonal habitat use and behaviour for effects assessment indicators;
- use available published information and newly collected data (in 2017) to predict impacts of TMF construction on flora and fauna and their habitats within the local and regional study areas;
- use available and collected data to predict impacts of upgrades and any construction to the TLA on flora and fauna and their habitats within the existing TLA right-of-way; and
- provide mitigation measures to minimize potential Project impacts.

Baseline data was gathered using the standard approaches of literature review, observation, sample collection and data analysis. Amec Foster Wheeler conducted a comprehensive terrestrial field program in 2017 to complement existing information for the Project site and surrounding region, and to provide qualitative and quantitative information on wildlife and vegetation communities within the Project study area.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The 2017 terrestrial biology surveys consisted of numerous ground-based plant and wildlife surveys, two winter aerial surveys for mammals and two spring aerial surveys for raptor stick nests. The study area for the 2017 ground-based surveys included areas located within 2 km of the proposed footprint changes (Figure 2-1). The study area for the 2017 aerial surveys involved flying 17 east-west transects over the proposed TMF and overburden stockpile footprints, and three east-west transects along the existing TLA right-of-way (ROW) from the Project site to the Shining Tree substation (Figure 2-1). For the aerial surveys, the study area extends 250 m beyond the outermost transects.

Study area boundaries for the 2017 field investigations changed from those presented in the EA (Amec Foster Wheeler, 2014a, b) to represent the Project plans:

- In 2016, IAMGOLD acquired lands to the west of the Project site that were previously unavailable. This ownership change has enabled IAMGOLD to optimize the land use with respect to siting the TMF and overburden stockpile, and minimizing the environmental footprint of the project and a new TMF site was selected. The previous study areas did not extend far enough west or south to document the habitats surrounding the new TMF and overburden stockpile. The previous regional study area for the mine site baseline was a 30 km buffer around the mine site footprint to account for species with large home ranges, such as Moose and wolves (Golder, 2013). As the previous baseline (Golder, 2013) assessed Project-specific effects on these species in the vicinity of the mine site, such an extensive regional study area was deemed unnecessary for the additional TMF footprint.
- Previously, two TLA options had been investigated and the EA had presented predictions of effects for the Cross Country TLA. The Project no longer requires a dedicated 230 kilovolt (kV) transmission line due to the reduced production rate, and therefore, the Project will tie into the existing 115 kV Shining Tree TLA, at the Shining Tree substation (Figure 2-2). The development of the TLA will include some refurbishments of the existing Shining Tree line from Timmins to the Shining Tree substation (e.g., replacement of poles, conductors and insulators). Significant regeneration has occurred within the unused ROW between the Shining Tree substation and the Project site, some of which will need to be cleared and a new segment of transmission line constructed.

2.2 Temporal Boundaries

The temporal boundaries of the EER will span all phases of the Project:

- Construction;
- Operations;

- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The Effects Assessment Indicators (EAIs) have not changed compared to the EA (Amec Foster Wheeler, 2014a, b) Prediction of Effects

2.4 Prediction of Effects

An analysis of the potential Project-related effects on identified EAIs has been conducted taking into consideration the application of avoidance, mitigation and reclamation measures to reduce or eliminate residual effects. Available data gathered through literature review and field studies was used to predict effects of the Project on flora and fauna and their habitat within the Project study area.

The EA (Amec Foster Wheeler, 2014a) laid out various predictions of effects for the proposed mine site, and the local and regional study areas current at the time of submission. With the acquisition of land to the west of the Project site, IAMGOLD has been able to optimize the environmental footprint of the project by selecting a new TMF site. The previous TMF footprint was 840 hectares (ha) and was located 4.5 km north of the open pit. The TMF footprint as of November 2017 is 480 ha and is located 2.8 km northwest of the open pit (between Moore Lake and Clam Lake; Figure 2-3). This new footprint results in a 360 ha decrease in the size of the TMF and is 42% smaller than the currently approved footprint detailed in the EA. This substantial optimization of the proposed TMF footprint results in less loss of both vegetation habitat types and wildlife habitats overall and avoids Bagsverd Valley which provides Painted Turtle habitat and habitat for other herpetile species. The Project footprint presented in the EA was 1,700 ha in size, but has now been adjusted to 1,050 ha; a decrease of 650 ha, or 38%. This optimization also results in substantially less habitat loss compared to the currently approved footprint. Additionally, the preferred TLA has changed from a newly constructed120 km dedicated 230 kV transmission line along the proposed Cross Country alignment, to an approximately 44 km, 115 kV transmission line from the Shining Tree substation to the Project site along an existing ROW. The development of this shorter 115 kV line will include some refurbishments of the existing line from Timmins to the Shining Tree substation and results in less habitat lost due to utilizing existing infrastructure.

The Project footprint also includes the establishment of a new overburden stockpile and two new seepage collection ponds, south of the open pit and north-west of Chester Lake (Figure 2-3). A majority of the overburden stockpile and collection ponds (86.3%) overlap the RSA surveyed in 2017. The overburden stockpile footprint is 40 ha and the two collection ponds are 3.9 ha combined (2.6 ha and 1.3 ha, respectively). The effects on plant communities are discussed in Sections 3.1.1 and 3.1.2. The area is small and is represented by plant communities common in the Project landscape, so no further noticeable effects on EAIs are predicted.

The predictions of effects in this Updated Technical Memorandum will discuss these new spatial boundaries and the vicinity of the mine site as a whole, but will not reassess nor restate all of the predictions specific to the 2013 / 2014 regional study area as it was not resurveyed in 2017. Table 2-1 presents a comparison of the major vegetation classes presented in the EA and the Project layout.

Table 2-1: Comparison of Number of Hectares of Vegetation Communities Affected by the EA Footprint and the Project Footprint

Vegetation Community (Golder 2014a)	Area (ha) Based on the EA Footprint	Area (ha) Based on the Project Footprint	Loss / Gain (ha)	Loss / Gain (%)
Bog – treed	32.6	6.1	-26.5	-81.3%
Forest – dense coniferous	293.0	132.9	-160.1	-54.6%
Forest – dense deciduous	24.7	49.2	+24.5	+99.2%
Forest – dense mixed	847.7	768.7	-79.0	-9.3%
Forest – sparse	105.2	46.7	-58.5	-55.6%
Forest Depletion – cuts	185.7	50.8	-134.9	-72.6%
Jack Pine Regeneration / Cut	231.1	1.1	-230.0	-99.5%
Water – deep clear	50.5	45.5	-5.0	-9.9%
Wetland	174.7	77.2	-97.5	-55.8%

The Project footprint has been optimized from the previously assessed 1,700 ha in the EA, compared to 1,050 ha in the updated layout, this decrease in area results in less habitat projected to be lost and the effects on plant communities are discussed in Sections 3.1.1 and 3.1.2. The footprint has decreased by 650 ha (38%) and changes in the number of hectares within each vegetation community listed in Table 2-1 are relatively small (changes in size range from 5 ha to 230 ha compared to the EA). Eight out of nine vegetation communities decreased in impact size (‘Forest - dense deciduous’ increased, see Table 2-1) and there are no new, sensitive areas affected. Therefore, the changes in areas impacted by the new footprint do not change any of the predicted effects on the EAIs, and their respective habitat types, and no new sensitive areas are impacted.

There are also no changes to the predicted effects of the TLA construction on the EAIs as much less habitat (both upland and wetland) will be affected by the shorter 115 kV transmission line from the Shining Tree substation to site. This route, which is 76 km shorter than the alignment presented in the EA, does not involve the construction of a new corridor and instead will be constructed along an existing, slightly overgrown ROW from the Shining Tree substation to the Project site.

3.0 PREDICTION OF EFFECTS

3.1 Construction Phase

3.1.1 Upland Plant Community Types (Mine Site)

Construction of the TMF is anticipated to remove 310 ha of habitat that supports upland plant communities, which represents 78.8% of the habitats in the TMF footprint (Figures 2-3 and 3-1). Approximately 167.3 ha of Dry to Fresh, Coarse: Pine – Black Spruce Conifer community type will be affected, representing the largest proportion of upland community affected within the TMF footprint. Additionally, Moist, Coarse: Mixedwood (85.1 ha), Dry to Fresh, Coarse: Pine – Black Spruce Conifer (43.6 ha) and small amounts of three other communities will be removed during this construction (Table 3-1).

Construction of the overburden stockpile and two seepage collection ponds (Figure 2-3) is anticipated to remove approximately 43.9 ha of upland plant communities. The plant community that will experience the largest impact from the stockpile and two ponds is the 'Very Shallow, Humid: Black Spruce – Pine Conifer' community type (22.2 ha; Table 3-2).

The previous footprint presented in the EA was anticipated to remove 1687.4 ha of upland plant habitat while the new, smaller footprint will remove approximately 1049.4 ha of upland plant habitat, a reduction of 638 ha (-37.8%). The predicted effects on the EAIs that depend on upland plant communities remain unchanged from those described in the EA.

Dewatering of water bodies and realignment of watercourses around the Project site may affect the abundance of the upland plant community by changing the quality of the supporting habitat. Plant community changes resulting from changes to hydrology will likely remain in effect until flows are allowed to return to baseline conditions, following Post-closure stage II.

Changes are anticipated to be measurable at the local scale, but no measurable changes to the abundance and distribution of plant populations and communities are expected in a regional context as a result of habitat loss and fragmentation. Disturbance to plant populations and communities will be restricted to the TMF and overburden stockpile footprints. Following closure, the effects on upland plant communities within the TMF and overburden stockpile footprints are predicted to be partially reversible within 15 years after closure.

3.1.2 Wetlands (Mine Site)

Wetlands consist of bog, fen, swamp and marsh ecosite types. Construction of the TMF is anticipated to remove 75.0 ha of habitat that currently supports wetlands, which represents 19.1% of the habitats in the TMF footprint. This will result in a loss of 2.2% of the wetland habitat in the 2017 study area (Figure 3-1). Approximately 43.4 ha of Hardwood Swamp community type will be affected, representing the largest proportion of wetland community affected within the TMF footprint. Additionally, Mineral Shallow Marsh (8.5 ha), Sparse Treed

Fen (5.5 ha), Shrub Shore Fen (3.8 ha) and small amounts of six other wetland communities will be removed during this construction (Table 3-1). The location of the new TMF allows for the avoidance of Bagsverd Valley and consequently avoids habitat for Painted Turtles and other herpetile species.

Construction of the two seepage collection ponds associated with the new overburden stockpile are anticipated to remove 1.8 ha of habitat that supports wetland plant communities which do not overlap the 2017 study area (Table 3-2). Approximately 0.5 ha of Mineral Meadow Marsh community type and 1.3 ha of Shrub Shore Fen will be affected (Table 3-2).

The footprint presented in the EA was anticipated to remove 207.3 ha of wetland plant communities and 50.5 ha of open water. The updated footprint is anticipated to remove 160.5 ha of wetland habitat (a reduction of 46.8 ha, or -22.6%) and 45.5 ha of open water (a reduction of 5 ha, or -9.9%). The new footprint is smaller and less wetland and water habitat will be lost; therefore the predicted effects on other EAIs, which depend on upland communities, remains unchanged.

Dewatering of water bodies and realignment of watercourses around the Project site may affect the quantity of wetlands by changing the quality of the habitat available. The hydrologic regime will be maintained resulting in no measurable residual effect to wetlands, provided that habitat compensation for the water realignments includes features and functions of the present watercourses. These changes are predicted to be partially reversible within 15 years of closure once natural flows are reverted (following Post-closure stage II).

Table 3-1: Vegetation Communities within the Proposed Tailings Management Facility Footprint

Vegetation Community	Area within TMF Footprint (ha)	Percent Cover of TMF Footprint	Percent Cover of 2017 Study Area
Upland Communities			
Deciduous / Mixedwood Forest			
Moist, Coarse: Mixedwood (B076)	85.1	21.6	2.5
Fresh, Silty to Fine Loamy: Aspen - Birch Hardwood (B104)	8.9	2.3	0.3
Total Upland Deciduous / Mixedwood Forest	**94.0**	**23.9**	**2.8**
Coniferous Forest			
Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated (B049)	167.3	42.5	5.0
Dry to Fresh, Coarse: Pine - Black Spruce Conifer (B050)	43.6	11.1	1.3
Fresh, Silty to Fine Loamy: Black Spruce - Jack Pine Dominated (B098)	3.7	0.9	0.1
Total Upland Coniferous Forest	**214.6**	**54.5**	**6.4**
Anthropologically-Disturbed Upland Communities			
Fine, Clean Fill (B196)	1.4	0.4	<0.1
Total Upland Communities	**310.0**	**78.8**	**9.3**
Wetland Communities			

Vegetation Community	Area within TMF Footprint (ha)	Percent Cover of TMF Footprint	Percent Cover of 2017 Study Area
Swamp			
Organic Rich Conifer Swamp (B129)	1.9	0.5	0.1
Intolerant Hardwood Swamp (B130)	2.9	0.7	0.1
Hardwood Swamp (B133)	43.4	11.0	1.3
Mineral Thicket Swamp (B134)	2.7	0.7	0.1
Fen			
Sparse Treed Fen (B136)	5.5	1.4	0.2
Open Moderately Rich Fen (B140)	2.0	0.5	0.1
Shrub Shore Fen (B147)	3.8	1.0	0.1
Bog			
Sparse Treed Bog (B137)	1.5	0.4	<0.1
Marsh			
Mineral Meadow Marsh (B142)	2.8	0.7	0.1
Mineral Shallow Marsh (B148)	8.5	2.2	0.3
Total Wetland Communities	**75.0**	**19.1**	**2.2**

Table 3-2 Vegetation Community Types and Associated Areas Impacted by the New Overburden Stockpile and Seepage Collection Ponds

Vegetation Community	Area (ha) within the 2017 Study Area	Area (ha) outside the 2017 Study Area
Very Shallow, Humid: Black Spruce – Pine Conifer (B024)	18.0	4.2
Dry to Fresh, Coarse: Jack Pine – Black Spruce Dominated (B049)	11.7	0
Fresh, Silty to Fine Loamy: Aspen - Birch Hardwood (B104)	8.2	0
Mineral Meadow Marsh (B142)	0	0.5
Shrub Shore Fen (B147)	0	1.3

Effects from construction of the TMF, overburden stockpile and collection ponds on the abundance and distribution of wetlands are expected to be measurable at the local scale, but no measurable changes to the abundance and distribution of wetland plant populations and communities are expected in a regional context as a result of habitat loss and fragmentation. Disturbance to plant populations and communities will be restricted to the TMF and overburden stockpile footprints. Wetlands are common throughout the study area and the landscape surrounding the Project site and there will be sufficient undisturbed habitat for the continued persistence of wetlands.

3.1.3 Vegetation Species at Risk, Species of Special Concern and Provincially Rare Species (Mine Site)

No plant SAR or provincially rare plants have been reported in vicinity of the Project site (Amec Foster Wheeler, 2013; Golder, 2013; ECCC, 2017; MNRF, 2017a, b) and none were observed during the 2017 field investigations of the new TMF and overburden stockpile footprints. As a result, the Project is predicted to have no measurable effects on this EAI.

3.1.4 Ungulates (Mine Site)

Suitable potential summer habitat for Moose includes dense mixed, dense deciduous and regenerating forest, treed bog, treed fen and aquatic and wetland habitats. Potential suitable winter habitat includes dense coniferous and dense mixed forest. Construction of the TMF is anticipated to remove 118.2 ha (3.5% in the 2017 study area) and 299.8 ha (9.0% in the 2017 study area) of summer and winter Moose habitat, respectively.

Although numerous Moose tracks were observed within the 2017 study area and around the periphery, Moose and Moose evidence were observed infrequently within the TMF and overburden stockpile footprints during the 2017 winter and summer surveys (Figure 3-2). Only one set of tracks was observed within the TMF overburden stockpile footprints during winter aerial surveys.

As stated in the EA, sensory disturbance during the construction, operations and Closure phases is expected to result in measurable changes to the occupancy of habitat by Moose near the Project site, as large mammals have been found to have lower abundance within 5 km of human developments (Benitez-Lopez et al., 2010; Golder, 2014b). There will likely be measurable changes in the movement and behaviour of Moose throughout the Construction and Operations phases of the Project (e.g., by avoidance), but effects will be partially reversible by the end of closure as regenerating vegetation (e.g., willow) will provide food sources for Moose, similar to what is seen in regenerating clearcut areas in the region. Effects from habitat loss and fragmentation are expected to be partially reversible with a duration of greater than 15 years after Project closure. However, the local changes in habitat quantity and quality from the Project are anticipated to have no measurable effect on the abundance and distribution of the moose population.

Vegetation clearing activities are not expected to result in any significant increase in wolf, bear or hunter access to areas that were previously less accessible as there will not be any new linear corridors established and hunting will not be permitted within the Project boundaries. Increased traffic during construction may increase the risk of vehicle collisions with furbearers. As the operation phase begins, the risk of collisions is likely to decrease.

As the Project footprint is considerably smaller than that presented in the EA, the amount of suitable habitat that will be affected is greatly reduced. Effects from the Project are expected to be measurable but within the predicted adaptive capacity and resilience limits for this species. The Moose population in Ontario is increasing, and there is sufficient undisturbed habitat in the vicinity of the Project site for a self-sustaining population.

3.1.5 Furbearers (Mine Site)

Potential suitable habitats for Gray Wolves include dense forest (coniferous, mixed and deciduous), regenerating forest, treed bog, treed fen and other wetland habitats. Potential suitable habitats for American Black Bears were determined to be dense deciduous and mixed forests, regenerating forest, wetland habitats and sparse forest habitats. Suitable habitat for American Marten was considered to be dense forest (coniferous, mixed and deciduous), treed bog and treed fen habitats. Potential suitable habitats for Beavers were determined as dense deciduous and mixed forests and regenerating habitats that were within 200 m of wetlands and other water bodies.

Construction of the TMF will remove an estimated 261.4 ha of suitable Beaver habitat, 274.2 ha of suitable American Black Bear habitat, 321.6 ha of suitable Gray Wolf habitat and 315.7 ha of suitable American Marten habitat. This represents a loss of between 7.8% and 9.6% suitable furbearer habitats within the 2017 study area.

Limited furbearer evidence was observed directly within the TMF footprint during winter and summer 2017 field surveys. No wolves or wolf evidence was observed within the TMF footprint during the 2017 winter or summer surveys, three observations of track were recorded during the winter aerial survey within and adjacent to the 2017 study area, southwest of the TMF (Figure 3-2). American Marten evidence was not recorded within the TMF or overburden stockpile footprints during the 2017 field surveys, but tracks were recorded twice within the 2017 study area during the 2017 aerial survey (Figure 3-3).

Evidence of Black Bears, and Beavers were observed frequently throughout the 2017 summer surveys within the TMF footprint and the surrounding study areas.

Tracks from Canada Lynx, River Otter and Red Fox were each observed once within the TMF footprint during the 2017 winter aerial surveys. Tracks of these three species, especially the Red Fox which is comfortable in anthropogenic settings, were seen regularly within the 2017 study area throughout the aerial surveys (Figure 3-3).

Measurable changes in the movement and behaviour of Gray Wolf, Black Bear, American Marten and Beavers are predicted near the Project site, as small and large mammals were found to have lower abundances within 1 km and 5 km of human developments (Benitez-Lopez et al., 2010; Golder, 2014b), respectively. Effects are anticipated to continue from the Construction phase through the Operations phase but are considered to be partially reversible at the end of closure. Effects from habitat loss and fragmentation are expected to be partially reversible, with a duration of greater than 15 years after Project closure. Many of the furbearers in the vicinity of the Project site have likely adapted to human-related sensory disturbances, in the form of logging, mineral exploration and recreation. Vegetation clearing activities may result in an increase of wolf, bear and hunter access to areas previously less accessible. Wolves may benefit from this improved access, increased hunting efficiency and prey availability, while bears may benefit from early-successional vegetation induced by roadside cutting. Construction may also displace Moose or other secondary prey species which would temporarily alter movements and distribution of local wolves. Increased traffic during construction may increase the risk of vehicle collisions with furbearers. As the operation phase begins, the risk of collisions is likely to decrease.

As the Project footprint is considerably smaller than that presented in the EA the amount of suitable habitat that will be affected is greatly reduced. Effects from the Project on Black Bear and Gray Wolf populations are predicted to be measurable, but within the predicted adaptive capability and resilience limits for these species. The Project is anticipated to have no measurable effect on the abundance and distribution of American Marten and Beaver populations in the vicinity of the Project site. Populations are likely increasing or stable and there should be sufficient undisturbed habitat in the Project area for self-sustaining populations.

3.1.6 Migratory Birds (Mine Site)

3.1.6.1 Upland Migratory Birds

According to an updated secondary source review, ten upland breeding bird species with the potential to occur in the vicinity of the Project site are currently listed under Provincial or Federal legislation. Some of these are different than those presented in the EA due to status changes or updates to known ranges since 2013. Chimney Swift and Eastern Whip-poor-will are both listed as Threatened provincially under the *Endangered Species Act* (ESA, 2007) and federally under Schedule 1 of the *Species at Risk Act* (SARA, 2012). Common Nighthawk and Olive-sided Flycatcher are listed as Special Concern provincially under the ESA and federally under SARA. Canada Warbler and Wood Thrush are listed as Special Concern provincially under the ESA and as Threatened under SARA. Rusty blackbirds are listed as Special Concern under SARA but are not listed under the ESA and Bald Eagles are listed as Special Concern under the ESA but are not listed under SARA.

Chimney Swifts nest in chimneys and natural habitat features, such as caves and hollow trees. Changes to Chimney Swift habitat from the Project are anticipated to be negligible because forestry operations, including past and future work on the Project site, are likely the limiting factor for providing suitable natural nesting habitat (i.e., hollow trees). No Chimney Swifts were observed during 2017 field investigations.

Eastern Whip-poor-will and Common Nighthawk are nightjar species that require similar habitat for nesting. No Eastern Whip-poor-will or Common Nighthawk was observed within the TMF or overburden stockpile footprints. One Common Nighthawk was observed calling and flying over the coniferous forest within the 2017 study area. Potential suitable habitat for Common Nighthawk and Eastern Whip-poor-will was considered to exist in sparse forest habitat and rock barrens. The construction of the TMF is not predicted to remove any potential suitable habitat for nightjars.

No Olive-sided Flycatchers were observed during 2017 field investigations. Potential suitable habitat for Olive-sided Flycatchers is considered to be sparse forest, recently logged areas and treed bog habitats. The TMF construction is predicted to remove very minimal (1.5 ha) potential suitable Olive-sided Flycatcher habitat.

Two Canada Warblers were observed during the 2017 breeding bird surveys (Figure 3-4). Potential suitable Canada Warbler habitat is considered to be dense forests (mixed, coniferous and deciduous), treed bog, treed fen and regenerating habitats. The construction of the TMF is predicted to remove 315.7 ha of potential suitable Canada Warbler habitat.

One Rusty Blackbird was observed during the 2017 breeding bird surveys within the TMF footprint (Figure 3-4). Suitable habitat for this species is considered to be wetland habitats such as coniferous and deciduous swamps, bogs and fens. The construction of the TMF is predicted to remove 61.0 ha of potential Rusty Blackbird habitat.

The critical habitats for upland bird species present within the TMF footprint and surrounding study areas are common across the boreal region, including the surrounding landscape. As such, the habitat loss and fragmentation expected to occur in the construction of the TMF is not considered to be limiting to these species' populations.

Measurable changes in the movement and behaviour of listed and non-listed upland breeding birds are predicted near the Project site, as bird abundances were found to generally be lower within 1 km of human developments (Benitez-Lopez et al., 2010; Golder, 2014b). Effects are expected to continue from the Construction phase through the Closure phase. Effects from habitat loss and fragmentation are expected to be partially reversible, with a duration of greater than 15 years after Project closure.

As the Project footprint is considerably smaller than that presented in the EA the amount of suitable habitat that will be affected is greatly reduced. The Project is anticipated to have measurable effects that are within the adaptive capability and resilience limits on the abundance and distribution of listed upland breeding bird species' populations. Recently harvested areas may have a positive influence on some populations and can even provide suitable habitats for Olive-sided Flycatchers, Common Nighthawks and Eastern Whip-poor-wills. Many of the upland bird species found in the vicinity of the Project site have likely adapted to human-related sensory disturbances in the form of logging, mineral exploration and recreation.

3.1.6.2 Waterbirds

Breeding habitat for waterbirds is considered to be wetlands, treed fens within 200 m of wetlands and water bodies and shorelines of large lakes (100 m buffer). The construction of the TMF is predicted to remove 30.8 ha of waterbird habitat.

Many of the waterbird species found in the vicinity of the Project site have likely adapted to human-related sensory disturbances in the form of logging, mineral exploration and recreation.

As the Project footprint is considerably smaller than that presented in the EA the amount of suitable habitat that will be affected is greatly reduced. Measurable changes in the movement and behaviour of waterbirds are predicted near the Project, as bird abundance may be lower within 1 km of human developments (Benitez-Lopez et al., 2010; Golder, 2014b). Effects are anticipated to continue from the Construction phase up until the end of the Closure phase at the Project site, and to be partially reversible at the end of closure. Eventually, waterbirds may use the flooded open pit as a staging or roosting area. Effects are expected to be partially reversible, with a duration of greater than 15 years after Project closure. Overall, local changes in abundance and distribution of waterbird populations from the Project are anticipated to have no measurable effect on waterbird populations in a regional context.

3.1.6.3 Raptors

The majority of raptor species in northern Ontario nest in large trees, which are typically found in mature upland forest habitats. One exception is the Short-eared Owl, which typically nests in open areas such as open bog habitat (potential suitable Short-eared Owl habitat). Potential suitable tree-nesting raptor habitat was considered to be dense forests (coniferous, mixed and deciduous) and sparse forest. Other habitat features, such as cliffs, may also be selected by raptors for nesting but these habitats are not present within the2017 study area.

The construction of the TMF is predicted to remove 308.8 ha (9.2% of the 2017 study area) of potential suitable tree-nesting raptor habitat. The construction of the TMF is not predicted to remove any potential suitable Short-eared owl habitat.

One active Bald Eagle nest was observed during aerial surveys with two adults present. The nest was located between Upper Three Duck Lakes and Côté Lake just outside (east) of the 2017 study area (Figure 3-4). This nest is in close proximity to the proposed mine site footprint, and consultation with the Ministry of Natural Resources and Forestry (MNRF) is needed to mitigate and manage effects to this nest site. Significant Bald Eagle nesting habitat (MNR, 2015) includes any nest known, or suspected, to have been used within the last five years, as well as habitat within a radius of 400 to 800 m around the nest. Two other raptor species, Red-tailed Hawk and Broad-winged Hawk, were observed during the 2017 spring and summer field surveys and are likely to be breeding in the vicinity of the Project site. Broad-winged Hawks were observed daily within the TMF footprint and the surrounding study areas.

There will likely be measurable changes to the occupancy of habitat by raptors near the Project site. Sensory disturbance effects should be partially reversible at the end of closure. The residual footprint from the Project is predicted to cause a long-term decrease in potential suitable habitat within affected areas. Eventually, the flooded open pit may attract waterbirds and increase local prey abundance for some raptors (e.g., Peregrine Falcon and Bald Eagle). Project effects are expected to be partially reversible, with a duration of greater than 15 years after closure. Overall, the local changes in habitat quantity and quality from the Project are anticipated to have no measurable effect on the abundance and distribution of raptor populations in the 2017 study area.

As the Project footprint is considerably smaller than that presented in the EA the amount of suitable habitat that will be affected is greatly reduced. Effects from the Project are predicted to be measurable, but within the adaptive capability and resilience limits for species. Forestry activities are more likely to have a measurable effect on populations, while the construction of the TMF is expected to have no measurable effect on raptor populations.

3.1.7 Wildlife Species at Risk (Mine Site)

During the summer, bats occupy a variety of day and night roosts including buildings, caves and trees. Suitable habitat is considered to be dense forest (coniferous, mixed and deciduous) and sparse forest habitats. The construction of the TMF is anticipated to remove 308.8 ha (9.2% of the 2017 study area) of potential bat habitat.

Desktop GIS studies indicated that no bat hibernacula or potential maternity roost colonies were present in the expanded areas to be studied in 2017, and nor were observed during the field investigations. Bat activity was highest at acoustic detectors adjacent to wetland habitats, indicating usage of the Project study area for foraging.

Local effects on bat abundance and distribution are anticipated to be measurable near the Project as small mammal and bird abundances have been found to be lower within 1 km of human developments. However, these local effects are expected to have no measurable effect at the population level. Local changes in bat habitat and occupancy near the Project are likely to occur from the Construction phase until the end of the Closure phase of the Project and effects are expected to be partially reversible. Changes in habitat quantity and quality from the Project are expected to have no measurable effect on the abundance and distribution of bat population.

Effects to listed upland breeding birds and raptors are provided above.

3.1.8 Vegetation Communities (Transmission Line)

The EA presented the prediction of effects for constructing the Cross Country TLA, a new corridor which was the preferred option at the time of submission. Due to a predicted lower production rate a dedicated 230 kV line is no longer required so the Project will tie into the existing 115 kV Shining Tree TLA and the construction of a new transmission corridor is no longer the necessary.

The preferred option includes refurbishments to an existing line and minor clearing of the existing ROW from the Shining Tree Substation to the Project Site. This change results in less previously undisturbed habitat being lost. Predicted effects from the construction of the Shining Tree TLA are covered in two Technical Support Documents (TSD) supporting the Côté Gold Project EA. The TSD: Vegetation (Golder, 2014) covers the majority of the east-west TLA ROW from the Project site to the Shining Tree substation and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation.

Additional vegetation surveys were not considered necessary, and therefore, the results presented in these previous TSDs remain valid and are unchanged.

3.1.9 Ungulates - Moose (Transmission Line)

The TSD: Vegetation (Golder, 2014) covers the majority of the existing east-west TLA ROW from the Project site to the Shining Tree substation and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation. The results presented in these previous TSDs are still relevant; however, no aerial surveys were undertaken along the east-west TLA ROW from the Project site to the Shining Tree substation in the previous study (Golder 2014). To ascertain site-specific information regarding ungulate populations along this section of TLA, aerial surveys were undertaken in the winter and spring of 2017.

This section of the TLA footprint uses an existing ROW which is not currently operational. There is significant vegetation regeneration present, and vegetation clearing, including widening of the current ROW, is expected in addition to construction of a transmission line. Suitable potential summer habitat for Moose includes dense mixed, dense deciduous and regenerating forest, treed bog, treed fen and aquatic and wetland habitats. Potential suitable winter habitat includes dense coniferous and dense mixed forests. The vegetation surveys completed by Golder (2013), indicated that this section of the TLA passes through all of these forest types, several wetland communities and areas of open water. These habitats therefore have the potential to be used by Moose during all seasons. The Spanish River Forestry Management Plan (MNR, 2010) identifies Moose aquatic feeding areas within the TLA footprint and the surrounding wetlands, although the plan does not identify any wintering areas in the vicinity of the ROW. While adjacent forest communities are likely be cleared during the widening of the ROW, open water and wetland communities occurring in the footprint are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

Evidence of Moose was observed along the TLA between the Project site and the Shining Tree substation during the 2017 winter and spring aerial surveys (Figure 3-2). Tracks were observed in low to medium densities during the winter surveys and four individual Moose were observed at two locations.

The prediction of effects for Moose along this section of the TLA has not changed from what was presented in the TSD (Amec Foster Wheeler, 2014b). Loss of terrestrial and wetland habitats and / or portions of associated key habitat areas for Moose including aquatic feeding and over wintering areas are not expected to result in any direct mortalities of Moose. These habitats are common throughout the landscape in the vicinity of the TLA and the Project and Moose will be able to move into surrounding habitats during the life of the Project. In a local context, the removal of this habitat is notable but no population level effects are expected for Moose in a regional context. Vegetation clearing activities may result in temporary displacement of local individuals due to sensory disturbances caused by the presence of equipment and personnel during the Construction phase. These noise effects will be temporary, subsiding once the TLA has been constructed.

The effect of the direct habitat loss from the removal of vegetation along a ROW is minor relative to the indirect effects, including alteration of predator-prey dynamics, influx of competition and disease, and increased mortality by humans due to ease of access. Increased predation and hunting rates on local Moose populations may occur under the expanded ROW and associated access road network. However, due to the decreased amount of habitat affected these rates will likely be substantially lower than they would have been for the construction of a new corridor.

These effects would occur during the life of the Project and are reversible during Post-closure of the Project when the transmission line is removed and the ROW is revegetated. The Moose population in Ontario is increasing and there should be sufficient undisturbed habitat in the vicinity of the TLA and Project site for a self-sustaining population.

3.1.10 Furbearers - Wolves, Black Bears and American Marten (Transmission Line)

The TSD: Vegetation (Golder, 2014) covers the majority of the existing east-west TLA line ROW from the Project site to the Shining Tree substation, and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation.

The results presented in these previous TSDs are still relevant; however, no aerial surveys were undertaken along the east-west TLA ROW from the Project site to the Shining Tree substation.

To ascertain site-specific information regarding furbearer populations along this section of TLA, aerial surveys were undertaken in the winter and spring of 2017.

This section of the TLA footprint uses an existing ROW which is not currently operational. There is significant vegetation regeneration present and vegetation clearing, including widening of the current ROW, is expected for the construction of a transmission line. SWH (MNR, 2015) lists specialized habitat for Gray Wolves as open bogs, burns, clearcuts, open wetlands and open forests which are often used as rendezvous sites for resting and congregating. American Marten are an ecological indicator species of mature, interior forests featuring structural complexity (MNR, 2001). Preferred habitats are large areas of dense forest (coniferous, mixed and deciduous), treed bog and treed fen habitats. Suitable habitats for American Black Bear are dense deciduous and mixed forests, regenerating forest, wetland habitats and sparse forest habitats. The vegetation surveys completed by Golder (2013) indicated that this section of the TLA passes through all of these forest types, several wetland communities and areas of open water. These habitats therefore have the potential to be used by these three furbearers during all seasons. While adjacent forest communities are likely be cleared during the widening of the ROW, open water and wetland communities occurring in the footprint are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

Evidence of wolf activity was observed only once along the TLA (Figure 3-2) between the Project site and the Shining Tree substation, during the 2017 winter aerial surveys while American Marten tracks were recorded at three locations. Evidence of Red Fox, Canada Lynx and River Otters were all observed frequently in low densities along the TLA during the 2017 winter aerial surveys (Figure 3-3). No evidence of American Black Bear was observed along the TLA during any of the 2017 aerial surveys.

The prediction of effects for furbearers along this section of the TLA has not changed from what was presented in the TSD (Amec Foster Wheeler, 2014b). Loss of terrestrial and wetland habitats and / or portions of associated key habitat areas for furbearers are not expected to result in any direct mortalities. These habitats are common throughout the landscape in the vicinity of the TLA and the Project, and these species will be able to move into surrounding habitats during the life of the Project. In a local context, the removal of this habitat is notable, but no population level effects are expected for any of these furbearer species in a regional context. Vegetation clearing activities may result in temporary displacement of local individuals due to sensory disturbances caused by the presence of equipment and personnel during the Construction phase but these noise effects will be temporary, subsiding once the TLA has been constructed.

The effect of the direct habitat loss from the removal of vegetation along a ROW is minor relative to the indirect effects, including alteration of predator-prey dynamics, influx of competition and disease, and increased mortality by humans due to ease of access. Vegetation clearing activities may result in an increase of wolf, bear and hunter access to areas previously less accessible. Wolves may benefit from this improved access, increased hunting efficiency and prey availability, while bears may benefit from early-successional vegetation induced by roadside cutting. However, due to the decreased amount of habitat affected these benefits will likely be substantially less than they would have been for the construction of a new corridor. Construction may also displace Moose or other secondary prey species which would temporarily alter movements and distribution of local wolves. Increased traffic during construction may increase the risk of vehicle collisions with furbearers. As the operation phase begins, the risk of collisions is likely to decrease. Noise may act to temporarily influence local wolf - prey dynamics during construction. As an existing ROW is being utilized, local Gray Wolf, Black Bear and American Marten populations are expected to have adapted to the local setting and no appreciable effect on furbearer behaviour after the Construction phase is expected.

These effects would occur during the life of the Project and are reversible during Post-closure of the Project when the transmission line is removed and the ROW is revegetated.

3.1.11 Bats (Transmission Line)

Predicted effects from the construction of the Shining Tree TLA are covered in two TSDs supporting the Côté Gold Project EA. The TSD: Vegetation (Golder, 2014) covers the majority of the existing east-west TLA ROW from the Project site to the Shining Tree substation and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation. As construction of a new corridor is no longer planned the amount of suitable habitat that will be affected is greatly reduced.

Additional bat acoustic and habitat surveys were not considered necessary, and therefore, the results presented in these previous TSDs are unchanged.

3.1.12 Migratory Birds (Transmission Line)

Predicted effects from the construction of the Shining Tree TLA are covered in TSDs supporting the Côté Gold Project EA. The TSD: Vegetation (Golder, 2014) covers the majority of the existing east-west TLA ROW from the Project site to the Shining Tree substation and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation. As construction of a new corridor is no longer planned the amount of suitable habitat that will be affected is greatly reduced.

Additional migratory bird surveys were not considered necessary, and therefore, the results presented in these previous TSDs are unchanged.

3.1.13 Raptors (Transmission Line)

The prediction of effects presented in the EA detailed the implementation of the Cross Country TLA which is no longer the preferred option. The predicted effects from the new preferred option, construction of the Shining Tree TLA, are covered in two TSDs supporting the Côté Gold Project EA. The TSD: Vegetation (Golder, 2014) covers the majority of the existing east-west TLA ROW from the Project site to the Shining Tree substation and the Transmission Line Alignment Terrestrial Biology TSD (Amec Foster Wheeler, 2014b) covers the existing TLA and ROW from Timmins to the Shining Tree substation.

The results presented in these previous TSDs are still relevant; however, no aerial surveys were undertaken along the east-west TLA ROW from the Project site to the Shining Tree substation. To ascertain site-specific information regarding raptor populations along this section of TLA, aerial surveys were undertaken in the spring of 2017.

The majority of raptor species in northern Ontario nest in large trees, which are typically found in mature upland forest habitats. Two exceptions are Short-eared Owls and Northern Harriers, which typically nest in open areas such as open wetlands or grasslands. Woodland raptor nesting is associated with all natural forested ecosites. Bald Eagle and Osprey nests are associated with treed shorelines of lakes, ponds and rivers. The vegetation surveys completed by Golder (2013) indicate that this section of the TLA passes through all of these forest types, several wetland communities and areas of open water. These habitats therefore have the potential to be used by raptors for nesting and foraging. While adjacent forest communities are likely be cleared during the widening of the ROW, open water and wetland communities occurring in the footprint are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

No nests were observed along the east-west route between the Shining Tree substation and the Project site surveyed in 2017. During aerial surveys, a pair of Bald Eagles was observed near an active nest located at the west end of the TLA and adjacent to the 2017 2017 study area. This nest and SAR are discussed previously under the Migratory Birds (Mine Site) heading. The only other raptor species observed along the TLA in 2017 was one Northern Harrier. This species nests in large, undisturbed tracts of wetland and grasslands with low thick vegetation; as such, it is possible it is using open areas of the ROW for breeding, but could also be using nearby wetlands and using the ROW as foraging habitat. Other species of raptors are likely present within forested habitats surrounding the TLA; however, cavity nests and smaller nests such as for Broad-winged Hawk, Sharp-shinned Hawk, American Kestrel and Barred Owl are inconspicuous or unobservable from the air.

The prediction of effects for raptors along this section of the TLA has not changed from what was presented in the TSD (Amec Foster Wheeler, 2014b). Loss of terrestrial and wetland habitats and / or portions of associated key habitat areas for raptors are not expected to result in any direct mortalities. As construction of a new corridor is no longer planned the amount of suitable habitat that will be affected is greatly reduced. These habitats are common throughout the landscape in the vicinity of the TLA and the Project and these species will be able to move into surrounding habitats during the life of the Project. In a local context, the removal of this habitat is notable but no population level effects are expected for raptors in a regional context. Vegetation clearing activities may result in temporary displacement of local individuals due to sensory disturbances caused by the presence of equipment and personnel during the Construction phase but these noise effects will be temporary, subsiding once the TLA has been constructed. Power line strikes and electrocutions are a major source of bird mortalities. Electrocutions are a notable risk to raptors which may nest and perch on towers and power lines.

It is anticipated that the installation of the proposed transmission line may provide increased opportunities for raptor nesting and increase raptor hunting habitat. Common Ravens, Osprey and Red-tailed Hawks are all known to use transmission line poles as nesting locations. Increased traffic during construction may increase the risk of vehicle collisions with raptors. As the operation phase begins, the risk of collisions is likely to decrease. As an existing ROW is being utilized, local raptor species currently nesting within the TLA footprint are likely relatively tolerant to anthropogenic disturbance. These effects would occur during the life of the Project and are reversible during Post-closure of the Project when the transmission line is removed and the ROW is revegetated.

3.1.14 Species at Risk, Species of Special Concern and Provincially Rare Species (Transmission Line)

Additional ground surveys along the TLA were not considered necessary. The only SAR which was observed along the TLA during the 2017 surveys was the Bald Eagle nest discussed in the Migratory Birds and Wildlife Species at Risk sections for the mine site. This nest is located just outside the 2017 study area.

3.2 Operations Phase

The effects to all terrestrial EAIs predicted during the Construction phase will likely occur continuously throughout the Operations phase of the Project. Effects are expected to be partially reversible at the end of operations. Species may begin moving back and utilizing some habitats once the sensory disturbances associated with construction have stopped.

3.3 Closure Phase

At closure, all disturbed sites will begin a process of natural revegetation resulting in various terrain types that can be utilized by a diversity of wildlife species. The effects to all terrestrial EAIs predicted during the Construction and Operations phases will continue but to a lesser extent as time passes. It is expected that the Project effects on vegetation and wildlife will be partially reversible at the end of closure.

3.4 Post-Closure Phase

At closure, all disturbed sites will begin a process of natural revegetation resulting in various terrain types that can be utilized by a diversity of wildlife species. This will continue to progress throughout the Post-closure phase and forest regeneration can take upwards of 60 years to regenerate. The effects to all terrestrial EAIs predicted during the Construction and Operations phases will continue but to a lesser extent as time passes. It is expected that the Project effects on vegetation and wildlife will be fully reversible over time.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

Table 4-1 provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA. In instances where measures are no longer applicable, they have been removed with reasons provided.

Table 4-1: Mitigation Measures – Terrestrial Biology

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Terrestrial Biology	Construction through Closure	Direct vegetation (and wildlife habitat) loss, alteration, and fragmentation from the physical footprint of the Project.	Limit the area of Project footprint and limit disturbance from employees and mining activities. No vegetation removal is to occur during sensitive wildlife breeding seasons such as the migratory bird nesting season (April 15 to August 31). Construct the transmission line to minimize the potential for ground disturbance and soil erosion during construction and to reduce the necessity for creation of additional permanent access roads. Retain existing low-lying vegetation along the transmission line ROW thereby minimizing vegetation clearing and allowing for the maintenance of root masses and ground vegetation that will reduce the potential for erosion and encourage continued vegetation growth	Existing access roads and infrastructure used to the extent practical in transmission line construction. Vegetation clearing to take place outside of the migratory bird nesting season (April 15 to August 31). If under unforeseen circumstances minor vegetation removal is necessary between April 15 and August 31, non-intrusive surveys such as point counts for singing male birds will be completed by qualified individuals. If singing males are recorded then it will be assumed that a nesting female is nearby and proper provincial and federal species-specific nest buffers will be established around the singing male; no vegetation removal will occur within these buffers between April 15 and August 31. A mitigation / management plan will be developed in	Canadian Migratory Birds Convention Act	Mitigation measure updated. The mitigation measure no longer needs to include the construction of the 230 kV transmission line. The Project no longer requires a dedicated 230 kV transmission line; therefore, the Project will tie into an existing 115 kV transmission line at the Shining Tree location. Migratory Bird Nesting Season dates have been changed to April 15 to August 31 to reflect updated government standards and

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			through operations and beyond closure. Where practical, use existing roads and trails. Where practical, rehabilitate habitat for plants and wildlife.	consultation with Environment Canada and the Ministry of Natural Resources to address potential impacts to breeding birds. Retain existing low ground cover along transmission line ROW thereby minimizing vegetation clearing. Maintain vegetated buffers adjacent to creek and river transmission line crossings.		protocols. All other components of the mitigation measure have remained the same as presented in the EA.
Terrestrial Biology	Construction through Closure	Direct vegetation (and wildlife habitat) loss, alteration, and fragmentation from the physical footprint of the Project. (continued)	Limit the area of Project footprint and limit disturbance from employees and mining activities. No vegetation removal is to occur during sensitive wildlife breeding seasons such as the migratory bird nesting season (April 15 to August 31). Construct the transmission line to minimize the potential for ground disturbance and soil erosion during construction and to reduce the necessity for creation of additional	Apply and enforce speed limits along all Project access roads and always give the right-of-way to wildlife. Vehicle use will be restricted to designated areas and use of off-road vehicles for recreational purposes will be prohibited for workers. Progressive revegetation will be implemented where practical to reduce the amount of disturbed habitat during the Project lifecycle and will include active seeding to	Canadian Migratory Birds Convention Act	Mitigation measure updated. The mitigation measure no longer needs to include the construction of the 230 kV transmission line. The Project no longer requires a dedicated 230 kV transmission line; therefore, the Project will tie into

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			permanent access roads. Retain existing low-lying vegetation along the transmission line ROW thereby minimizing vegetation clearing and allowing for the maintenance of root masses and ground vegetation that will reduce the potential for erosion and encourage continued vegetation growth through operations and beyond closure. Where practical, use existing roads and trails. Where practical, rehabilitate habitat for plants and wildlife.	promote vegetation growth, stabilize the substrate, reduce potential erosion and enhance natural recovery of vegetation communities.		an existing 115 kV transmission line at the Shining Tree location. Migratory Bird Nesting Season dates have been changed to April 15 to August 31 to reflect updated government standards and protocols. All other components of the mitigation measure have remained the same as presented in the EA.
Terrestrial Biology	Construction through Closure	Introduction of invasive plant species can change vegetation ecosystem	Limit / prevent the transfer of invasive plant species from equipment and imported soil used for rehabilitation.	Create topsoil and overburden stockpiles for use in future rehabilitation activities. Clean construction equipment and vehicles on a regular basis.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		composition.		Use locally-sourced native species to revegetate disturbed and exposed areas and encourage natural revegetation.		
Terrestrial Biology	Construction through Post-closure	Construction and operation of the transmission line can result in bird and bat strikes and increase mortality of migratory and non-migratory bird and bat species.	Reduce the risk of mortality to birds and bats.	Use bird/bat deterrents / deflectors on transmission lines in high use areas (e.g., waterfowl movement corridors).	Ontario Endangered Species Act	Mitigation measure updated. The Project no longer requires a dedicated 230 kV transmission line; however, the mitigation measure still applies to any construction enabling the tie in to the 115 kV transmission line at the Shining Tree location and from the Shining Tree substation to the Project site.
Terrestrial Biology	Construction through Closure	Project preparation, construction, operation and	Limit risk of nest destruction and mortality of migratory birds.	Typically, clearing of vegetation will take place outside of the migratory bird nesting season (April 15 to August 31). If under	Canadian Migratory Birds Convention	Mitigation measure updated.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		closure activities can increase the risk of nest destruction and mortality of migratory birds (incidental take).		unforeseen circumstances minor vegetation removal is necessary between April 15 and August 31, non-intrusive surveys such as point counts for singing male birds will be completed by qualified individuals. If singing males are recorded, then it will be assumed that a nesting female is nearby and proper provincial and federal species-specific nest buffers will be established around the singing male; no vegetation removal will occur within these buffers between April 15 and August 31. A mitigation/ management plan will be developed in consultation with Environment Canada and the MNRF to address potential impacts to breeding birds. Minimize disturbance to active nest sites.	Act	Migratory Bird Nesting Season dates have been changed to April 15 to August 31 to reflect updated government standards and protocols. All other components of the mitigation measure have remained the same as presented in the EA.
Terrestrial Biology	Construction through Closure	Wildlife-vehicle collisions and	Reduce risk of mortality to wildlife	Enforce speed limits on Project roads. The presence of wildlife will be	Canadian Species at Risk Act	The mitigation measure has not changed from the

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		physical hazards on the Project site may cause injury / mortality to individual animals.		monitored and communicated to Project site personnel. All Project personnel will be provided with environmental awareness training. Vehicles will yield right-of-way to wildlife. Vehicle use will be restricted to designated areas and use of off-road vehicles for recreational purposes will be prohibited for workers. The Mine rock Areas, TMF polishing pond and low-grade ore stock pile will be regularly monitored for wildlife activity and hazards. If a SAR is identified within the Project area during construction, and construction activities will harm or harass the observed individual(s), work within the vicinity of the observed occurrence will be modified to minimize disturbance until the individual(s) leave the area.	Ontario Endangered Species Act	EA.

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
				Information regarding the observation of SAR (species, number of individuals, location) should be reported to the MNRF within 48 hours. Temporary suspension of surface blasting if Moose, Black Bear, wolf and other wildlife are observed within the danger zone identified by the blast supervisor.		
Terrestrial Biology	Construction through Closure	Attractants (e.g., food waste, oil products) may increase carnivore-human encounters and result in the loss (destruction or relocation) of individual animals. Attractants may also increase	Reduce the risk of mortality to wildlife.	Education and reinforcement of proper waste management practices will be provided to all Project personnel. Prohibit littering. Prohibit feeding of wildlife. Dispose of waste in accordance to a Waste Management Plan which will limit the presence of food attractants. All Project personnel will be provided with environmental awareness training. Presence of wildlife will be	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		predator numbers and thereby increase predation risk on prey species.		monitored and communicated to Project site personnel.		
Terrestrial Biology	Construction	Adverse effects to wetlands.	Where practical, avoid placement structures in waterbodies along the transmission line ROW, and to the extent practicable, in low-lying areas (difficult for some portions of the existing Shining Tree ROW).	Where practical, avoid placement structures in waterbodies along the transmission line ROW, and to the extent practicable, in low-lying areas	n/a	The mitigation measure has not changed from the EA.
Terrestrial Biology	Construction	Adverse effects to ungulates (Moose) and furbearers (Wolves, Bears, Marten) due to the loss of habitat or noise disturbance.	Develop a compact Project site to reduce overall habitat loss and to limit the potential adverse effects related to interference with wildlife movement. Utilize existing infrastructure for access and minimize construction of new roads and other corridors wherever alternatives exist. Construction crews will be	Minimize the width of the transmission line ROW to the proposed 50 m. Utilize existing infrastructure for access and minimize construction of new roads where practical. No hunting by Project personnel will be permitted while working or residing on-site. Enforce speed limits along	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			advised to not interfere or harass wildlife. No hunting by Project personnel permitted while working or residing on site. Enforce speed limits along Project roads to reduce the potential for collisions with wildlife. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity. Include wildlife awareness information in regular safety and environmental inductions. Project personnel will be made aware of seasonal changes in local large mammal behaviour or presence.	Project roads. Include wildlife awareness information in regular safety and environmental inductions.		
Terrestrial Biology	Construction	Adverse effects to bats due to loss of habitat or noise disturbance.	Develop a compact site to reduce overall habitat loss and to limit potential adverse effects related to sound emissions, to the extent practicable. Enforce speed limits along	Minimize the width of the transmission line ROW to the proposed 50 m. Enforce speed limits along Project roads and reduce vehicular traffic associated with construction.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			Project roads and reduce vehicular traffic associated with construction.			
Terrestrial Biology	Construction	Adverse effects to migratory birds and avian SAR due to loss of habitat or noise disturbance.	Minimize the Project footprint to the extent practicable. Construction and clearing within the transmission line ROW outside migratory bird breeding season (April 15 to August 31). Maintain existing vegetation ground cover along the transmission line ROW to the extent practicable. Install conductor wires at a sufficient distance apart to prevent the accidental electrocution (contact of wingtips with wire) of large avian species. Utilize existing infrastructure for access and minimize construction of new roads and other corridors where possible. Advise Project personnel not to interfere or harass wildlife.	Minimize the width of the transmission line ROW to the proposed 50 m. Construct in winter, where frozen surfaces are required to minimize surface erosion. Retain existing low-lying vegetation ground cover along the transmission line ROW thereby minimizing vegetation clearing. Utilize existing infrastructure for access and minimize construction of new roads. No hunting by Project personnel will be permitted while working or residing on-site. Enforce speed limits along Project roads. Include wildlife awareness information in regular safety	Canadian Migratory Birds Convention Act Canadian Species at Risk Act Ontario Endangered Species Act	Mitigation measure updated. Migratory Bird Nesting Season dates have been changed to April 15 to August 31 to reflect updated government standards and protocols. All other components of this mitigation measure have not changed notably from the EA. As the Project no longer involves construction of a new dedicated transmission line the wording has been changed to reflect the same

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			Include Common Nighthawk and Bank Swallow identification as part of site induction to improve success of wildlife reporting programs. Contact the MNRF and Environment Canada within 24 hours if Common Nighthawk or Bank Swallow are recorded nesting on site. No hunting by Project personnel permitted while working or residing on-site. Educate Project personnel on how to handle food and food wastes in a responsible manner and create and enforce policies to ensure no feeding of wildlife.	and environmental inductions.		measure applies to any construction and clearing within the existing ROW.
Terrestrial Biology	Construction	Adverse effects to raptors due to loss of habitat or noise disturbance.	Develop a compact site to prevent encroachment of Project activities on raptor nesting sites and adjacent habitat. Minimize the level of potentially disturbing activities near any known or	Minimize the width of the transmission line ROW to the proposed 50 m. Dispose of food wastes generated on site in an appropriate manner. Remove carcasses of road-	n/a	Mitigation measure updated. Raptor Nesting Season dates have been changed to April 15 to August 31 to reflect updated

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			subsequently discovered active raptor nest sites during the raptor breeding season (April 15 – August 31) until nests are vacated. Dispose of food wastes generated on site in an appropriate manner that limits the attraction of wildlife, including Common Ravens, Turkey Vultures and Bald Eagles. Remove carcasses of road-killed animals or any other carcasses found onsite in a timely manner to limit the attraction of wildlife, such as Common Ravens and Turkey Vultures.	killed animals or any other carcasses found onsite in a timely manner.		government standards and protocols. All other components of the mitigation measure have remained the same as presented in the EA.
Terrestrial Biology	Operations	Adverse effects to vegetation communities due to activities associated with the maintenance	The generation of dust by transmission line service vehicles is expected to be limited and can be minimized by having these vehicles drive slowly along the transmission line ROW. Ensure that ongoing clearing is	Minimize the speed of service vehicles along the transmission line ROW.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		of the transmission line wires and poles (dust production by service vehicles) and the need for periodic clearing of tall woody vegetation to ensure adequate clearance below the conductors.	constrained to the necessary area of clearance (the ROW). Use mechanical brushing.			
Terrestrial Biology	Operations	Adverse effects to ungulates (Moose) and furbearers (Wolves, Bears, Marten) due to activities associated with maintenance	Include wildlife awareness information in regular safety and environmental inductions. Project personnel will be advised not to interfere or harass or feed wildlife. Project personnel will be made aware of seasonal changes in local large mammal behaviour or presence.	Include wildlife awareness information in regular safety and environmental inductions.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		of the transmission line wires and poles.	Project personnel will be required to handle food and food wastes in a responsible manner. No hunting by Project personnel will be permitted while working or residing on-site. Enforce speed limits along Project roads to reduce the potential for collisions with wildlife. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity.			
Terrestrial Biology	Operations	Adverse effects to migratory birds, raptors and avian SAR due to activities associated with maintenance of the	Minimize the speed of service vehicles along the transmission line ROW to minimize dust production and thereby limit the zone of influence. Use marker balls and bird diverters on the transmission line wires to reduce the likelihood of bird collisions with power lines in high-risk	Minimize the speed of service vehicles along Project roads and along the transmission line ROW. Use marker balls and bird diverters on wires in high-risk areas.	Canadian Migratory Birds Convention Act Canadian Species at Risk Act Ontario Endangered	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		transmission line wires and poles.	location such as near wetlands.		Species Act	
Terrestrial Biology	Post-closure	Adverse effects to vegetation communities due to activities associated with the removal of the transmission line wires and poles.	Time removal of transmission line infrastructure to minimize the potential for ground disturbance and soil erosion by equipment and vehicles and to reduce the necessity for creation of additional permanent access roads. Retain existing low-lying vegetation ground cover thereby minimizing vegetation clearing and allowing for the maintenance of root masses and ground vegetation that will reduce the potential for erosion and encourage continued vegetation growth beyond closure. Minimize the speed of service vehicles along Project roads and along the transmission line ROW to lessen dust production and thereby limit the zone of influence.	Remove transmission line infrastructure in the winter and minimize disturbance to vegetation during closure activities. Minimize the speed of service vehicles along Project roads and along the transmission line ROW to lessen dust production.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			Encourage natural revegetation and recolonization of the ROW as part of the reclamation process.			
Terrestrial Biology	Post-closure	Adverse effects to ungulates (Moose) and furbearers (Wolves, Bears, Marten) due to activities associated with the removal of the transmission line wires and poles.	Utilize existing infrastructure for access and minimize construction of new roads and other corridors where other alternatives exist. Include wildlife awareness information in regular safety and environmental inductions. Project personnel will be advised not to interfere or harass or feed wildlife. Project personnel will be made aware of seasonal changes in local large mammal behaviour or presence. Project personnel will be required to handle food and food wastes in a responsible manner. No hunting by Project personnel will be permitted	Utilize existing infrastructure for access and minimize construction of new roads. Include wildlife awareness information in regular safety and environmental inductions.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			while working or residing on-site. Enforce speed limits along proposed access roads to reduce the potential for collisions with wildlife. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity.			
Terrestrial Biology	Post-closure	Adverse effects to bats due to activities associated with the removal of the transmission line wires and poles.	Utilize existing infrastructure for access and minimize construction of new roads and other corridors where alternatives exist. Project personnel will be advised not to interfere or harass wildlife.	n/a	Ontario Endangered Species Act	The mitigation measure has not changed from the EA.
Terrestrial Biology	Post-closure	Adverse effects to migratory birds, raptors and avian SAR due to	Utilize existing infrastructure for access and minimize construction of new roads and other corridors where alternatives exist. Include wildlife awareness	Utilize existing infrastructure for access. Include wildlife awareness information in regular safety and environmental inductions.	Canadian Migratory Birds Convention Act Canadian	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		activities associated with the removal of the transmission line wires and poles.	information in regular safety and environmental inductions. Project personnel will be advised not to interfere or harass or feed wildlife. Project personnel will be made aware of seasonal changes in local large mammal behaviour or presence. Project personnel will be required to handle food and food wastes in a responsible manner. No hunting by Project personnel will be permitted while working or residing on-site. Enforce speed limits along Project roads to reduce the potential for collisions with wildlife. Signs warning drivers of the possibility of wildlife encounters will be posted in areas of high wildlife activity.		Species at Risk Act Ontario Endangered Species Act	

5.0 MANAGEMENT

Table 5-1 provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA.

Table 5-1: Monitoring Measures – Terrestrial Biology

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Terrestrial Biology	Wildlife-project interactions (incidents[1])	Site surveillance monitoring to identify the species, number, and location of wildlife incidents and risks to wildlife. The information provides direct feedback for adaptive management of Project operations, Project designs and effectiveness of mitigation.	n/a	Frequency of interactions will be recorded as they occur from Construction through Closure phases.	Project Site	The monitoring measure has not changed from the EA.
Terrestrial Biology	Wildlife observations	Record incidental observations of Common Nighthawk and Bank Swallow on wildlife logs.	n/a	Continuous throughout from Construction through Closure phases.	Project Site	The monitoring measure has not changed from the EA.

6.0 CONCLUSION

This analysis has determined that direct and indirect disturbances resulting from the Project at the proposed TMF location and Shining Tree TLA are considered to have no lasting residual effects relative to baseline conditions, once mitigation and closure measures are considered. The Project footprint, including both the smaller area impacted for the TMF construction and the use of an existing transmission line and ROW for the TLA, have decreased the amount of habitat which will be affected from that predicted in the EA. Temporary effects to plants and wildlife are solely confined to Project lands, but will last continuously through construction, operations and into the mine Post-closure phase until the existing vegetation communities are restored. These habitats are common throughout the region and are restorable, and hence the Project effects are reversible and therefore, no lasting residual effects are anticipated.

Short-term displacement of wildlife species found within the TMF footprint and along the existing Shining Tree TLA footprint will occur during the Construction and Closure phases of the Project due to the temporary presence of Project personnel and equipment; however displaced species and their preferred habitats are common throughout the vicinity of the Project and these species will be able to settle in nearby suitable habitats. Conducting construction and closure activities between August and April would avoid sensitive summer breeding seasons for wildlife (April 15 to August 31). Late winter habitat areas for Moose (upland coniferous areas) should also be avoided in January and February when Moose can be nutritionally and energetically stressed.

During the Operations phase, some wildlife species will avoid the TLA footprint (for instance interior species that avoid open fields or linear corridors), and most wildlife species will avoid the TMF footprint due to the complete change of available habitats to active mine site. The majority of these species and their preferred habitats are common in the vicinity of the Project, and these species will be able to settle in nearby suitable habitats and will eventually return to the footprint after natural revegetation during the Post-closure phase.

It should be noted that there is a history of disturbance and habitat loss from forestry and fires in the surrounding landscape, and this is reflected in the vegetation structure. Vegetation communities include young and mature stands of Trembling Aspen, Balsam Poplar, White Birch, Balsam Fir and White Spruce, all of which are considered pioneer species, colonizing recently disturbed areas. Historical logging has taken place in several areas in the vicinity of the Project (including the 2017 study area), as well as in the surrounding landscape. As a result of other widespread land use interests in the region, such as hunting, fishing and camping, wildlife species in the area may already be somewhat adapted to both temporary and chronic, direct and indirect, disturbances.

7.0 REFERENCES

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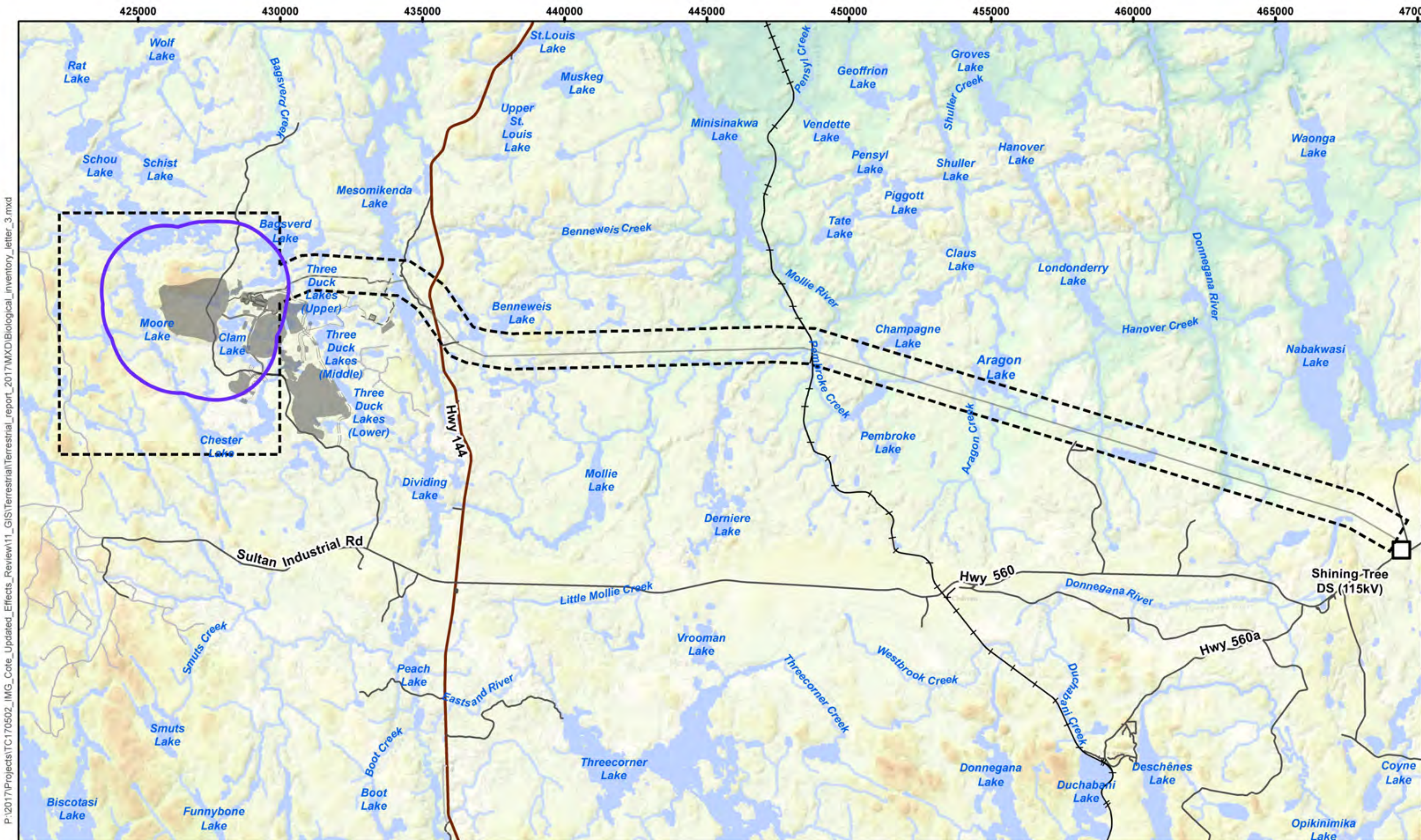
8.0 GLOSSARY AND ABBREVIATIONS

EA	Environmental Assessment
EAI	Environmental Assessment Indicator
EER	Environmental Effects Review
ESA	Endangered Species Act
Ha	hectare
IAMGOLD	IAMGOLD Corporation
Km	kilometre
kV	kilovolt
m	metre
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
ROW	Right-of-way
SAR	Species at Risk
SARA	Species at Risk Act
SARO	Species at Risk in Ontario
SWH	Significant Wildlife Habitat
TLA	Transmission Line Alignment
TMF	Tailings Management Facility
TSD	Technical Support Document

FIGURES



LEGEND

- 2017 Aerial Survey Study Area
- 2017 Study Area
- Substations
- Mine Site Footprint
- Expressway / Highway
- Local Road
- Resource / Recreation
- Railway
- Watercourse
- Waterbody

NOTES:
- Background extracted from ESRI topo maps and Provincial DEM from LIO, MNRF.
- * Scale when printed 8.5x11in letter size

Datum: NAD83
Projection: UTM Zone 17N

0 2.5 5 10 15 20 25 Kilometres

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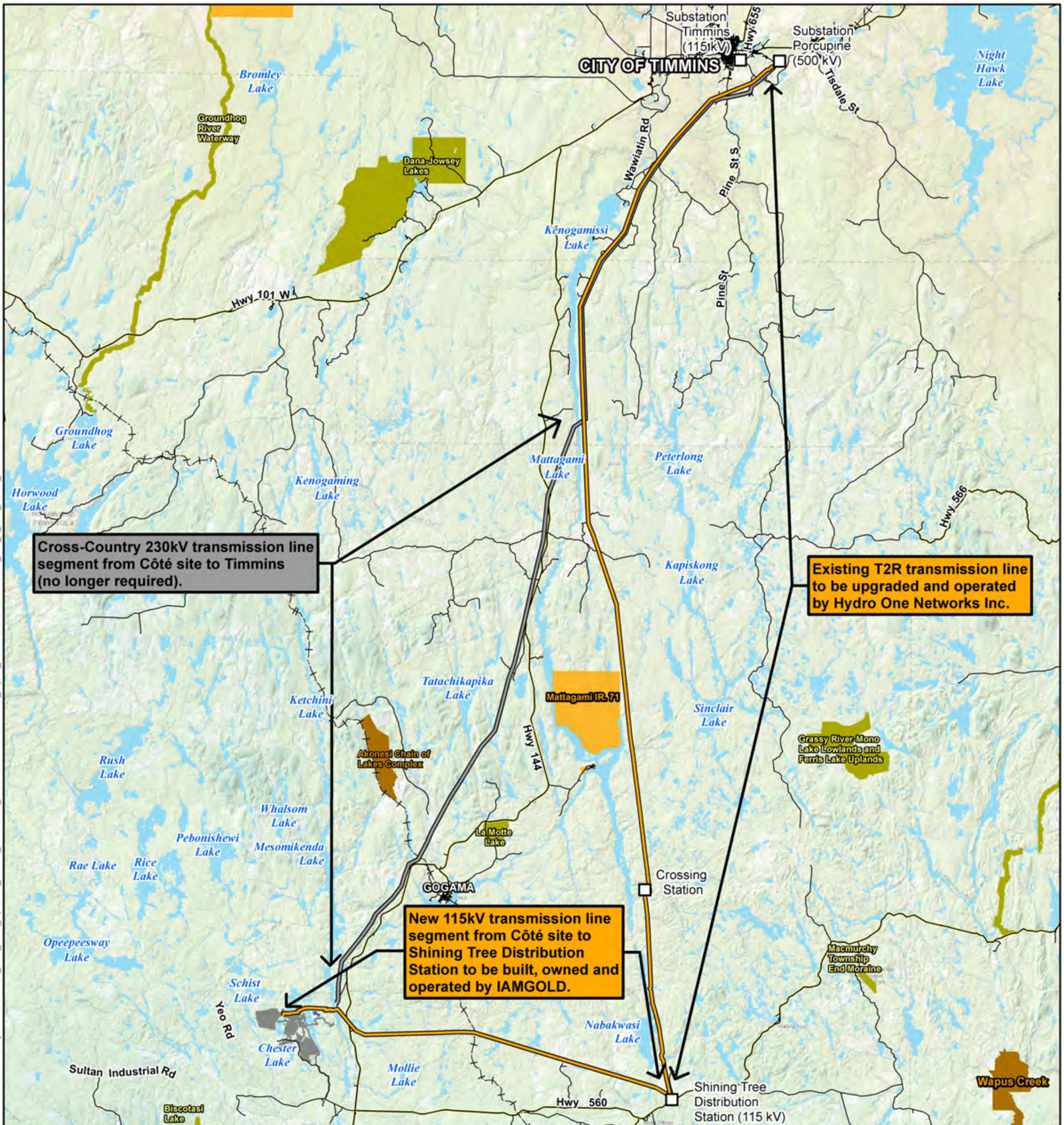
CÔTE GOLD PROJECT

2017 Biological Inventory Study Areas

PROJECT N^{o}: TC170502	**FIGURE: 2-1**
SCALE: 1:183,000	DATE: May 2018



P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Terrestrial\Terrestrial_report_2017\MXD\Transmission_line_2_with_Notes_1.mxd

LEGEND

- Shining Tree 115 kV Transmission Line Alignment
- Cross-Country 230 kV Transmission Line (no longer required)
- Substations
- Project Footprint
- First Nation Reserve
- Conservation Reserve (Regulated)
- Provincial Park
- Railway
- Highway/Expressway
- Local Road
- Waterbody / Large Watercourse

0 10 20 30 40 50 Kilometres

NOTES:
- Background extracted from ESRI topo maps and Provincial DEM from LIO, MNRF.
* Scale when printed 8.5x11in letter size

Datum: NAD83
Projection: UTM Zone 17N

N S W E

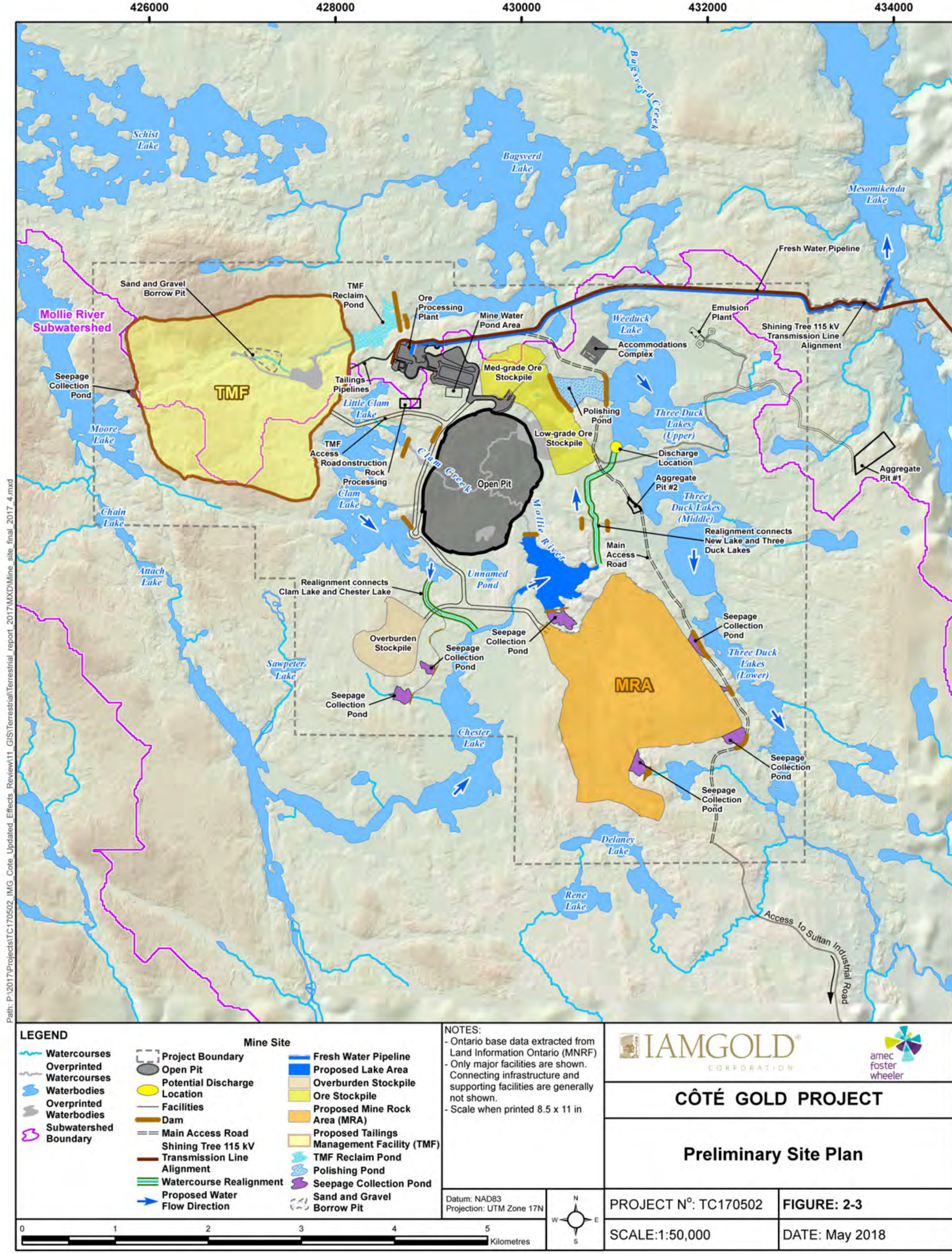
IAMGOLD CORPORATION

amec foster wheeler

CÔTÉ GOLD PROJECT

Proposed Transmission Line Alignment

PROJECT N^{o}: TC170502	**FIGURE: 2-2**
SCALE: 1:550,000	DATE: May 2018



426000
428000
430000
432000
434000
5270000
5268000
5266000
5264000
5262000
Schist Lake
Bagsverd Lake
Bagsverd Creek
Mesomikenda Lake
Fresh Water Pipeline
Mollie River Subwatershed
Sand and Gravel Borrow Pit
TMF Reclaim Pond
Ore Processing Plant
Mine Water Pond Area
Weeduck Lake
Emulsion Plant
Shining Tree 115 kV Transmission Line Alignment
Accommodations Complex
Seepage Collection Pond
TMF
Tailings Pipelines
Med-grade Ore Stockpile
Polishing Pond
Little Clam Lake
Three Duck Lakes (Upper)
Moore Lake
TMF Access Road
Construction Rock Processing
Low-grade Ore Stockpile
Discharge Location
Clam Creek
Open Pit
Aggregate Pit #2
Aggregate Pit #1
Clam Lake
Mollie River
Three Duck Lakes (Middle)
Chain Lake
Realignment connects New Lake and Three Duck Lakes
Main Access Road
Attach Lake
Unnamed Pond
Realignment connects Clam Lake and Chester Lake
Seepage Collection Pond
Overburden Stockpile
Seepage Collection Pond
Seepage Collection Pond
Three Duck Lakes (Lower)
Sawpeter Lake
MRA
Seepage Collection Pond
Chester Lake
Seepage Collection Pond
Seepage Collection Pond
Delaney Lake
Rene Lake
Access to Sultan Industrial Road
Path: P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\Terrestrial\Terrestrial_report_2017\MXD\Mine_site_final_2017_4.mxd
LEGEND
Watercourses
Overprinted Watercourses
Waterbodies
Overprinted Waterbodies
Subwatershed Boundary
Mine Site
Project Boundary
Open Pit
Potential Discharge Location
Facilities
Dam
Main Access Road
Shining Tree 115 kV Transmission Line Alignment
Watercourse Realignment
Proposed Water Flow Direction
Fresh Water Pipeline
Proposed Lake Area
Overburden Stockpile
Ore Stockpile
Proposed Mine Rock Area (MRA)
Proposed Tailings Management Facility (TMF)
TMF Reclaim Pond
Polishing Pond
Seepage Collection Pond
Sand and Gravel Borrow Pit
NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in
IAMGOLD CORPORATION
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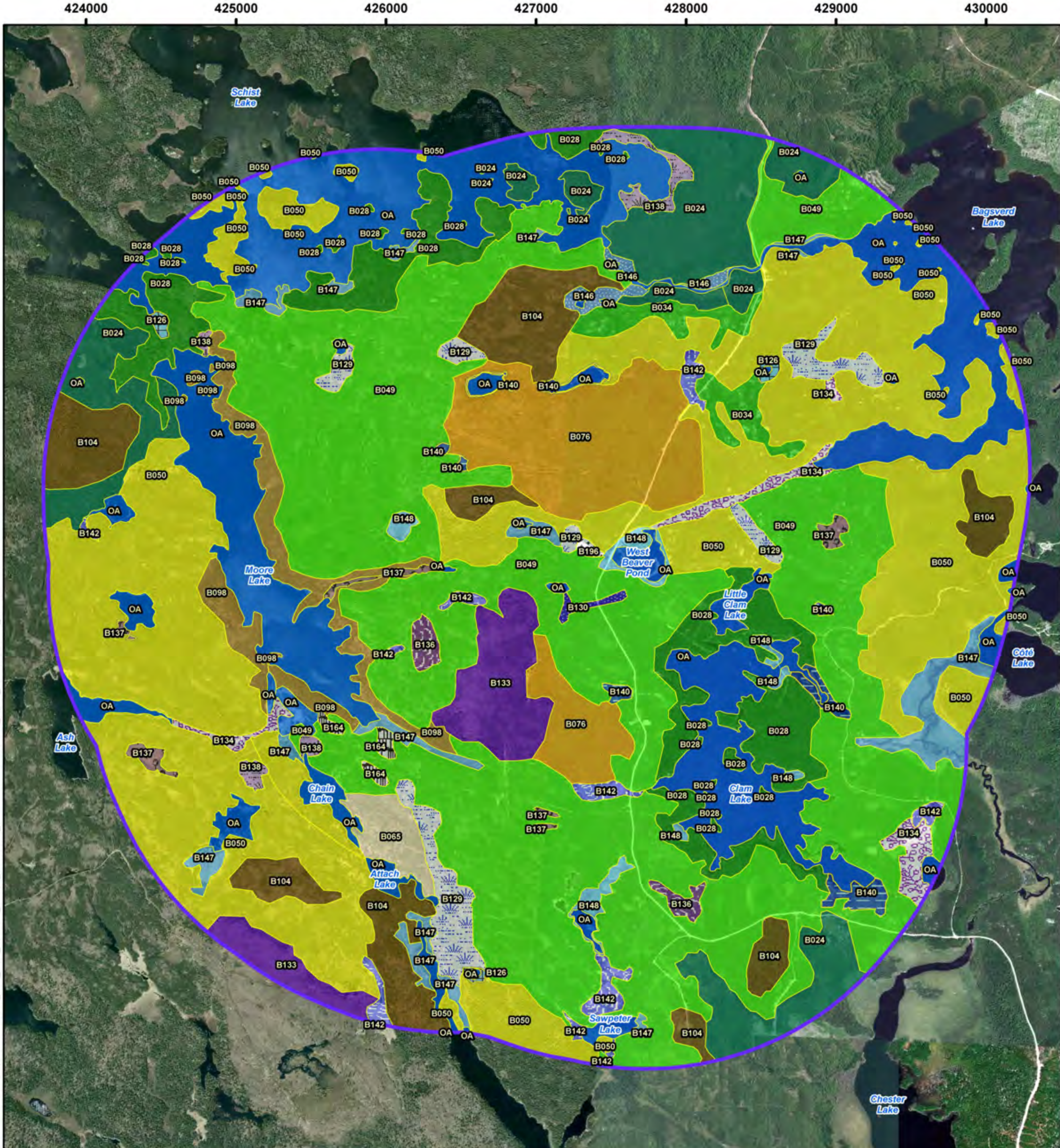
CÔTÉ GOLD PROJECT
Preliminary Site Plan
Datum: NAD83
Projection: UTM Zone 17N
N
W E
S
PROJECT Nº: TC170502
FIGURE: 2-3
0 1 2 3 4 5 Kilometres
SCALE:1:50,000
DATE: May 2018



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- B024 - Very Shallow, Humid: Black Spruce - Pine Conifer
- B028 - Very Shallow, Humid: Mixedwood
- B034 - Dry, Sandy: Jack Pine Black Spruce Dominated
- B049 - Dry to Fresh, Coarse: Jack Pine - Black Spruce Dominated
- B050 - Dry to Fresh, Coarse: Pine - Black Spruce Conifer
- B065 - Moist, Coarse: Pine -Black Spruce Conifer
- B076 - Moist, Coarse: Mixedwood
- B098 - Fresh, Silty to Fine Loamy: Black Spruce - Jack Pine Dominated
- B104 - Fresh, Silty to Fine Loamy: Aspen - Birch Hardwood
- B126 - Low Treed Bog
- B129 - Organic Rich Conifer Swamp
- B130 - Intolerant Hardwood Swamp
- B133 - Hardwood Swamp
- B134 - Mineral Thicket Swamp
- B136 - Sparse Treed Fen
- B137 - Sparse Treed Bog
- B138 - Open Bog
- B140 - Open Moderately Rich Fen
- B142 - Mineral Meadow Marsh
- B146 - Open Shore Fen
- B147 - Shrub Shore Fen
- B148 - Mineral Shallow Marsh
- B164 - Rock Barren
- B196 - Fine, Clean Fill
- OA - Open Water
- 2017 Study Area

N
W E
S

Datum: NAD83
Projection: UTM Zone 17N

0 0.6 1.2 1.8 2.4 3
Kilometres

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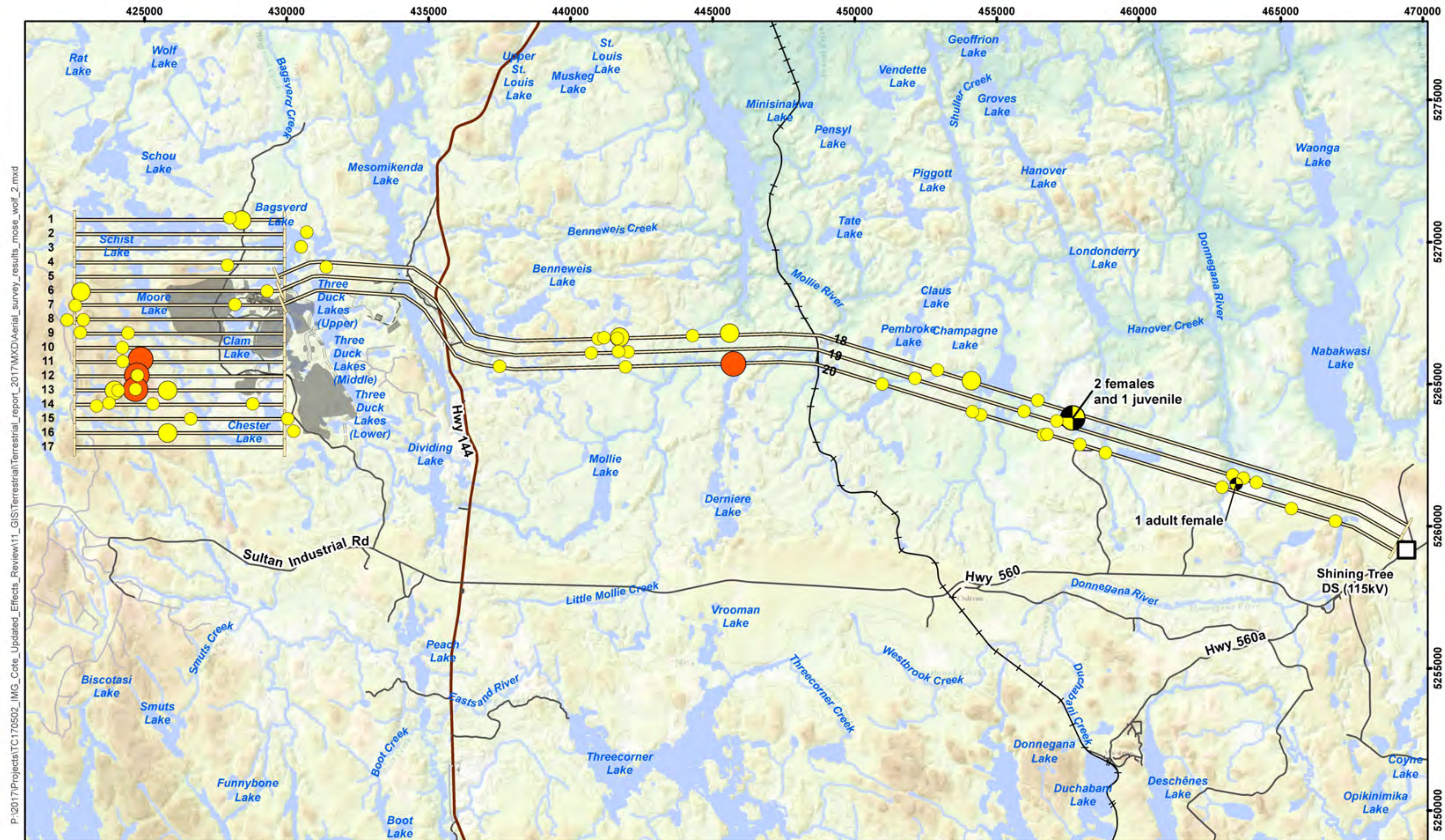
CÔTÉ GOLD PROJECT

Vegetation Communities

PROJECT N°: TC170502	FIGURE: 3-1
SCALE: 1:35,000	DATE: May 2018



LEGEND

- 2017 Aerial Survey Study Area (labelled with transect ID)
- Substations
- Mine Site Footprint

SPECIES

- Moose
- Gray Wolf
- Sighting*

DENSITY

- High
- Medium
- Low

NOTES:
* Sightings are labelled with the number of individuals observed.
- Background extracted from ESRI topo maps and Provincial DEM from LIO, MNRF.
- Scale when printed 8.5x11in letter size

Datum: NAD83
Projection: UTM Zone 17N

N W E S

0 2.5 5 10 15 20 25 Kilometres

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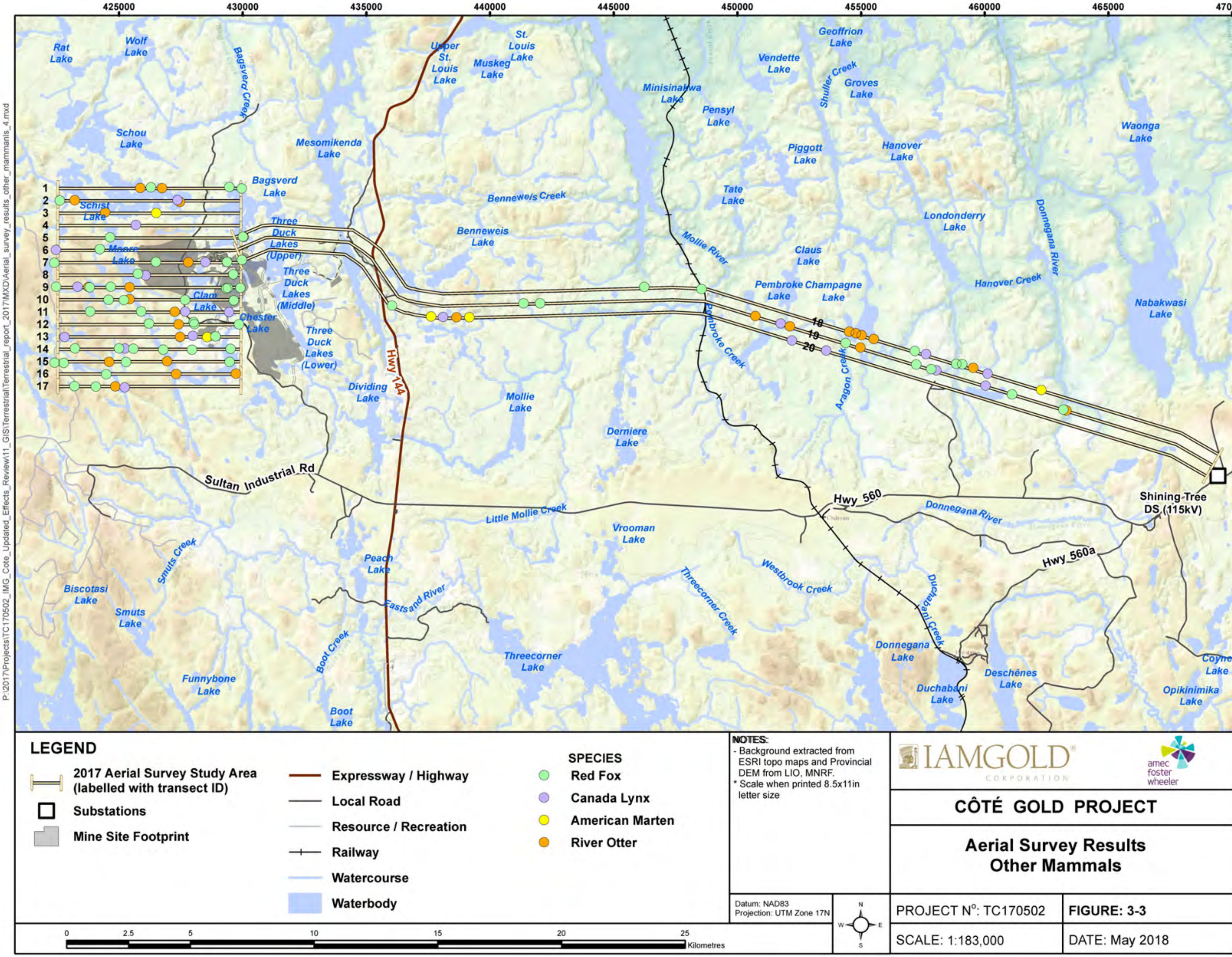
CÔTÉ GOLD PROJECT

Aerial Survey Results
Moose and Wolf

PROJECT N°: TC170502	FIGURE: 3-2
SCALE: 1:183,000	DATE: May 2018



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425000
430000
435000
440000
445000
450000
455000
460000
465000
470000
5275000
5270000
5265000
5260000
5255000
5250000
Rat Lake
Wolf Lake
Bagsverd Creek
Upper St. Louis Lake
Muskeg Lake
St. Louis Lake
Minisinakwa Lake
Geoffrion Lake
Vendette Lake
Shuller Creek
Groves Lake
Pensyl Lake
Waonga Lake
Schou Lake
Mesomikenda Lake
Piggott Lake
Hanover Lake
Bagsverd Lake
Schist Lake
Tate Lake
Benneweis Creek
Three Duck Lakes (Upper)
Moore Lake
Benneweis Lake
Mollie River
Londonderry Lake
Donnegana River
Claus Lake
Three Duck Lakes (Middle)
Clam Lake
Chester Lake
Pembroke Lake
Champagne Lake
Hanover Creek
Nabakwasi Lake
Three Duck Lakes (Lower)
Pembroke Creek
Aragon Creek
Hwy 144
Dividing Lake
Mollie Lake
Derniere Lake
1
2
3
4
5
6
7
8
9
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11
12
13
14
15
16
17
18
19
20
Sultan Industrial Rd
Hwy 560
Little Mollie Creek
Donnegana River
Shining Tree DS (115kV)
Vrooman Lake
Hwy 560a
Smuts Creek
Peach Lake
Westbrook Creek
Threecorner Creek
Biscotasi Lake
Smuts Lake
Eastsand River
Duchabani Creek
Boot Creek
Threecorner Lake
Donnegana Lake
Funnybone Lake
Deschênes Lake
Coyne Lake
Duchabani Lake
Opikinimika Lake
Boot Lake
LEGEND
2017 Aerial Survey Study Area (labelled with transect ID)
Substations
Mine Site Footprint
Expressway / Highway
Local Road
Resource / Recreation
Railway
Watercourse
Waterbody
SPECIES
Red Fox
Canada Lynx
American Marten
River Otter
NOTES:
- Background extracted from ESRI topo maps and Provincial DEM from LIO, MNRF.
* Scale when printed 8.5x11in letter size
IAMGOLD CORPORATION
amec foster wheeler
CÔTÉ GOLD PROJECT
Aerial Survey Results
Other Mammals
Datum: NAD83
Projection: UTM Zone 17N
N
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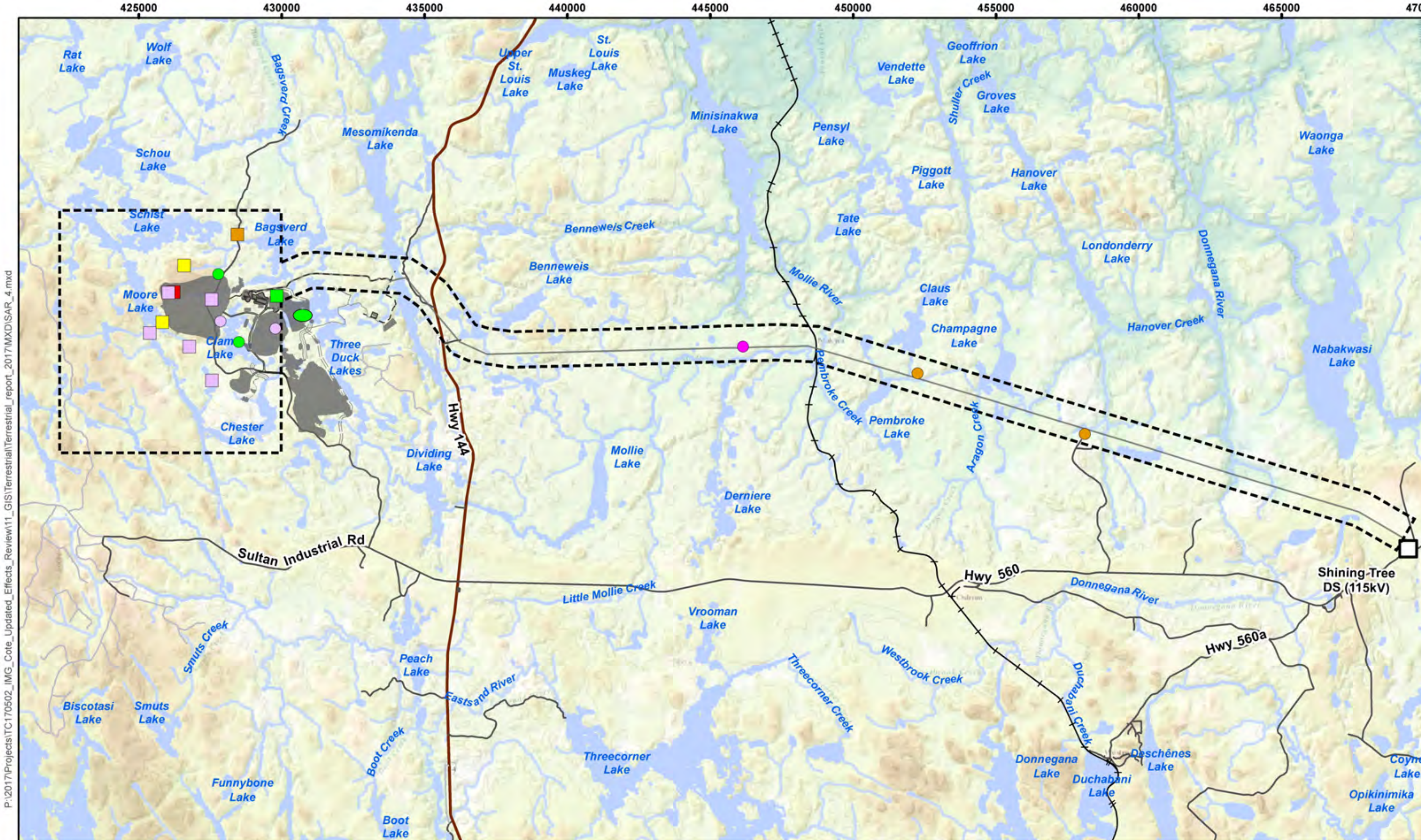
PROJECT N°: TC170502
FIGURE: 3-3
SCALE: 1:183,000
DATE: May 2018
0
2.5
5
10
15
20
25
Kilometres



LEGEND

- 2017 Aerial Survey Study Area
- Substations

SPECIES AT RISK

- Bald Eagle Active Nest
- Bald Eagle
- Eastern Whip-poor-will
- Canada Warbler
- Common Nighthawk
- Little Brown Myotis
- Rusty Blackbird

- 2017 Observations (Amecfw)
- 2013 Observations (Amecfw / Golder)

0 2.5 5 10 15 20 25 Kilometres

NOTES:
- Background extracted from ESRI topo maps and Provincial DEM from LIO, MNRF.
* Scale when printed 8.5x11in letter size

Datum: NAD83
Projection: UTM Zone 17N

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CÔTÉ GOLD PROJECT

Species at Risk Observations

PROJECT N^{o}: TC170502

FIGURE: 3-4

SCALE: 1:183,000

DATE: May 2018

APPENDIX I

EXECUTIVE SUMMARY

IAMGOLD Corporation is planning to develop the Côté Gold Project located approximately 20 kilometers (km) southwest of Gogama, 130 km southwest of Timmins and 200 km northwest of Sudbury.

Extensive baseline surveys were completed by Amec Foster Wheeler and Golder Associates in 2012 and 2013 for the proposed mine site and transmission line alignment (TLA). Additional baseline environmental studies were needed to supplement this updated technical memorandum and provide site-specific data to address changes to the Tailings Management Facility (TMF) location and the chosen TLA. Amec Foster Wheeler conducted the additional baseline studies in 2017 to evaluate and document the terrestrial natural resources present within the local and regional study areas of the new proposed TMF footprint and to provide supplemental aerial survey information for the chosen TLA. Baseline data was gathered using the standard approaches of literature review, observational surveys and data analysis. Amec Foster Wheeler conducted a comprehensive four season terrestrial field program to complement existing information from the site and to provide site-specific, qualitative and quantitative information on wildlife and vegetation communities within the updated study areas.

Study area boundaries for the 2017 field investigations changed from those presented in the EA to represent the Project plans. The local study area for the new proposed TMF consists of areas located within 1 km of the proposed footprint and the regional study area consists of areas located within 2 km of the proposed footprint. The aerial survey study area involved flying 17 east-west transects over the proposed TMF footprint and surrounding study areas, and the aerial survey study area boundary can be defined as 250 metres (m) beyond either side of the outermost transects

Previously, two TLA options had been investigated and the EA had presented predictions of effects for the Cross Country TLA. The Project no longer requires a newly constructed dedicated 230 kilovolt (kV) transmission line due to the reduced production rate, and therefore, the Project will tie into the existing 115 kV Shining Tree TLA, at the Shining Tree substation greatly reducing the amount of habitat affected. Additional ground surveys were not considered necessary however three east-west transects, along the existing TLA right-of-way from the Project site to the Shining Tree substation, were flown and this study area extended 750 m from the centerline on each side of the TLA.

At the completion of the 2017 baseline environmental studies an analysis was conducted to predict updated effects the Project may have on identified environmental indicators, taking into consideration the application of avoidance, mitigation and reclamation measures to reduce or eliminate residual effects. Environmental indicators are those aspects of the natural environment that are particularly notable or valued because of their ecological, scientific or resource importance, and that have a potential to be adversely affected by the Project development. The environmental indicators have not changed compared to those presented in the EA. The following were considered during the analysis of the new proposed TMF site: i) upland plant community types, ii) wetlands, iii) vegetation species at risk, species of special concern and provincially rare species, iv) ungulates, v) furbearers, vi) migratory birds, and vii wildlife species at risk. Similarly, the following were considered during the analysis of the chosen TLA: i) vegetation communities, plants with special conservation status or rarity in the province, and traditional use plants, ii) ungulates (Moose), iii) furbearers (wolves, Black Bears, American Marten), iv) bats, v) migratory birds, vi) raptors, and vii) Species at Risk.

The Project footprint, including both the smaller area impacted for the TMF construction and the use of an existing transmission line and ROW for the TLA, have decreased the amount of habitat which will be affected from that predicted in the EA. The analysis to predict potential Project effects determined that for both the new TMF placement and the chosen Shining Tree TLA, short-term displacement of wildlife species found within the footprints will occur during the Construction and Closure phases of the Project due to the temporary presence of Project personnel and equipment. However, displaced species and their preferred habitats are common throughout both the local and regional study areas and these species will be able to settle in nearby suitable habitats. Conducting Construction and Closure activities between September 1 and April 14 would avoid sensitive summer breeding seasons for wildlife (April 15 to August 31). Later winter habitat areas for Moose (upland coniferous areas) should also be avoided in January and February when Moose can be nutritionally and energetically stressed.

Some wildlife species will avoid the TMF and TLA footprint during the Operations phase (for instance interior species that avoid anthropogenic settings, open fields or linear corridors) but these species and their preferred habitats are also common throughout both the local and regional study areas, and these species will be able to settle in nearby suitable habitats, and will eventually return to the footprints after natural revegetation during the Post-closure phase.

IAMGOLD

B-8: Updated Technical Memorandum: Aquatic Biology

Memorandum

To:	Steve Woolfenden	**From:**	Cynthia Russel
Company:	IAMGOLD Corporation		Minnow Environmental Inc.
cc:	Stephan Theban	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: AQUATIC BIOLOGY		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada (ECCC) in 2016, IAMGOLD are proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Minnow and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;

- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Aquatic Biology

In 2014, Minnow completed a study of the potential aquatic biology effects of the Project as it was proposed in support of the Federal Environmental Impact Statement / Final Environmental Assessment Report and the Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. The study considers indicators assessed through the EA, where changing Project effects could have the potential to warrant an update to the conclusions of the EA. The Project mine plan has a smaller footprint than the mine plan presented in the EA. Similar to the EA mine plan, the Project mine plan will overprint Côté Lake and several other small waterbodies and include the realignment of effected watercourses. As a result of the smaller and more compact footprint associated with the Project mine plan, loss and disruption of aquatic habitat will be reduced and watershed boundaries will be maintained. Specifically, during Operations Côté Lake, some small ponds and part of Upper Three Duck Lakes will be overprinted and the Mollie River and Clam Creek will be realigned to accommodate the open pit development (Figure 1-1). Water from Clam Lake will flow south to Chester Lake which will discharge to the Mollie River and flow north east into a newly constructed lake. The new lake will discharge into a watercourse realignment channel of the Mollie River and discharge into Upper Three Duck Lake (Figure 1-1). The construction of the Tailing Management Facility (TMF) and associated infrastructure, now located to the northwest of the open pit, will overprint West Beaver Pond and a small tributary to South Bagsverd Lake, which is significantly less than the previous TMF location that resulted in the realignment of a large portion of Bagsverd Creek. Finally, the Mine Rock Area (MRA) will overprint a small portion of East Beaver Creek and an unnamed tributary to Unnamed Lake 3 (Figure 1-1).

The Closure Plan is similar to that presented in the EA such that the open pit will be flooded, the realignment channels will be decommissioned, the new lake will be removed, Clam Creek will be reconstructed allowing Clam Lake to flow into the pit lake, and the Mollie River will also be reconstructed to flow into the pit lake (Figure 1-2). The open pit lake will be discharged into the reconstructed West Arm of Upper Three Duck Lake. Disturbed areas will be revegetated as described in the EA (Figure 1-2).

In addition to the watercourse realignment channels, the changes to the Project have resulted in changes to discharge location. Under the Project plan, mine waste water will be discharged in to Upper Three Duck Lakes near the inlet of the Mollie River realignment channel (Figure 1-1). Several seepage collections ponds have also been added to collect seepage from the MRA and overburden stockpile. Consistent with the EA, seepage ponds will be pumped to the polishing pond or the Reclaim Pond to be used as mine process water.

The objective of this memo is to consider and assess the changes in the Project relative to the assessment criteria presented in the EA for the aquatic environment. Therefore, the focus of this assessment was to consider the potential effects to:

- aquatic toxicology based on changes to predicted water quality;
- commercial, recreational and aboriginal fisheries (CRA) based on changes in aquatic habitats, flows and operating conditions; and
- aquatic habitat based on changes in realignments and waterbodies.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The Local Study Area (LSA) includes areas where there is potential for measurable effects as a result of either, Construction, Operations or Closure. Based on this definition, the LSA includes the Project site as well as downstream water bodies that may receive effluent or storm water discharge from the Project or may be affected by watercourse realignments. The extent of the water bodies included in the assessment were based on the defined Project design and the expected extent of potential changes to the respective aquatic environment (Figures 1-1 and 1-2).

A regional study area was not defined for the Aquatic Baseline Study as the effects were not anticipated to be measurable beyond the LSA.

2.2 Temporal Boundaries

The temporal boundaries of the EER span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed from the EA. The effects assessment indicators previously used are still applicable. Refer to Table 2-1 for indicators, the rationale for their selection and definitions of magnitude levels. The methodology for the assessment was consistent with the EA, except where noted.

Table 2-1: Assessment Indicators for the Aquatic Environment Effects Assessment for the Côté Gold Project

Discipline	Effect Assessment Indicator	Rationale for Selection	Magnitude Level Definitions		
			Level I	Level II	Level III
Aquatic Environment	Aquatic Toxicology	Protection of aquatic species is predicated on exposure to concentrations of substances in water which will not cause impairment. Water quality concentrations can be predicted and toxicity concentrations are well established.	Median concentrations of substances in water within the receiving environment are not expected to affect fish or aquatic life such that predicted concentrations will be less than water quality criteria for the protection of aquatic life for substances with water quality guidelines and less than chronic toxicity thresholds for substances without guidelines.	Maximum concentrations of substances in water in the receiving environment are predicted to be greater than criteria for the protection of aquatic life but less than acute toxicity thresholds for resident species.	Median concentrations of substances in water in the receiving environment are predicted to be greater than sub-lethal toxicity thresholds.
	Commercial, Recreational and Aboriginal Fisheries	To ensure the protection of CRA fish, Project activities must not impair CRA fish communities or populations.	There is no measurable effect to sport fish communities or populations.	Project activities expected to limit or reduce some life history requirements but measurable population level effects not expected.	Project activities are expected to have measureable effects on one or more of the sport fish populations.

Discipline	Effect Assessment Indicator	Rationale for Selection	Magnitude Level Definitions		
			Level I	Level II	Level III
	Aquatic Habitat	Loss of aquatic habitat can affect the aquatic ecosystem through the loss of biota and supporting habitat for fish and other aquatic life.	Less than 10% of lotic habitat (stream length - m) and /or lentic habitat (lake area m^2).	Greater than 10% of lotic habitat (stream length - m) and /or lentic habitat (lake area m^2) but less than 35%.	Greater than 35% of lotic habitat (stream length - m) and /or lentic habitat (lake area m^2).

2.4 Prediction of Effects

2.4.1 Aquatic Toxicology

Golder Associates (Golder) has provided water quality predictions for all waterbodies potentially influenced by the Project under three climate scenarios (average, wet and dry). Minimum and maximum monthly concentrations were provided for the operational period, as well as Closure Phase I (pit filling) and Phase II (reconnection of the pit lake) for both the Mollie River watershed and the Mesomikenda watershed (Golder 2018a).

Predicted water quality concentrations were compared to benchmarks that were based on the most recent water quality guidelines (Canadian Water Quality Guidelines [CWQG] CCME 2013 and Provincial Water Quality Objectives [PWQO; Ontario Ministry of Environment and Energy (OMOEE) 1994]) for the protection of fish and aquatic life or background, whichever was higher. For the purpose of the EER, the benchmarks were updated to include additional baseline data (January 2012 to July 2017; Golder 2018a) and the guidelines were reviewed to ensure they represented the most recent values. Predicted water quality concentrations were then compared to single benchmarks based on:

- The most recent federal or provincial guideline;
- a guideline from another Canadian jurisdiction if no federal or Ontario guideline exists;
- if higher than guidelines, the baseline concentration; or
- baseline, if no water quality guidelines exist (Table 2-2).

However, since baseline concentrations have no relevance to aquatic toxicity, toxicity reference values (TRVs) were developed for substances without guidelines (i.e., calcium, manganese, sodium, and strontium) and were used for the assessment of effects (Table 2-1). Predicted concentrations that were greater than guidelines were compared to chronic toxicity effect thresholds, as appropriate (Appendix Table II-1).

For each phase of mine development, predicted maximum concentrations were summarized for any analytes that exceeded the water quality benchmark. Values greater than the water quality benchmark were flagged.

Predicted concentrations (maximums) were identified as having no effect on aquatic life if concentrations were less than the benchmark. Concentrations that were predicted to be elevated compared to the benchmark (guidelines and / or baseline concentrations) were considered relative to three effect level definitions (low, medium and high; Table 2-1). These effect definitions considered the magnitude of an anticipated effect.

Table 2-2: Selected Benchmarks for the Evaluation of Water Quality Predictions, Côté Gold Project

Analyte	Units	95th Percentile Baseline Concentration [2]	Water Quality Guidelines [1] – Primary – PWQO OMOEE 1994 [3]	Primary – CWQG Environment Canada[4] – Value	Primary – CWQG Environment Canada[4] – Year	Alter-native – BCMOE 2006 [5] unless noted	Selected Bench-mark[6]
Aluminum	mg/L	0.143	0.075 [7]	0.1 [7]	1987		0.143
Ammonia (Total)	mg/L	0.15	-	6.98 [7]	2001		6.89
Ammonia (Un-ionized)	mg/L	0.0001	0.02	0.019	2001		0.019
Antimony	mg/L	< 0.001	0.02	-			0.02
Arsenic	mg/L	< 0.003	0.1 / 0.05 [14]	0.005	1997		0.005
Barium	mg/L	0.007	-	-		1.0	1.0
Beryllium	mg/L	< 0.001	0.011 [7]	-			0.011
Boron	mg/L	< 0.01	0.2	1.5	2009		1.5
Cadmium	mg/L	0.00003	0.0001 [7]	0.00007 [7,8]	2014		0.00007
Calcium	mg/L	11.265	-	-			11.265
Chloride	mg/L	4.826	-	120	2011		120
Chromium	mg/L	< 0.002	0.0089 [7]	0.0089 [7]	1997		0.0089
Cobalt	mg/L	0.00025	0.0009	0.0025 [7]			0.0025
Copper	mg/L	0.003	0.005 [7]	0.002 [7]	1987		0.005
Cyanide (Total)	mg/L	0.001	-	-			0.001
Cyanide (Free)	mg/L	0.001	0.005	0.005	1987	0.0098 [12]	0.0098
Fluoride	mg/L	0.025	-	0.12	2002		0.12
Iron	mg/L	0.494	0.3	0.3	1987		0.494
Lead	mg/L	0.0005	0.003 [7]	0.001 [7]	1987		0.001
Magnesium	mg/L	2.03	-	-			2.03
Manganese	mg/L	0.125	-	-		0.76 [7]	0.76
Mercury	mg/L	< 0.0000	0.0002	0.000026	2003		0.000026
Molybdenum	mg/L	< 0.001	0.04	0.073	1999		0.073
Nickel	mg/L	0.0015	0.025	0.025 [7]	1987		0.025
Nitrate	mg/L	0.17	-	13	2012		13
Nitrite	mg/L	< 0.03	-	0.06	1987		0.06
Phosphorus (Total) [9]	mg/L	0.050	0.02	0.02	2004		0.05
Potassium	mg/L	0.52	-	-		373 [13]	373
Selenium	mg/L	< 0.001	0.1	0.001 [10]	1987		0.001
Silver	mg/L	0.00002	0.0001	0.00025	2015		0.0001

Analyte	Units	95th Percentile Baseline Concentration [2]	Water Quality Guidelines [1]				Selected Bench-mark[6]
			Primary			Alter-native	
			PWQO OMOEE 1994 [3]	CWQG Environment Canada[4]		BCMOE 2006 [5] unless noted	
				Value	Year		
Sodium	mg/L	2.6	-	-			2.6
Strontium	mg/L	0.024	-	-			0.024
Sulphate	mg/L	4.076	-	-		218 [7,11]	218
Thallium	mg/L	0.00003	0.0003	0.0008	1999		0.0008
Titanium	mg/L	0.0016	-	-			0.0016
Tungsten	mg/L	< 0.01	0.03	-			0.03
Uranium	mg/L	< 0.002	0.005	0.015	2011		0.015
Vanadium	mg/L	< 0.001	0.006	-			0.006
Zinc	mg/L	0.021	0.02	0.03	1987		**0.021**
Zirconium	mg/L	< 0.004	0.004	-			0.004

Selected benchmark

Benchmark is the upper limit of baseline.

Bold Upper limit of background is greater than the water quality guideline.

[1] The most recent CWQG or PWQO for the protection of aquatic life was used. If there was no federal or provincial guideline, the most recent guideline from another Canadian jurisdiction (BCMOE) was used.

[2] The 95th Percentile Baseline Concentration was calculated using data from January 2012 to July 2017.

[3] PWQO - Provincial Water Quality Objectives. Ministry of Environment and Energy, July 1994, re-issued in 1999 (OMOEE 1994).

[4] CWQG - Canadian Water Quality Guidelines for the protection of aquatic life. Canadian Council of Ministers of the Environment, http://st-ts.ccme.ca/, accessed November 2017 (CCME 2017). The dates for the derivation of the guideline for each substance is provided.

[5] British Columbia Ministry of Environment, Water Quality Guidelines (BCMOE 2006).

[6] Selected water quality benchmark was the most recent water quality guideline of the upper limit of background whichever was higher.

[7] Aluminum guideline depends on pH; total ammonia guideline depends on pH and temperature; beryllium, cadmium, copper, lead, manganese, nickel and sulphate guidelines depend on hardness; guidelines in table assume: pH = 7, temperature = 15^{o}C, hardness = 33.5 mg/L as CaCO3 based on background water quality (Golder 2018). Guideline for trivalent chromium used for comparison purposes for total chromium.

[8] Cadmium CCME guideline is based on the CCME for cadmium (CCME 2014)

[9] The 95th percentile total phosphorus concentration was calculated based on data from samples collected by IAMGOLD 2013 to 2017 and analyzed via spectrophotometer.

[10] The CCME guideline was selected as the PWQO value is not consistent with other jurisdictions in Canada (BCMOE 2006) or internationally (USEPA 2004)

[11] Sulphate guideline established by BCMOE in 2013 (BCMOE 2013)

[12] USEPA free cyanide value selected for non-salmonid bearing waters, PWQO was used for Mesomikenda due to presence of salmonids.

[13] Water Quality Criteria Second Edition. Publication 3-A (Reprint, June 1, 1974). Edited by J.E. McKee and H.W. Wolf. The Resource Agency of California State Water Resources Control Board. P. 244.

[14] Interim PWQO value used.

Table 2-3: Selected Toxicity Reference Value (TRV) for Chemicals Found to be Higher than Baseline, Côté Gold Project

Chemical	TRV (mg/L)	Species Endpoint	Endpoint Type	Reference
Calcium	423.9	Aquatic Invertebrates (*Daphnia magna*)	Lowest Observed Effect Concentration (reproduction 21 d)	Baillieul et al. 1993
Magnesium	82	Aquatic Invertebrates (*Daphnia magna*)	Lowest Chronic Value (EC16 - reproduction)	Biesinger and Christensen 1972 as cited in Suter II and Tsao 1996
Sodium	180	Fish	Lowest reported toxicity value for aquatic life	Mount et. al. 1997 cited in OMOE 2011
Strontium	15	various datasets reviewed	Tier II Secondary Acute	Suter II and Tsao 1996
	1.5	various datasets reviewed	Tier II Secondary Chronic	Suter II and Tsao 1996

2.4.2 Commercial, Recreational and Aboriginal Fisheries (CRA)

Some fish species residing within the LSA have the potential to support recreational opportunities and a subsistence food base and are afforded protection under the Canadian *Fisheries Act* (Government of Canada 2013). The key fish species within the LSA are northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), whitefish (*Coregonus clupeaformis*) and smallmouth bass (*Micropterus dolomieu*). The Project has been reviewed to assess the potential impact to the resident fish populations relative to maintaining sufficient quantities of critical habitat for the key life history stages (i.e., spawning, juvenile rearing, adult foraging, and overwintering; Table 2-4). It is important to note that the protection of fish from potential contaminant effects has been addressed through the aquatic toxicity indicators discussed above.

Project activities were assessed for their potential to adversely affect fish (CRA) within the LSA. Activities proposed during each phase of the mine life were considered in terms of the established assessment indicators (Table 2-1). The following activities were identified:

- potential effects from blasting within the open pit on fish in adjacent water bodies;
- flooding of terrestrial vegetation for watercourse realignments may cause increased methyl mercury production, which may reduce the usability of sport fish for recreation;
- construction of activities potentially causing water quality impairment through sediment migration and elevated total suspended solids (TSS);
- effluent and storm water discharges may affect fish through impaired water quality (addressed through aquatic toxicology Section 2.4.1);

- impingement of fish through fresh water taking influent structures;
- loss of aquatic habitats for the development of the open pit and TMF will require the removal of fish from these habitats with the potential loss of some fish; and
- the development of watercourse realignments within the LSA could impair critical life history habitats (i.e., spawning, juvenile rearing, adult foraging and over wintering) of the resident fish (northern pike, yellow perch, walleye, whitefish and smallmouth bass; Table 2-4).

Table 2-4: Summary of habitat requirements for various life stages of key sport fish found in the vicinity of the Côté Gold Project

Species	Spawning/Incubation	Juvenile/Rearing	Adult/Foraging	Overwintering
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 on 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.

Species	Spawning/Incubation	Juvenile/Rearing	Adult/Foraging	Overwintering
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 et. al. 2009, Holmes et al. 2010, Inskip 1982, Kreiger et. al. 1983, McMahon et. al. 1984, McPhail 2007, Scott and Crossman 1998, Twomey et. al. 1984

Calculated setback distances for noise and vibration effects to fish were confirmed to remain consistent with those presented in the EA. However, given the revised open pit configuration, the assessment was updated such that these setbacks were imposed on the Project pit layout and potential effects to fish and / or fish habitat were considered.

Some of the created fish habitat associated with the watercourse realignments will involve flooding existing terrestrial habitats. However, the extent of flooding required is substantially less in the Project mine plan compared to the EA (i.e. 33 % less). Potential implications to fish due to flooding and the potential for methyl mercury production have been considered.

During construction there will be the potential for elevated TSS in watercourses downstream of active disturbance. Elevated TSS can affect fish and other aquatic life through impacts to habitat (i.e., smothering of spawning substrate), and critical life stages (i.e., egg incubation and young of the year). Construction related changes were considered after best management practices were assumed.

Water required for the mill during Operations will be recycled from the open pit, seepage collection ponds, and supernatant water stored in both the mine water pond and the TMF pond Any additional fresh water required (up to 360 m^3/d), will be drawn from Mesomikenda Lake. The intake of water from Mesomikenda Lake has the potential to affect fish through entrainment and / or impingement in the intake structure. Mitigation strategies, consistent with applicable guidelines, will be utilized to prevent potential effects to resident fish within Mesomikenda Lake.

Prior to the draining of water bodies for the development of the open pit and TMF, fish within these habitats will need to be relocated. However, it is not possible to capture and safety relocate all fish from these habitats, and as such, some fish will be lost. The approach to the relocation of fish and fish habitat offsetting measures are unchanged for the commitments made in the EA.

2.4.3 Aquatic Habitat

Habitat is critical in maintaining aquatic ecosystems. Loss of aquatic habitat can affect fish communities and / or populations as well as other aquatic life (i.e., aquatic birds, amphibians, reptiles). The loss of aquatic habitat associated with the Project was considered relative to the current habitat within the LSA. Changes to both lentic (lakes and ponds) and lotic (streams) habitat within the LSA were considered. The predicted loss of habitat for each habitat type (i.e., lentic or lotic) was considered relative to the total amount (stream length in metres for lotic habitats, and surface area in square metres for lentic habitat) currently measured within the LSA (Table 2-1). A draft offsetting plan was prepared for the previous mine plan and was acceptable to DFO. This plan will be updated to address the realignments and overprinting of habitat associated with the Project mine plan.

3.0 PREDICTION OF EFFECTS

3.1 Aquatic Toxicology

Consistent with the previous mine plan, the Project has the potential to effect water quality in the Mollie River and Mesomikenda Lake watersheds. Water quality within the Mollie River watershed will continue to be influenced by drainage from the MRA and the polishing pond, but under the Project mine plan, mine effluent will now be discharged to Upper Three Duck Lakes. Comparatively, effluent will no longer be discharged to the Mesomikenda Lake watershed and the only potential mine influence within this watershed will be seepage from the Reclaim Pond to the south arm of Bagsverd Lake (Figure 1-2). As a result, the Project influence on water quality in the Mesomikenda Lake watershed is substantially reduced relative to that presented in the EA. A description of the expected changes in water quality within each watershed is provided below.

In the Mollie River watershed, analytes are generally expected to meet the selected benchmark (water quality guideline or background) throughout all phases with a few exceptions (arsenic, calcium, magnesium, sodium, strontium, and total cyanide; Table 3-1, Appendix Tables II-2 – II-4). Of these analytes, only arsenic exceeds a water quality guideline, while the remaining analytes have no established water quality guideline, but were predicted to exceed background / baseline concentrations. Since baseline concentrations have no relevance to aquatic toxicity, these analytes were compared to TRVs, and were all found to be well below their respective TRVs (Table 3-2).

During average and 1:25 wet year scenarios, arsenic concentrations are predicted to be less than the water quality benchmark (CCME of 0.005 mg/L) in Upper and Middle Three Duck Lakes. However, during the 1:25 dry year scenario, arsenic concentrations are predicted to intermittently exceed the benchmark (Appendix Table II-2). During this period the monthly maximum (0.0071 mg/L) is only marginally above the guideline (0.005 mg/L), and annual average concentration in Upper Three Duck Lakes is 0.0051 mg/L, and 0.0046 mg/L in Middle Three Duck Lakes (Table 3-2). However, it is important to note that arsenic concentrations never exceed the provincial water quality objective (PWQO) of 0.10 mg/L, or established chronic or acute toxicity thresholds (0.45 mg/L and 1.08 mg/L respectively; Suter and Tsao 1996, Hale 1977). Therefore, predicted arsenic concentrations are not expected to negatively affect aquatic biota within the downstream receiver.

Total cyanide is predicted to exceed the benchmark (background) in all modelled lakes (except Delaney Lake, which does not receive seepage directly from the TMF, or inflow from an upstream lake that receives TMF seepage) in both Operations and Post-closure Phase I because total cyanide mass is added to the system via seepage from the TMF (Appendix Tables II-2 – II-7). During Post-closure Phase I, it is assumed that seepage from the TMF will continue to contain cyanide for the first few decades after Closure, but will eventually be “flushed” out by Post-closure Phase II. While predicted total cyanide concentrations are above the benchmark (background), there is no water quality guideline for total cyanide. Rather, water quality guidelines are established for free cyanide, the form associated with toxicity and bioavailability to aquatic organisms (CCME 2017). Predicted concentrations of free cyanide are not expected to exceed the benchmark (0.0098 mg/L) throughout the mine life or Closure phases. Therefore, predicted cyanide concentrations are not expected to affect aquatic biota within the downstream receiver.

Within the Mesomikenda watershed only calcium, magnesium, sodium and strontium are expected to exceed their respective benchmarks throughout the Project life, but remain below their TRVs (Table 3-1, Appendix Tables II-5 – II-7). Similar to the Mollie River watershed, total cyanide concentrations are predicted to exceed the benchmark (background) but free cyanide is not predicted to exceed water quality guidelines.

Compared to the EA, fewer substances were found to exceed selected benchmarks in the Project mine plan. In addition, of the substances that are expected to exceed the benchmark, these benchmarks are generally based on background concentrations as water quality guidelines do not exist for them. Only arsenic is predicted to exceed a water quality guideline, and then only during the 1 in 25 year dry condition although concentrations remain well below toxicity thresholds. Furthermore, the maximum predicted arsenic concentrations in the EA were higher than those predicted for the Project mine plan and thus any effects are expected to be less. Thus, effects to aquatic biota in the downstream receiver is not anticipated. Overall, predicted conditions appear to be improved to those predicted for the EA.

Table 3-1: Highest Predicted Maximum Concentration for Each Substance Predicted to Exceed Selected Water Quality Benchmarks for Each Phase of the Mine Life

a) Mollie River Watershed

Substance	Units	Selected Benchmark[1]	Toxicity Reference Value (TRV)	Highest Maximum Predicted Concentration > Benchmark		
				Operations	Post-closure Phase I	Post-closure Phase II
Arsenic	mg/L	0.005	0.45	0.007	< benchmark	< benchmark
Calcium	mg/L	10	423.9	47	16	16
Magnesium	mg/L	2.0	82	2.8	2.7	2.7
Sodium	mg/L	1.3	180	18	18	9.9
Strontium	mg/L	0.026	1.5	0.081	0.034	0.034

b) Mesomikenda Lake Watershed

Substance	Units	Selected Benchmark[1]	Toxicity Reference Value (TRV)	Highest Maximum Predicted Concentration > Benchmark		
				Operations	Post-closure Phase I	Post-closure Phase II
Calcium	mg/L	10.5	423.9	14.0	12.8	12.3
Magnesium	mg/L	2.0	82	2.5	2.3	2.1
Sodium	mg/L	1.34	180	17.2	17.2	10.1
Strontium	mg/L	0.026	1.5	0.031	0.028	0.026

[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

Note: Highlighted value represents maximum concentrations that exceed the TRV.

Table 3-2: Monthly Average Arsenic Water Quality Model Results

Month	Monthly Average Arsenic Concentration (mg/L)					
	Three Duck Lakes (Upper)			Three Duck Lakes (Middle)		
	Average	1:25 Year Wet	1:25 Year Dry	Average	1:25 Year Wet	1:25 Year Dry
January	0.0033	0.0037	0.0043	0.0035	0.0037	0.0045
February	0.0032	0.0036	0.0040	0.0035	0.0037	0.0044
March	0.0030	0.0034	0.0038	0.0033	0.0036	0.0042
April	0.0032	0.0034	0.0042	0.0032	0.0033	0.0040
May	0.0043	0.0031	0.0038	0.0042	0.0032	0.0038
June	0.0027	0.0033	**0.0055**	0.0029	0.0030	0.0040
July	0.0037	0.0041	**0.0065**	0.0030	0.0034	0.0044
August	0.0041	0.0041	**0.0071**	0.0034	0.0037	0.0047
September	0.0040	0.0040	**0.0071**	0.0036	0.0038	**0.0053**
October	0.0041	0.0040	**0.0060**	0.0038	0.0039	**0.0058**
November	0.0043	0.0029	**0.0050**	0.0039	0.0031	**0.0054**
December	0.0037	0.0026	0.0035	0.0038	0.0028	0.0042
Median Concentration	0.0036	0.0036	0.0044	0.0035	0.0035	0.0044
Average Concentration	0.0036	0.0035	**0.0051**	0.0035	0.0035	0.0046

Note: bold values indicates an arsenic concentration > 0.005 mg/L.

3.2 Commercial Recreational and Aboriginal Fisheries

The potential effects from noise and vibration on fish and fish habitat associated with blasting within the open pit has been assessed relative to the EA mine plan (Figure 3-1). As indicated in Section 2.4.2, calculated setback distances for noise and vibration effects to fish were confirmed to remain consistent with those presented in the EA. Consistent with the EA, spawning habitat in a small area in south east of Clam Lake will potentially be affected during Construction and Operations. However, in the EA this habitat was lost due to a realignment of the Mollie River whereas in the Project mine plan, this habitat will not be lost and as such potential effects to fish spawning are possible within the area. The offsetting plan will be updated to recognize the potential disruption of habitat and the impact to fish habitat will be recognized in the *Fisheries Act* Authorization application. In addition, the setbacks for the open pit will impinge on the north end of the new lake to be constructed downstream of Chester Lake. The potential implications on the habitat quality within the new lake will be addressed in an updated offsetting plan to be submitted to DFO. Other than these differences, the effects of blasting associated with the Project mine plan are consistent with those presented in the EA.

As described in the EA, some terrestrial habitat will need to be flooded in order to create new habitats for offsetting and to manage watercourse realignments. However, the area to be flooded in the previous EA was 454,820 m^2 whereas the area to be flooded under the Project mine plan is 306,284 m^2, which is primarily associated with the development of the new lake. This is approximately 33% smaller area to be flooded. As committed in the EA, the areas to be flooded will have vegetation and organic soil removed prior to the implementation of water course realignments to reduce the potential for methyl mercury production. Therefore, the potential effects associated with flooding will be less in the Project mine plan than those described in the EA.

There will be some potential for elevated TSS in watercourses downstream of mine construction. Elevated TSS can affect fish and aquatic life through impacts to habitat (i.e., smothering of spawning substrates), at critical life stages (i.e., egg incubation and young-of-the-year rearing). However, since the footprint of the revise mine plan is considerably smaller than that presented in the EA, the potential effects of migrating sediment caused by erosion during construction are expected to be less. Consistent with the EA, it is expected that through the implementation of best management practices for erosion and sediment control and timing of the construction periods relative to life history stages of resident fish, potential effects will be mitigated, and no residual effects to fish communities and populations are expected. Monitoring of the effectiveness of these mitigation measures will be required (see Section 5.0).

The volume of water required for mine process water and the intake location is less than that described in the EA (1/2 the volume) and therefore the potential for effects is expected to be less. Consistent with the EA, the water intake structure will be designed not to interfere with fish passage, constrict the channel width, or reduce flows, and will be equipped with screens to prevent entrapment or impingement of fish. The design and installation of the intake end of pipe fish screens will address the requirements provided by Department of Fisheries and Ocean (DFO) (1995).

Since the aquatic habitat to be over printed and / or realigned is less with the Project mine plan, it is expected that fewer fish will need to be relocated. Consistent with the EA, mitigation measures will be implemented to ensure that fish will be relocated at ideal timing windows to minimize fish and egg stranding during the watercourse realignments and protect year classes.

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; Golder 2018b). 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 Closure, water levels and flow will be adjusted towards baseline conditions as channel realignments and the New Lake are removed.

Under the Project mine plan, the relocation of the TMF will result in a significant reduction in the amount of fish habitat lost. Of the habitat to be lost, only a few areas were not included in the EA. These habitats are generally associated with small ponds located within the TMF footprint (Figure 1-1). Previously, the TMA was located north of the mine site and over printed Bagsverd Creek which supports both large and small-bodied fish, whereas under the Project plan, the TMF is now located west of the mine site and only overprints a few small ponds which support small bodied fish. Furthermore, the Project mine plan will not alter watershed boundaries, which will also limit the potential for changes to the structure of the fish community. The mine Closure Plan incorporates the filling of the open pit into a fresh water lake and the removal of channel realignments and the new lake. Since habitat for various life stages of the key sport fish is generally not limited within the LSA, it is expected that community level effects will not be realized, and any effects that do occur will be limited. Newly constructed habitat will be established over a growing season, or actively vegetated prior to commissioning, promoting more established habitats. This mitigation together with measures to reduce lag times, incorporated into the offsetting plan should reduce any potential disruption to the fish within the LSA. Monitoring will be required to assess the successful implementation of the watercourse realignments (see Section 5.0).

3.3 Aquatic Habitat

Fish habitat within the LSA will be affected by the construction of dams and channel realignments required to accommodate the removal of Côté Lake and the development of the open pit, as well as the TMF (Figure 1-1 and 1-2). However, the amount of habitat loss associated with the Project mine plan is substantially less (20 to 25%) than the EA (Table 3-4). Given that the habitats to be affected were all assessed in the EA with the exception of a few small ponds overprinted by the new location of the TMF, impact to aquatic habitat and fisheries resources are expected to be less with the Project mine plan than that presented in the EA.

Table 3-3: Simulated Surface Water Flow and Elevation Change During the Operation Phase, Côté Gold Baseline

Water Body		Surface Water Elevation (average annual masl)		
		Existing Conditions	Operations Phase	Change (m)
Average Year Modelled				
Mollie River	Chester Lake	384.69	384.71	0.02
	Little Clam Lake	387.53	387.53	0.00
	Clam Lake	386.02	385.92	-0.09
	Weeduck Lake	381.38	381.38	0.00
	Three Duck Lakes (Upper)	380.63	380.65	0.03
	Three Duck Lakes (Lower)	380.35	380.46	0.11
	Delaney Lake	390.78	390.78	0.00
	Dividing Lake	375.06	375.06	0.00
Mesomikenda Lake	Bagsverd Lake	379.99	379.99	0.00
	Schist Lake	380.44	380.45	0.01
	Bagsverd Creek	369.74	369.73	-0.01
	Mesomikenda Lake	364.03	364.02	0.00
Wet Year Modelled				
Mollie River	Chester Lake	384.76	384.75	-0.01
	Little Clam Lake	387.56	387.56	0.00
	Clam Lake	386.02	385.93	-0.09
	Weeduck Lake	381.50	381.49	0.00
	Three Duck Lakes (Upper)	380.65	380.68	0.02
	Three Duck Lakes (Lower)	380.40	380.49	0.09
	Delaney Lake	390.79	390.79	0.00
	Dividing Lake	375.08	375.08	0.00
Mesomikenda Lake	Bagsverd Lake	380.01	380.01	0.00
	Schist Lake	380.45	380.46	0.01
	Bagsverd Creek	369.81	369.80	-0.01
	Mesomikenda Lake	364.13	364.13	0.00
Dry Year Modelled				
Mollie River	Chester Lake	384.56	384.61	0.04
	Little Clam Lake	387.46	387.46	0.00
	Clam Lake	385.88	385.73	-0.15
	Weeduck Lake	381.25	381.25	0.00
	Three Duck Lakes (Upper)	380.60	380.63	0.03
	Three Duck Lakes (Lower)	379.93	380.42	0.49
	Delaney Lake	390.41	390.41	0.00
	Dividing Lake	375.00	375.01	0.01
Mesomikenda Lake	Bagsverd Lake	379.95	379.96	0.00
	Schist Lake	380.32	380.33	0.01
	Bagsverd Creek	369.67	369.66	-0.01
	Mesomikenda Lake	363.51	363.51	-0.01

Table 3-4: Comparison of Habitat Lost Between Mine Plans Relative to the Size of the Local Study Area

Habitat Type	Watercourses		Lakes/Ponds	
Existing Habitat	121,463 m		24,142,000m^2	
Mine Plan	Lost (m)	% of LSA	Lost (m^2)	% of LSA
EA Mine Plan	9,812	8.1%	746,000	3.1%
Project Mine Plan	7,838	6.5%	553,075	2.3%
% Reduction	20%	-	26%	-

Consistent with the EA, the watercourse realignment channels will be designed to compensate for habitat lost within the LSA and to ensure productive capacity within the LSA is maintained. 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. Therefore, the general approach will be to design habitat to meet the life history requirements of the resident fish. Consideration with respect to spawning, juvenile rearing, adult foraging, migration and over wintering habitat will be incorporated into the design as appropriate. The compensation / offsetting plans will be updated and will consider not only the physical habitat requirements (i.e., flow, depth, fish passage, cover, substrate) but also the biological requirements (i.e., food base, vegetation).

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce, or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation, or any other means. Mitigation measures have been incorporated into the mine plan to remove or reduce potential impacts. These mitigation measures were reviewed in light of the Project mine plan and any addition or reduction of mitigation measures required was identified.

Table 4-1 provides the mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA. In instances where measures are no longer applicable, they have been removed with reasons provided.

Table 4-1: Mitigation Measures – Aquatic Biology

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Construction	During construction water quality may be impaired due to elevated TSS in runoff which can affect aquatic species. IAMGOLD will implement best management practices to control runoff and minimize TSS effects. Some concentrations above background may occur temporarily.	The use of erosion control measures and timing of construction to avoid spawning and egg incubation periods will reduce the potential for effect to fish and aquatic life.	Construction in water bodies will be undertaken within the in-water construction windows to minimize effects to fish spawning. Erosion control fencing and sedimentation catchments will be installed downstream of active construction areas.	As required under a consolidated works permit under the *Lakes and Rivers Improvement Act* issued by the Ministry of Natural Resources and Forestry and under the *Fisheries Act* Section 35. TSS must not exceed 5 mg/L (long-term) or 25 mg/L TSS (short-term; CCME 2013)	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Construction	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.	Relocate fish (representative numbers of the community) to established habitats. Time relocation relative to life cycle requirements and environmental conditions to minimize stress.	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.	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.	The mitigation measure has not changed from the EA.
Aquatic Biology	Construction	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.	Removal of terrestrial vegetation and organic soils prior to flooding will reduce the potential for methyl mercury production through decaying of terrestrial vegetation.	Terrestrial vegetation and organic soils will be removed prior to flooding.	Health Canada consumptions restriction guideline (0.61 mg/kg Hg)- Health Canada 2004	The mitigation measure has not changed from the EA.

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Construction and Operations	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.	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.	Spawning habitat in Clam Lake within 238.5 m from open pit will be included in the Fisheries Act Authorization and ensuing compensation plan.	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 measure updated. 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.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Construction	Loss of existing lentic and lotic habitat will occur through the construction of the Project.	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.	Construct realignments to provide for life cycle requirements of resident fish	*Fisheries Act* Section 35. No loss of productive habitat related to commercial, aboriginal or recreational fisheries.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Construction	Reduction in flow associated with the loss of the TMF drainage to Bagsverd Creek will reduce flow and water levels and could affect fish passage and use of habitats.	Predicted reductions in flow will be compared to the measured stream morphology and the stream bed will be modified, as required to ensure fish passage and utilization of habitats. The modifications should be conducted as part of the fish habitat compensation plan.	Conduct a survey of the stream morphology at critical times of the year (low and peak flows) and assess the potential impact to habitat associated with predicted reductions in flow and water levels. Incorporate streambed modifications into the habitat compensation plan, if required.	*Fisheries Act* Section 35. No loss of productive habitat related to commercial, aboriginal or recreational fisheries.	Mitigation measure no longer applicable. Loss of habitat associated with reduction in flow is not anticipated under the Project plan in Bagsverd Creek, or in any other habitats and therefore this mitigation is no longer required.
Aquatic Biology	Operations	Water intake structures will trap, impinge fish.	Design water intake structures to meet DFO requirements to prevent/limit fish impingement.	Ensure intake pipe are fitted with screens to prevent fish impingement and consistent with DFO guidelines.	DFO Freshwater Intake End-of-Pipe Fish Screen Guideline	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Operations	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.	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.	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.	Section 35 *Fisheries Act* authorization	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Operations	Maximum values of several substances are predicted to exceed water quality guidelines in a few locations but concentrations of most substances are less than acute toxicity values appropriate for the assessment of short term exposure. Copper, iron and zinc will periodically exceed water quality guidelines in the effluent mixing zone with potential for short term effects to aquatic life.	Since toxicity of these substances can be modified by factors within the receiving environment such as hardness, dissolved organic carbon and pH, the predicted concentrations may not result in effects to aquatic biota. Site specific water quality objectives will need to be developed for these substances or effluent treatment will need to be employed such that protection of aquatic life is assured. To ensure that effluent is non-toxic, IAMGOLD will commit to a pH effluent limit of 6.7 to 9.0.	Prepare site-specific water quality guidelines following CCME protocols.	Water quality outside the mixing zone will need to achieve water quality guidelines and within the mixing zone must be non-acutely toxic to aquatic life– Ontario Water Resources Act (OWRA) and Section 36 of the Fisheries Act	Mitigation measure no longer applicable. Under the Project mine plan, metals are not predicted to exceed water quality guidelines, with the exception of arsenic during the dry year (1 in 25 yr) scenario. However, toxicity thresholds are not predicted to be exceeded even in the dry year. While mixing zone modelling will be required to support permitting, it is not anticipated that site specific water quality guidelines will be required.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Aquatic Biology	Post-Closure (Stage II)	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.	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.	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.	Section 35 *Fisheries Act* authorization	The mitigation measure has not changed from the EA.

5.0 MONITORING

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 Project 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 demonstrate that conditions within the aquatic habitats are consistent with predictions. Monitoring will be required by DFO and ECCCas 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.

Table 5-1 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.

Table 5-1 Monitoring Measures – Aquatic Biology

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Aquatic Biology	Water- TSS and turbidity	Standard Methods and water quality multi-meter	1 mg/L TSS and 1 Nephelometric Turbidity Unit (NTU) as Method Detection Limits (MDLs)	Daily during construction.	Downstream of active construction areas.	The monitoring requirement has not changed from the EA.
Aquatic Biology	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.	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.	(MDL< PWQO/CWQG standards). Concentrations in mine-exposed areas will also be compared to baseline and reference area values.	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.	Downstream of Project discharge and in all areas potentially affected by mine related discharges as well as in appropriate reference areas.	Monitoring Measure updated. Total and free cyanide should be added to the monitoring parameter list.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Aquatic Biology	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.	Surficial sediment collected from grab or core sample (top depositional layer). Method detection limits will be less than federal and provincial water quality guidelines.	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.	Every 3 years during Operations and twice following Closure.	Locations downstream of Project discharge and reference areas.	The monitoring requirement has not changed from the EA.
Aquatic Biology	Benthic invertebrate community	Depositional sampling using petite Ponar, reduced to 500 micron and identified to lowest practical level.	EEM under Federal Metal Mining Effluent Regulations (MMER) and Canadian-Ontario Agreement (COA) requirements under OWRA.	Every 3 years during Operations and twice following Closure.	Locations downstream of the Project discharge and reference areas.	The monitoring requirement has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Aquatic Biology	Fish community	Collect fish (small-bodied and large bodied) using standardized collection methods. Identify and enumerate and determine relative abundance.	EEM under MMER and COA requirements under OWRA.	Every 3 years during Operations and twice following Closure.	Locations downstream of the Project discharge and habitats affected by watercourse realignments.	The monitoring requirement has not changed from the EA.
Aquatic Biology	Fish health	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.	EEM under MMER and COA requirements under OWRA.	Every 3 years during Operations and twice following Closure.	Locations downstream of the Project discharge and reference areas.	The monitoring requirement has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Aquatic Biology	Fish tissue	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.	Health Canada and Ministry of the Environment and Climate Change consumption benchmarks.	Every 3 years during Operations and twice following Closure or until mercury concentrations in fish are stable or equal to reference areas.	In areas affected by stream realignments and reference areas.	Monitoring Measure updated. This monitoring should be conducted in New Lake and in reference lakes as no other terrestrial habitats are proposed for flooding.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Aquatic Biology	Noise and Vibration	Acoustic monitoring to confirm the predicted effects of blasting in the Open Pit	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).	During Construction and within the first two years of Operations.	South east bay of Clam Lake and the north bay of New Lake.	New Monitoring Measure. The EA did not anticipate potential effects from blasting on fish habitat in Clam Lake and New Lake.

6.0 CONCLUSION

The potential impacts to the aquatic environment have been considered for the Project mine plan through Construction, Operations and the two Post-closure phases. The effects assessment is based on baseline conditions summarized in the EA, predicted changes in water quality and hydrology provided by Golder (2018 a, b) and the proposed mine development and closure plan. Based on this assessment the Project mine plan will result in fewer effects to the aquatic environment associated with:

- A smaller footprint causing less disruption of habitat;
- the relocation of the TMF that will now overprint a few small ponds that support only small bodied forage fish as opposed to the previous location that overprinted a large portion of Bagsverd Creek that supported both large bodied and small bodied fish;
- less lentic and lotic habitat lost than with the previous mine plan;
- the maintenance of watersheds and limited changes in water elevations over baseline;
- generally, the habitats lost were assessed under the EA and the proposed offsetting is expected to provide adequate habitat to support the life history requirements of the resident fish; and
- improved water quality in terms of fewer substance elevated above benchmarks, and concentrations of most substances achieving water quality guidelines with the exception of arsenic, which is expected to periodically exceed the water quality guideline (CCME) during the dry year (1 in 25 year). However, the maximum predicted monthly average concentration is only marginally over the guidelines (0.0071 mg/L). It is important to note that arsenic concentrations never exceed the provincial water quality objective (PWQO) of 0.10 mg/L, or established chronic or acute toxicity thresholds (0.45 mg/L and 1.08 mg/L respectively).

No increase/change in the magnitude of effects for any of the aquatic indicators. Mitigations will continue to be implemented as described in the EA and updated herein. The monitoring program for the aquatic environment has been updated and will allow for the assessment of conditions relative to those predicted herein.

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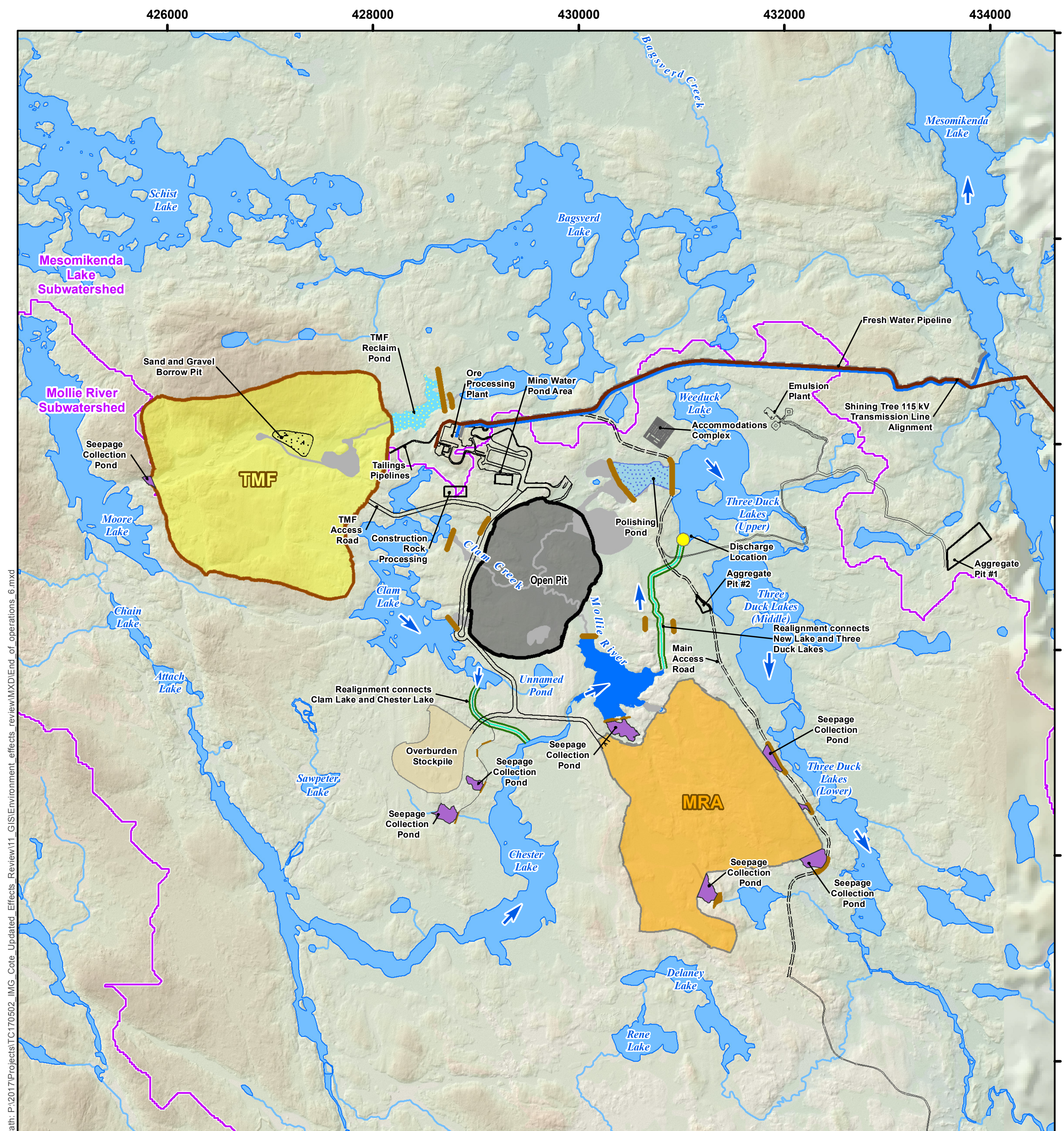
8.0 GLOSSARY AND ABBREVIATIONS

BCMOE	British Columbia Ministry of Environment
CCME	Canadian Council of Ministers of the Environment
COA	Canadian-Ontario Agreement
CRA	Commercial, Recreational, and Aboriginal
CWQG	Canadian Water Quality Guidelines
DFO	Department of Fisheries and Ocean
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EER	Environmental Effects Review
Hg	mercury
km	kilometer
L	litres
LSA	Local Study Area
MMER	Federal Metal Mining Effluent Regulations
MRA	Mine Rock Area
OMOEE	Ontario Ministry of Environment and Energy
OWRA	Ontario Water Resources Act
PWQO	Provincial Water Quality Objectives for the protection of aquatic life
TMF	Tailings Management Facility
TRV	Toxicity Reference Values
TSS	Total suspended solids

FIGURES



LEGEND

- Watercourses
- Waterbodies
- Overprinted Watercourses
- Overprinted Waterbodies
- Subwatershed Boundary
- Wooded Area
- Open Pit
- Potential Discharge Location
- Facilities
- Dam
- Main Access Road
- Shining Tree 115 kV Transmission Line Alignment
- Watercourse Realignment
- Fresh Water Pipeline
- Proposed Water Flow Direction
- Proposed Lake Area
- Overburden Stockpile
- Proposed Mine Rock Area (MRA)
- Proposed Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Polishing Pond
- Seepage Collection Pond
- Potential Borrow Areas

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 17N

0 1 2 3 4 5 Kilometres

N W E S

IAMGOLD CORPORATION

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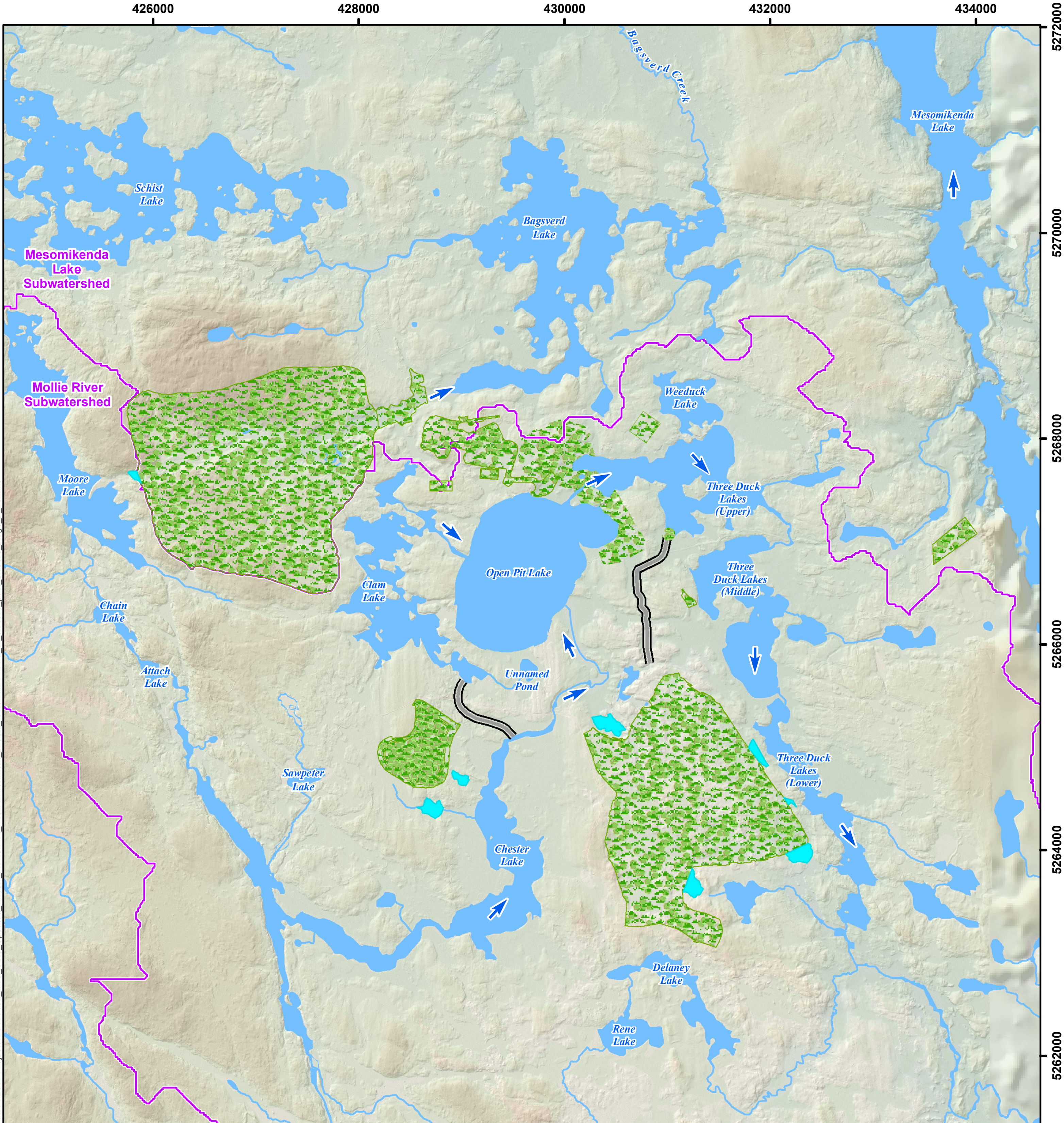
CÔTÉ GOLD PROJECT

Conceptual Layout for End of Operations

PROJECT N°: TC170502	**FIGURE: 1-1**
SCALE:1:50,000	DATE: February 2018



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LEGEND

- Proposed Water Flow Direction
- Decomissioned Realignments
- Rehabilitated Ponds
- Revegetated Area
- Subwatershed Boundary
- Watercourses
- Waterbodies
- Wooded Area

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.

Datum: NAD83
Projection: UTM Zone 17N

N W E S

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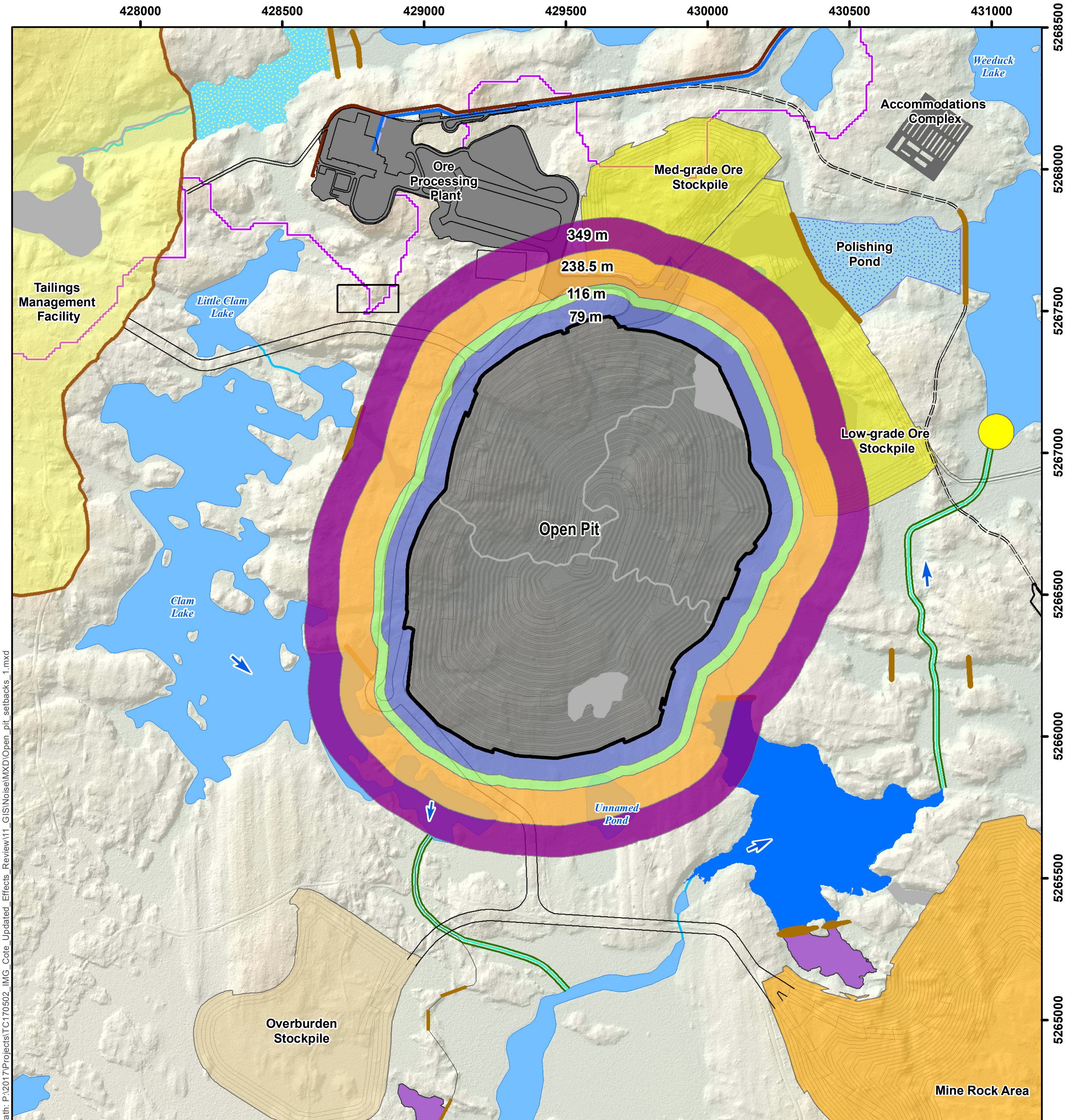
CÔTÉ GOLD PROJECT

End of Post-Closure Stage I / Beginning of Post-Closure Stage II

PROJECT N^{o}: TC170502	**FIGURE: 1-2**
SCALE:1:50,000	DATE: February 2018



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LEGEND

Open Pit Setback
- 79 m
- 116 m
- 238.5 m
- 349 m
- Watercourses
- Overprinted Watercourses
- Waterbodies
- Overprinted Waterbodies
- Subwatershed Boundary

Mine Site
- Open Pit
- Potential Discharge Location
- Facilities
- Dam
- Main Access Road
- Shining Tree 115 kV Transmission Line Alignment
- Watercourse Realignment
- Proposed Water Flow Direction
- Fresh Water Pipeline
- Proposed Lake Area
- Overburden Stockpile
- Ore Stockpile
- Proposed Mine Rock Area (MRA)
- Proposed Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Polishing Pond
- Seepage Collection Pond
- Sand and Gravel Borrow Pit

0 0.5 1 1.5 Km

NOTES:
- Prepared to support Aquatic Biology Updated Technical Memorandum for Environmental Effects Review.
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N E S W

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CÔTÉ GOLD PROJECT

Open Pit Setbacks

PROJECT N°: TC170502

FIGURE: 3-1

SCALE:1:18,000

DATE: February 2018

APPENDIX I

EXECUTIVE SUMMARY

Côté Gold Project
Environmental Effects Review Report
UTM – Aquatic Biology
May 2018
EAB: EA 05-09-02; EAIMS: 13022; CEAA: 80036

IAMGOLD Corporation (IAMGOLD) has developed an optimized mine plan (the optimized project is referred to as ‘the Project’) which has a smaller footprint than the mine plan presented in the Environmental Assessment (EA). Similar to the previous mine plan, the Project mine plan will overprint Côté Lake and several other small waterbodies and include the realignment of effected watercourses. As a result of the smaller and more compact footprint associated with the Project mine plan, loss and disruption of aquatic habitat will be reduced and watershed boundaries will be maintained. The closure plan is similar to that presented in the EA such that the open pit will be flooded, the realignment channels will be decommissioned, New Lake will be removed, Clam Creek will be reconstructed allowing Clam Lake to flow into the pit lake, and the Mollie River will also be reconstructed to flow into the pit lake (Figure 1-2). The open pit lake will discharge into the reconstructed west arm of Upper Three Duck Lakes. Disturbed areas will be revegetated as described in the EA (Figure 1-2). In addition to watercourse realignment channels, the updates to the mine plan and site layout has resulted in changes to discharge locations. Under the Project plan, mine waste water will be discharged to Upper Three Duck Lakes near the inlet of the Mollie River realignment channel (Figure 1-1). Several seepage collections ponds have also been added to collect seepage from the mine rock area (MRA) and overburden stockpile. Consistent with the EA, seepage ponds will be pumped to the polishing pond or the Reclaim Pond to be used as mine process water.

The aquatic environment was assessed for the Project mine plan relative to the mine plan presented in the EA. Assessment indicators (aquatic toxicology, commercial, recreational and aboriginal fisheries and aquatic habitat) and effect level definitions (low, medium and high) were employed, consistent with the EA. There were no changes in the spatial or temporal boundaries assessed.

Golder Associates (Golder) has provided water quality predictions for all waterbodies potentially influenced by mine related discharges under three climate scenarios (average, wet and dry). Minimum and maximum monthly concentrations were provided for the operational period, as well as Phase I (pit filling) and Phase II (reconnection of the pit lake) of closure for both the Mollie River watershed and the Mesomikenda Lake watershed (Golder 2018a). Predicted water quality indicated that fewer substances were elevated above benchmarks relative to the EA, and concentrations of most substances achieve water quality guidelines with the exception of arsenic, which is expected to periodically exceed the water quality guideline (CCME) during the dry year (1 in 25 year). However, the maximum predicted monthly average concentration is only marginally over the guidelines (0.0071 mg/L) and does not exceed toxicity thresholds. Concentrations of calcium, magnesium, sodium and strontium are predicted to exceed background/baseline concentrations but these substances, which do not have water quality guidelines, are not predicted to exceed established toxicity reference values (TRV). Total cyanide downstream of the tailings management facility (TMF) and effluent discharge will also exceed background, but free cyanide which is biologically relevant (toxicity) will not exceed established water quality guidelines for the protection of aquatic life.

Generally, most of the potential effects to commercial, recreational, and aboriginal fisheries were addressed in the EA and with the reduction in the footprint of the mine, several potential effects are reduced. The most significant changes are:

- A 33% reduction in areas flooded for habitat creation which will reduce potential for methyl mercury production, although mitigation measures (removal of vegetation and organic soils) will continue to be implemented; and,
- the influence of blasting on fish habitat will be realized in the south east bay of Clam Lake and the north bay of the new lake. The revision of the off-setting plan will address the disruption of habitat in these areas.

Fish habitat within the local study area (LSA) will be affected by the construction of dams and channel realignments required to accommodate the removal of Côté Lake, and the development of the open pit as well as the TMF. However, the amount of habitat loss associated with the Project mine plan is substantially less (20 to 25%) than that included in the EA. Given that the habitats to be affected were all assessed in the EA with the exception of a few small ponds overprinted by the new location of the TMF, impact to aquatic habitat and fisheries resources are expected to be less with the Project mine plan than that presented in the EA.

Mitigation measures identified in the EA will continue to reduce effects associated with the mine plan. The monitoring program has been modified to reflect the changes in the mine plan (e.g., change in discharge location).

The potential impacts to the aquatic environment have been considered for the Project mine plan through Construction, Operations, Closure and the two Post-closure phases. The effects assessment is based on baseline conditions summarized in the EA, predicted changes in water quality and hydrology provided by Golder (2018 a, b), and the proposed mine development and closure plan. Based on this assessment the Project mine plan will result in fewer potential effects to the aquatic environment.

APPENDIX II

WATER QUALITY

Table II-1: Toxicity Reference Values (TRV) for Substances without Water Quality Guidelines

Substance	TRV mg/L	Rationale	Reference
Arsenic	0.45	This values represents the lowest chronic value LC50 for *Daphnid magna* from EPA (1985).	Suter II and Tsao (1996)
Calcium	423.9	This represents the lowest observed effect concentration (LOEC) in a 21 day test using *Daphnia magna* .	Baillieul et al. (1993)
Magnesium	82	Lowest reported chronic toxicity value. A LOEC (EC16 for reproduction of Daphnia magna.	Biesinger and Christensen (1972) as cited in Suter II and Tsao (1996)
Sodium	180	Lowest reported toxicity value for aquatic life	Mount et. al., 1997 cited in OMOE 2011
Stronium	15	US EPA Ecotox Data base value for acute toxicity - short term exposure used to assess maximum values	Suter II and Tsao (1996)
	1.5	US EPA Ecotox Data base value for chronic toxicity - long term exposure used to assess median values	Suter II and Tsao (1996)

Table II-2: Revised Maximum Predicted Operational Water Quality Modeling Results for the Mollie River Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Moore Lake	Chester Lake	Little Clam Lake	Clam Lake	New Lake	Three Duck Lakes (Upper)	Three Duck Lakes (Middle)	Three Duck Lakes (Lower)	Delaney Lake	Dividing Lake
Aluminum	mg/L	0.143	0.110	0.108	0.137	0.121	0.105	0.087	0.078	0.071	0.116	0.069
Ammonia (Total)	mg/L	6.89	0.40	0.21	0.33	0.31	0.20	0.89	0.76	0.56	0.09	0.40
Ammonia (Un-ionized)	mg/L	0.019	0.0009	0.0004	0.0007	0.0007	0.0003	0.0023	0.0014	0.0015	0.0002	0.0011
Antimony	mg/L	0.02	0.0008	0.0009	0.0011	0.0010	0.0009	0.0027	0.0022	0.0016	0.0011	0.0012
Arsenic	mg/L	0.005	0.0022	0.0025	0.0031	0.0027	0.0025	0.0071	0.0058	0.0042	0.0030	0.0032
Barium	mg/L	1.0	0.0078	0.0086	0.011	0.009	0.0085	0.0149	0.013	0.0096	0.010	0.0080
Boron	mg/L	1.5	0.0076	0.0086	0.011	0.009	0.0084	0.0111	0.0095	0.0078	0.010	0.0070
Cadmium	mg/L	0.00007	0.000019	0.000022	0.000027	0.000023	0.000021	0.000030	0.000026	0.000021	0.000026	0.000018
Calcium	mg/L	11.3	12.1	12.6	15.8	13.9	12.3	47.2	38.7	26.6	14.3	19.1
Chloride	mg/L	120	1.8	1.8	2.3	2.1	1.8	2.8	2.4	1.9	2.0	1.6
Cobalt	mg/L	0.0025	0.0005	0.0005	0.0007	0.0006	0.0005	0.0006	0.0005	0.0004	0.0005	0.0004
Copper	mg/L	0.005	0.0044	0.0029	0.0042	0.0039	0.0028	0.0044	0.0036	0.0028	0.0020	0.0022
Cyanide (Total)[2]	mg/L	0.001	0.0190	0.0090	0.0146	0.0141	0.0086	0.0051	0.0039	0.0033	-	0.0026
Cyanide (Free)[2]	mg/L	0.0098	0.0047	0.0023	0.0036	0.0035	0.0022	0.0013	0.0010	0.0008	-	0.0007
Iron	mg/L	0.494	0.3348	0.3575	0.4456	0.3916	0.3498	0.2662	0.2421	0.2281	0.4084	0.2317
Lead	mg/L	0.001	0.0005	0.0006	0.0007	0.0006	0.0005	0.0005	0.0005	0.0004	0.0007	0.0004
Magnesium	mg/L	2.0	2.0	2.2	2.7	2.4	2.1	2.8	2.4	1.9	2.6	1.7
Manganese	mg/L	0.76	0.08	0.09	0.12	0.10	0.09	0.12	0.10	0.09	0.11	0.08
Molybdenum	mg/L	0.073	0.003	0.002	0.003	0.003	0.002	0.006	0.005	0.003	0.002	0.002
Nickel	mg/L	0.025	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.003	0.002
Nitrate	mg/L	13	0.51	0.58	0.72	0.63	0.71	3.45	3.02	2.20	0.70	1.61
Phosphorus (Total)	mg/L	0.05	0.017	0.019	0.023	0.020	0.019	0.037	0.031	0.022	0.023	0.018
Potassium	mg/L	373	1.2	0.8	1.2	1.1	0.8	2.7	2.2	1.5	0.6	1.1
Sodium	mg/L	2.6	17.9	8.7	13.9	13.4	8.3	5.3	4.2	3.6	2.2	2.9
Strontium	mg/L	0.024	0.026	0.027	0.034	0.030	0.027	0.081	0.066	0.047	0.031	0.035
Sulphate	mg/L	218	39.3	19.4	30.8	29.7	18.5	12.3	10.5	8.8	5.6	7.1
Uranium	mg/L	0.015	0.002	0.002	0.002	0.002	0.002	0.006	0.005	0.003	0.002	0.002
Vanadium	mg/L	0.006	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.002	0.002	0.002
Zinc	mg/L	0.021	0.009	0.010	0.012	0.010	0.010	0.016	0.013	0.010	0.012	0.009

Notes:

Monthly average concentrations greater than the selected benchmark concentrations are highlighted.

[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

[2] Total and free cyanide are not predicted for Delaney Lake, as it does not receive seepage from the Tailings Management Facility (TMF) or inflow from an upstream lake that receives TMF seepage.

Table II-3: Revised Maximum Predicted Post-closure Phase I (With Pit Filling) Water Quality Modeling Results for the Mollie River Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Moore Lake	Chester Lake	Little Clam Lake	Clam Lake	New Lake	Three Duck Lakes (Upper)	Three Duck Lakes (Middle)	Three Duck Lakes (Lower)	Delaney Lake	Dividing Lake
Aluminum	mg/L	0.143	0.11	0.10	0.14	0.11	0.10	0.089	0.083	0.072	0.12	0.072
Ammonia (Total)	mg/L	6.89	0.40	0.20	0.33	0.26	0.19	0.15	0.13	0.10	0.091	0.087
Ammonia (Un-ionized)	mg/L	0.019	0.00092	0.00037	0.00065	0.00057	0.00032	0.0003	0.0003	0.0002	0.00015	0.00021
Antimony	mg/L	0.02	0.00083	0.00088	0.0011	0.00091	0.00086	0.00078	0.00073	0.00065	0.0011	0.00066
Arsenic	mg/L	0.005	0.0022	0.0025	0.0031	0.0025	0.0024	0.0022	0.0021	0.0018	0.0030	0.0019
Barium	mg/L	1.0	0.0078	0.0084	0.011	0.0087	0.0082	0.0074	0.0069	0.0061	0.010	0.0061
Boron	mg/L	1.5	0.0076	0.0083	0.011	0.009	0.0081	0.007	0.007	0.0060	0.010	0.0061
Cadmium	mg/L	0.00007	0.000019	0.000021	0.000027	0.000022	0.000021	0.000019	0.000018	0.000016	0.000026	0.000016
Calcium	mg/L	11.3	12	12	16	13	12	11	10	9.0	14	9.1
Chloride	mg/L	120	1.8	1.8	2.3	1.9	1.7	1.5	1.4	1.2	2.0	1.2
Cobalt	mg/L	0.0025	0.00054	0.00050	0.00066	0.00054	0.00048	0.00043	0.00039	0.00034	0.00054	0.00034
Copper	mg/L	0.005	0.0044	0.0028	0.0042	0.0034	0.0027	0.0022	0.0020	0.0017	0.0020	0.0015
Cyanide (Total)[2]	mg/L	0.001	0.019	0.0083	0.015	0.012	0.0079	0.0060	0.0050	0.0038	-	0.0030
Cyanide (Free)[2]	mg/L	0.0098	0.0047	0.0021	0.0036	0.0029	0.00198	0.00150	0.00126	0.00096	-	0.00074
Iron	mg/L	0.494	0.33	0.35	0.45	0.36	0.34	0.30	0.28	0.25	0.41	0.25
Lead	mg/L	0.001	0.00050	0.00054	0.00069	0.00056	0.00053	0.00048	0.00045	0.00039	0.00066	0.00040
Magnesium	mg/L	2.0	2.0	2.1	2.7	2.2	2.1	1.9	1.7	1.5	2.6	1.5
Manganese	mg/L	0.76	0.083	0.091	0.12	0.09	0.089	0.08	0.08	0.067	0.11	0.067
Molybdenum	mg/L	0.073	0.0027	0.0021	0.0029	0.0024	0.0020	0.0017	0.0016	0.0014	0.0020	0.0013
Nickel	mg/L	0.025	0.0023	0.0025	0.0032	0.0026	0.0025	0.0022	0.0021	0.0018	0.0031	0.0018
Nitrate	mg/L	13	0.51	0.57	0.72	0.58	0.55	0.50	0.46	0.41	0.69	0.41
Phosphorus (Total)	mg/L	0.05	0.017	0.019	0.023	0.019	0.018	0.017	0.016	0.014	0.023	0.014
Potassium	mg/L	373	1.2	0.80	1.2	1.0	0.77	0.66	0.60	0.51	0.65	0.48
Sodium	mg/L	2.6	18	8.0	14	11	7.6	5.8	4.9	3.7	2.2	3.0
Strontium	mg/L	0.024	0.026	0.027	0.034	0.028	0.026	0.023	0.022	0.019	0.031	0.020
Sulphate	mg/L	218	39	18	31	25	17	13	11	8.6	5.6	6.9
Uranium	mg/L	0.015	0.0016	0.0017	0.0021	0.0017	0.0016	0.0015	0.0014	0.0013	0.0020	0.0013
Vanadium	mg/L	0.006	0.0015	0.0017	0.0021	0.0017	0.0016	0.0015	0.0014	0.0012	0.0020	0.0012
Zinc	mg/L	0.021	0.0086	0.0094	0.012	0.010	0.0092	0.0084	0.0078	0.0069	0.011	0.0069

Notes:

Monthly average concentrations greater than the selected benchmark concentrations are highlighted.

[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

[2] Total and free cyanide are not predicted for Delaney Lake, as it does not receive seepage from the Tailings Management Facility (TMF) or inflow from an upstream lake that receives TMF seepage.

Table II-4: Revised Maximum Predicted Post-closure Phase II (After Pit is Filled) Water Quality Modeling Results for the Mollie River Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Moore Lake	Chester Lake	Little Clam Lake	Clam Lake	Côté Lake (Pit Lake)	Three Duck Lakes (Upper)	Three Duck Lakes (Middle)	Three Duck Lakes (Lower)	Delaney Lake	Dividing Lake
Aluminum	mg/L	0.143	0.10	0.085	0.13	0.11	0.074	0.094	0.081	0.076	0.12	0.073
Ammonia (Total)	mg/L	6.89	0.067	0.064	0.094	0.077	0.057	0.072	0.062	0.058	0.091	0.056
Ammonia (Un-ionized)	mg/L	0.019	0.00016	0.00014	0.00019	0.00017	0.00014	0.00016	0.00014	0.00014	0.00015	0.00014
Antimony	mg/L	0.02	0.00081	0.00075	0.0011	0.00091	0.00067	0.00084	0.00073	0.00069	0.0010	0.00067
Arsenic	mg/L	0.005	0.0022	0.0021	0.0031	0.0026	0.0019	0.0024	0.0021	0.0020	0.0030	0.0019
Barium	mg/L	1.0	0.0077	0.0071	0.011	0.0087	0.0063	0.0080	0.0069	0.0065	0.010	0.0063
Boron	mg/L	1.5	0.0076	0.0071	0.010	0.009	0.0063	0.008	0.007	0.0065	0.010	0.0063
Cadmium	mg/L	0.00007	0.000019	0.000018	0.000027	0.000022	0.000016	0.000021	0.000018	0.000017	0.000026	0.000016
Calcium	mg/L	11.3	13	10.6	16	13	9.4	12	10	9.6	14	9.3
Chloride	mg/L	120	1.6	1.4	2.2	1.8	1.3	1.6	1.4	1.3	2.0	1.3
Cobalt	mg/L	0.0025	0.00047	0.00040	0.00061	0.00050	0.00035	0.00044	0.00038	0.00036	0.00054	0.00034
Copper	mg/L	0.005	0.0029	0.0018	0.0031	0.0026	0.0015	0.0019	0.0016	0.0015	0.0020	0.0014
Cyanide (Total)[2]	mg/L	0.001	-	-	-	-	-	-	-	-	-	-
Cyanide (Free)[2]	mg/L	0.0098	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.494	0.32	0.29	0.43	0.36	0.26	0.33	0.28	0.26	0.41	0.26
Lead	mg/L	0.001	0.00049	0.00046	0.00068	0.00056	0.00041	0.00052	0.00045	0.00042	0.00066	0.00041
Magnesium	mg/L	2.0	2.0	1.8	2.7	2.2	1.6	2.0	1.8	1.7	2.6	1.6
Manganese	mg/L	0.76	0.083	0.078	0.12	0.09	0.070	0.09	0.08	0.072	0.11	0.070
Molybdenum	mg/L	0.073	0.0022	0.0016	0.0025	0.0021	0.0014	0.0017	0.0015	0.0014	0.0020	0.0013
Nickel	mg/L	0.025	0.0023	0.0022	0.0032	0.0026	0.0019	0.0024	0.0021	0.0020	0.0031	0.0019
Nitrate	mg/L	13	0.51	0.48	0.71	0.59	0.43	0.55	0.47	0.44	0.69	0.43
Phosphorus (Total)	mg/L	0.05	0.017	0.016	0.023	0.019	0.014	0.018	0.02	0.015	0.023	0.014
Potassium	mg/L	373	0.88	0.57	0.96	0.8	0.48	0.59	0.52	0.48	0.65	0.45
Sodium	mg/L	2.6	9.9	3.9	8.2	6.8	2.8	3.3	2.9	2.6	2.2	2.2
Strontium	mg/L	0.024	0.026	0.023	0.034	0.028	0.020	0.025	0.022	0.021	0.031	0.020
Sulphate	mg/L	218	23	9.4	20	16	6.8	8.1	7.0	6.2	5.6	5.3
Uranium	mg/L	0.015	0.0015	0.0014	0.0021	0.0017	0.0013	0.0016	0.0014	0.0013	0.0020	0.0013
Vanadium	mg/L	0.006	0.0015	0.0014	0.0021	0.0017	0.0013	0.0016	0.0014	0.0013	0.0020	0.0013
Zinc	mg/L	0.021	0.0086	0.0081	0.012	0.010	0.0072	0.0091	0.0079	0.0074	0.011	0.0072

Notes:

Monthly average concentrations greater than the selected benchmark concentrations are highlighted.

[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

[2] Total and free cyanide are not predicted for Mollie River Watershed locations during post-closure phase stage II, as there is assumed not to be a source of cyanide to this system decades after closure of the Project site.

Table II-5: Revised Maximum Predicted Operational Water Quality Modeling Results for the Mesomikenda Lake Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Unnamed Lake #6 (Tributary to Schist Lake Outflow)	Bagsverd Lake (South)	Bagsverd Lake	Neville Lake	Mesomikenda Lake (Upper Basin)
Aluminum	mg/L	0.143	0.081	0.12	0.10	0.087	0.065
Ammonia (Total)	mg/L	6.89	0.37	0.11	0.17	0.073	0.055
Ammonia (Un-ionized)	mg/L	0.019	0.00080	0.00023	0.00036	0.00017	0.00013
Antimony	mg/L	0.02	0.00057	0.0010	0.00089	0.00078	0.00058
Arsenic	mg/L	0.005	0.0015	0.0030	0.0025	0.0023	0.0017
Barium	mg/L	1.0	0.0054	0.010	0.0085	0.0075	0.0056
Boron	mg/L	1.5	0.0052	0.0098	0.0084	0.0075	0.0056
Cadmium	mg/L	0.00007	0.000013	0.000025	0.000022	0.000020	0.000014
Calcium	mg/L	11.3	8.6	14	12	11	7.9
Chloride	mg/L	120	1.4	2.0	1.8	1.5	1.1
Cobalt	mg/L	0.0025	0.00041	0.00054	0.00049	0.00041	0.00030
Copper	mg/L	0.005	0.0039	0.0022	0.0025	0.0015	0.0012
Cyanide (Total)	mg/L	0.001	0.018	0.0029	0.0065	0.0022	0.0014
Cyanide (Free)	mg/L	0.0098	0.0046	0.00078	0.0016	0.00055	0.00034
Iron	mg/L	0.49	0.23	0.40	0.35	0.31	0.23
Lead	mg/L	0.001	0.00033	0.00065	0.00055	0.00049	0.00037
Magnesium	mg/L	2.0	1.3	2.5	2.2	1.9	1.4
Manganese	mg/L	0.76	0.055	0.11	0.093	0.083	0.062
Molybdenum	mg/L	0.073	0.0022	0.0020	0.0020	0.0015	0.0011
Nickel	mg/L	0.025	0.0016	0.0030	0.0026	0.0023	0.0017
Nitrate	mg/L	13	0.34	0.68	0.58	0.52	0.38
Phosphorus (Total)	mg/L	0.05	0.011	0.022	0.019	0.017	0.013
Potassium	mg/L	373	1.0	0.68	0.73	0.49	0.36
Sodium	mg/L	2.6	17	3.3	6.3	2.2	1.4
Strontium	mg/L	0.024	0.018	0.031	0.027	0.023	0.017
Sulphate	mg/L	218	38	7.8	14	5.3	3.6
Uranium	mg/L	0.015	0.0011	0.0020	0.0017	0.0015	0.0011
Vanadium	mg/L	0.006	0.0010	0.0020	0.0017	0.0015	0.0011
Zinc	mg/L	0.021	0.0058	0.011	0.010	0.0086	0.0064

Notes:
Monthly average concentrations greater than the selected benchmark concentrations are highlighted.
[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

Table II-6: Revised Maximum Predicted Post-closure Phase I (With Pit Filling) Water Quality Modeling Results for the Mesomikenda Lake Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Unnamed Lake #6 (Tributary to Schist Lake Outflow)	Bagsverd Lake (South)	Bagsverd Lake	Neville Lake	Mesomikenda Lake (Upper Basin)
Aluminum	mg/L	0.143	0.081	0.10	0.10	0.087	0.065
Ammonia (Total)	mg/L	6.89	0.37	0.091	0.17	0.073	0.055
Ammonia (Un-ionized)	mg/L	0.019	0.00080	0.00019	0.00036	0.00017	0.00013
Antimony	mg/L	0.02	0.00057	0.0009	0.00089	0.00078	0.00058
Arsenic	mg/L	0.005	0.0015	0.0027	0.0025	0.0023	0.0017
Barium	mg/L	1.0	0.0054	0.0091	0.0085	0.0075	0.0056
Boron	mg/L	1.5	0.0052	0.0091	0.0084	0.0075	0.0056
Cadmium	mg/L	0.00007	0.000013	0.000023	0.000022	0.000020	0.000014
Calcium	mg/L	11.3	8.6	13	12	11	7.9
Chloride	mg/L	120	1.4	1.8	1.8	1.5	1.1
Cobalt	mg/L	0.0025	0.00041	0.00049	0.00049	0.00041	0.00030
Copper	mg/L	0.005	0.0039	0.0019	0.0025	0.0015	0.0012
Cyanide (Total)	mg/L	0.001	0.018	0.0022	0.0065	0.0022	0.0014
Cyanide (Free)	mg/L	0.0098	0.0046	0.00058	0.0016	0.00055	0.00034
Iron	mg/L	0.49	0.23	0.37	0.35	0.31	0.23
Lead	mg/L	0.001	0.00033	0.00059	0.00055	0.00049	0.00037
Magnesium	mg/L	2.0	1.3	2.3	2.2	1.9	1.4
Manganese	mg/L	0.76	0.055	0.10	0.093	0.083	0.062
Molybdenum	mg/L	0.073	0.0022	0.0018	0.0020	0.0015	0.0011
Nickel	mg/L	0.025	0.0016	0.0028	0.0026	0.0023	0.0017
Nitrate	mg/L	13	0.34	0.62	0.58	0.52	0.38
Phosphorus (Total)	mg/L	0.05	0.011	0.020	0.019	0.017	0.013
Potassium	mg/L	373	1.0	0.60	0.73	0.49	0.36
Sodium	mg/L	2.6	17	2.5	6.3	2.2	1.4
Strontium	mg/L	0.024	0.018	0.028	0.027	0.023	0.017
Sulphate	mg/L	218	38	6.0	14	5.3	3.6
Uranium	mg/L	0.015	0.0011	0.0018	0.0017	0.0015	0.0011
Vanadium	mg/L	0.006	0.0010	0.0018	0.0017	0.0015	0.0011
Zinc	mg/L	0.021	0.0058	0.010	0.010	0.0086	0.0064

Notes:
Monthly average concentrations greater than the selected benchmark concentrations are highlighted.
[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

Table II-7: Revised Maximum Predicted Post-closure Phase II (After Pit is Filled) Water Quality Modeling Results for the Mesomikenda Lake Watershed Compared to Selected Benchmarks, Côté Gold Project

Parameter	Units	Selected Benchmark[1]	Unnamed Lake #6 (Tributary to Schist Lake Outflow)	Bagsverd Lake (South)	Bagsverd Lake	Neville Lake	Mesomikenda Lake (Upper Basin)
Aluminum	mg/L	0.143	0.071	0.086	0.10	0.087	0.065
Ammonia (Total)	mg/L	6.89	0.045	0.067	0.075	0.068	0.051
Ammonia (Un-ionized)	mg/L	0.019	0.00011	0.00015	0.00016	0.00016	0.00012
Antimony	mg/L	0.02	0.00056	0.00077	0.00087	0.00078	0.00058
Arsenic	mg/L	0.005	0.0015	0.0022	0.0025	0.0023	0.0017
Barium	mg/L	1.0	0.0053	0.0074	0.0084	0.0075	0.0056
Boron	mg/L	1.5	0.0051	0.0074	0.0083	0.0075	0.0056
Cadmium	mg/L	0.00007	0.000013	0.000019	0.000021	0.000020	0.000014
Calcium	mg/L	11.3	9.7	10	12	11	7.9
Chloride	mg/L	120	1.2	1.5	1.7	1.5	1.1
Cobalt	mg/L	0.0025	0.00035	0.00040	0.00047	0.00041	0.00030
Copper	mg/L	0.005	0.0026	0.0015	0.0020	0.0015	0.0011
Cyanide (Total)[2]	mg/L	0.001	-	-	-	-	-
Cyanide (Free)[2]	mg/L	0.0098	-	-	-	-	-
Iron	mg/L	0.49	0.22	0.30	0.34	0.31	0.23
Lead	mg/L	0.001	0.00033	0.00049	0.00055	0.00049	0.00037
Magnesium	mg/L	2.0	1.3	1.9	2.1	1.9	1.4
Manganese	mg/L	0.76	0.055	0.082	0.092	0.083	0.062
Molybdenum	mg/L	0.073	0.0017	0.0015	0.0018	0.0015	0.0011
Nickel	mg/L	0.025	0.0016	0.0023	0.0025	0.0023	0.0017
Nitrate	mg/L	13	0.34	0.51	0.57	0.52	0.38
Phosphorus (Total)	mg/L	0.05	0.011	0.017	0.019	0.017	0.013
Potassium	mg/L	373	0.77	0.48	0.64	0.48	0.36
Sodium	mg/L	2.6	10	1.8	4.0	1.8	1.3
Strontium	mg/L	0.024	0.019	0.023	0.026	0.023	0.017
Sulphate	mg/L	218	24	4.4	10	4.5	3.4
Uranium	mg/L	0.015	0.0011	0.0015	0.0017	0.0015	0.0011
Vanadium	mg/L	0.006	0.0010	0.0015	0.0017	0.0015	0.0011
Zinc	mg/L	0.021	0.0058	0.0085	0.009	0.0086	0.0064

Notes:

Monthly average concentrations greater than the selected benchmark concentrations are highlighted.

[1] Selected water quality benchmark was the most recent water quality guideline, or the upper limit of background, whichever was higher.

[2]Total and free cyanide are not predicted for Mesomikenda Lake Watershed locations during post-closure phase stage II, as there is assumed not to be a source of cyanide to this system decades after closure of the Project site.

B-9: Updated Technical Memorandum: Land and Resource Use

Memorandum

To:	Steve Woolfenden	**From:**	Don Carr / Mary Kelly
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Krista Maydew (Amec Foster Wheeler) Stephan Theben (SLR)	**Date:**	May 25, 2018 (revised September 4, 2018)
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: LAND AND RESOURCE USE		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;

- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Land and Resource Use

In 2014, Amec Foster Wheeler conducted a technical study of potential Project-related effects on non-traditional use of land and resources within the Project footprint as well as adjacent and neighbouring land and resource uses, for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). These include:

- Land use planning areas;
- industrial and commercial activities (mineral exploration and forestry); and
- outdoor recreation and tourism (hunting, trapping, fishing, cottaging, outfitters, canoeing, and motorized vehicles) including incidental wood gathering and/or berry and mushroom picking.

The technical study, along with a description of the existing baseline conditions, was presented in the Land and Resource Use Technical Support Document which was included in the EA Report. Indigenous Traditional Knowledge and Land Uses are covered in the Updated Technical Memorandum: Traditional Land and Resource Use. To support the development of this Updated Land and Resource Use Technical Memorandum, several other Updated Technical Memoranda that were reviewed and considered, including:

- Updated Noise and Vibration Technical Memorandum;
- Updated Human and Ecological Health Risk Technical Memorandum;
- Updated Terrestrial Biology Technical Memorandum;
- Updated Aquatic Biology Technical Memorandum;
- Updated Air Quality Technical Memorandum; and
- Updated Visual Aesthetics Technical Memorandum.

Since the submission of the EA, IAMGOLD has continued to receive and review feedback from government regulators, technical experts, local stakeholders and Indigenous communities regarding the Project. The feedback has contributed to IAMGOLD optimizing the Project with a reduced production rate that has decreased energy requirements. Therefore, the 120 km Cross-

Country 230 kV transmission line presented in the EA is no longer required and instead a shorter 44 km 115 kV Shining Tree transmission line alignment (TLA) is being proposed. The Shining Tree TLA will require the refurbishment of an existing line and minor clearing of the existing right-of-way from the Shining Tree Substation to the Timmins Substation. This memorandum considers the potential effects from the Shining Tree TLA as opposed to the Cross-Country TLA assessed in the EA. Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. This memorandum considers the optimizations of the Project from those assessed in the EA, with a focus on potential effects from the Shining Tree TLA as opposed to the Cross-Country TLA.

This memorandum also considers the following relevant changes to the Project:

- Reduced Project footprint from 1,700 hectares (ha) (17 km^2) to 1,050 ha (10.5 km^2), including the reduction in size of the open pit, mine rock area, and Tailings Management Facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- establishment of an overburden stockpile south of the open pit;
- reduced number of watercourses requiring realignment (from seven to two); and
- decommissioning and naturalization of watercourse realignments at Closure.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The Côté Gold Project is located in the District of Sudbury, outside of any lower tier municipality boundary. The Project site is located within two geographic townships: Chester and Yeo. The Shining Tree TLA will include construction of a new transmission line along a 44 km corridor between the Project site and the Shining Tree Substation as well as the refurbishment of the line from the Shining Tree Substation to the Timmins Substation. This corridor will intersect with six geographic townships: Miramichi, Garibaldi, Londonderry, Champagne, Benneweis and Chester; it also intersects with the lower tier municipality boundary of the City of Timmins.

Depending on the type of land and resource use, the local and regional study areas (LSA and RSA) for terrestrial or aquatic biology disciplines were used to set parameters for land and resource uses. This methodology is consistent with the EA. Updates to the spatial boundaries from the EA spatial boundaries are described in the corresponding updated technical memoranda for terrestrial biology and for aquatic biology.

2.2 Temporal Boundaries

The temporal boundaries of the EER will span all phases of the Project and are unchanged from the EA.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed from those included in the EA. The effects assessment indicators previously used are still applicable.

2.4 Prediction of Effects

The prediction of effects followed the same assessment process used in the EA, where for each effects assessment indicator, residual effects were predicted by assessing the:

- Presence of a potential interaction between a Project activity and a land and resource use; and
- application of effects management strategies.

3.0 PREDICTION OF EFFECTS

3.1 Construction Phase

3.1.1 Land Use Plans and Policies

The Project footprint will overlap with small portions of Ontario's Living Legacy Land Use Strategy Areas. This overlap is not expected to create any land use conflicts. The Project is located within the Mattagami Region Source Water Protection Plan, Intake Protection Zone 3. Based on the feedback received from the Ministry of the Environment and Climate Change (MOECC) and the prediction of effects on water quality for the Project, it is expected that there will be no adverse effects on Timmins' drinking water supply. The potential effects to land use plans and policies are predicted to be less than or equivalent to potential effects predicted in the EA.

3.1.2 Mineral Exploration

The Project, as proposed in the EA, overprinted mining claims owned by other entities and it was anticipated that this may have an effect on exploration activities, with some areas becoming more accessible due to Project development allowing easier access for exploration activities. Sanatana Resource Inc. (Sanatana), a company which jointly held mineral claims within the Project area, had expressed concern during the EA process that they would be materially impacted by the Project. Since the EA, IAMGOLD acquired lands, previously unavailable, to the west of the Project site from Sanatana and is in the process of securing all mining claims within the Project footprint. This acquisition has enabled IAMGOLD to optimize the land use with respect to siting the TMF and minimizing the environmental footprint of the Project. A new TMF site was selected northwest of the open pit. As a result, there are no longer potential effects to mining claims held by other entities. Thus, potential effects to mineral exploration are predicted to be less than the potential effects predicted in the EA.

3.1.3 Forestry

The Project, as proposed in the EA, overprinted portions of the surrounding Forest Management Units. The Project footprint and TLA will continue to overlap several portions of surrounding Forest Management Units; however, the areas of overlap have been reduced. This overlap will not substantially limit forestry resources or the ability to conduct forestry activities. IAMGOLD is working with EACOM, which holds the Sustainable Forest Licence for the Spanish River Forest Management Unit, to maintain access through the Project site. The potential effects to forestry are predicted to be less than or equivalent to potential effects predicted in the EA.

3.1.4 Hunting

For safety reasons, hunting within the Project Boundary will not be permitted during the Construction phase. The Project will overlap hunting areas (i.e., Wildlife Management Area and Bear Management Area). As a result, there will be a loss of hunting areas within the terrestrial biology LSA. 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 hunting. Although the Project overlaps one Wildlife Management Unit and one Bear Management Area, this overlap will not limit the ability to carry out hunting activities in the area. There may be increased risk of wildlife-vehicle collisions during Construction. With the Project's smaller footprint and no new linear corridor, the potential effects to hunting are predicted to be less than or equivalent to potential effects predicted in the EA. This prediction is supported by the findings presented in the Updated Terrestrial Biology Technical Memorandum.

During the EA process, concern was expressed by Indigenous groups that the Cross-Country TLA would increase hunting by non-Indigenous people, increasing competition for resources related to increased access within the TLA. The removal of the Cross-Country TLA in the Project design serves to mitigate this concern expressed by both First Nations and Métis.

3.1.5 Trapping

Trapping within the Project Boundary, except for the removal of nuisance wildlife, will not be permitted during Project construction to provide for both trapper and worker safety. The Project footprint will overlap trapline areas. 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 trapping in the area. Although the Project overlaps several trapline areas, this overlap will not limit the ability to carry out trapping activities in the area. Access to trapline areas along the TLA is expected to stay the same.

Due to the Project's smaller footprint and no longer creating a new linear corridor, the potential effects to trapping are predicted to be less than or equivalent to potential effects predicted in the EA. This prediction is supported by the findings presented in the Updated Terrestrial Biology Technical Memorandum and Updated Aquatic Biology Technical Memorandum.

3.1.6 Recreational and Commercial Fishing

The movement of the TMF will result in Clam Lake and Little Clam Lake being inaccessible for use during the Construction and Operations phases due to potential interaction with mine activities and IAMGOLD's commitment to safety (Zero Harm Framework). Similarly, New Lake will be inaccessible. Most of the popular fishing lakes are outside of the LSA with the exception of Mesomikenda Lake and access to fishing in Mesomikenda Lake will not change. Two areas where fish habitat will be potentially affected include Clam Lake and New Lake. These potential effects will be addressed through the offsetting / compensation plan and monitored through a monitoring program. Consistent with the EA, it is expected implementation of best management practices will mitigate potential effects and no residual effects of fish communities or populations are expected.

Access to bait fish harvest blocks may be limited during the Construction phase. Bait fishers can avoid access restraints by requesting re-allocation of harvest blocks within the Timmins District should they so choose.

As a result of the Project's smaller footprint and reduction in the number of watercourses requiring realignment, the potential effects to recreational and commercial fishing are predicted to be less than or equivalent to potential effects predicted in the EA. This prediction is supported by the findings presented in the Updated Aquatic Biology Technical Memorandum.

3.1.7 Cottagers and Outfitters

The Project will not overprint any cottage properties. Some cottagers may experience changes in background air quality, noise and vibration levels from traffic. However, these levels are expected to meet applicable regulations. During the EA process, concern was expressed by cottagers related to potential Project-related noise and visual effects resultant from the TMF. There will be no change to the viewshed, at nearby receptors, during the Construction phase. Daytime construction noise levels will be less than or equal to the levels reported in the EA, with the exception of three cottages and one recreation access point; however, the change to the four receptors are predicted to be below the daytime baseline noise level of 44 dBA and will meet the MOECC NPC_300 noise criteria of 45 dBA as predicted in the updated Noise and Vibration Technical Memoranda. Nighttime construction noise levels will be less than or equal to the levels reported in the EA with the exception of four cottages, three recreation access points and one tourist establishment area; however, they will remain within the MOECC nighttime criteria limit of 40 dBA. Consistent with the EA, nighttime construction noise will likely be audible at a number of receptor locations.

Noise from construction blasting is predicted to be less than or equal to those reported in the EA, with the exception of a predicted increase at four receptors (three cottages and one recreation access point) but will remain within the criteria limit as outlined in the updated Noise and Vibration Technical Memoranda. Vibration from blasting during Construction will be less than or equal to that reported in the EA, with some increase expected at seven receptors (four cottages and three recreation access points); however, the levels are well below the cautionary vibration limits as outlined in the updated Noise and Vibration Technical Memoranda.

The Project will not affect the use of water for swimming or freshwater take. The Project will not limit the use of the area by existing cottagers. Public access along EACOM's forestry road (Chester Road) will be restricted due to potential interactions with the Project; however, IAMGOLD will provide an alternative access route. Additionally, outfitters are not typically using the areas that would be overlapped by the Project. The Project will not limit the use of the area by existing outfitters.

During the EA process, IAMGOLD received questions from cottagers and the Ministry of Natural Resources and Forestry about the potential effects associated with the transmission line crossing Mesomikenda Lake. With the removal of the Cross-Country alignment from the Project, there will still be a requirement for the TLA to cross Mesomikenda Lake; however, it will cross at a narrower point on the lake further south.

Clearing and widening of an existing 44 km transmission line corridor will have reduced visual effects on the landscape compared to TLA considered in the EA. Consistent with the EA Project, the new 44 km transmission line segment is expected to result in a perceptible change in landscape that will remain the same throughout Operations and Closure.

3.1.8 Navigable Waters

As a result of the Project footprint, the 4M Circle Canoe Route will no longer be affected by the realignment of the watercourses and will be accessible to users as identified in the EA. The Route's Portage 3, between the north end of Weeduck Lake and the south end of Bagsverd Lake, will continue to require a portage across the Project site. The movement of the TMF in the Project design will not affect the controlled access lakes as identified through the EA process.

The potential effects to navigable waters are predicted to be less than or equivalent to potential effects predicted in the EA.

3.1.9 Other Recreational Uses

Other recreational uses could include the use of motorized and non-motorized recreational vehicles, hiking, mushroom and berry picking, and wood gathering. Such uses will not be permitted on, or in close proximity to, the Project site during the Construction phase. Based on known limited use of the Project site area for these recreational uses, the effects of the Project footprint are considered less than or equivalent to potential effects predicted in the EA. Other recreational uses will not be affected by the loss of access to the Project area since much of the active recreation areas are not affected by the Project footprint. Some snowmobilers may be affected during the short-term construction of the TLA.

3.2 Operations Phase

Effects related to the overlapping of land and resource uses with the Project footprint are expected to be the same in the Operations phase as they were in the Construction phase as it assumes full site development.

Considering visual aesthetics from full site development, there will be change in viewscape for receptors and non-receptors as noted in the Updated Visual Aesthetics Technical Memorandum.

From a receptors perspective, a very small portion of the TMF would be visible from a receptor (cottager) on Schist Lake due to location change and increase in height, whereas the EA TMF location was not visible from the receptors. In general, the MRA is reduced in elevation compared to the EA MRA design and visual effects to the five receptors are reduced compared to the EA. Overall, the number of receptors that will have the viewscape affected by the Project is consistent with the EA.

From a non-receptor perspective, the TMF will be a more prominent feature on the landscape and hence will be visible from a greater area. It is predicted that the TMF presented in the EER will be seen from Schist Lake, Bagsverd Lake, Clam Lake, Chain Lake, Chester Lake and Moore Lake. The MRA will be the most prominent Project component, being visible from Clam Lake, Chester Lake, Three Duck Lakes, Bagsverd Lake, Delaney Lake, Rene Lake and portions of Schist Lake, Dividing Lake and Mesomikenda Lake, consistent with the results presented in the EA. However, the reduced size and change in location of the MRA reduces the visibility of the structure due to natural topography. It is predicted that the MRA will be less prominent on the viewscape in the Project layout than in the EA layout.

Noise and vibration levels during Operations are predicted to be less than or equal to levels reported in the EA, with some differences in levels predicted at specific receptors. However, all noise and vibration criteria limits will be met at all receptors.

Residual effects over the Operations phase are therefore considered the same (related to the footprint overlap) as those in the Construction phase.

3.3 Closure Phase

Effects related to the overlapping of land and resource uses with the Project footprint are expected to be the same in the Closure phase as they were in Construction and Operations phases. However, as closure activities occur in areas where land and resources use were affected, there will be a progressive return to baseline conditions. The Project site will still be an active industrial site and the effects created by the overlap will remain until it has been fully decommissioned and remediated. Access to Clam Lake for recreation, navigation and fishing will be restored during Closure.

During the Closure phase, access limitations will be the same or similar as during the Construction and Operations phases. Where access had been increased in the Construction phase (i.e., along the TLA), it would also remain accessible throughout the Closure phase.

Effects to land and resource uses related to disturbance during the Closure phase would be similar to that experienced during the Construction phase. Nevertheless, there would be some on-site traffic and on-site activities that would create disturbances to the surrounding area and detract from the wilderness aesthetic desired by recreational users.

3.4 Post-closure Phase

After the Closure phase, affected areas will continue to return to baseline conditions. Access restrictions will be removed with the exception of the open pit and TMF. The IAMGOLD owned portions of the transmission line will be removed once the water pumps are no longer required, and the area will be allowed to naturally revegetate. There are no anticipated residual effects of post-closure activities on selected land and resource uses.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. In the case of Land and Resource Use, the term used in this document is 'effects management strategies' and refers to measures to avoid, mitigate and/or compensate effects. Mitigation is generally applied to biophysical effects because it refers to mitigating adverse impacts whereas effects management strategies address both positive and negative effects typical to human environment (including traditional land and resource use) effects. Effects management strategies can include elements inherent in the Project design to enhance a positive effect or prevent the effect from occurring. If the anticipated effect is positive, the actions that could be taken to enhance the effect will be indicated.

The table below provides the effects management strategies applicable to the EER and indicates if the measures / strategies have changed or stayed the same from the EA. The table below also includes measures / strategies that were introduced post-EA in response to comments received during the EA review process (new text is indicated in italics).

Table 4-1: Mitigation Measures – Land and Resource Use

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	Incompatibility with Ontario Ministry of the Environment and Climate Change's Land-Use Policy (D-Series Guidelines)	Incorporate the MOECC D-series guidelines (MOE, 1995).	Develop minimum 300 metre setbacks from provincially or municipally designated sensitive recreation uses, any building or associated amenity area not associated with industrial use where humans or the natural environment may be adversely affected by air emissions from the Class III Industrial facilities (excludes transmission line) such as campgrounds, residences, as per the MOECC D-Series Guidelines (MOE, 1995).	MOECC D-Series Guidelines	The mitigation measure has not changed from the EA.
Land and Resource Use	Construction through Closure	Maintain access to forestry resources	Re-route the Chester Access Road south of the Project site.	Discuss alignment with the Forestry Management Area holders and EACOM for re-routing the Chester Access Road south of the Project site.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	*Maintain access to cottage on Schist Lake*	*Provide road alternate access to cottages north of Schist Lake*	*IAMGOLD will provide alternative road access to the cottages north of Schist Lake.*	n/a	This is a new mitigation measure
Land and Resource Use	Construction through Closure	Hunting – loss of Bear Management Area (BMA)	The Ministry of Natural Resources and Forestry (MNRF) has advised that the affected BMA holder can apply to obtain licenses to additional BMAs in the Timmins District to augment the loss of access to the northern portion of the affected BMA.	Discuss potential Project effects with MNRF and the affected BMA holders.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	Hunting – potential adverse effects due to increased vehicular traffic	Enforce speed limits and warn IAMGOLD personnel of areas of high wildlife activity and crossings.	Enforce speed limits along proposed Project access roads to reduce the potential adverse effects of increased vehicular traffic associated with the Project.	n/a	The mitigation measure has not changed from the EA.
Land and Resource Use	Construction through Closure	Hunting – safety of Project site workers	Prohibit hunting on IAMGOLD property to provide safety for both hunters and workers.	Inform workers of the no hunting policy and post signs warning hunters. Control access to the site for general public including hunters.	n/a	The mitigation measure has not changed from the EA.
Land and Resource Use	Construction through Closure	Hunting - potential adverse effects due to poor waste management practices	Food wastes generated on-site will be appropriately disposed of to reduce the attraction of wildlife.	Ensure frequent pick-up and removal of waste generated on-site.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	Trapping – loss of access to trapline area (GO031)	Based on discussion with the MNRF no compensation is required for trap line losses. Appropriate mitigation measures to be determined through consultation between the MNRF and affected trappers.	Continue discussions with the MNRF and affected trappers about potential effects and/or effects management strategies, where appropriate.	n/a	The mitigation measure has not changed from the EA.
Land and Resource Use	Construction	Trapping – relocation of trapper cabins or buildings along transmission line alignment	Appropriate mitigation measures to be determined through consultation between the MNRF and affected trappers.	Discuss with the MNRF and the affected trappers about appropriate effects management strategies for the removal of trapper cabins or associated buildings that may be overlap with the selected transmission line alignment.	n/a	The mitigation measure has not changed from the EA.

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Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	Cottagers and Outfitter Camps – increased boating on Mesomikenda Lake	Limit recreational boating for workers while they are staying at the work camp on-site. Potential purchase of cottages.	Inform workers of the recreational boating policy.	n/a	The mitigation measure has not changed from the EA.
Land and Resource Use	Construction and Operations	Navigable Waters – restricted access to the 4M Circle Canoe Route	To be determined through consultation with any potential canoe route users to facilitate safe navigation during Construction and Operations.	Through consultation with users, establish a suitable portage / connection such that the portage route will still be usable or an alternative route is developed. This could also include placing markers to ensure canoes do not approach active construction sites. The area will be posted with signage indicating which camp sites are closed and access is limited to a period of 24-hours. If the need arises the area can be monitored.	*Navigation Protection Act*	Mitigation measure updated. Updated to remove reference to remove reference to diversion dams in Three Duck Lakes and Bagsverd Lake as the previously affected waterways are no longer being re-routed. Clarification about the area signage was also updated.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction	Other Recreational Use – access limitations along transmission line alignment	Consult with local snowmobile clubs and organizations, particularly when construction timing and transmission line engineering / pole placement is better known, to minimize potential conflicts.	Consult with local snowmobile clubs and organizations, as applicable, to minimize potential conflicts with snowmobilers during construction of the transmission line.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Land and Resource Use	Construction through Closure	Maintain access for mineral exploration	Work with claim holders to identify access changes and negotiate access agreements if there is any requirement to use or cross IAMGOLD properties.	Negotiate access as necessary and maintain access agreements.	As per existing access agreements and exploration permit (*Mining Act*).	Mitigation measure no longer applicable. No longer required as IAMGOLD secured all mining claims within the Project footprint.

5.0 MANAGEMENT

No monitoring measures have been recommended.

6.0 CONCLUSION

The potential effects to the land and resource uses have been considered for the Project mine plan through Construction, Operations, Closure and Post-closure phases. The effects assessment is based on:

- Baseline conditions summarized in the EA;
- predicted changes to land and resource uses; and
- proposed mine development and Closure Plan.

Based on the assessment for the Project mine plan, compared to the EA Project, there will be fewer effects to land and resource uses, attributed to:

- A smaller footprint causing less disruption of use and associated terrestrial and aquatic habitat;
- the relocation of the TMF that will no longer overprint a large portion of Bagsverd Creek, situated away from cottagers and limit the impact to the 4M Circle Canoe Route;
- a decrease in terrestrial and aquatic habitat lost than with the previous mine plan; and
- a shorter TLA along a previously cleared corridor.

There is no increase / change in the magnitude of effects for any of the land and resource use indicators. Mitigations measures will continue to be implemented as described in the EA.

7.0 GLOSSARY AND ABBREVIATIONS

BMA	Bear Management Area
EA	Environmental Assessment
EER	Environmental Effects Review
ha	hectare
Indigenous	In the context of the Côté Gold Project, includes both First Nation and Métis people
km	kilometre
LSA	Local Study Area
MOE	Ministry of the Environment
MOECC	Ministry of the Environment and Climate Change
MNRF	Ministry of Natural Resources and Forestry
MRA	Mine Rock Area
RSA	Regional Study Area
TLA	Transmission Line Alignment
TMF	Tailings Management Facility

APPENDIX I

EXECUTIVE SUMMARY

IAMGOLD Corporation (IAMGOLD) has developed an optimized mine plan that has been modified compared to the mine plan presented in the Environmental Assessment (EA). The Côté Gold Project (the Project) has the potential to affect land and resource uses, which can include land use plans and policies, mineral exploration, forestry, hunting, trapping, fishing, and other recreational uses; however, the potential effects are reduced compared to the EA. Amec Foster Wheeler has prepared an updated technical memorandum for potential effects to land and resource use, to compare Project effects to those predicted in the EA. Criteria for assessing effects were based on the:

- Presence of a potential interaction between a Project activity and a land and resource use; and
- application of effects management strategies.

Following the same methodology used in the EA, this Updated Land and Resource Use Technical Memorandum presents updated effects predictions considering Project changes relevant to land and resource use. Effects predictions for land and resource use are anticipated to be the same in Construction and Operations phases. A summary of effects for each land and resource use type considered is presented below.

- **Land Use Plans and Policies:** The Project continues to overlap small portions of the Ontario's Living Legacy Land Use Strategy Areas but is not expected to create any land use conflicts. The Project is located within the Mattagami Region Source Water Protection Planning zones; however, it is expected that there will be no adverse effects on Timmins drinking water supply. Effects predictions on land use plans and policies are predicted to be less than or equivalent to potential effects predicted in the EA.
- **Mineral Exploration:** The potential effects to mineral exploration are anticipated to be less than predicted in the EA since IAMGOLD acquired lands, previously unavailable, to the west of the Project site from Sanatana.
- **Forestry:** The Project continues to overlap several small portions of surrounding Forest Management Units but will not substantially limit forestry resources or the ability to conduct forestry activities. IAMGOLD will work with EACOM, who holds the Sustainable Forest Licence for the Spanish River Forest Management Unit, to maintain access through the Project site. Effects on forestry are predicted to be equivalent to or less than effects predicted in the EA.
- **Hunting, Trapping and Fishing:** The Project will overlap with a number of hunting, trapline and fishing areas and will result in some displacement of wildlife species from the Project site; however, this displacement is not expected to have long-term effects on resources available for hunting, trapping and fishing activities in the area. Some users may experience a change in viewshed associated with changes to the TMF and MRA. For safety reasons, Clam Lake and Little Clam Lake will be inaccessible during Construction and Operations.

- **Cottagers:** Project will not overprint any cottage properties; however, some cottagers may experience changes in background air quality, noise and vibration levels from traffic. Some cottagers may see a change in the viewshed associated with changes to the TMF and MRA. However, these levels are expected to meet applicable regulations. The Project will not limit the use of the area by existing cottagers. Public access along EACOM's forestry road (Chester Road) will be restricted due to potential interactions with the Project; however, IAMGOLD will provide an alternative access route.
- **Outfitters:** Outfitters are not typically using the areas that would be overlapped by the Project. Tourism / outfitter lodges located in Gogama may see an increase in accommodations revenue from temporary visitors, workers, and/or contractors from the Project. The Project will not limit the use of the area by existing outfitters.
- **Navigable Waters:** Changes to the Project have resulted in a positive change to the effects predicted in the EA on the 4M Circle Canoe Route. Only one portage on this route will continue to be affected and IAMGOLD will establish a suitable portage / connection such that the 4M Canoe Route will still be usable. Some users may experience a change in viewshed associated with changes to the TMF and MRA. As a result, the predicted effects to navigable waters are expected to be less than or equivalent to EA effects predictions.
- **Other Recreational Uses:** Other recreational uses could include the use of motorized and non-motorized recreational vehicles, hiking, mushroom and berry picking, and wood gathering. Such uses will not be permitted on, or in close proximity to the Project site. However, there is very limited use of the Project site area for these recreational uses. Other recreational uses will not be affected by the loss of access to the Project area since much of the active recreation areas are not affected by the Project footprint. Some snowmobilers may be affected during the short-term construction of the transmission line. Predicted effects along the transmission line for snowmobilers or other recreational users are expected to last only for the Construction phase. Some users may experience a change in viewshed associated with changes to the TMF and MRA.

At the end of the Closure phase, there will be no residual effects on land use policies and plans, recreational and commercial fishing, cottagers and outfitters, and other recreational uses. During Post-closure, affected areas will continue to re-naturalize and therefore habitat will be re-established. Access restrictions will be removed following close out. As habitat is re-established, effects on forestry, hunting and trapping are expected to cease.

No increase / change in the magnitude of effects for any of the land and resource use indicators are anticipated. Mitigation measures will continue to be implemented as described in the EA with the exception that mitigation measures will no longer be required for mineral exploration or navigable waters.

B-10: Updated Technical Memorandum: Traditional Land Use

Memorandum

To:	Steve Woolfenden	**From:**	Don Carr / Mary Kelly
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Krista Maydew (Amec Foster Wheeler) Stephan Theben (SLR)	**Date:**	May 25, 2018 (revised September 4, 2018)
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		

UPDATED TECHNICAL MEMORANDUM: TRADITIONAL LAND USE

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemistry Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;

- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Traditional Land and Resource Use

In 2014, Amec Foster Wheeler conducted a technical study of potential Project-related effects on traditional land uses within the Project footprint as well as adjacent and neighbouring traditional land and resource uses. The baseline conditions and assessment were presented in the Traditional Land Use Technical Support Document, appended to the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA').

Indigenous traditional land uses were identified through consultation with Indigenous communities and through traditional use and knowledge studies conducted by the communities, specifically Wabun Tribal Council on behalf of Mattagami First Nation and Flying Post First Nation (2013), and Métis Nation of Ontario (MNO) (2015). These studies were conducted by the communities through agreements with IAMGOLD. The EA included information from the Mattagami and Flying Post First Nations Traditional Knowledge/Traditional Land Use Study (FN TK / TLUS) for the Côté Gold Project (McKay, 2013). The Métis Nation of Ontario Traditional Knowledge & Land Use Study and High Level Impact Assessment (MNO TK / TLUS) Côté Gold Project (Shared Value Solutions, 2015) was received following the submission of the EA and has been considered in the development of this Traditional Land Use Updated Technical Memorandum.

Further, in response to comments and questions received during the review period for the final EA, IAMGOLD included an additional monitoring measure related to traditional land use, specifically:

> *IAMGOLD will continue to discuss potential Project effects on traditional activities with potentially affected Indigenous communities throughout the life of the Project. Should additional information regarding an Indigenous community's traditional practices become available, IAMGOLD will review and consider any potential effects, and develop and implement necessary mitigation measures, as appropriate.*

To support the development of this Traditional Land Use Updated Technical Memorandum, several other updated technical memoranda that were reviewed and considered in preparing this memorandum, including:

- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Land and Resource Use; and
- Updated Technical Memorandum: Visual Aesthetics.

Since the submission of the EA, IAMGOLD has further considered feedback received from government regulators, technical experts, local stakeholders and Indigenous communities regarding the Project. The feedback has contributed to IAMGOLD optimizing the Project with a reduced production rate that has decreased energy requirements. Therefore, the 120 km Cross-Country 230 kV transmission line presented in the EA is no longer required and instead a shorter 44 km 115 kV Shining Tree transmission line alignment (TLA) is being proposed. The Shining Tree TLA will require the refurbishment of an existing line and minor clearing of the existing right-of-way from the Shining Tree Substation to the Timmins Substation. Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. This memorandum considers the optimizations of the Project from those assessed in the EA, with a focus on potential effects from the Shining Tree TLA as opposed to the Cross-Country TLA.

This memorandum also considers the following relevant changes to the Project:

- Reduced Project footprint from 1,700 hectares (ha) (17 km^2) to 1,050 ha (10.5 km^2), including the reduction in size of the open pit, mine rock area, and Tailings Management Facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- relocation of the discharge pipeline;
- establishment of an overburden stockpile south of the open pit;
- reduced number of watercourses requiring realignment (from seven to two); and
- decommissioning and naturalization of watercourse realignments during Post-closure.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The Côté Gold Project is located in the District of Sudbury, outside of any lower tier municipality boundary. The Project site is located within two geographic townships: Chester and Yeo. The Shining Tree TLA will include construction of a new transmission line along a 44 km corridor between the Project site and the Shining Tree Substation as well as the refurbishment of the line from the Shining Tree Substation to the Timmins Substation. This corridor will intersect with six geographic townships: Miramichi, Garibaldi, Londonderry, Champagne, Benneweis and Chester; it also intersects with the lower tier municipality boundary of the City of Timmins.

IAMGOLD consulted with potentially affected Indigenous communities with respect to Project effects. Through advice from the Provincial and Federal Crowns, and through consultation with the Indigenous communities, IAMGOLD has determined that the Côté Gold Project is located primarily within the traditional territory of the Mattagami First Nation and the Flying Post First Nation, with the exception of a small portion of the 44 km transmission line which appears to be located within the traditional territory of Matachewan First Nation. Boundaries for these territories are determined internally between the Wabun Tribal Council members and are not shared publicly. Members of the MNO may also exercise harvesting rights in the Project area. The Project is located in the MNO Region 3 harvesting area.

Depending on the type of traditional land use, the local and regional study areas (LSA and RSA) for terrestrial or aquatic biology disciplines were used to set parameters for traditional land uses. This methodology is consistent with the EA. Updates to the spatial boundaries from the EA spatial boundaries are described in the corresponding updated technical memoranda for terrestrial biology and for aquatic biology.

The FN TK / TLUS (McKay, 2013) identified specific Sensitive Areas. A Sensitive Area is described as a key area where traditional land use and the majority of hunting, fishing, trapping and gathering take place. The only Sensitive Area that may be affected by Project is area C, which the Shining Tree TLA crosses.

2.2 Temporal Boundaries

The temporal boundaries of the EER will span all phases of the Project and are unchanged from the EA.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed from those included in the EA. The effects assessment indicators previously used are still applicable.

2.4 Prediction of Effects

The prediction of effects followed the same assessment process used in the EA, where for each effects assessment indicator, residual effects were predicted by assessing the:

- Presence of a potential interaction between a Project activity and a traditional land and resource use; and
- application of effects management strategies.

3.0 PREDICTION OF EFFECTS

3.1 Construction Phase

3.1.1 Plant Harvesting

The FN TK / TLUS identified that blueberry harvesting takes place within Sensitive Areas. Few berry plants were observed in the LSA. Construction activities within the Project footprint overlap with Sensitive Area C, and may be carried out in areas neighbouring blueberry patches. Some blueberries were noted along the existing Shining Tree TLA and in clear-cut areas. There is a potential for blueberry harvesting to be affected during the Construction phase of the transmission line due to clearing of vegetation; however, there will be no use of chemical clearing (only mechanical clearing) along the right-of-way.

The MNO TK / TLUS did not identify any plant harvesting areas that could be affected by the Project.

The potential effects to plant harvesting are predicted to be less than or equivalent to potential effects predicted in the EA.

3.1.2 Hunting

As predicted in the EA, potential effects on traditional hunting during the Construction phase include:

- Changes in access to, and overlapping of the waterfowl hunting site and waterfowl hunting route, therefore limiting its use;
- changes in access to, and overlapping of the large game and upland bird harvesting areas, therefore limiting its use;
- enhanced access to hunting areas and travel corridor resulting from transmission line right-of-way clearing; and
- changes to the abundance and distribution of wildlife due to construction activities that have the potential to affect hunting.

The FN TK / TLUS has identified a single point for hunting, located in the vicinity of the Mine Rock Area. A waterfowl hunting route was also identified in the FN TK / TLUS. The waterfowl hunting route begins at a secondary road, east of Mesomikenda Lake, heads west towards Upper Three Duck Lake, crosses Weeduck Lake at an island and heads south towards Chester Lake.

Project Construction will potentially affect portions of the FN TK / TLUS waterfowl hunting route and the waterfowl hunting site. Much of the waterfowl hunting route will be inaccessible as it overlaps with the active construction areas. Parts of the TLA, the water intake infrastructure and other site access roads may also potentially affect these traditional hunting areas. While these changes in access will occur, the majority of hunting activity is reported to occur within the Sensitive Areas. Access to Sensitive Area C is not expected to change.

The MNO TK / TLUS identified a large game (i.e., moose and bear) harvesting area and upland bird (i.e., grouse and partridge) harvesting area along a section of the 44 km the Shining Tree TLA.

Project Construction along the Shining Tree TLA will potentially affect portions of the MNO TK/TLUS large game and upland bird harvesting areas. There is a potential for wildlife within the identified traditional hunting areas to be displaced in close proximity to Project construction activities. Wildlife species will likely find equally suitable habitat adjacent to the Project site during the short-term construction activities.

During the EA process, concern was expressed by Indigenous groups that the Cross-Country TLA would increase hunting by non-Indigenous people, increasing competition for resources related to increased access within the TLA. The removal of the Cross-Country TLA in the Project design serves to mitigate this concern expressed by both First Nations and Métis.

With a more compact Project site and shorter TLA, it is anticipated that the Project will have fewer effects on hunting compared to the EA. Overall, the EA conclusions related to hunting remain valid and are considered conservative.

3.1.3 Fishing

As predicted in the EA, and confirmed through the EER, potential effects on fishing during the Construction phase of the Project include:

- Loss of traditional fishing areas;
- changes to access to fishing areas; and
- changes to the abundance and distribution of fish due to construction activities.

The FN TK / TLUS identifies lakes within Sensitive Area C as the most popular lakes for catching pickerel (also known as walleye). 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.

The MNO TK / TLUS identified a non-commercial fish harvesting site outside the Project footprint but within the aquatic LSA and situated near the Shining Tree TLA at Mesomikenda Lake.

Surface runoff from construction areas will be managed using best management practices (e.g., silt fencing) to prevent the release of suspended solids to surrounding surface waters. It is not expected that Project activities during construction will have an effect on the health of fish and its consumers.

As a result of the Project's smaller footprint and reduction in the number of watercourses requiring realignment, the potential effects to fishing are predicted to be less than or equivalent to potential effects predicted in the EA. This prediction is supported by the findings presented in the Updated Aquatic Biology Technical Memorandum.

3.1.4 Canoeing

The FN TK / TLUS has identified a portage route (assumed to be a canoe route) that follows the chain of lakes that surround the Project and includes lakes: Chester, Clam, Bagsverd, Weeduck Lake, and Three Duck (Upper, Middle, and Lower). The movement of the TMF will result in Clam Lake being inaccessible for use during the Construction and Operations phases due to potential interaction with mine activities and IAMGOLD's commitment to safety (Zero Harm Framework). The use of the canoe and portage route will be controlled during the Construction phase, recognizing that an alternate portage connection will be required due to the lack of access through the Project site. IAMGOLD has committed to developing a notification process related to land access controls and/or activity restrictions on current use and suitable portage / connections in consultation with affected Indigenous groups.

The MNO TK / TLUS did not identify any canoe routes that could be affected by the Project.

The potential effects to canoeing identified during the EA are confirmed through the EER.

3.1.5 Cultural, Spiritual and Ceremonial Sites

The FN TK / TLUS identified an eagle's nest in the vicinity of the Project. Due to the nest's location, its potential removal, and considering the importance of the eagle in traditional Ojibwe culture, it is understood that this nest is of concern to the community.

Clearing of the area where the eagle's nest is currently located will take place outside of the breeding season. Upon the eagle's return to the area, it is expected that the eagle will the either find an equally suitable area to build a new nest or will take over a nearby existing eagle's nest. Based on comments received from Wabun Tribal Council during the EA process, IAMGOLD enhanced an existing management measure to inform workers of locally nesting raptors to also include: *Consult with Mattagami First Nation and Flying Post First Nation on how the removal of an eagle's nest can be conducted in a culturally sensitive manner, and be open to hosting a traditional ceremony (ies) on site should one be requested.*

The FN TK / TLUS did not identify any other spiritual or ceremonial sites that could be affected by the Project.

The MNO TK / TLUS did not identify any cultural, spiritual or ceremonial sites that could be affected by the Project.

The potential effects identified during the EA are confirmed through the EER.

3.2 Operations Phase

3.2.1 Plant Harvesting

The EER confirmed that activities associated with the Operations phase are not expected to remove additional blueberry patches in the FN TK / TLUS Sensitive Area. It is expected that blueberry patches will establish themselves in the TLA as blueberries are prone to grow in disturbed areas with lots of light. Harvesting of blueberries in the TLA could occur as early as four years after clearing.

Vegetation clearing during operations will occur periodically in the TLA via mechanical methods and no use of herbicides is planned, thereby protecting the quality or health of blueberries.

3.2.2 Hunting

As identified in the EA, the potential effects on hunting during the Operations phase are anticipated to be the same as those outlined in the Construction phase with the exception of the following changes:

- The development of the TLA through a closed forest will open up the canopy, creating edges that encourage the growth of shrubs preferred by moose;
- linear corridors may also be considered habitat enhancement if these corridors act as travel corridors for moose in otherwise unsuitable habitat; and
- human presence, which may perturb wildlife, along the TLA, the fresh water line and associated access road will be reduced compared to the Construction phase.

3.2.3 Fishing

As identified in the EA, the potential effects on fishing during the Operations phase are anticipated to be the same as those outlined in the Construction phase. A notable change is the relocation of treated water discharge location out of the Mesomikenda Lake watershed to Three Duck Lakes (upper), reducing the potential for effects to Mesomikenda Lake.

3.2.4 Canoeing

Access to the portage route will be the same as during Construction; conditions for access to canoe routes will be developed in consultation with the affected Indigenous groups.

3.2.5 Cultural, Spiritual and Ceremonial Sites

Given the nature of the environment during operations, it is unlikely that eagles will find a suitable area within the Project footprint to nest during this phase. No other cultural, spiritual or ceremonial sites have been identified.

3.3 Closure Phase

During the Closure phase, most of the Project infrastructure will be removed, closed and revegetated. Access to Clam Lake will be restored during Closure. At the end of the Closure phase there will be no residual effects on plant harvesting, hunting, fishing, canoeing and cultural spiritual and ceremonial sites.

3.4 Post-Closure Phase

Post-closure, affected areas will continue to re-naturalize and therefore habitat will be re-established. No effects on plant harvesting, hunting, fishing, canoeing and cultural, spiritual and ceremonial sites are expected. IAMGOLD will decommission and naturalize the two proposed watercourse realignments once the open pit is flooded. Previously the EA identified that the watercourse realignments would remain in place and remain functional Post-closure.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. In the case of Traditional Land Use, the term used in this document is ‘effects management strategies’ and refers to measures to avoid, mitigate and / or compensate traditional land use effects. Mitigation is generally applied to biophysical effects because it refers to mitigating adverse impacts whereas effects management strategies address both positive and negative effects typical to human environment (including traditional land and resource use) effects. Effects management strategies can include elements inherent in the Project design to enhance a positive effect or prevent the effect from occurring. If the anticipated effect is positive, the actions that could be taken to enhance the effect will be indicated.

The table below provides the effects management strategies applicable to the EER and indicates if the measures / strategies have changed or stayed the same from the EA. In the case of traditional land use, all measures / strategies proposed in the EA continue to be applicable. The table below also includes measures / strategies that were introduced post-EA in response to comments received during the EA review process (new text is indicated in italics).

Table 4-1: Mitigation Measures – Traditional Land Use

Discipline	**Project Phase**	**Issue / Concern / Interaction**	**Mitigation Measure**	**Description / Commitment**	**Standard**	**Comparison between EA and EER measures**
Traditional Land Use	Construction through Closure	Hunting (traditional) – safety of Project site workers	Prohibit hunting on IAMGOLD property to provide safety for both hunters and workers.	Inform workers of the no hunting policy and post signs warning hunters. Control access to the site for general public including hunters.	n/a	The mitigation measure has not changed from the EA.
Traditional Land Use	Operations	Plant Harvesting (traditional) – contamination of vegetation from use of chemical agents for vegetation management along transmission line alignment	Vegetation clearing will avoid the use of chemical agents.	No use of chemical agents for vegetation clearing along transmission line right of way; use of mechanical vegetation management only.	n/a	The mitigation measure has not changed from the EA.
Traditional Land Use	Construction	Fishing (traditional) – in-water works along transmission line alignment	Design or time construction activities so there are limited or no in-water works required.	In-water works are limited during construction of the transmission line alignment.	n/a	The mitigation measure has not changed from the EA.
Traditional Land Use	Construction; Operations	Canoeing (traditional) – loss of portage route	To be determined through consultation with any potential canoe route users to facilitate *safe*	Through consultation with users, establish a suitable portage/ connection such that the portage route will	*Navigation Protection Act*	Mitigation measure updated. Text in italics was

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			navigation during construction and operations.	still be usable or an alternative route is developed. *The area will be posted with signage indicating which camp sites are closed and access is limited to a period of 24-hours. If the need arises the area can be monitored. Notification processes related to land access controls and/or activity restrictions on current use will be developed in consultation with affected Indigenous groups, in consideration of individual consultation preferences of each community and consistent with any potential commercial agreements.*		added post-EA submission in response to comments received during the EA review period. This update to the mitigation was added to the updated Appendix Y EA Commitment Tables and shared with the Canadian Environmental Assessment (CEA) Agency, Ministry of Environment and Climate Change (MOECC) and Wabun Tribal Council in February 2016. Clarification about the area signage was also updated.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Traditional Land Use	Construction; Operations	Cultural, Spiritual and Ceremonial Sites, Eagle's Nest – impacts to raptors	Inform workers of locally nesting raptors. *Consult with Mattagami First Nation and Flying Post First Nation on how the removal of an eagle's nest can be conducted in a culturally sensitive manner, and be open to hosting a traditional ceremony (ies) on site should one be requested.*	Inform workers of locally nesting raptors to avoid unnecessary disturbance.	n/a	Mitigation measure updated. Text in italics was added post-EA submission in response to comments received during the EA review period. This update to the mitigation was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Wabun Tribal Council in February 2016.
Traditional Land Use	Construction through Closure	Hunting and Fishing (traditional) – depletion of fish / wildlife	No hunting or fishing by Project personnel will be permitted while working or residing on-site.	No hunting or fishing by Project personnel will be permitted while working or residing on-site.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Traditional Land Use	Construction through Closure	Impacts on the exercise of Indigenous rights by the Métis rights-bearing community in the Project Area	*Through a memorandum of understanding, dated June 21, 2014, as amended by an Addendum dated February 1, 2016 (collectively, the "MOU"), Trelawney, a wholly-owned subsidiary of IAMGOLD, and the Métis Nation of Ontario intend to continue to develop a positive relationship and, should the Project receive regulatory approval, further commit to reaching an agreement on an Impact Benefit Agreement if commercially reasonable terms can be arrived at by the parties in accordance with the MOU. The agreement will aim to address mutually agreeable interests such as (i) terms for financial benefits, (ii) compensation relating to*	IAMGOLD will continue to engage with the Métis community to address community priorities and potential impacts arising from the Project in accordance with the mechanisms outlined in the MOU.	n/a	New mitigation measure. Added post-EA submission in response to comments received during the EA review period. This update to the mitigation was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Wabun Tribal Council in February 2016. Since February 2016, the commitment description was further updated to remove reference to Trelawney as it is no longer applicable.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			any specific and identifiable Project impacts which are not otherwise resolved through mitigation or accommodation, and (iii) other key areas including training, employment, environmental monitoring/management and business opportunities.			

5.0 MANAGEMENT

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA. There were no monitoring measures for traditional land use within the EA; however, one monitoring measure was added post-EA submission as a response to comments received during the EA process (new text is indicated in italics).

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Table 5-1: Monitoring Measures – Traditional Land Use

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Traditional Land Use	Project effects on Indigenous traditional activities / traditional land use	*IAMGOLD will continue to discuss potential Project effects on traditional activities with potentially affected Indigenous communities throughout the life of the Project. Should additional information regarding an Indigenous community's traditional practices become available, IAMGOLD will review and consider any potential effects, and develop and implement necessary mitigation measures as appropriate.*	n/a	Construction to closure phases	n/a	New monitoring measure. Added post-EA submission in response to comments received during the EA review period. This measure was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Indigenous groups in February 2016.

6.0 CONCLUSION

The potential effects to the traditional land uses have been considered for the Project mine plan through Construction, Operations, Closure and Post-closure phases. The effects assessment is based on:

- Baseline conditions summarized in the EA;
- predicted changes to traditional land uses; and
- proposed mine development and Closure Plan.

Based on the assessment for the Project mine plan, compared to the EA Project, there will fewer effects to traditional land uses, attributed to:

- A smaller footprint causing less disruption of use and associated terrestrial and aquatic habitat;
- the relocation of the TMF that will no longer overprint a large portion of Bagsverd Creek;
- the relocation of the discharge pipeline;
- a decrease in terrestrial and aquatic habitat lost than with the previous mine plan; and
- a shorter TLA along a previously cleared corridor.

There is no increase/change in the magnitude of effects for any of the traditional land use indicators. Mitigation measures will continue to be implemented as described in the EA with the exception the changes to mitigation measures for canoe routes and the eagle's nest. A monitoring measure was also added that identifies that IAMGOLD will work with Indigenous communities to monitor for potential effects to traditional land uses.

7.0 REFERENCES

McKay, W.C. Consulting Services. 2013 Mattagami/Flying Post First Nations Traditional Knowledge/Traditional Land Use Study, Final Report. Prepared for IAMGOLD for the Côté Gold Project.

Shared Value Solutions. 2015. Draft Report on the Métis Nation of Ontario, Traditional Knowledge & Land Use Study and High Level Impact Assessment Côté Gold Project.

8.0 GLOSSARY AND ABBREVIATIONS

The CEA Agency	Canadian Environmental Assessment Agency
EA	Environmental Assessment
EER	Environmental Effects Review
FN	First Nation
ha	Hectare
Indigenous	In the context of the Côté Gold Project, includes both First Nation and Métis people
km	Kilometre
LSA	Local Study Area
MNO	Métis Nation of Ontario
MOECC	Ministry of the Environment and Climate Change
RSA	Regional Study Area
TK	Traditional Knowledge
TLA	Transmission Line Alignment
TLUS	Traditional Land Use Study
TMF	Tailings Management Facility

APPENDIX I

EXECUTIVE SUMMARY

IAMGOLD Corporation (IAMGOLD) has developed an optimized mine plan that has been modified compared to the mine plan presented in the Environmental Assessment (EA). The Côté Gold Project (the Project) has the potential to affect land and resource uses, which can include hunting, trapping, fishing, and other traditional uses; however, the potential effects are reduced compared to the EA. Amec Foster Wheeler has prepared an updated technical memorandum for potential effects to traditional land uses, to compare Project effects to those predicted in the EA. Criteria for assessing effects were based on the:

- Presence of a potential interaction between a Project activity and traditional land uses; and
- application of effects management strategies.

Following the same methodology used in the EA, this Traditional Land Use Updated Technical Memorandum presents updated effects predictions considering Project changes relevant to traditional land uses. IAMGOLD made efforts to obtain information on traditional land uses and resources from the potentially affected First Nations and the Métis. The EA included information from the Mattagami and Flying Post First Nations Traditional Knowledge / Traditional Land Use Study (FN TK / TLUS) for the Côté Gold Project (McKay, 2013). Subsequent to the submission of the EA, IAMGOLD received the Draft Report on the Métis Nation of Ontario Traditional Knowledge & Land Use Study and High Level Impact Assessment (MNO TK / TLUS) Côté Gold Project (Shared Value Solutions, 2015). The results of these studies were used to inform the EER.

It is expected that some components of the Project will overlap with some traditional blueberry harvesting areas, but it is not expected that this will impede the overall ability to harvest blueberries. In general, this effect will last throughout the Construction and Operations phases. However, during the Operations phase blueberry harvesting along the TLA may be enhanced compared to existing conditions.

The construction of Project components is predicted to overlap with some traditional hunting areas. It is not expected that this will impede the ability to carry out traditional hunting activities in the area. This effect is expected to occur throughout the Construction and Operations phases.

Project construction along the Shining Tree TLA will potentially affect portions of the MNO TK / TLUS large game and upland bird harvesting areas. There is a potential for wildlife within the identified traditional hunting areas to be displaced in close proximity to Project construction activities. Wildlife species will likely find equally suitable habitat adjacent to the Project site during the short-term construction activities.

The Project footprint does not overlap any Sensitive Area lakes identified in the FN TK / TLUS. One non-commercial fish harvesting area near the Project site and the Shining Tree TLA was identified in the MNO TK / TLUS. With the effects management strategies identified above in place, it is not expected that the Project will limit the ability to carry out fishing activities in these areas.

The FN TK/TLUS has identified a portage route (assumed to be a canoe route) that follows the chain of lakes that surround the Project and includes lakes: Chester, Clam, Bagsverd, Weeduck, and Three Duck (Upper, Middle, and Lower). The movement of the Tailings Management Facility (TMF) will result in Clam Lake being inaccessible for use during Project Construction and Operations. Project activities will result in controlled access to the traditional portage route; however, this is not expected to limit the ability to canoe. IAMGOLD will consult with affected Indigenous groups to develop a notification process and suitable portage / connections.

The TK / TLUS identified an eagle's nest in the vicinity of the Project. Due to the nest's location and its potential removal, and considering the importance of the eagle in traditional Ojibwe culture, it is understood that this nest may is a concern for the community. Clearing of the area where the eagle's nest is currently located will take place outside of the breeding season. Should the eagle return to the area, it is expected that the eagle will the either find an equally suitable area to build a new nest or will take over a nearby existing nest. The local population of eagles will not be affected by the loss of the individual nest. With the exception of the eagle's nest, the Project does not overlap with any other known or reported traditional cultural, spiritual or ceremonial sites in the LSA or RSA.

During the Closure phase, most of the Project infrastructure will be removed and the watercourse realignments will be decommissioned and naturalized. The TMF and Mine Rock Area will be closed out and selected areas will be revegetated. At the end of the Closure phase, there will be no residual effects on plant harvesting, hunting, fishing, canoeing and cultural spiritual and ceremonial sites.

Post-closure, affected areas will continue to re-naturalize and therefore, habitat will be re-established. No effects on plant harvesting, hunting, fishing, canoeing and cultural, spiritual and ceremonial sites are expected.

Overall, the EER found that EA conclusions regarding potential Project-related environmental effects remain valid and conservative.

B-11: Updated Technical Memorandum: Human and Ecological Health Risk

Memorandum

To:	Steven Woolfenden	**From:**	Stuart Bailey
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Stephan Theben (SLR Consulting) Debbie Dyck, Don Carr (Amec Foster Wheeler)	**Date:**	May 25, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: HUMAN AND ECOLOGICAL HEALTH RISK		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate an open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;

- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Visual Aesthetics;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Human and Ecological Risk Evaluation

In 2014, Amec Foster Wheeler completed a study of the potential health risk to human and ecological receptors attributable to the Project as it was proposed in support of the Federal Environmental Impact Statement / Final Environmental Assessment Report and the Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The evaluation of risk relied on the results of dispersion and deposition modelling as described in the Air Quality Technical Support Document as well as water quality effects described in the Water Quality Technical Support Document.

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. The optimization of the Project resulted in updates to the EER modelling and subsequent updates to this memorandum. This memorandum provides an evaluation of whether any of the changes to the Project materially affect the evaluation of risk to human and ecological receptors. Key differences between the EA and the Project relevant to air quality are:

- Reductions in key operating parameters, including the mining and processing rate and maximum annual movements of ore, overburden, and mine rock, and the total ore, overburden, and mine rock over the life of the mine;
- a reduction in the footprint of the open pit, mine rock area (MRA), and tailings management facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- realignment of the haul road used to transport mine rock from the open pit to the MRA; and
- the use of fewer and smaller haul trucks to transport materials.

The site layout of the Project places the required mine related facilities in close proximity to the proposed open pit, to the extent practicable. The EER site plan showing the Project site is shown in Figure 1.

The objectives of the human and ecological risk assessment have not changed from the EA, namely to qualitatively and quantitatively evaluate the potential for adverse health effects to human and ecological receptors resulting from air emissions and water discharges attributable to the Project activities.

This memorandum provides a review of the Project and an evaluation of whether any of the changes materially affect the evaluation of risk to human and ecological receptors and thus the conclusions of the EA. A comparison of key changes between the Project and EA Project are summarized in Table 1. In addition to the changes noted, the emissions resulting from the ore processing plant will also decrease with the reduction in processing rate to 36,000 metric tonnes per day (tpd).

Table 1: Updates to the Project Affecting Evaluation of Health Risk

Project Metric	EA	The Project	% Change
Processing Rate	60,000 tpd	36,000 tpd	-40%
Maximum Annual Ore Movement	27 million tonnes (Mt)	19 Mt	-30%
Maximum Annual Overburden Movement	12 Mt	6 Mt	-50%
Maximum Annual Mine Rock Movement	79 Mt	49 Mt	-38%
Haul Truck Capacity	300 tonnes	220 tonnes	-27%
Number of Haul Trucks	33	27	-18%
Open Pit Surface Expression	2,100,000 square metres (m^2)	1,450,000 m^2	-31%
TMF Surface Area (Projected)	840 hectares (ha)	480 ha	-43%

2.0 RISK EVALUATION

As discussed in the following sections, consistent with the EA there are no unacceptable risks to either human or ecological receptors in the Local Study Area (LSA) or Regional Study Area (RSA) attributable to the Project. For all receptor groups examined, exposure and resulting risk are lower than that modeled in the EA.

2.1 Human Health Risk Assessment

The LSA has not changed from the EA and is defined as an area that extends approximately 5 km from the Project emission sources, including a 1 km buffer on either side of the selected transmission line alignment. The LSA has been updated due to the relocation of the TMF, smaller open pit footprint and respective downsizing of equipment fleet and stockpiles.

The RSA has not changed from the EA and is defined as the area that extends approximately 10 (km) from the main Project emission sources. It is not expected that the effects of the Project would be measurable beyond the regional study area, and the regional study area for the Project is consistent with that of the EA Project.

Based on the updated local and regional study areas, the receptors that could come into contact with emissions and discharges originating from the Project site are unchanged from the EA.

The extent to which estimates of exposure and risk change as a result of changes to the Project are discussed in the following sub-sections.

2.1.1 Inhalation of Airborne Emissions

Potential health risks from direct exposure to airborne emissions were evaluated in the EA through a direct comparison of exposure point concentrations modeled for receptors located at the maximum point of impingement (i.e., outside of the Project site) and at the sensitive receptor locations. While the risk assessment identified hazard quotients greater than 0.2 at the maximum point of impingement for several contaminants of concern, unacceptable risks were not anticipated based on the fact that conditions producing these levels were infrequent and transitory in nature. No unacceptable risks associated with direct inhalation were identified for the sensitive receptor.

As described in the Air Quality Updated Technical Memorandum (UTM), with the revised configuration of the Project concentrations of contaminants of concern compared to the EA are predicted to be 9% to 22% lower at the maximum point of impingement and 23% to 41% at the nearest sensitive receptor. Based on the reduced emissions and the conclusions of the EA, unacceptable risk to human receptors at the maximum point of impingement and the nearest sensitive receptor are not predicted for the Project.

2.1.2 Soil Deposition and Effects on Soil Quality

Airborne emissions resulting from the Project and Project-related activities have the potential to deposit to soil ultimately affecting soil quality and the health of any organisms that inhabit the soil, or consume plants that grow in the soil. To understand potential risk associated with this exposure pathway, deposition modelling was undertaken in the EA to understand how deposition affects soil quality over the course of the Project. The EA assumed that any contaminants of concern that deposit in soil are restricted to mixing within the first centimetre of soil. Over the 15-year operational phase of the facility, there was no appreciable change to background soil quality resulting from aerial deposition. Consequently, it was concluded that exposure via this pathway would not result in unacceptable risk attributable to Project emissions to ecological receptors, or human receptors who may harvest traditional foods from the area.

While the Air Quality UTM did not evaluate deposition for the LSA on the understanding that emissions are significantly lower with the revised configuration of the Project, IAMGOLD has committed to evaluate deposition as part of its monitoring plan.

2.1.3 Ingestion of Surface Water

Potential health risks associated with discharges to surface water were evaluated in the EA through an examination of changes to water quality in the receiving environment under different flow conditions. Resulting water quality, when compared to health-based benchmarks was not found to result in unacceptable health risks to users or consumers of such surface water.

Water quality modelling was completed using a modified GoldSim model for the receiving water and areas downstream consistent with the EA. The Operations and Post-closure phases were each modelled for three climate conditions: the annual average, dry and wet conditions. Return periods of 25 years were used to derive the water quality predictions for the dry and wet conditions. With the exception of arsenic, modelled all parameters and concentrations in the receiving water (monthly maxima), were below applicable water quality guidelines. The one exception was arsenic where the predicted maximum monthly average concentration in Three Duck Lakes under the 1:25 year dry condition (Upper and Middle) were higher than the interim Provincial Water Quality Objectives (PWQO). However, the maximum predicted concentrations of arsenic in the receiving water were less than the Ontario Drinking Water Quality Standard for arsenic connoting no unacceptable risk to human health attributable to the Project via this exposure pathway.

2.1.4 Ingestion of Traditional Foods (Wild Game, Plants & Fish)

In terms of the health risk associated with ingestion of terrestrial plants and wild game that consume such plants, this exposure pathway was evaluated in the EA through an examination of airborne deposition and changes in soil quality over the course of the project. Changes to soil quality resulting from deposition of project-related emissions would not increase above values representative of background for Ontario soils. As such, indirect exposure of project related emissions that would result from consumption of local vegetation and / or game that consume such vegetation is not predicted to result in unacceptable health risk.

In terms of the consumption of fish and aquatic plants, predicted changes in water quality, when compared to health-based benchmarks were not found to result in unacceptable health risks to users or consumers of such surface water. Watercourse realignments will, however, result in the flooding of terrestrial lands. While this raises the possibility that the decay of terrestrial vegetation will result in the production of methyl mercury that will be taken up by resident fish, the extent of flooding required by the Project is 33% less than described in the EA. As there are currently fish consumption advisories for mercury in lakes within the study area. Consequently, as described in the Aquatic Biology UTM, measures for potentially mitigating mercury exposure have been proposed.

2.2 Ecological Risk Assessment

The ecological receptors and operational exposure pathways in the LSA are unchanged from the EA.

2.2.1 Terrestrial Receptors

In the EA, potential risks to ecological receptors were evaluated through an examination of direct exposure via airborne emissions or through deposition to soil with subsequent uptake. Unacceptable risks were not identified for either exposure pathway. This conclusion is unchanged with the revised configuration of the Project and concomitant reduction in airborne emissions.

2.2.2 Aquatic Receptors

The Water Quality UTM evaluated predicted changes in water quality resulting from changes to the Project. Arsenic was the only contaminant of concern identified where predicted concentrations resulted in an exceedance of a relevant water quality objective with maximum predicted concentrations comparable to those predicted for the Project (i.e. 0.007 milligrams per liter (mg/L) vs 0.006 mg/L). Regardless, when compared to risk-based toxicity reference values (TRVs) protective of sensitive species (*Scenedesmus obliquus*) the maximum predicted concentrations are not indicative of unacceptable risk.

2.3 Evaluation of Non-occupational Exposure within the Project Boundary

Within the Project boundary there is the potential for Indigenous and non-Indigenous land users to use the water routes for recreational use, an activity that may include the harvesting and consumption of plants that grow in the area potentially leading to higher exposure than that which would be experienced in the LSA. Based on our understanding of the existing use of watercourses in the area and the Project footprint, it can be expected that the public will have the ability to access Three Duck Lakes, Weeduck Lake, Bagsverd Lake and Chester Lake during all phases of the project. Consequently, potential risk associated with indirect soil contact pathways were evaluated for this receptor group.

Similar to the receptor groups within the LSA, 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 discussed in Section 2.1.2, the approach taken to assess changes in ambient concentrations of trace elements in soil, and by extension vegetation and wildlife, is based on an evaluation of changes in soil chemistry resulting from wet and dry deposition. Figure 2 presents the results of depositional modeling for the Project boundary which includes parts of Three Duck Lakes, Weeduck Lake, Bagsverd Lake and Chester Lake. As shown in the Figure, predicted deposition rates for total particulate these areas are well less than 30 g/m^2 expressed as an annual average with the exception of the northern reach of Chester Lake near the confluence with the new realignment channel. Modelling conducted as part of the EA determined that particulate deposition at a rate of 38.2 g/m^2 at the maximum point of impingement would not result in concentrations of contaminants of concern in soil to values that are representative of background in Ontario soils. As the depositional modelling conducted as part of the EA did not predict an increase in soil concentrations for any parameters above background it was concluded that there would be no unacceptable risk via direct and indirect soil contact pathways inclusive of uptake by plants. For the receptors who frequent areas within the Project Footprint, as the maximum rate of deposition is less than that modelled in the EA, the same conclusion can be drawn, namely that there is no unacceptable risk attributable to the indirect soil exposure pathway.

3.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. While the HEHRA has not identified the need for mitigative measures for the protection of human health or environmental receptors, specific measure which IAMGOLD has committed to for the Project are described in the Air Quality UTM, the Water Quality UTM and the Aquatic Biology UTM.

4.0 MANAGEMENT

There are no monitoring measures applicable for the human and ecological health risk assessment, which is consistent with the management measures provided in the EA.

5.0 CONCLUSION

Emissions rates and the predicted concentrations in the receiving environment are lower than the EA. Consequently, based on the assessment of risk to human and ecological receptors completed for the EA that demonstrated there were no unacceptable risk attributable to the Project, the same conclusion can be drawn for the Project.

6.0 REFERENCES

Amec Foster Wheeler. 2014. Côté Gold Project Draft Environmental Assessment Report Technical Support Document: Human and Ecological Health Risk Assessment.

Amec Foster Wheeler. 2014. Environmental Impact Statement / Final Environmental Assessment Report – Addendum to Appendix F Air Quality Technical Support Document.

Canadian Council of Ministers of the Environment (CCME). 2017. Accessed November 2017 from https://www.ccme.ca/en/resources/air/index.html

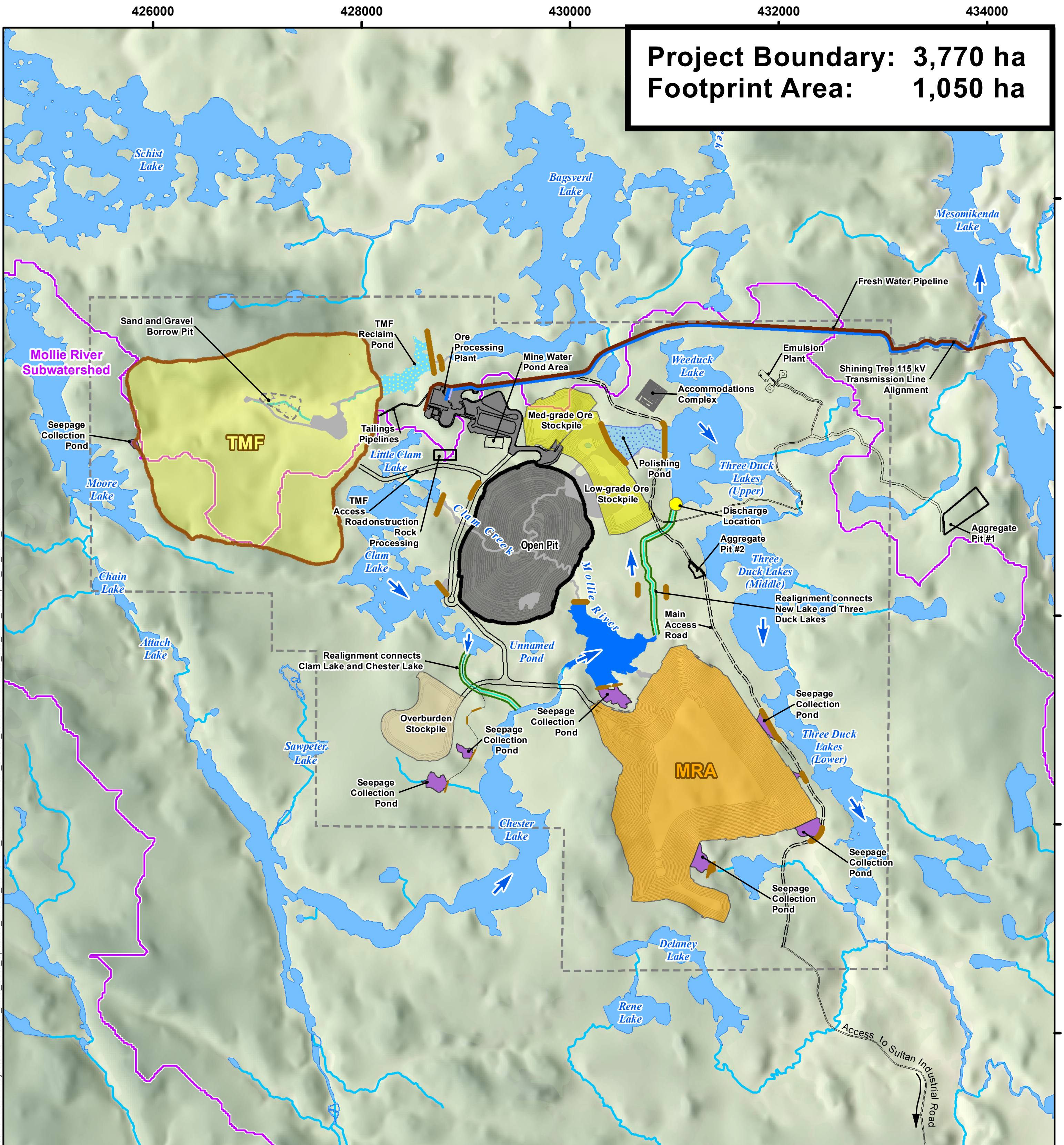
Ontario Ministry of the Environment and Climate Change (MOECC). 2016a. Ontario's Ambient Air Quality Criteria.

Ontario Ministry of the Environment and Climate Change (MOECC). 2016b. Ontario's Air Contaminant Benchmarks.

7.0 GLOSSARY AND ABBREVIATIONS

EA	Environmental Assessment
EER	Environmental Effects Review
g/m^2	Gram per meter squared
ha	Hectares
km	Kilometer
LSA	Local Study Area
mg/L	Milligram per Liter
m^2	Square meters
MRA	Mine Rock Area
Mt	million tonnes (Mt)
PWQO	Provincial Water Quality Objectives
RSA	Regional Study Area
Tpd	metric tonnes per day
TMF	Tailings Management Facility
TRVs	Toxicity Reference Values
UTM	Updated Technical Memorandum

FIGURES



LEGEND

Watercourses
Overprinted Watercourses
Waterbodies
Overprinted Waterbodies
Subwatershed Boundary

Mine Site

Open Pit
Potential Discharge Location
Facilities
Dam
Main Access Road
Shining Tree 115 kV Transmission Line Alignment
Watercourse Realignment
Fresh Water Pipeline
Proposed Water Flow Direction

Proposed Lake Area
Overburden Stockpile
Ore Stockpile
Proposed Mine Rock Area (MRA)
Proposed Tailings Management Facility (TMF)
TMF Reclaim Pond
Polishing Pond
Seepage Collection Pond
Sand and Gravel Borrow Pit

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N S W E

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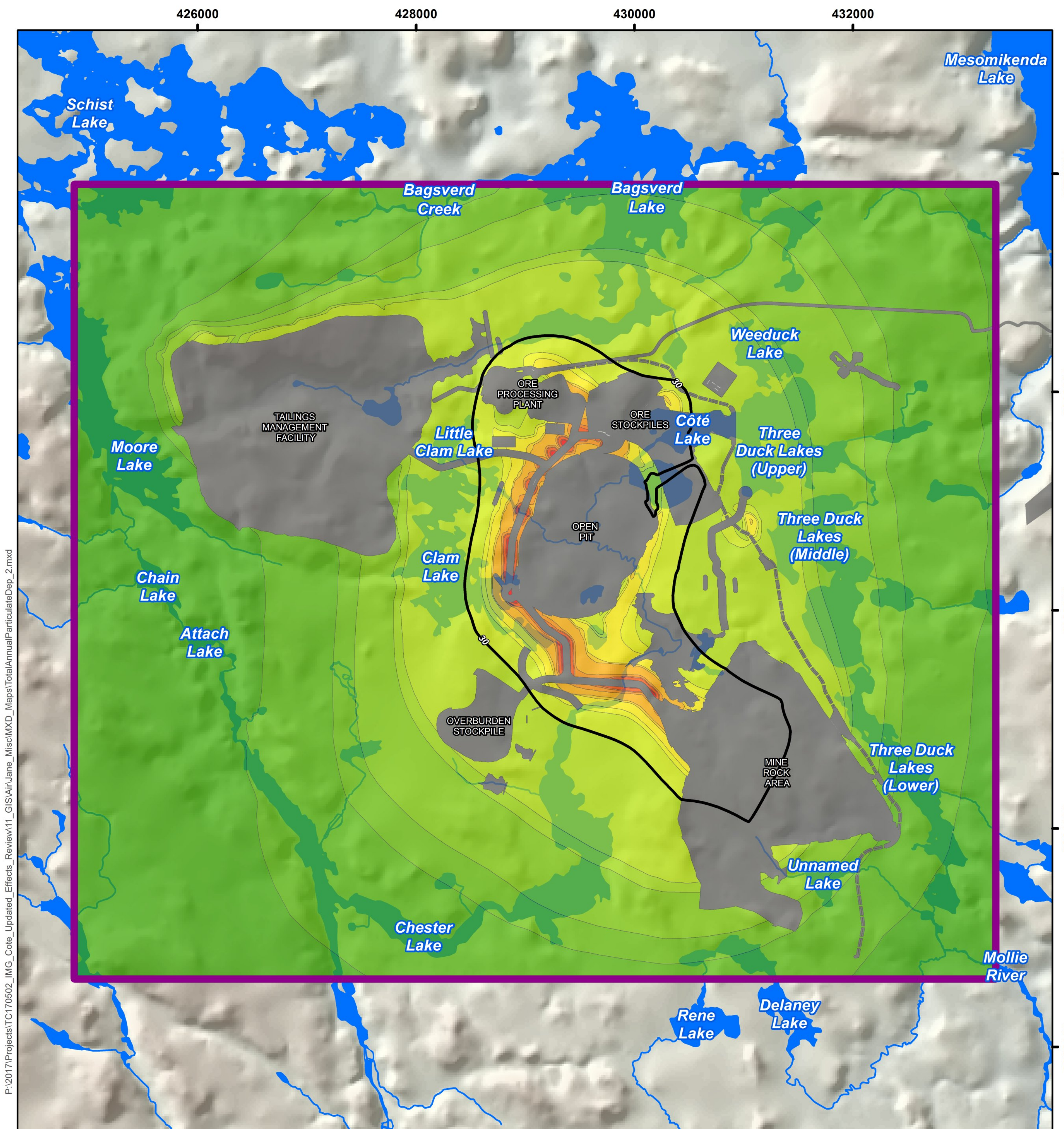
CÔTÉ GOLD PROJECT

Site Plan
Environmental Effects Review

PROJECT N°: TC170502	**FIGURE: 1**
SCALE:1:50,000	DATE: November 2017



P:\2017\Projects\TC170502_IMG_Cote_Updated_Effects_Review\11_GIS\AirJane_Misc\MXD_Maps\TotalAnnualParticulateDep_2.mxd

LEGEND

- Model Extent Boundary
- Mine Site Footprint
- Watercourses
- Waterbodies

Total Annual Particulate Deposition (g/m²/year)

30 — 30g / m² / year (contour)

1000 - 2000	90 - 100	6 - 9
900 - 1000	60 - 90	5 - 6
600 - 900	50 - 60	3 - 5
500 - 600	30 - 50	1 - 3
300 - 500	10 - 30	
100 - 300	9 - 10	

0 1 2 3 4 Kilometres

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

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CÔTÉ GOLD PROJECT

Total Annual Particulate Deposition

PROJECT N°: TC170502

FIGURE: 2

SCALE: 1:47,000

DATE: March 2018

APPENDIX I

EXECUTIVE SUMMARY

Introduction

In 2014, Amec Foster Wheeler completed an evaluation of potential risk to human and ecological receptors attributable to the Côté Gold Project (the Project), in support of the Federal Environmental Impact Statement and the Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The evaluation of risk relied on the results of dispersion and deposition modelling as described in the Air Quality Technical Support Document as well as water quality effects detailed in the Water Quality Technical Support Document.

This memorandum updates the human health and ecological risk assessment for the Project based on predicted changes to air emissions and effluent discharge. The key differences between the EA and the Project relevant to understanding exposure and risk are:

- Reductions in key operating parameters, including the mining and processing rate and maximum annual movements of ore, overburden, and mine rock, and the total ore, overburden, and mine rock over the life of the mine;
- a reduction in the footprint of the open pit, mine rock area, and tailings management facility (TMF);
- relocation of the TMF from north of the open pit to the west;
- realignment of the haul road used to transport mine rock from the open pit to the mine rock area; and
- the use of fewer and smaller haul trucks to transport materials.

Human Health Risk Assessment

The objectives of the human and ecological risk assessment are not changed from the EA, namely to qualitatively and quantitatively evaluate the potential for adverse health effects to human and ecological receptors resulting from air emissions and water discharges attributable to Project activities. Based on the updated local and regional study areas, the human receptor/exposure pathways that are operational and attributable to the Project are unchanged from the EA.

Based on the conclusions of the EA and fact that the Air Quality Updated Technical Memorandum modelled reductions in airborne concentrations of contaminants of concern compared to the EA are predicted to be 9% to 22% lower at the maximum point of impingement and 23% to 41% at the nearest sensitive receptor.

Indirect exposure pathways consider the deposition of airborne contaminants to soil with subsequent uptake by plants and animals. This was evaluated in the EA through an evaluation of changes in soil quality that would result from airborne deposition over the course of the Project. Over the 15-year operational phase of the facility, depositional modeling concluded there was no appreciable change to background soil quality resulting from aerial deposition.

Consequently, it was concluded that exposure via indirect exposure pathways would not result in unacceptable risk attributable to Project emissions for either ecological receptors, or human receptors who may harvest traditional foods from the area. As emissions are reduced for the Project, this conclusion is still valid.

Potential health risks associated with discharges to surface water were evaluated in the EA through an examination of changes to water quality in the receiving environment under different flow conditions. For all but one parameter modeled, predicted concentrations in the receiving water (monthly maxima), were below applicable water quality guidelines. The one exception was arsenic where the predicted maximum monthly average concentration in Three Duck Lakes under the 1:25 year dry condition (Upper and Middle) were higher than the Provincial Water Quality Objectives. However, the maximum predicted concentrations of arsenic in the receiving water were less than the Ontario Drinking Water Quality Standard for arsenic connoting no unacceptable risk to human health attributable to the Project via this exposure pathway.

In terms of the consumption of fish predicted changes in water quality, when compared to health-based benchmarks was not found to result in unacceptable health risks to users or consumers of such surface water. However, on the understanding that there are currently fish consumption advisories for mercury in lakes within the study area and that watercourse realignments will result in the flooding of terrestrial lands, measures for mitigating mercury exposure have been proposed.

Ecological Risk Assessment

The ecological receptors in the Local Study Area are unchanged from the EA and include terrestrial receptors (e.g. soil invertebrates), terrestrial plants, mammals and birds. Aquatic receptors include aquatic vegetation (submergent and emergent), benthic communities and higher trophic level receptors including a variety of fish.

The exposure pathways for ecological receptors are unchanged from those evaluated in the EA.

In the EA, potential risks to ecological receptors were evaluated through an examination of direct exposure via airborne emissions or through deposition to soil with subsequent uptake. Unacceptable risks were not identified for either exposure pathway. With the revised configuration of the Project and concomitant reduction in airborne emissions, these conclusions are still valid.

The Water Quality UTM evaluated predicted changes in water quality resulting from changes to the Project. Arsenic was the only contaminant of concern identified where predicted concentrations resulted in an exceedance of a relevant water quality objective with maximum predicted concentrations comparable to those predicted for the submitted Project. When compared to risk-based toxicity reference values protective of sensitive species (*Scenedesmus* *obliquus*) the maximum predicted concentrations are not indicative of unacceptable risk to aquatic receptors.

MANAGEMENT

There are no monitoring measures applicable for the human and ecological health risk assessment, which is consistent with the management measures provided in the EA.

IAMGOLD

B-12: Updated Technical Memorandum: Visual Aesthetics

Memorandum

To:	Steven Woolfenden	**From:**	Ken Brookes, Braeden Connor
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Debbie Dyck, Don Carr (Amec Foster Wheeler) Stephan Theben (SLR Consulting)	**Date:**	May 25, 2018
Subject:	**CÔTÉ GOLD PROJECT ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: VISUAL AESTHETICS		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;

- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Socio-Economic; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Visual Aesthetics

In 2014, Amec Foster Wheeler modelled the potential visual aesthetics of the Project on the natural landscape from key receptors surrounding the site for the purposes of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA'). The Visual Aesthetics Study (see Côté Gold Project Visual Aesthetics Technical Support Document) used the project design at the time of EA submission, along with the topography and tree canopy elevations to determine the visibility of prominent project features including the Mine Rock Area (MRA), Ore Stockpiles, and Tailings Management Facility (TMF) from these sensitive receptors.

Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. To reflect the changes in the project design on the visual aesthetics of the landscape, additional modelling and generation of photographic renderings of select Project infrastructure from the sensitive receptors has been prepared. This technical study considers indicators assessed through the EA, where changing the Project effects could have the potential to warrant an update to the conclusions of the EA.

The key changes to the Project layout that are relevant to the visual aesthetics of the Project include:

- Location of the TMF changed to west of the open pit;
- increase in TMF height from 45 metres (m) to 70 m;
- addition of an Overburden Stockpile to the west of the MRA;
- change in the size of the MRA with a reduced total capacity from 850 metric tons (Mt) to 559 Mt;
- location of the MRA has moved south to allow for New Lake;
- altered ore stockpile configuration; and
- transmission line will utilize the Shining Tree alignment (upgrades along existing T2R line from Timmins to Shining Tree, and a 44 km alignment along a previous transmission line corridor from Shining Tree to the Project site.

The updated site plan is shown in Figure 1.

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2.0 METHODOLOGY

2.1 Spatial Boundaries / Selection of Receptors

The EA visual aesthetics receptors were initially selected based on a 5 km buffer around the Project site. This area is considered the local study area (LSA) and is depicted in Figure 2. Additional receptors were included beyond the 5 km buffer for contingency. Receptors considered in this Updated Technical Memo are unchanged from the EA.

2.2 Temporal Boundaries

The temporal boundaries of the EER remain as those provided in the EA, and will span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed compared to those presented in the EA. The effects assessment indicators previously used and still applicable include:

- Change in Landscape from Receptor Locations;
- change in Landscape from Non-Receptor Locations; and
- change in Landscape due to the Transmission Line.

2.4 Fieldwork

Two fieldwork campaigns were carried out to capture the existing winter and the summer visual landscape during 2013. Twenty receptor locations were visited during the 2013 winter field campaign based on the initial selection of receptors (see Figure 2). This included locations along Highway 144 where there were existing forest clearings near the road.

One or more photographs were taken in the direction of the Project to capture baseline visuals for each of the receptor locations. A levelled tripod was set up to hold the camera (Canon T3i Rebel) for each photograph. The following information was recorded for each photograph: date and time, Global Positioning System (GPS) coordinates, azimuth, height above sea level and the height of the camera above the ground.

Most of the receptors were located on the periphery of a lake. Photographs were taken from either the dock of the cottages or from the shore towards the planned MRA in order to get a clear shot.

2.5 Building the 3D model

In order to determine whether the proposed Ore Stockpiles, Overburden Stockpile, TMF and/or MRA would be visible from specific receptor locations, a hypothetical 3D surface was generated with the Project design specifications for the stockpiles and TMF.

The first step consisted of creating an existing conditions 3D surface that included detailed tree height data and other potential visual impedance information throughout the entire local study area. IAMGOLD provided Amec Foster Wheeler with the full feature Light Detection and Ranging (LiDAR) American Standard Code for Information Interchange (ASCII) XYZ text files. This LiDAR survey was conducted in the summer of 2012. The ASCII XYZ raster surface tiles were georeferenced to North American Datum of 1983 (NAD83) Universal Transverse Mercator zone 17N, using the Canadian Geodetic Vertical Datum of 1928 and had a spatial resolution of 1 m. Typical vertical accuracy for such LiDAR data is approximately +/- 15 to 20 centimetres (cm).

Approximately 63% of the visual aesthetics LSA was covered by the high resolution full feature LiDAR data. Areas within the LSA that did not have LiDAR data coverage (37%) were modelled using Ontario Ministry of Natural Resources and Forestry (MNRF) data to build a hypothetical full feature 3D surface. The provincial digital elevation model, in conjunction with forest resource inventory tree stand data, was used. The digital elevation model data served as the bare earth topographic surface. Forest stand polygon information and its respective average canopy height attribute information were used to generate approximate tree height for the areas outside of LiDAR coverage within the LSA. These estimated canopy height areas were then merged with the provincial digital elevation model data to produce a best approximation 3D surface of forest visual impedance regions for areas outside of LiDAR coverage. The LiDAR 3D surface and the MNRF estimated 3D surface were combined to create a full 3D digital elevation raster surface for the local study area with full feature information necessary for modelling viewsheds from specific locations.

The outer toe and crest / upper limit 3D polyline information for the TMF, Ore Stockpiles, Overburden Stockpile and MRA was provided by the Amec Foster Wheeler design team on June 23 2017 as an AutoCAD interchange .dxf file. The 3D polyline information was used to interpolate a 3D raster surface for all four project components being modelled. The Project component raster surfaces were then combined with the existing conditions full feature 3D surface creating a hypothetical 3D surface with the Ore Stockpiles, TMF, Overburden Stockpile and MRA embedded into the hypothetical 3D landscape based on the Project component design specifications. This hypothetical 3D surface could be used to model viewshed locations from any position within the local study area.

2.6 Viewshed Analysis

Selected receptor locations within the local study area were visited during the winter field campaign in 2013. Photographs were taken from these receptor locations pointed in the general direction of the proposed Project components (Ore Stockpiles, TMF, Overburden Stockpile and MRA). The specific position data for the photograph locations were collected by GPS receiver and then mapped onto the hypothetical 3D raster surface. The 1 m by 1 m raster cells directly underneath these photograph locations were then raised by 1.5 m in order to estimate average eye height above the ground surface. Viewshed analysis was then performed for each photograph location resulting in 20 viewshed raster outputs.

These output datasets are essentially categorical raster datasets where every location within the local study area is determined to be “visible” or “not visible” from the specified location. This method was used to determine which of the 20 investigated receptor locations had a potential line of sight to the proposed Project components. This resulted in portions of the proposed Project components to be highlighted as “visible” on the 3D surface if they were part of the photograph location’s viewshed (see Figure 3). Only 10 of the 20 initial receptor sites were remodelled using the Project site plan layout due to line of sight obstructions presented during the EA site plan visual aesthetics modelling in 2013.

The viewshed analysis determined that 5 of the 10 receptor locations that were remodelled for the Project had a clear line of sight to the MRA and 1 of the 10 receptors locations had a clear line of sight to the TMF. A small portion of the Ore Stockpiles was visible from receptor C16 (see Figure 3). This was not captured by the photographs from this location due to the photograph being directed toward the primary visual impact region of the MRA during the EA site plan visual aesthetics evaluation. The Overburden Stockpile was not visible from any of the receptor locations. All 5 receptor locations that had a clear line of sight to the MRA had suitable winter and summer photographs. The receptor location that had a clear line of sight to the TMF only had a suitable summer photograph.

In addition to the receptor viewshed analysis a full landscape area viewshed analysis was conducted for the local study area in order to identify areas on the ground where at least the highest portions of the Project components would be visible. This procedure involved producing viewpoint locations at 100 m intervals along the top edges of all Project components (MRA, TMF, Overburden Stockpile and Ore Stockpiles). Subsequently viewshed analysis was conducted from each viewpoint and categorized into their respective Project component. For example, 72 viewpoints set-up at 100 m intervals at the top of the TMF dams were combined to produce a single viewshed result throughout the local study area identifying regions where the top of the TMF dams would be visible. This process was continued for the MRA, Overburden Stockpile and Ore Stockpiles. Once the 4 categories of viewshed results were produced (i.e. “TMF visible”, MRA visible”, “Overburden Stockpile visible” and “Ore Stockpiles visible”) raster map algebra conditional statements (overlay geoprocessing) was used to isolate the overlapping viewshed areas and identify which Project components were visible from various locations throughout the local study area, effectively generating 15 categories of viewsheds within the local study area (see Figure 4).

3.0 PREDICTION OF EFFECTS

Updated effects to the visual aesthetics of the landscape during all phases of the Project have been predicted for receptors, non-receptors, and for the Shining Tree Transmission Line, which is consistent with what was reported in the effects assessment completed for the EA. These effects have been further characterized based on the four phases of the Project (Construction, Operations, Closure and Post-closure). These predicted effects from the Project design have been compared with predicted effects presented in the EA.

3.1 Construction Phase

3.1.1 Change in Landscape from Receptor Locations

Activities performed during the Construction phase of the Project do not have the potential to affect the visual landscape of nearby receptors, which is consistent with the effects assessment presented in the EA.

3.1.2 Change in Landscape from Non-Receptor Locations

Activities performed during the construction phase of the Project will predominantly be activities completed at the ground level. As such, construction performed near water bodies or forest clearings will have the potential to affect the landscape from non-receptor locations. In the Project design for the EA, those activities included watercourse realignments, associated dam construction (Clam Lake, Chester Lake and Three Duck Lakes) and the creation of New Lake. The relocation of the TMF and optimized watercourse realignments excludes the need for damming Bagsverd Lake and the need for a large watercourse realignment channel for Bagsverd Creek, effectively reducing the overall visibility of Project activities from non-receptor locations during the Construction phase.

In the EA site layout, overburden was deposited in the MRA. A change in the Project design is establishment of a separate overburden stockpile southwest of the open pit. It is predicted that once the Overburden Stockpile reaches its maximum height in the Construction phase, it will be visible from Chester Lake and Clam Lake.

Consistent with the EA Visual Aesthetics Technical Support Document, the Project is expected to result in a perceptible change in landscape, which does not affect enjoyment of the viewscape.

3.1.3 Change in Landscape due to the Transmission Line

Construction activities along the transmission line alignment will consist of clearing the right-of-way (maximum 50 m) and installing the poles and transmission lines. Those activities are expected to be visible only from the cleared right-of-way as forests in this area of Ontario have a high canopy height and are quite dense. The Project requires upgrades to the existing Hydro One Networks Inc. T2R line from Timmins to Shining Tree, which will not result in perceptible changes to the landscape, and a 44 km 115 kilovolt (kV) transmission line from Shining Tree to site will be constructed along an existing right-of-way. Some clearing and widening of the existing right-of-way will be required to meet modern safety standards, and new poles and wires will be installed. Clearing and widening of an existing 44 km transmission line corridor, and installation of a new transmission line, will have reduced visual effects on the landscape compared to construction of a new 120 km transmission line alignment, that was assessed in the EA. Consistent with the EA Project, the new 44 km transmission line segment is expected to result in a perceptible change in landscape, which does not affect enjoyment of the viewscape.

3.2 Operations Phase

3.2.1 Change in Landscape from Receptor Locations

The components that were initially identified as having the potential to be seen from receptor locations in the EA included the Ore Stockpile, TMF, and the MRA. With the changes to the Project design described in Section 1.1, an Overburden Stockpile will be visible and visual aesthetics effects from the Ore Stockpile, TMF and MRA have been altered and the predicted visual aesthetics have changed for a number of receptor locations. In contrast to the Visual Aesthetics Study prepared for the EA, which identified just the MRA as being visible from six receptor locations, this assessment determined that a very small portion of the TMF would be visible from a cottage on Schist Lake and the MRA would be visible from five receptor locations, for a total of six effected receptors.

Both the MRA and TMF will be constructed gradually during the Operations phase of the Project. To simplify the visual aesthetics model described in Section 2.0, one scenario was modelled at the end of the Operations phase once the MRA and TMF have reached their final heights. This scenario allows for a conservative assessment of visual effects on nearby receptors. It is important to note that for many locations, the MRA and TMF will likely not be seen until several years into the Operations phase.

The results of the visual rendering modelling for winter and summer seasons from receptor locations are provided in Appendix II. Generally, the visual landscapes will be more affected during the summer months as the MRA will often be camouflaged by the snow in the winter season. Based on the mitigation presented in Section 4.0, a total of five receptors will have effects to the viewscape by the MRA, compared to six receptors from the EA Project layout. In general, the MRA is reduced in elevation compared to the EA MRA design and visual effects to the five receptors are reduced compared to the EA. The relocated TMF will be visible from one receptor on Schist Lake, whereas the EA TMF location was not visible from the receptors. Overall, the number of receptors that will have the viewscape affected by the Project is consistent with the EA.

Overall and consistent with the EA, the effect of the Project on the visual landscape during the Operations phase is perceptible but will not affect enjoyment of the viewscape for the receptors.

3.2.2 Change in Landscape from Non-Receptor Locations

As identified in Section 2.0, changes in landscape during the Operations phase have been modelled conservatively to represent the maximum heights of the MRA, TMF, the Overburden Stockpile and Ore Stockpiles. Figure 4 presents the results of the model which looks at identifying the areas that will view the TMF, MRA, Overburden Stockpile and Ore Stockpiles.

Results indicate that the MRA will be the most prominent Project component, being visible from Clam Lake, Chester Lake, Three Duck Lakes, Bagsverd Lake, Delaney Lake, Rene Lake and portions of Schist Lake, Dividing Lake and Mesomikenda Lake, which is consistent with the results of the Visual Aesthetics Study presented in the EA. However, the reduced size and change in location of the MRA reduces the visibility of the structure due to natural topography. It is predicted that the MRA will be less prominent on the viewscape in the Project layout than in the EA layout.

The TMF, which has undergone the most changes from the EA design both in location and height, was predicted to be visible from Bagsverd Lake and Unnamed Lake #1 in the Visual Aesthetics Study presented in the EA. Due to the increase in the containment dam height from 45 m to 70 m, it is predicted that the TMF will be a more prominent feature on the landscape and hence will be visible from a greater area. It is predicted that the TMF presented in the EER will be seen from Schist Lake, Bagsverd Lake, Clam Lake, Chain Lake, Chester Lake and Moore Lake.

The Ore Stockpiles, which are relatively small features compared to the TMF and MRA, will be seen from portions of Bagsverd Lake and Three Duck Lakes, which is consistent with the EA.

During the Operations phase, the Overburden Stockpile will be vegetated to mitigate the potential for erosion as well as to more effectively blend into the natural landscape. Although the Overburden Stockpile will remain visible from Chester Lake and Clam Lake, it will be less discernable from the natural landscape during the Operations phase as vegetation is established.

Based on the modelling and the current understanding of the Project components, it is expected that the changes in the visual landscape during the Operations phase will be perceptible but will not affect enjoyment of the viewscape.

3.2.3 Change in Landscape due to the Transmission Line

The visual effects experienced during the Construction phase are expected to continue into the Operations phase. The transmission line is expected to be visible from within the right-of-way (maximum 50 m). Photograph 1 presents an existing 230 kV transmission line. It is expected that the transmission line for the Project will be comprised of similar or smaller structures, as a

115 kV transmission line. The presence of this transmission line is expected to result in a perceptible change in landscape, which does not affect enjoyment of the viewscape.

Photograph 1: Typical 230 / 115 kV Transmission Line and Poles

Source: Detour Gold

3.3 Closure Phase

3.3.1 Change in Landscape from Receptor Locations

During the Closure phase, mitigation inherent in the Project design includes vegetation of the TMF and partial vegetation of the MRA, with a focus on vegetating the faces of the MRA which will be seen by receptors. The vegetation will decrease the discernibility of the MRA from the viewscape and will eventually become a feature on the natural landscape. It is anticipated that the effect of the Project on the visual landscape during Closure will continue to be perceptible but will not affect the receptors' enjoyment of the viewscape.

3.3.2 Change in Landscape from Non-Receptor Locations

During the Closure phase, mitigation inherent in the Project design includes vegetation of the TMF and partial vegetation of the MRA, with a focus on vegetating the faces of the MRA that will be seen by receptors. The vegetation will decrease the discernibility of the MRA from the viewscape and will eventually become a feature on the natural landscape. At Closure, the Ore Stockpiles will no longer exist, as the ore will be processed prior to Closure of the process plant. Additionally, during Closure activities, the material in the Overburden Stockpile will be used in the reclamation and revegetation of the site and will no longer exist.

It is anticipated that the effect of the Project on the visual landscape during Closure will continue to be perceptible but will not affect enjoyment of the viewscape.

3.3.3 Change in Landscape due to the Transmission Line

During the Closure phase, the transmission line will continue to provide power to site. During the closure phase, the presence of this transmission line is expected to continue to result in a perceptible change in landscape, which does not affect enjoyment of the viewscape.

3.4 Post-Closure Phase

3.4.1 Change in Landscape from Receptor Locations

During the Post-closure phase, vegetation planted on the MRA and TMF during the Closure phase will continue to grow and both structures will eventually appear as natural features on the landscape over time, which is the same outcome reported in the EA. The effects of the Project on the visual landscape during Post-closure will be perceptible but will not affect the receptors' enjoyment of the viewscape.

3.4.2 Change in Landscape from Non-Receptor Locations

During the Post-closure phase, vegetation planted on the MRA and TMF during the Closure phase will continue to grow and both structures will eventually appear as natural features on the landscape over time, which is the same outcome reported in the EA. As the effects of the Project on the visual landscape during Post-closure will be perceptible but will not affect enjoyment of the viewscape.

3.4.3 Change in Landscape due to the Transmission Line

During the Post-closure phase, once power for pumping water is no longer needed, the transmission line (44 km segment from Shining Tree to site) will be removed and natural vegetation will be allowed to regrow within the right-of-way. Once the removal of the transmission line is completed, there will be no more visible manmade equipment in the transmission line right-of-way.

Following removal of the 44 km transmission line, vegetation will continue to regrow in the right-of-way. It is anticipated that at some time into Post-closure, the right-of-way will return to its original state. Compared to current baseline conditions, it is anticipated that this effect will no longer be perceptible.

4.0 MITIGATION MEASURES

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means.

The table below provides the mitigation measures applicable to the Project and indicates if the mitigation measures have changed or stayed the same from the EA.

Table 4-1: Mitigation Measures – Visual Aesthetics

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Visual Aesthetics	Construction, through Closure	Obstruction of the viewscape	Limit the design height of the MRA to 150 meters. Removal of the trapper's cabin on Three Duck Lakes.	Mitigation and management measures inherent within the Project design that limit the extent of the visual effects includes: selection of one MRA, located further away from receptors and limiting the design height of the MRA to 150 m. Additionally, the trapper's cabin on Three Duck Lakes, given its location with respect to Project components, will be negotiated for removal to limit visual aesthetics, air quality and noise and vibration effects from the Project.	n/a	The mitigation measure has not changed from the EA.

5.0 MANAGEMENT

There are no monitoring measures applicable for visual aesthetics to the Project, which is consistent with the management measures provided in the EA.

6.0 CONCLUSION

Based on the Project design, the MRA will be visible from five receptor locations and the TMF will be visible from one receptor location in the vicinity of the Project site for a total of six effected receptors. This is similar to the findings of the Visual Aesthetics Study prepared for the EA, the difference being that the MRA would be visible from six receptor locations and the TMF was predicted to not be visible from any receptor locations. With the reduced size and relocation of the MRA, the visibility from the receptor locations is anticipated to be much less in the Project compared to the EA. This new MRA design provides more cover from the natural topography of the area and greatly reduces the visibility of the structure.

Similarly, the MRA, TMF, Overburden Stockpile and Ore Stockpiles will be visible from non-receptor locations around the Project, mainly: Three Duck Lakes, Clam Lake, Chester Lake, Bagsverd Lake, Delaney Lake, Dividing Lake, Schist Lake, Moore Lake, Chain Lake, as well as portions of Mesomikenda Lake.

Based on those results, it is expected that overall the Project will result in a visual effect on select receptors and areas in the local study area starting in the Construction phases until Post-closure. These effects are characterized as being perceptible but will not affect enjoyment of the viewscape.

The transmission line will be visible within the right-of-way of the transmission line alignment from Construction until Post-closure, where vegetation is expected to grow back to natural conditions. This effect is characterized as being perceptible but will not affect enjoyment of the viewscape, which is consistent with the findings of the Visualization Report created for the EA.

7.0 REFERENCES

EACOM. (2013). Forestry Maps. Retrieved 09 18, 2013, from EACOM Timber Corporation: http://www.eacom.ca/wood/forest/forestry-maps

8.0 GLOSSARY AND ABBREVIATIONS

ASCII	American Standard Code for Information Interchange
cm	Centimetre
EA	Environmental Assessment
EER	Environmental Effects Review
GPS	Global Positioning System
km	Kilometre
kV	Kilovolt
LiDAR	Light Detection and Ranging
LSA	Local Study Area
m	Metre
MRA	Mine Rock Areas
MNRF	Ontario Ministry of Natural Resources and Forestry
Mt	Metric ton
NAD83	North American Datum of 1983
TSD	Technical Support Document
TMF	Tailings Management Facility

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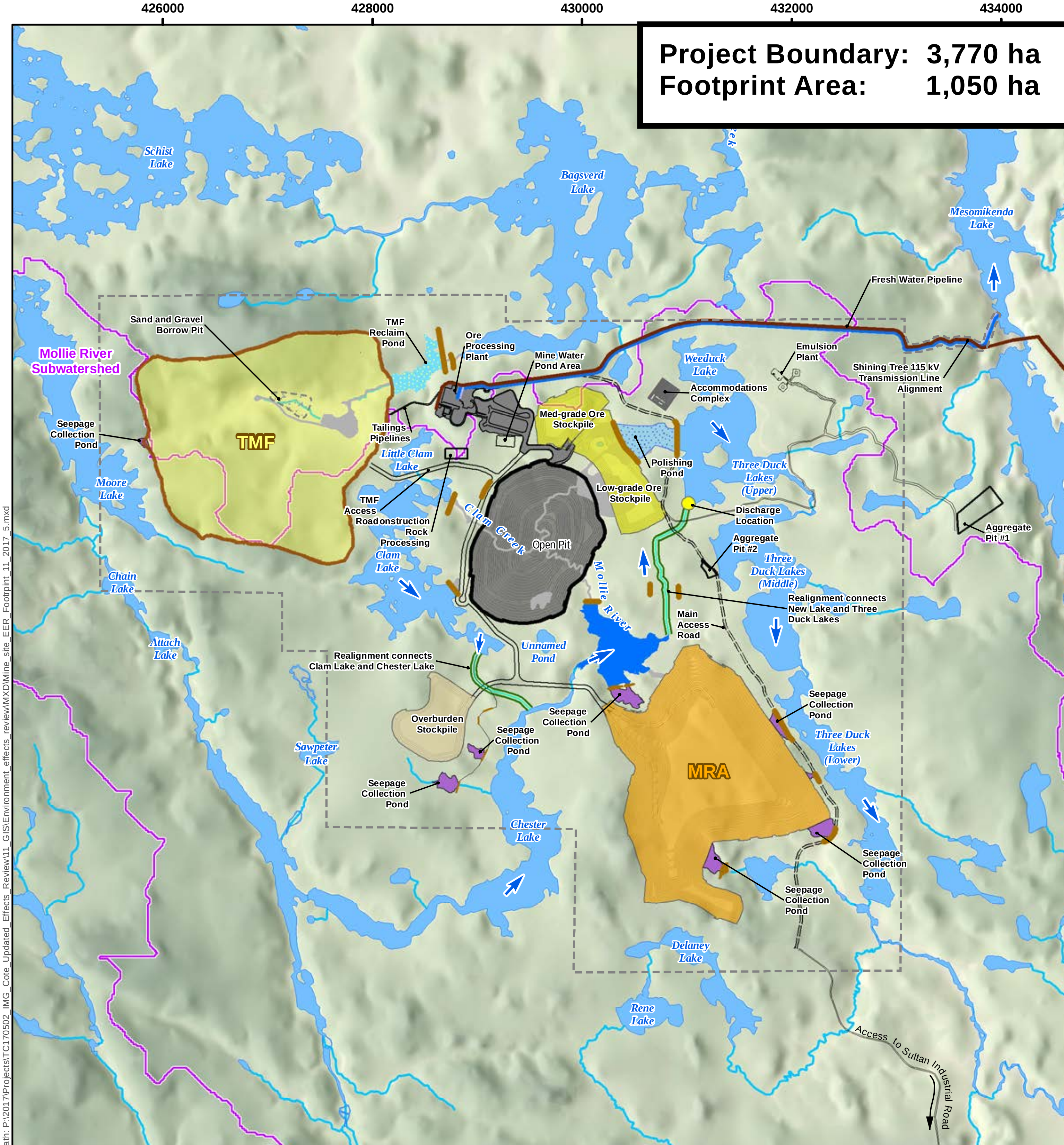
FIGURES



LEGEND

Mine Site

- Watercourses
- Overprinted Watercourses
- Waterbodies
- Overprinted Waterbodies
- Subwatershed Boundary
- Open Pit
- Potential Discharge Location
- Facilities
- Dam
- Main Access Road
- Shining Tree 115 kV Transmission Line Alignment
- Watercourse Realignment
- Fresh Water Pipeline
- Proposed Water Flow Direction
- Proposed Lake Area
- Overburden Stockpile
- Ore Stockpile
- Proposed Mine Rock Area (MRA)
- Proposed Tailings Management Facility (TMF)
- TMF Reclaim Pond
- Polishing Pond
- Seepage Collection Pond
- Sand and Gravel Borrow Pit

0 1 2 3 4 5 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNRF)
- Only major facilities are shown. Connecting infrastructure and supporting facilities are generally not shown.
- Scale when printed 8.5 x 11 in

Datum: NAD83
Projection: UTM Zone 17N

N S E W

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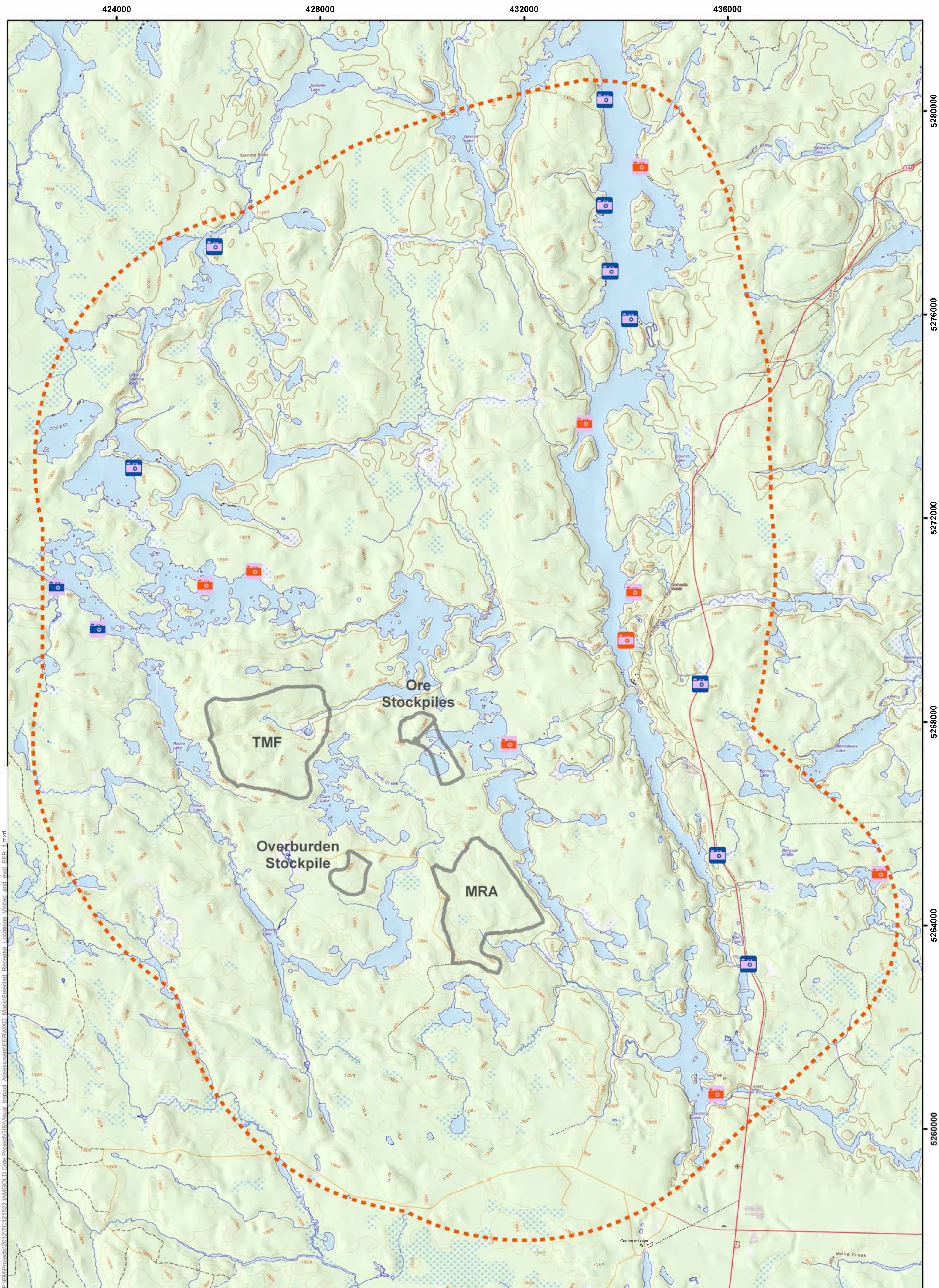
CÔTE GOLD PROJECT

Site Plan
Environmental Effects Review

PROJECT N°: TC170502	**FIGURE: 1**
SCALE:1:50,000	DATE: November 2017



LEGEND

Visual Aesthetics Local Study Area

Project Components being Modeled for Visibility for EER

Potential receptor locations visited during the winter (2013) field campaign not remodelled for EER due to obvious line-of-sight obstructions

Potential receptor locations visited during the winter (2013) field campaign remodelled for EER due to possible line-of-sight visibility change for current project component arrangement

Potential receptor locations visited during the winter and summer (2013) field campaigns not remodelled for EER due to obvious line-of-sight obstructions

Potential receptor locations visited during the winter and summer (2013) field campaigns remodelled for EER due to possible line-of-sight visibility change for current project component arrangement

0 1.25 2.5 5 7.5 10 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNR)

Datum: NAD83
Projection: UTM Zone 17N

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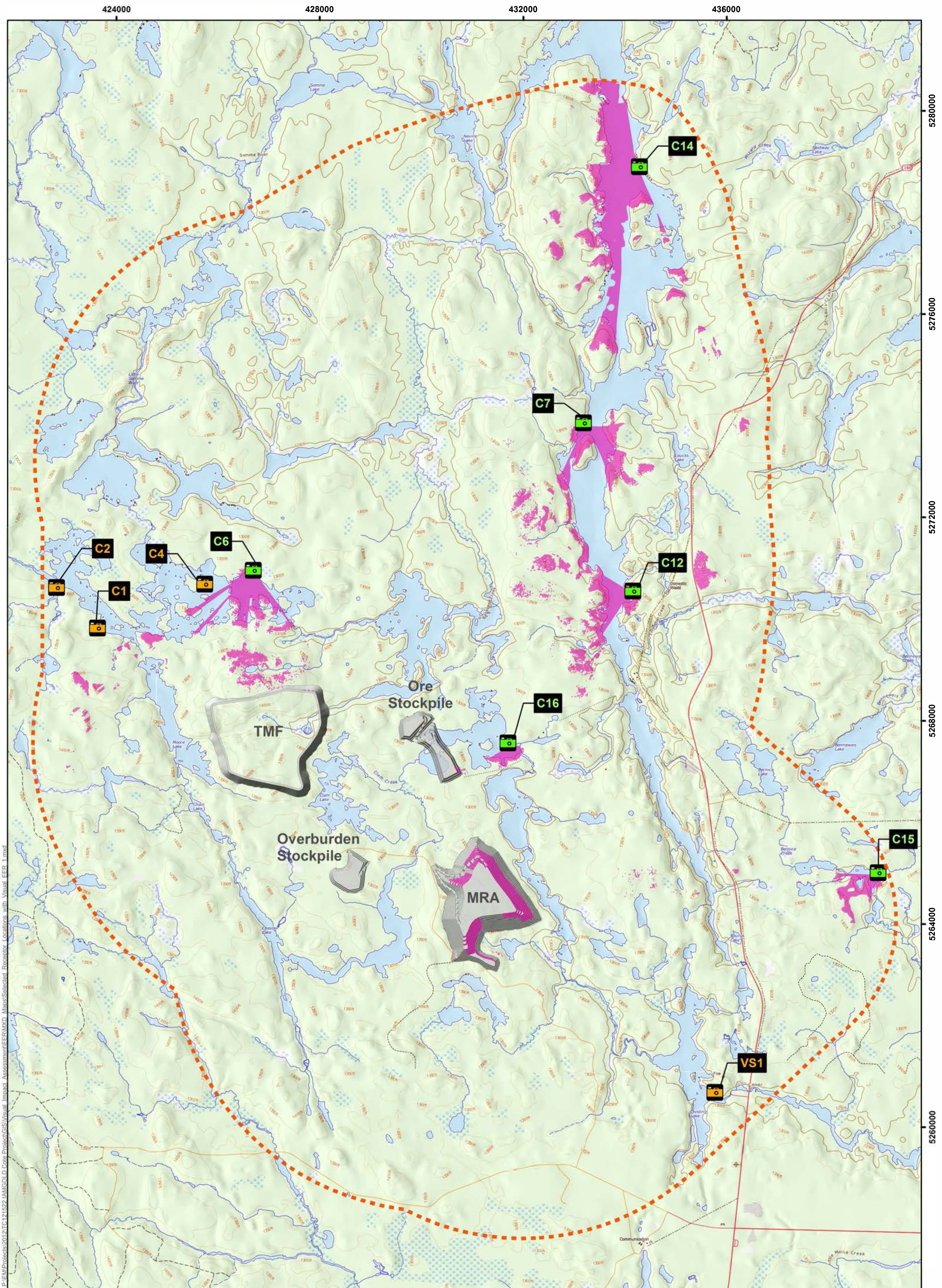
CÔTÉ GOLD PROJECT

Selected Visual Receptor Locations Visited During Field Campaigns and Remodelling Status for EEM

PROJECT N°: TC170502	FIGURE: 2
SCALE: 1:68,000	DATE: November 2017



LEGEND

- Visual Aesthetics Local Study Area
- Receptor Locations where Line-of-sight is Unobstructed (Labelled with ID)
- Receptor Locations where Line-of-sight is Obstructed (Labelled with ID)
- Combined Modeled Visible Areas from all 6 Receptor Locations

0 1.25 2.5 5 7.5 10 Kilometres

NOTES:
- Ontario base data extracted from Land Information Ontario (MNR)

Datum: NAD83
Projection: UTM Zone 17N

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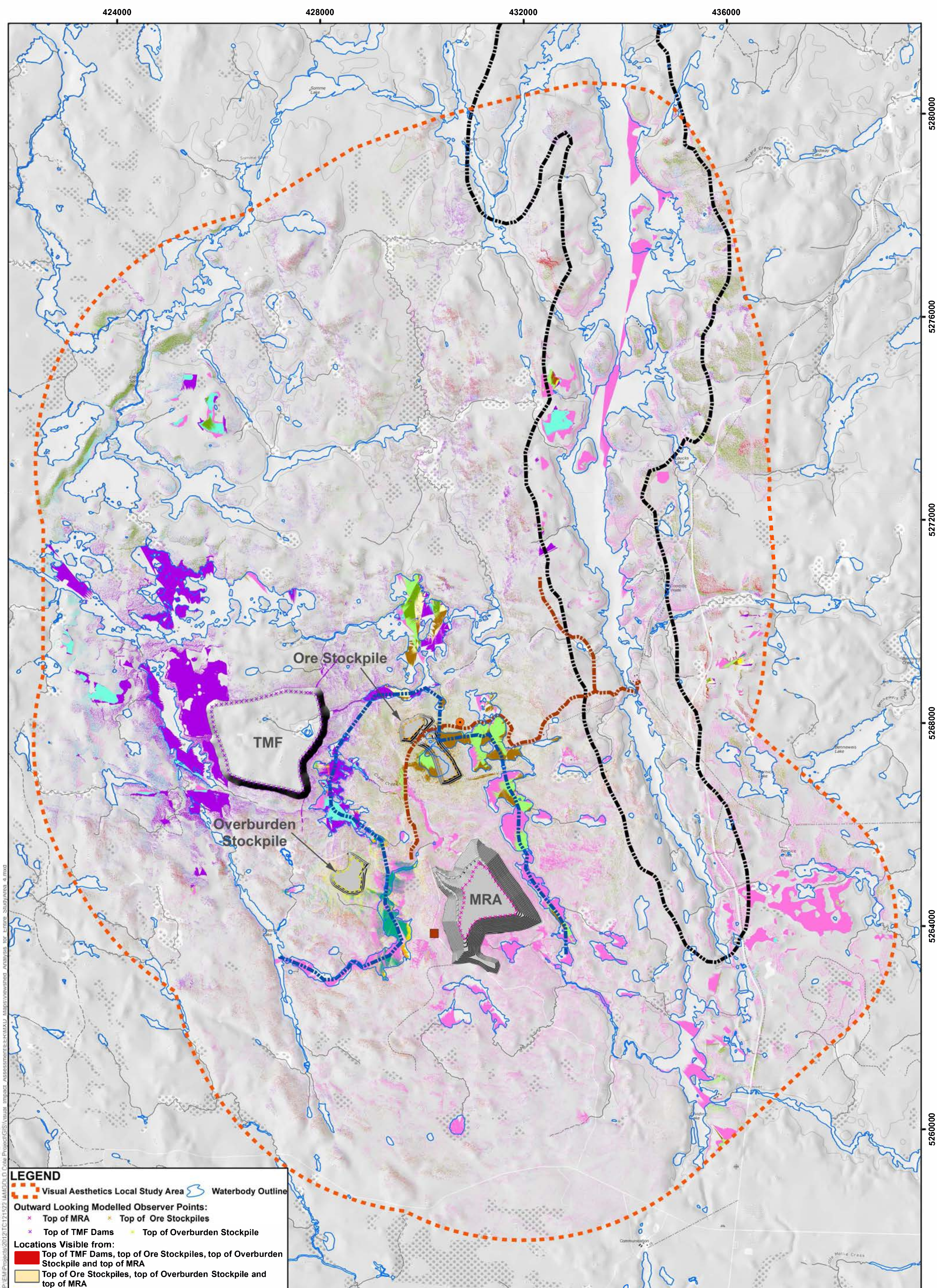
CÔTÉ GOLD PROJECT

Modeled Visible Areas from Visual Receptors for EER

PROJECT N°: TC170502	**FIGURE: 3**
SCALE: 1:68,000	DATE: December 2017



LEGEND

Visual Aesthetics Local Study Area
Waterbody Outline

Outward Looking Modelled Observer Points:

- Top of MRA
- Top of Ore Stockpiles
- Top of TMF Dams
- Top of Overburden Stockpile

Locations Visible from:

- Top of TMF Dams, top of Ore Stockpiles, top of Overburden Stockpile and top of MRA
- Top of Ore Stockpiles, top of Overburden Stockpile and top of MRA
- Top of TMF Dams, top of Ore Stockpiles and top of Overburden Stockpile
- Top of TMF Dams, top of MRA and top of Overburden Stockpile
- Top of TMF Dams, top of MRA and top of Ore Stockpiles
- Top of Overburden Stockpile and top of Ore Stockpiles
- Top of MRA and top of Overburden Stockpile
- Top of TMF and top of Overburden Stockpile
- Top of MRA and top of Ore Stockpiles
- Top of TMF and top of Ore Stockpiles
- Top of TMF and top of MRA
- Top of TMF
- Top of MRA
- Top of Overburden Stockpile
- Top of Ore Stockpiles

TK / TLU Identified Areas:

- Wildlife (Eagle Nest)
- Waterfowl Hunting Area
- Portage Route
- Waterfowl Hunting Route
- Sensitive Areas (1Km Buffer)

Viewshed Analysis Interpretation Key:

- Speckled colour areas indicate forest canopy visual, not ground level visual
- Solid colour areas indicate ground or water surface visual, not canopy visual

NOTES:
- Ontario base data extracted from Land Information Ontario (MNR)
- Portage route, Waterfowl Hunting route, Sensitive Areas, Wildlife and Hunting points provided and extracted by Wildlife Mattagami/Flying Post TK/TLU

Datum: NAD83
Projection: UTM Zone 17N

0 1.25 2.5 5 7.5 10 Kilometres

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CÔTÉ GOLD PROJECT

Modeled Project Component Visible Areas in the Local Study Area

PROJECT N°: TC170502	FIGURE: 4
SCALE: 1:68,000	DATE: November 2017

APPENDIX I

EXECUTIVE SUMMARY

Visual aesthetics are of particular interest for the cottagers near the Project, as the Project has the potential to alter their visual landscapes. Given the distance of the Project with the nearby communities, visual aesthetics is not a concern for people living in Gogama, Timmins or Sudbury. Government agencies have expressed interest in being provided results of the visual aesthetics effects assessment. Similarly, Indigenous communities have expressed interest in the potential visual effects of the Project on their traditional territories.

In support of the Environmental Effects Review for the Côté Gold Project (the Project), Amec Foster Wheeler has assessed visual aesthetic effects for the following assessment indicators: Change in Landscape from Receptor Locations; Change in Landscape from Non-Receptor Locations; and Change in Landscape due to the Transmission Line.

Two fieldwork campaigns were carried out during the Environmental Assessment (EA) to capture the existing winter and summer visual landscapes. Twenty receptor locations were considered in the study area. Only 10 of the 20 initial receptor sites were remodelled using the Project site plan layout due to line of sight obstructions presented during the EA site plan visual aesthetics modelling in 2013.

The components that were initially identified to have the potential to be seen from receptor locations included: the Ore Stockpiles, the Tailings Management Facility (TMF), the Mine Rock Area (MRA) and the Overburden Stockpile. In order to determine whether the proposed components would be visible from specific receptor locations, a 3D surface model was prepared with the Project design specifications for the stockpiles and TMF, existing LiDAR data as well as information on the estimated canopy height in the vicinity of the Project.

The viewshed analysis determined that 5 of the 10 receptor locations that were remodelled for the Project had a clear line of sight to the MRA and 1 of the 10 receptors locations had a clear line of sight to the TMF. In general, the MRA is reduced in elevation compared to the EA; the Project MRA design and visual effects to the five receptors is also reduced compared to the EA. The relocated TMF will be visible from one receptor on Schist Lake, whereas the TMF location in the EA was not visible from the receptors. Overall, the number of receptors that will have the viewscape affected by the Project is consistent with the EA.

For all Project phases, the EA conclusions remain unchanged. The Project does not have the potential to affect the visual landscape of nearby receptors during the Construction phase. During the remaining phases, effect of the Project on the visual landscape is perceptible but will not affect enjoyment of the viewscape for the receptors.

To assess Change in Landscape from Non-Receptor Locations, a full landscape area viewshed analysis was conducted for the local study area in order to identify areas on the ground where at least the highest portions of the Project components would be visible.

Results indicate that the MRA will be the most prominent Project component, being visible from Clam Lake, Chester Lake, Three Duck Lakes, Bagsverd Lake, Delaney Lake, Rene Lake and portions of Schist Lake, Dividing Lake and Mesomikenda Lake. However, the reduced size and change in location of the MRA reduces the visibility of the structure compared to the EA layout.

Compared to the EA layout, the TMF has taller dams and has been relocated to the west of the open pit. It is predicted to be visible from Schist Lake, Bagsverd Lake, Clam Lake, Chain Lake, Chester Lake and Moore Lake. The Ore Stockpiles, which are a relatively small Project feature compared to the TMF and MRA, will be seen from portions of Bagsverd Lake and Three Duck Lakes, which is consistent with the EA. The Overburden Stockpile is predicted to be visible from Chester Lake and Clam Lake.

Overall and consistent with the EA Visual Aesthetics Technical Support Document, the analysis the changes in the visual landscape during all Project phases will be perceptible but will not affect enjoyment of the viewscape.

The Project requires some upgrading of an existing transmission line between Timmins and Shining Tree, and re-clearing, widening, and installation of a new 44 km 115 kV transmission line between Shining Tree and Site, compared to a 120 km 230 kV transmission line assessed in the EA. Consistent with the EA, during the Construction, Operations and Closure phases, the new 44 km transmission line segment is expected to result in a perceptible change in landscape, which does not affect enjoyment of the viewscape. Following establishment of vegetation in the Post-closure phase the right-of-way will eventually return to its original state. Compared to current baseline conditions, it is anticipated that this effect will no longer be perceptible.

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APPENDIX II

UPDATED RECEPTOR SHEETS

RECEPTOR LOCATION C7

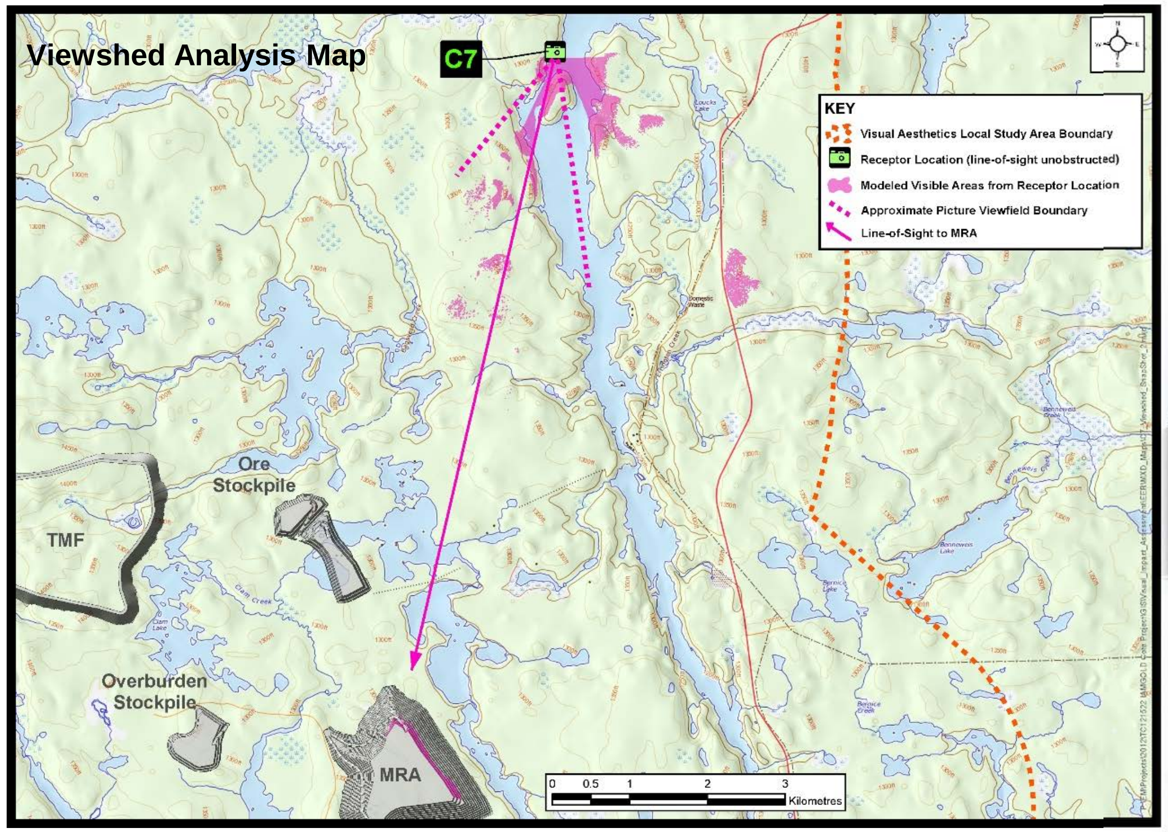
Description: Dock on Mesomikenda Lake for Cottage Located in the Forest

Longitude: 81° 53' 20.8" W

Latitude: 47° 36' 52.9" N

Distance from MRA: 8.8 km

Angle of View: Southwest



Receptor View – Winter Photograph Rendering

Baseline Photograph – Winter 2013

Receptor View – Summer Photograph Rendering

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RECEPTOR LOCATION C12

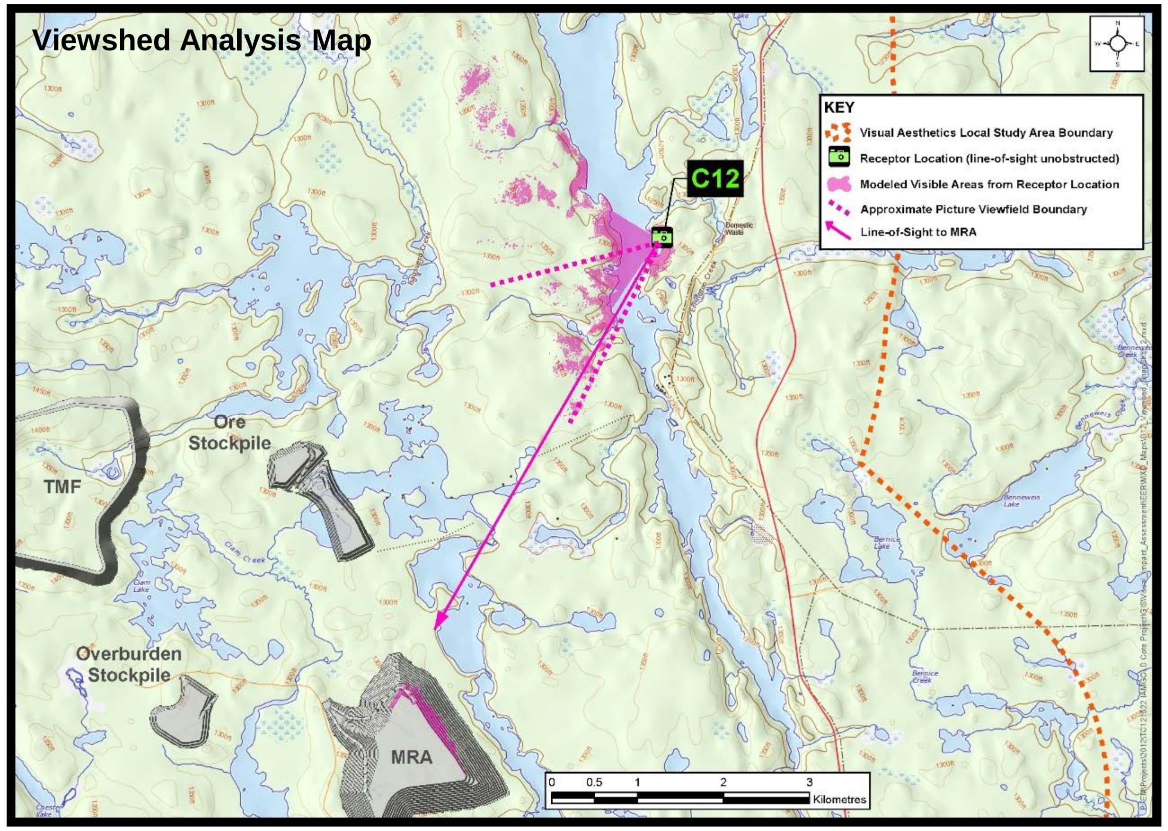
Description: Multiple Cottages on Mesomikenda Lake

Longitude: 81° 52' 32.5" W

Latitude: 47° 35' 6.1" N

Distance from MRA: 6 km

Angle of View: Southwest



Receptor View – Winter Photograph Rendering

Baseline Photograph – Winter 2013

Receptor View – Summer Photograph Rendering

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RECEPTOR LOCATION C14

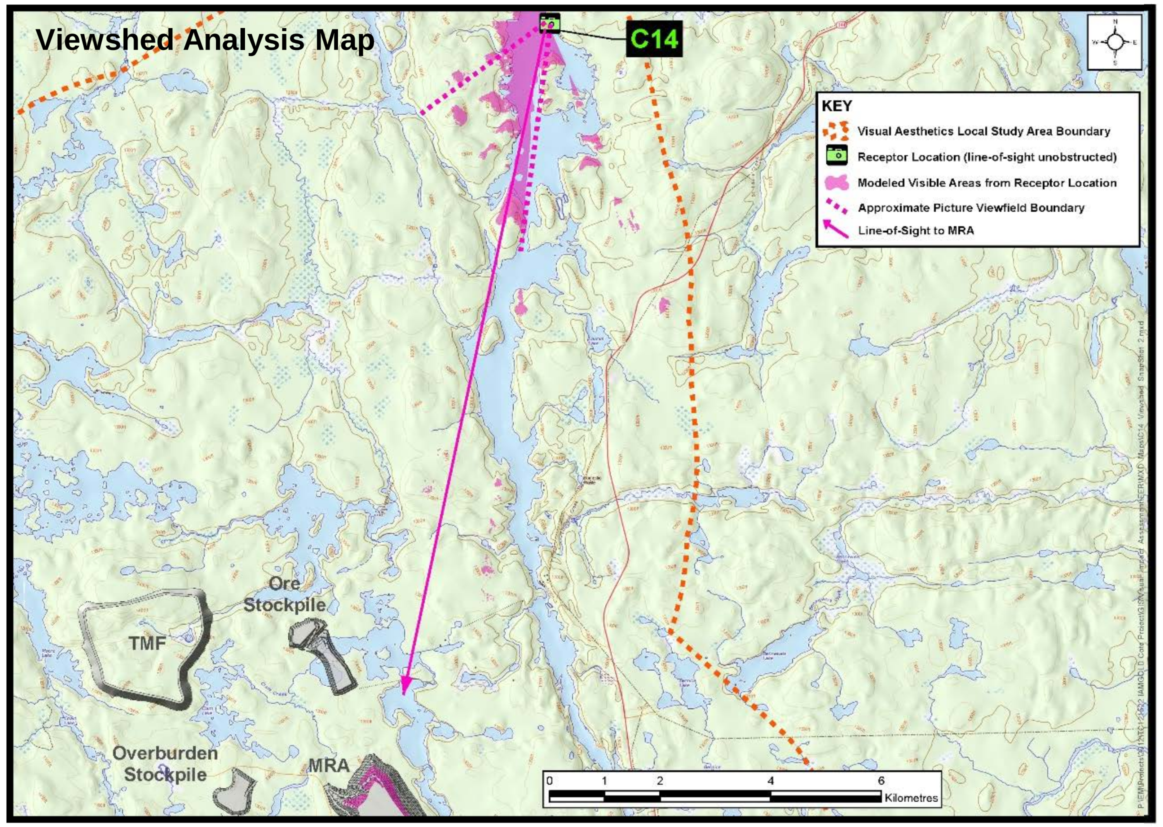
Description: Multiple Cottages on Mesomikenda Lake

Longitude: 81° 52' 30.9" W

Latitude: 47° 39' 36.7" N

Distance from MRA: 14 km

Angle of View: Southwest



Receptor View – Winter Photograph Rendering

Baseline Photograph – Winter 2013

Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION C15

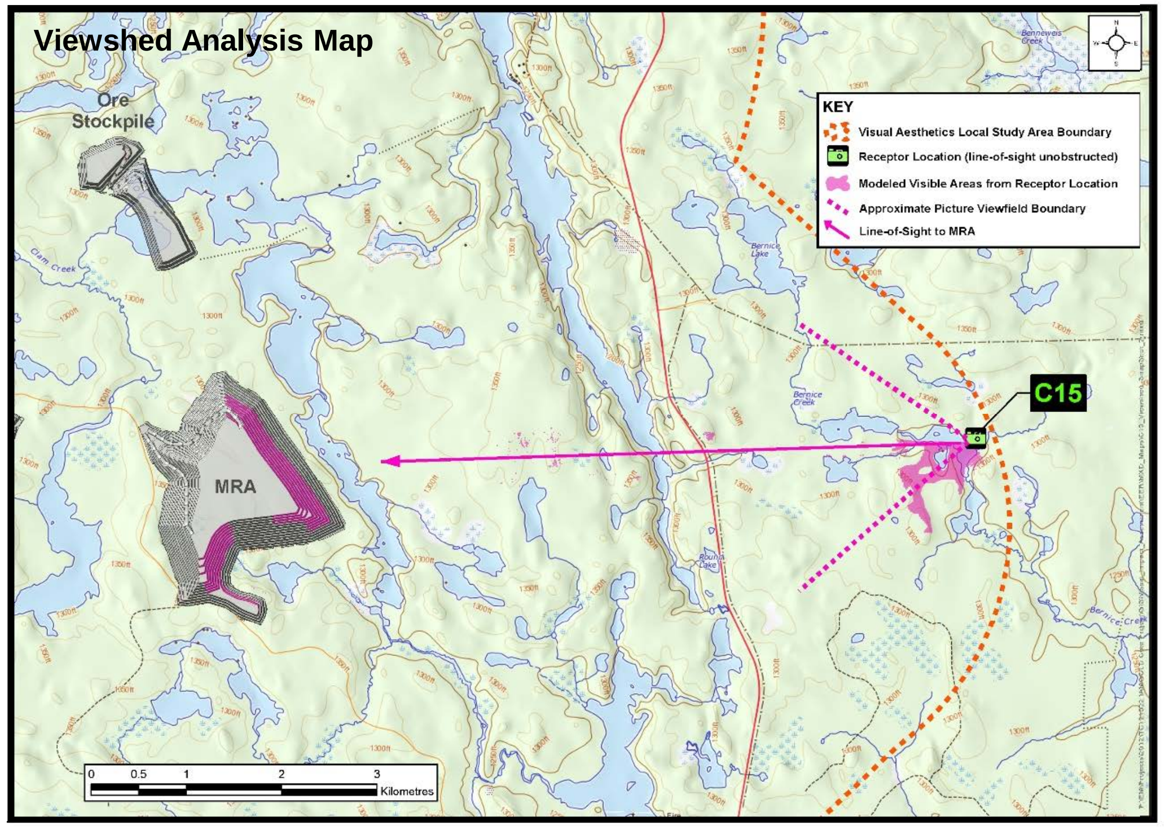
Description: Cabin on Annex Lake

Longitude: 81° 48' 38.8" W

Latitude: 47° 32' 8.4" N

Distance from MRA: 7 km

Angle of View: West




Receptor View – Winter Photograph Rendering


Baseline Photograph – Winter 2013


Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION VS1

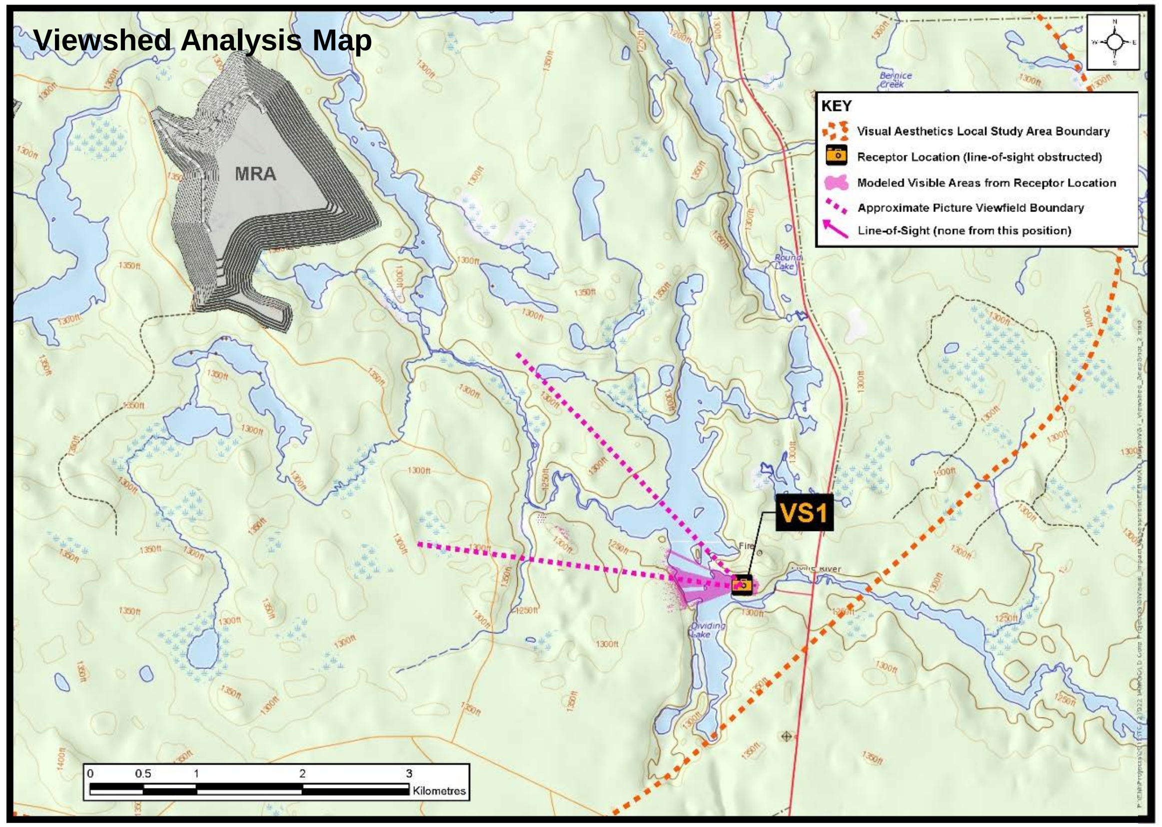
Description: Rangers Camp on Dividing Lake

Longitude: 81° 51' 10.1" W

Latitude: 47° 29' 47.2" N

Distance from MRA: 6 km

Angle of View: Northwest




Receptor View – Winter Photograph Rendering


Baseline Photograph – Winter 2013


Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION C4

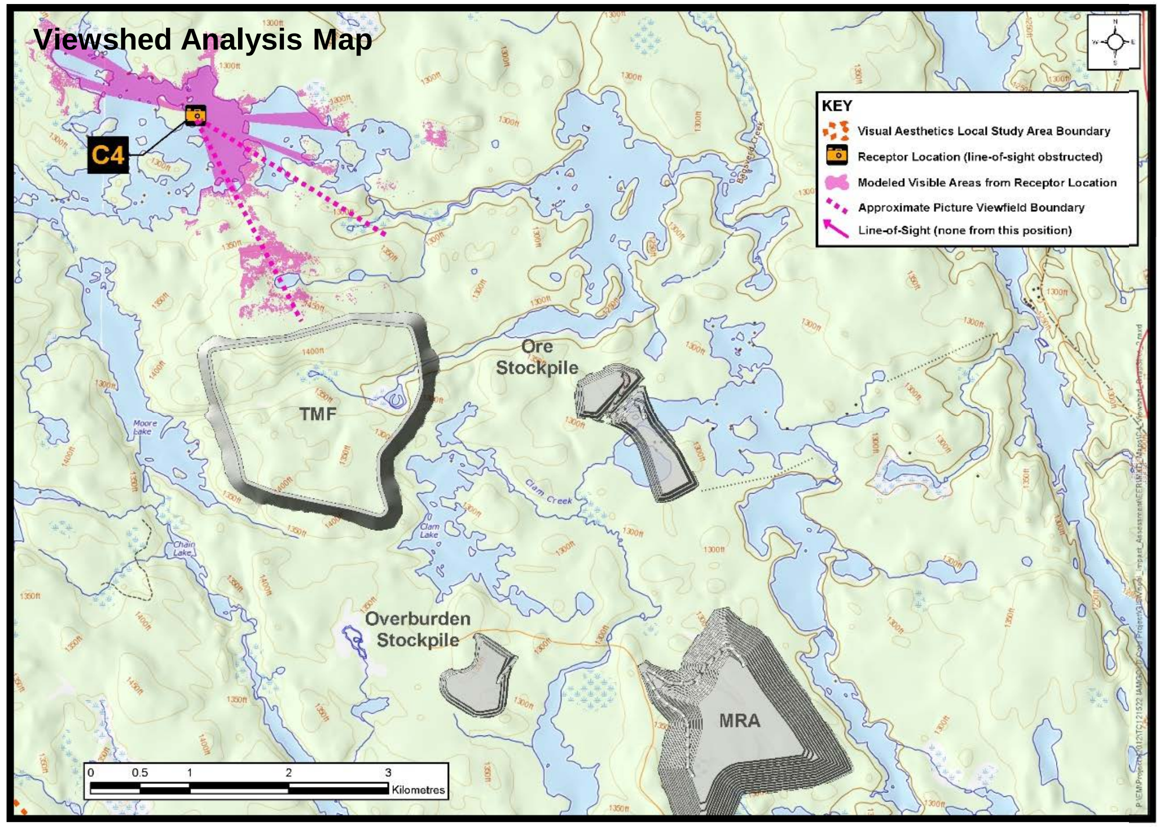
Description: Cabin on Schist Lake

Longitude: 81° 59' 15.6" W

Latitude: 47° 35' 7.3" N

Distance from MRA: 7.4 km
Distance from TMF: 2.4 km

Angle of View: Southeast



Receptor View – Winter Photograph Rendering

Baseline Photograph – Winter 2013

Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION C16

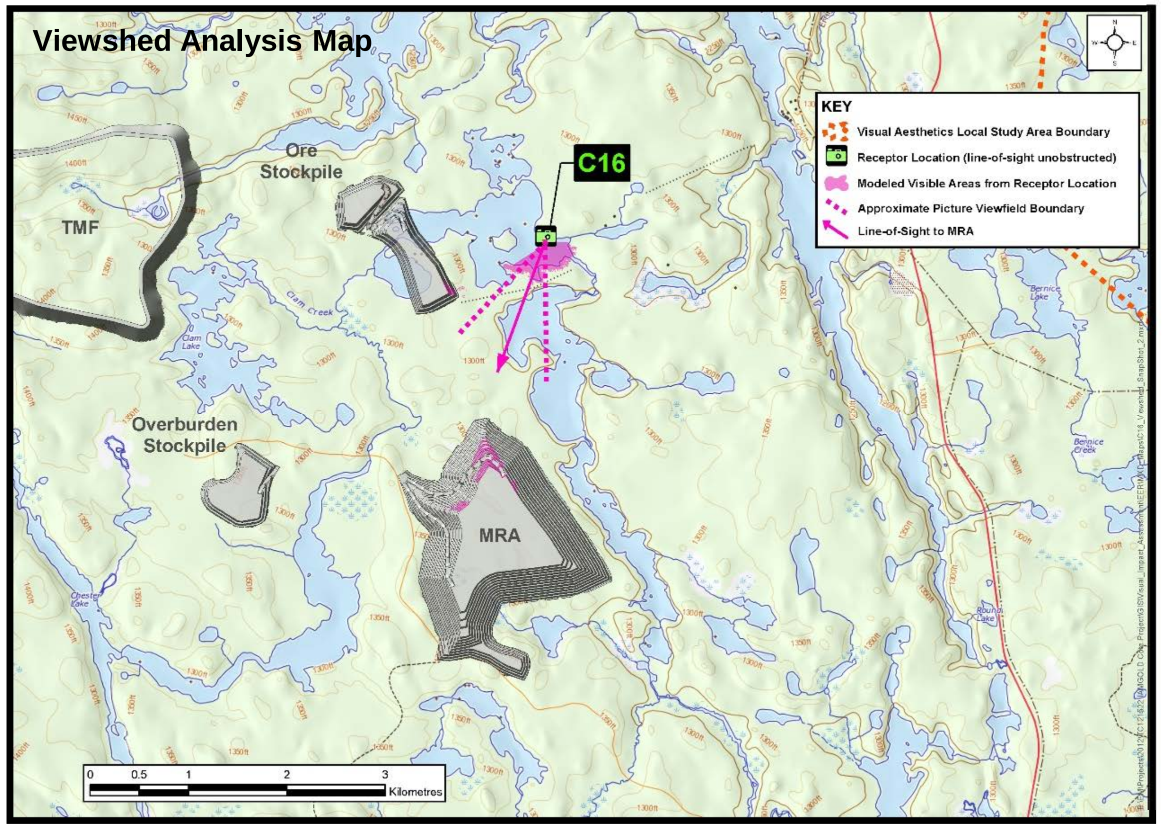
Description: Trapper's Cabin On Three Duck Lakes

Longitude: 81° 54' 28.4" W

Latitude: 47° 33' 28.6" N

Distance from MRA: 2.2 km

Angle of View: Southwest



Receptor View – Winter Photograph Rendering

Baseline Photograph – Winter 2013

Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION C6

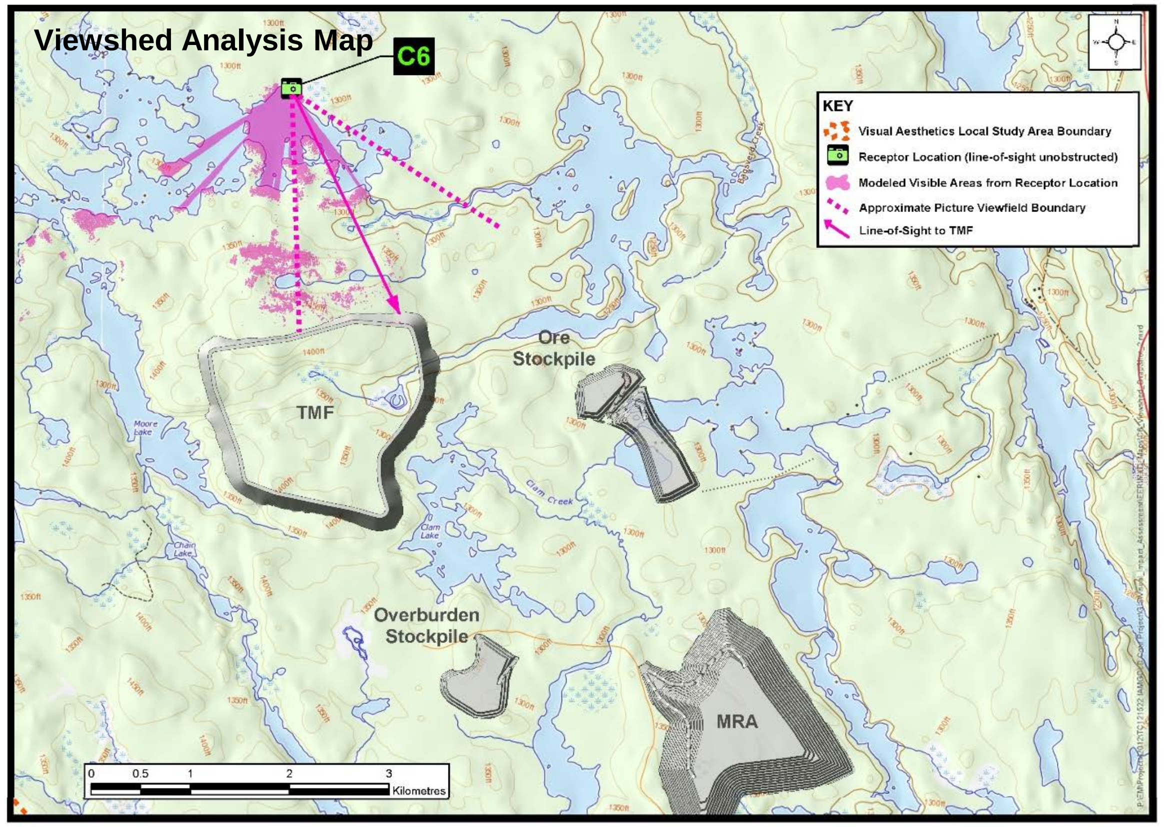
Description: Cabin on Schist Lake

Longitude: 81° 58' 29.9" W

Latitude: 47° 35' 16.4" N

Distance from TMF: 2.6 km

Angle of View: Southeast



No Comparable Winter Photograph Available


Baseline Photograph – Summer 2013


Receptor View – Summer Photograph Rendering

RECEPTOR LOCATION C1

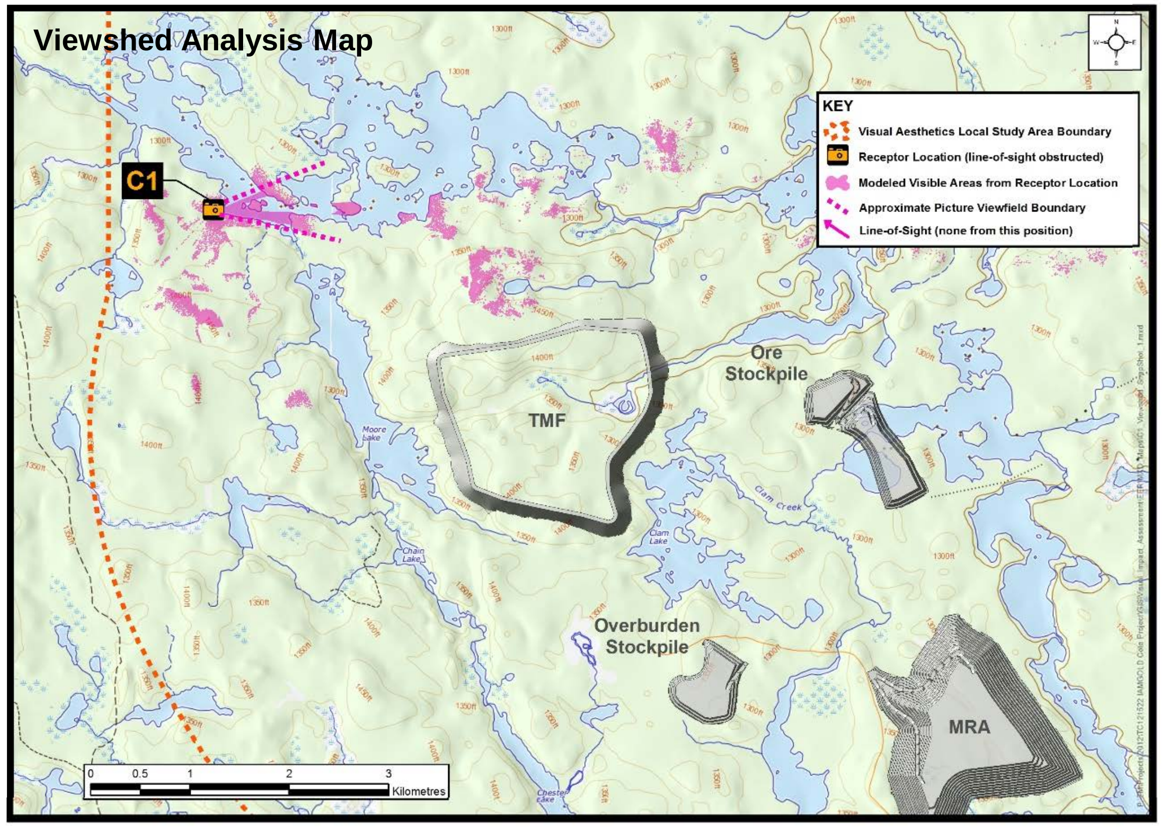
Description: Cabin on Schist Lake

Longitude: 82° 0' 57.1" W

Latitude: 47° 34' 37.5" N

Distance from TMF: 2.9 km

Angle of View: East



No Comparable Summer Photograph Available

Baseline Photograph – Winter 2013

Receptor View – Winter Photograph Rendering

RECEPTOR LOCATION C2

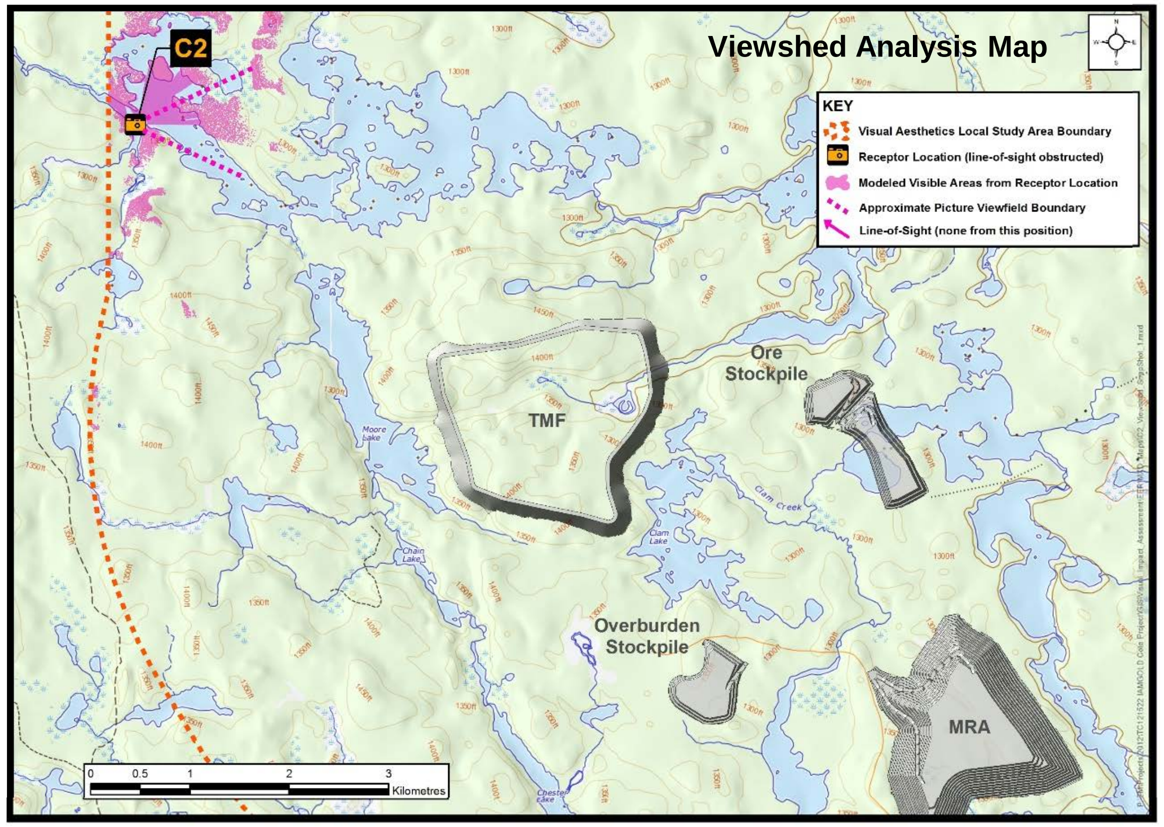
Description: Cabin on Schist Lake

Longitude: 82° 1' 35.2" W

Latitude: 47° 35' 4.8" N

Distance from TMF: 3.1 km

Angle of View: East



No Comparable Summer Photograph Available


Baseline Photograph – Winter 2013


Receptor View – Winter Photograph Rendering

B-13: Updated Technical Memorandum: Socio-Economic

Memorandum

To:	Steve Woolfenden	**From:**	Krista Maydew
Company:	IAMGOLD Corporation		Amec Foster Wheeler
cc:	Don Carr (Amec Foster Wheeler) Stephan Theben (SLR Consulting)	**Date:**	May 1, 2018
Subject:	**CÔTÉ GOLD PROJECT** **ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: SOCIO-ECONOMIC		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open-pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD is proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'

This updated technical memorandum has been prepared by Amec Foster Wheeler and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Air Quality
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;
- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;

- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics; and
- Updated Technical Memorandum: Archaeology and Built Heritage.

1.1 Socio-Economic

In 2014, Amec Foster Wheeler conducted an assessment of potential Project-related effects on the socio-economic environment. The socio-economic baseline study and socio-economic assessment were included as a Socio-economic Technical Support Document, appended to the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA').

Since the submission of the EA, IAMGOLD has further considered feedback received from government regulators, technical experts, local stakeholders and Indigenous communities regarding the Project. The feedback has contributed to IAMGOLD evaluating changes resulting in the optimization of the Project design through an EER. Specific comments received from First Nations and Métis following submission of the EA related to socio-economics related to:

- Monitoring Project-related socio-economic effects on Indigenous and non-Indigenous populations;
- interest in training, employment and business opportunities; and
- benefits to local communities.

These comments were addressed through additional mitigation, enhancement and monitoring activities detailed in Sections 4.0 and 5.0 of this memorandum.

Key changes to the Project which are relevant to the socio-economic environment include:

- A reduced processing rate from 60,000 tonnes per day (tpd) to 36,000 tpd; and
- an increase in the anticipated life of mine from 15 years to 17 years.

Other aspects of the Project relevant to the socio-economic environment which are anticipated to remain the same include:

- Length of Construction phase: two years;
- construction workforce size of 1,000 to 1,200;
- capital expenditures during construction estimated at $1,047 million; and
- operations workforce size of approximately 500.

Optimizations to the Project, which have reduced the footprint, are not relevant to the assessment of socio-economic indicators and as such are not discussed in this technical memorandum.

2.0 METHODOLOGY

2.1 Spatial Boundaries

The spatial boundaries considered for potential Project-related socio-economic effects are unchanged from the EA. The socio-economic local study area includes communities that are closest to the Project site and could therefore experience more direct socio-economic Project effects. The local study area (LSA) is comprised of Gogama and Mattagami First Nation reserve (Mattagami Indian Reservation #71) and the portion of Highway 144 that connects these communities with the Project site.

The regional study area (RSA) or the socio-economic prediction of effects is defined as the area that could be influenced by the Project and is unchanged from the EA.

RSA communities include Gogama, City of Timmins, City of Greater Sudbury, Unorganized North Sudbury Subdivision and Unorganized Timiskaming West. The portion of Highway 144 that connects the Project site with the City of Timmins to the north and City of Greater Sudbury to the south is also considered part of the regional study area. It is recognized that although some socio-economic influences may be felt outside of the regional study area (for example, procurement of equipment in other parts of Canada or internationally), the primary socio-economic effects are expected to be experienced in the local and regional study areas.

Indigenous communities included in the regional study area consist of:

- Flying Post First Nation;
- Brunswick House First Nation;
- Matachewan First Nation; and
- Métis Nation of Ontario – Region 3.

2.2 Temporal Boundaries

The temporal boundaries of the Project are unchanged from the EA; they will span all phases of the Project:

- Construction;
- Operations;
- Closure; and
- Post-closure.

2.3 Effects Assessment Indicators

The effects assessment indicators have not changed from the EA, and include:

- Economic indicators:
  - Labour Market;
  - Business Opportunities;
  - Government Finances;
- Social indicators:
  - Population and Demographics;
  - Community Health Conditions;
  - Housing and Temporary Accommodation;
  - Public Utilities;
  - Education;
  - Emergency Services;
  - Other Community Services; and
  - Transportation.

2.4 Prediction of Effects

The Project's economic effects were estimated in the EA using the provincial input / output economic multipliers for Ontario as provided by the Industry Accounts Division of Statistics Canada. Although changes have been made to the Project description, the capital cost remains the same; therefore, an update to the 2014 economic effects assessment results is not required. A qualitative update / confirmation of predicted effects is described in Section 3.0.

Following EA approval, additional statistical information about the study area communities has become available with the release of the 2016 Census data by Statistics Canada in 2017. A qualitative review of additional statistical data available about the study area was taken into account when reviewing the EA effects predictions for each of the social indicators discussed in Section 3.0.

3.0 PREDICTION OF EFFECTS

Effects predictions by socio-economic indicators and Project phases are presented in the following sections.

3.1 Construction Phase

Labour Market

According to the EA, over the Construction phase, residual effects on labour markets are positive and highly distinguishable in the RSA. The Project is expected to provide 2,637-person years of work (direct employment) and peak on-site employment will average 1,116 workers annually. Total indirect and induced employment in Ontario is projected to be about 1,521 person-years. Based on assessments of the regional capacity to provide services and labour, it is predicted that 60% of the construction workforce will be hired from the RSA and 40% from elsewhere in the province of Ontario. Jobs created by the Project will be relatively lucrative; people from the RSA directly employed in the construction of the Project are expected to earn an average of $148,645 annually in labour compensation. Although the median employment income for persons aged 15 years and over within the RSA communities has increased since the baseline study was conducted for the EA, the predicted effects are not anticipated to change. The average annual Project labour compensation is anticipated to be approximately 2.5 times the urban RSA average median earnings of those working full-time and about 4.5 times the average median earnings for all those persons aged 15 and over. Since the construction inputs haven't changed from the EA inputs, all the above described effects remain unchanged.

Business Opportunities

According to the EA, the Project is expected to have a positive, highly distinguishable effect on business opportunities in the local and regional study areas. Spending during the Construction phase has been estimated to be approximately $648 million on goods and services. This is an estimate of spending in the region over the Construction phase based on benchmarks. Businesses in the RSA can supply every major input demanded by the Project. Since the construction inputs haven't changed from the EA inputs, all the above described effects remain unchanged.

Government Finances

According to the EA, effects from the Project are also expected to be positive and outside normal variation for government revenues, with some $160 million in provincial and federal government revenues anticipated through direct economic activity and $240 million through direct, indirect and induced economic activity. Since the construction inputs haven't changed from the EA inputs, all the above described effects remain unchanged.

Population and Demographics

The projected workforce size required for Project construction is the same as that used for population and demographics effects predictions in the EA. Population and demographic conditions within the local and regional study area have not changed dramatically since the baseline conditions were reported as part of the EA. The population within the local and regional study area communities has grown by roughly 680 people (0.3% increase) with growth occurring in Gogama, the City of Greater Sudbury, Unorganized North Sudbury Subdivision and Unorganized Timiskaming West Subdivision. The other communities in the area reported static populations except for Timmins whose population shrunk by approximately 3.2% or 1,375 persons (Statistics Canada 2017). The effects predictions on population and demographics in the EA remain unchanged.

Community Health Conditions

The EA predicted no measurable effects on community health conditions within the local and regional populations. There is no anticipated change to this effects prediction anticipated as a result of updates to the Project.

Housing and Temporary Accommodation

Residual effects predictions in the EA on housing stocks in urban areas during the Construction phase were considered to be within the normal range of variability. Demand for housing in Gogama was predicted to increase and be distinguishable; however, it is anticipated that surplus housing in the area would be sufficient to meet the demand. Considering demands for new housing on the Mattagami First Nation reserve and existing wait lists for housing at the time of the EA it is unlikely that the First Nation would experience population increases linked to the Project. Since the anticipated construction workforce size has not changed from that proposed in the EA, there are no anticipated changes to EA effects predictions related to housing and temporary accommodation.

Public Utilities

Population changes in Timmins and Sudbury are not expected to have a noticeable effect on demand for public utilities. Increases in population in Gogama and Mattagami First Nation may place additional demands on public utility infrastructure; however, there are no concerns or capacity issues with provision of public utilities on the Mattagami First Nation reserve. With no change in the proposed construction workforce size, there are no anticipated changes to EA effects predictions related to public utilities.

Education

Education effects in the EA were predicted to be positive and within the normal range of variability. No changes in effects to education services predictions are anticipated as a result of updates to the Project.

Emergency Services

Efforts to avoid and mitigate potential negative effects of increased population on emergency services, as proposed in the EA, are expected to reduce effects to a level where they would not require additional community or government response or investment. Changes to the proposed Project will not affect the EA effects predictions related to emergency services.

Other Community Services

The EA predicted that effects on community services in Timmins and Sudbury are expected to be within the normal range of variability and last throughout the life of the Project. Increased demands for community services are likely to occur and be distinguishable in Gogama and Mattagami First Nation, with positive effects on recreation services and adverse effects on social services (e.g., shelters, victims' services, child care and health care) during construction. No changes in effects predictions related to community services are anticipated as a result of updates to the Project.

Transportation

Project related traffic volumes are expected to remain consistent with those predicted in the EA given the static workforce size and capital expenditure anticipated during construction. Therefore, no changes in effect predictions related to transportation are anticipated as a result of updates to the Project.

3.2 Operations Phase

Labour Market

According to the EA, on average, the Project will annually create direct employment for about 582 people in Ontario. Annual indirect and induced employment in Ontario during operations is expected to total an estimated 530 and 500 jobs, respectively. Total labour compensation from direct employment is estimated to be $89.4 million and total labour compensation from direct, indirect and induced employment is $147.6 million. Operations earnings are expected to be far higher than current local and regional study area median earnings: average projected earnings (including only wages and benefits) per direct employee ($153,800) are 2.5 times the current median earnings for full time workers within the local and regional study areas. This is considered a positive effect that is clearly distinguishable and a measurable change in employment and income that will last until after peak production and will start to decline in Year 15, although the magnitude is expected to lessen thereafter. Other than the expanded duration of operations: from 15 years in the EA to 17 years, the operations inputs haven't changed from the EA. Accordingly, the predicted positive effects of the Operations phase on labour market are expected to be larger and span over a longer period of time (17 years instead of 15).

Business Opportunities

According to the EA, the Project is forecast to create an annual average of $177 million in contracted expenditures on goods and services in the Operations phase that will be spent primarily on professional services ($37.4 million), other finance and insurance ($22.6 million) and mineral support services ($20.4 million). Business in the RSA can supply every major input demanded by the Project. Residual effects are such that the Project's Operations phase is expected to make a clearly distinguishable and positive contribution to business opportunities in the local and regional study area throughout the Operations phase. Other than the expanded duration of operations, from 15 years in the EA to 17 years, the operations inputs haven't changed from the EA. Accordingly, the predicted positive effects of the Operations phase on business opportunities are expected to be larger and span over a longer period (17 years instead of 15).

Government Finances

According to the EA, the Project is estimated to generate $48 million annually in government revenue from the taxation of direct, indirect and induced activity, of which $35 million is expected to arise from the taxation of direct economic activity. Over the operational life of the Project, the Project is expected to raise $483 million for the Federal government and $241 million for the Provincial government. In the context of the regional economy where taxes from mining accounted for an estimated $484 million in 2011, the annual increase over the Operations phase in government revenues is estimated at around 10.0% of that amount. The effect on the RSA is therefore considered highly distinguishable. Other than the expanded duration of operations, from 15 years in the EA to 17 years, the operations inputs haven't changed from the EA. Accordingly, the predicted positive effects of the Operations phase on government finance are expected to be larger and span over a longer period (17 years instead of 15).

Population and Demographics

Changes in population resulting from Project operations as predicted in the EA are considered positive and are greatest when operations begin in Year 1 in Timmins and Sudbury, with a net increase of 106 net migrants each, an effect not likely to be noticeable. For Gogama and Mattagami First Nation, effects on population are anticipated to stabilize after Years 5 and 6. This is considered positive, but not distinguishable over the Operations phase. The anticipated workforce size during operations is consistent with that proposed in the EA and as such, the only anticipated change as a result of the Project is an extension of the duration of effect from 15 years to 17 years of operations.

Community Health Conditions

The EA predicted that community health conditions throughout Project operations are expected to be within the normal range of variability. No changes to EA predictions are anticipated as a result of the Project lifespan.

Housing and Temporary Accommodation

Anticipated declines in housing requirements within the local and regional study area associated with on-site workforce declines nearing the end of operations would be deferred by two years as a result of the update in the projected operations timeframe from 15 to 17 years.

Public Utilities

The Project site will have its own supply of power and potable water, sewage treatment and solid waste disposal. No residual effects were predicted in the EA on public utilities during operations; this remains unchanged.

Education

Effects on education services during operations as predicted in the EA may have a distinguishable positive effect, sustaining or growing primary school enrollments. Positive effects were also predicted as new training needs for IAMGOLD workers hired through the Operations phase to replace leaving or returning workers could sustain post-secondary demands. The predicted effects remain unchanged.

Emergency Services

As noted in the EA, efforts to avoid and mitigate potential negative effects on emergency services during operations associated with increases in population and income are expected to reduce effects to noticeable but manageable levels throughout the life of the Project. This predicted effect remains unchanged with the exception that the effects may last an additional two years given the extended mine life.

Other Community Services

Demands for child care services as predicted in the EA are expected to be distinguishable but within the normal range of variability and last throughout the life of the Project. This remains unchanged; however, the duration of any effect will increase by two years as a result of the longer mine life.

Transportation

No residual effects on transportation were predicted in the EA; this remains unchanged.

3.3 Closure and Post-Closure Phase

Labour Market

According to the EA, annual indirect and induced employment in Ontario during closure is expected to total approximately 77 and 54 jobs, respectively. When added to direct employment, total employment in Ontario as a result of closure is 275 jobs per year. Total labour compensation from direct employment is estimated to be $12.0 million and total labour compensation from direct, indirect and induced employment is $24.4 million. Closure inputs have not changed from the EA. Accordingly, the predicted effects remain unchanged.

According to the EA, post-closure is expected to have fewer jobs associated with the Project (related to ongoing monitoring or site maintenance). Post-closure inputs have not changed from the EA. Accordingly, the predicted effects remain unchanged.

Business Opportunities

According to the EA, effects management strategies can help businesses develop the capacity to serve new clients during Project closure, but it cannot reverse the end of most (but not all) procurement opportunities arising from the Project. Internal capacity, in the form of improved management and processes, will foster new business activity. Still, reductions in expenditures relative to the Operations phase are expected to have an overall negative effect on business opportunities until they return to baseline conditions. Closure and post-closure inputs have not changed from the EA. Accordingly, the predicted effects remain unchanged.

Government Finances

According to the EA, during the Closure phase the Project is expected to generate $14.4 million in government revenues through direct economic activity and an additional $3.4 million through indirect and induced economic activity and to generate no government revenues in post-closure. Although some tax revenues are gained through the Closure phase, overall the effect on government revenue is a predictable decline relative to those seen in the Operations phase which may be a temporary negative effect as government revenues return to baseline conditions. These effects are within the normal range of variability. Closure inputs are unchanged from the EA. Accordingly, the predicted effects remain unchanged.

The Project will generate no government revenues post-closure. Government revenues will return to baseline conditions. These effects are outside the normal range of variability. Post-closure inputs are unchanged from the EA; accordingly, the predicted effects remain unchanged.

Population and Demographics

There is no change to the EA prediction that community populations are expected to return to baseline conditions with the exception of workers who may choose to remain in the community to commute to a different mine, follow a different career path or retire. The only difference anticipated is that the return to baseline conditions would occur two years later than anticipated in the EA as a result of the extended life of mine.

Community Health Conditions

The EA predicted community health service provisions during operations are expected to be adequate to address demands in closure and Post-closure phases. Potential effects may be distinguishable during closure and will become indistinguishable in the Post-closure phase. This remains unchanged.

Housing and Temporary Accommodation

The EA predicted that housing prices would decline during closure and remain low during post-closure with potential risk of oversupply in Gogama should additional housing development occur in Gogama during the life of the Project. Effects on housing and temporary accommodation predicted in the EA are not anticipated to change; rather they will commence two years later than anticipated due to the extended life of mine.

Public Utilities

No residual effects on public utilities were anticipated in the EA. At closure and during post-closure, the Project upgrades to the transmission line from the Shining Tree substation to Timmins may be retained by Hydro One Networks Inc. who will own and operate the upgraded line. If retained by Hydro One Networks Inc., this line could serve to reinforce the local electrical grid.

Education

The EA predicted that there may be a decline in school enrolments and an increase in demand for post-secondary training as workers transition to employment elsewhere during closure and Post-closure phases. This effects prediction remains unchanged.

Emergency Services

The EA predicted that efforts to avoid and mitigate potential negative effects on emergency services during closure related to declining employment and population would fall within the normal range of variability of established service levels. This effect would last until the end of the Closure phase and possibly into the first few years of the Post-closure phase. This effects prediction remains unchanged.

Other Community Services

Increased demand for some community services was predicted in the EA linked to personal and family stresses during a period of decreased employment and/or transition to new employment. These effects were anticipated to last throughout the Closure phase and would diminish and become indistinguishable during the Post-closure phase. There are no changes to the Project that would alter the effects conclusions contained within the EA.

Transportation

The EA predicted no residual effects on transportation during the closure and Post-closure phases. This effects prediction remains unchanged.

4.0 MITIGATION MEASURES

Mitigation measures are generally applied to biophysical aspects to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. In the case of socio-economics, effects may be both positive and adverse, thereby warranting both mitigative and enhancement strategies to prevent, reduce, control or enhance potential effects on socio-economic aspects of the human environment.

The table below provides the mitigation and/or enhancement measures applicable to the socio-economic aspects of the EER and indicates if the mitigation or enhancement measures have changed or stayed the same from the EA. In the case of socio-economics, all measures proposed in the EA continue to be applicable. The table below also includes measures that were introduced post-EA in response to comments received during the EA review process (new text is indicated in italics), bringing the total number of socio-economic mitigation or enhancement measure commitments to 39.

Table 4-1: Mitigation Measures – Socio-Economic

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction and Operations	Labour Market / Population Demographics – local employment	Support employment of local community members where possible.	Support employment for local community members (First Nation, Métis communities and Gogama) *including opportunities to support environmental monitoring activities.*	n/a or as established in negotiated agreements.	Mitigation measure updated. Text in italics was added post-EA submission in response to comments received during the EA review period.
Socio-economic	Construction through Closure	Impacts on the exercise of Aboriginal* rights by the Métis rights-bearing community in the Project Area *Indigenous (previously referred to as Aboriginal in the EA), original wording maintained	*Through a memorandum of understanding, dated June 21, 2014, as amended by an Addendum dated February 1, 2016 (collectively, the "MOU"), Trelawney, a wholly-owned subsidiary of IAMGOLD, and the Métis Nation of Ontario intend to continue to*	IAMGOLD will continue to engage with the Métis community to address community priorities and potential impacts arising from the Project in accordance with the mechanisms outlined in the MOU.	n/a	New mitigation measure. This is a new mitigation added post-EA submission in response to comments received during the EA review period. This mitigation was added to the

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
		for consistency in wording comparison.	*develop a positive relationship and, should the Project receive regulatory approval, further commit to reaching an agreement on an Impact Benefit Agreement if commercially reasonable terms can be arrived at by the parties in accordance with the MOU. The agreement will aim to address mutually agreeable interests such as (i) terms for financial benefits, (ii) compensation relating to any specific and identifiable Project impacts which are not otherwise resolved through mitigation or accommodation, and (iii) other key areas including training, employment, environmental*			updated Appendix Y EA Commitment Tables and shared with the Canadian Environmental Assessment (CEA Agency), MOECC and Wabun Tribal Council in February 2016. Since February 2016, the commitment description was further updated to remove reference to Trelawney as it is no longer applicable.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
			monitoring/manageme nt and business opportunities.			
Socio-economic	Construction through Closure	Unidentified Project-related socio-economic / community effects	*Management plan to address potential Project-related socio-economic / community effects.*	IAMGOLD will work 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 environmental assessment process and/or at later stages of the Project	n/a or as established in negotiated agreements.	New mitigation measure. This is a new mitigation added post-EA submission in response to comments received during the EA review period. This mitigation was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Wabun Tribal Council in February 2016.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Labour Market / Population Demographics – local suppliers	Implement a procurement process that promotes Aboriginal and local suppliers.	Develop and implement a procurement process that promotes suppliers from the local community (First Nations, Métis and Gogama).	n/a or as established in negotiated agreements.	The mitigation measure has not changed from the EA.
Socio-economic	Construction and Operations	Labour Market / Population Demographics– cultural awareness training	Cultural awareness training.	Develop a cultural awareness-training program and require employees and contractors to complete the training.	n/a or as established in negotiated agreements.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction and Operations	Labour Market / Population Demographics – employee training and development	Provide on-the-job Common Core training to workers.	Provide on-the-job Common Core training to assist local and regional workers to develop mining-specific skills or develop partnerships with existing initiatives. Employees would be part of IAMGOLD's Performance Management Process and development needs and opportunities would be identified through this process	n/a or as established in negotiated agreements.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction and Operations	Labour Market / Population Demographics – training to access Project employment	Support and/or provide training and education in local communities, where possible.	Support and/or provide education and training for potential employees from local communities (Aboriginal communities and members of Gogama). Initiate discussions with potential partners for developing youth mentorship programs. *Work with appropriate community contacts to identify training needs, develop relevant training plans, and identify potential participants.*	n/a or as established in negotiated agreements.	Mitigation measure updated. Text in italics was added post-EA submission in response to comments received during the EA review period. This update was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Wabun Tribal Council in February 2016.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Closure	Labour Market / Population Demographics – job placement assistance	Offer company services linking workers with local social services that provide job placement assistance.	IAMGOLD will facilitate access to external job placement or community services, etc. to transition laid-off or downsized employees into career opportunities as available	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Labour Market / Population Demographics – employment relations	Develop an employment community relations program.	Develop an employment community relations program to provide appropriate parties with plans and progress throughout the life of the Project.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Operations and Closure	Labour Market / Population Demographics – further training	Identify and implement basic skills and technical training for Aboriginal and local community members to upgrade marketable skills and increase capacity, where possible.	Identify and implement basic skills and technical training for Aboriginal and local community members to upgrade marketable skills and increase capacity.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Closure	Labour Market / Population Demographics – closure planning	Work with local communities to develop a Project closure strategy that will minimize potential adverse effects of Project closure on regional communities.	Engage and support local communities to develop specific strategies and actions as part of the closure plan that minimizes potential adverse closure effects on the regional communities.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Labour Market / Population Demographics – future site use	Engage and support local and regional communities and stakeholders in planning decisions relating to future use of the Project site.	Engage and support local and regional stakeholders in planning decisions for future use of the Project site that might benefit the regional economy or contribute to community pride, cohesiveness, and sense of place.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Labour Market / Population Demographics – connect workers and employment opportunities	Support the establishment of local/regional job opportunities roster/forum accessible for workers.	Support local communities and government efforts to connect workers to a local/regional job opportunities forum prior to Project closure.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Closure	Labour Market / Population Demographics – support for small business development	Post information on site for workers about other services agencies in the region that support small business ventures and planning.	Inform workers about regional service agencies that support small business ventures and planning, if available.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Business Opportunities – Encourage local suppliers	Implement a procurement process that encourages Aboriginal and local suppliers.	Implement a procurement process that encourages suppliers from local Aboriginal communities and Gogama.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Operations and Closure	Business Opportunities – procurement process	Implement a procurement policy that structures opportunities in terms of package size and bid evaluation to reflect Aboriginal and local capabilities.	Implement a procurement policy that structures opportunities in terms of package size and bid evaluation to reflect local capabilities, where practicable.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Construction and Operations	Business Opportunities – monitor/report on local and regional procurement	Establish a system to monitor and report on local and regional content with mechanisms to adapt procurement policies where required.	Establish a system to monitor and report on local and regional content with mechanisms to adapt procurement policies, where required.	n/a or as established in negotiated agreements.	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Closure	Business Opportunities – communicate contract terminations effectively	Communicate with affected businesses to prepare for the effects of contract termination.	Communicate with affected businesses to prepare for the effects of contract termination.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Business Opportunities – support local businesses through procurement process	Support capacity building for local businesses.	Increase capacity building for local businesses during the Construction and Operations phases to help them effectively bid for opportunities in the Closure and Post-closure phases.	n/a or as established in negotiated agreements or Closure Plan.	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Business Opportunities – entrepreneurial economic development	Support local entrepreneurial development.	Support local entrepreneurial development for a diverse range of industries in order to lay foundations of post-operations economic diversification.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Community Health Conditions – long distance phone service for worker health	Provide access to long distance phone service for employees.	Provide access to long-distance calls and internet connections to help maintain healthy family relationships.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Community Health Conditions – demands on local health services Emergency Services – demands on local emergency services	Provide for basic worker health care.	Provide immediate access to care if required to minimize additional demands on off-site community health facilities.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Community Health Conditions – health management	Provide information on health-related issues such as nutrition, sexually transmitted infections, alcohol abuse etc. to workers.	Provide information on health-related issues such as nutrition, sexually transmitted infections, alcohol abuse etc. to workers to promote a healthy living culture in surrounding communities.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Community Health Conditions – unsafe driving conditions potentially leading to traffic accidents	Provide worker transportation to and from Project site.	IAMGOLD will consider bussing from communities that are beyond a reasonable commuting distance, e.g., Timmins and Sudbury.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Housing and Temporary Accommodations – on-site camp	Develop on-site camp.	Develop on-site camp while supporting the needs of commuters from across the regional study area through the provision of transportation services.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Housing and Temporary Accommodations – demands for housing	Monitor indicators of Project housing effects and adapting management measures.	Monitor indicators of Project housing effects and adapting management measures with the local study area communities and appropriate agencies.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Housing and Temporary Accommodations – resident retention after Project closure	Support local economic diversification programs that could facilitate resident retention after Project closure.	Support local economic diversification programs that could facilitate resident retention after Project closure.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction and Operations	Public Utilities – demands on Gogama's wastewater treatment capacity	Work with Gogama Local Service Board.	Continue to support Gogama Local Services Board to identify ways to improve Gogama's wastewater treatment capacity.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Education – training to facilitate access to employment	Support post-secondary education of workers.	Encourage and support post-secondary education of workers (including scholarships for programs related to mining for First Nation and Métis students).	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Emergency Services – demands on local emergency services	Maintain open communication with local service providers to monitor existing social issues.	Maintain open communication with local service providers to monitor existing social issues. Indicators will be selected with input from these service providers so that any Project effects are identified and managed properly by responsible parties.	n/a	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Other Community Services and Infrastructure – demands on local medical services	Implement the Zero Harm policy at the Project site.	Implement the Zero Harm policy and associated health and safety plans that could assist in promoting a safety culture in local communities, potentially reducing demands on local medical services.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Closure	Other Community Services and Infrastructure – closure effects on employment	Inform and/or provide employees with access to resources to support transition to other employment.	Inform employees of resources to help support employment training, provide information about available financial assistance programs, and career development initiatives.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Transportation – road safety training	Road safety awareness training.	Implement regular road safety awareness training for workers and contractors.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Transportation – highway safety and conflicts with large equipment transport	Schedule major equipment delivery and removal.	Schedule major equipment delivery and removal at off-peak travel times, where practical.	Ministry of Transportation (MTO) *Highway Traffic Act*	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Transportation – conflicts with other traffic	Schedule shuttle bus travel.	Schedule shuttle bus travel at off-peak travel times to avoid traffic conflicts with other commuters, school buses and recreation traffic.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Transportation – traffic volumes at peak travel times	Schedule shifts to limit the number of daily shuttle buses.	Schedule shifts so that not all construction workers travel off-site on the same days, and thereby limiting the number of daily shuttle buses.	n/a	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Transportation – effects on highway infrastructure	Ensure heavy load sizing and seasonal load restrictions.	Ensure heavy loads are sized appropriately and that truck traffic observes seasonal load restrictions.	MTO – *Highway Traffic Act* O.Reg., 413/05	The mitigation measure has not changed from the EA.
Socio-economic	Construction through Closure	Transportation – effects on highway infrastructure	Transport oversized loads in parts.	Transport oversized loads in parts to the mine site, if possible, to limit load stress on highway surfaces and obstruction of other traffic.	MTO – *Highway Traffic Act* O.Reg., 413/05	The mitigation measure has not changed from the EA.

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Socio-economic	Construction through Closure	Transportation – potential for wildlife-vehicular accidents	Report wildlife sightings on highways. *Implement a wildlife observation log for all mammals (and road kill) on or near the Project roads.*	Report wildlife sightings on highways and on or near Project roads to inform workers and identify areas where wildlife is persistently present.	n/a	Mitigation measure updated. Text in italics was added post-EA submission in response to comments received during the EA review period. This update to the mitigation was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Wabun Tribal Council in February 2016.

5.0 MANAGEMENT

The table below provides the monitoring measures applicable to the EER and indicates if the management measures have changed or stayed the same from the EA. One additional monitoring measure was added post-EA submission as a response to comments received during the EA process (new text is indicated in italics).

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Table 5-1: Monitoring Measures – Socio-Economic

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Socio-economic	Project-related socio-economic effects on Aboriginal and non-Aboriginal populations	*Socio-economic / Community Management Plan to monitor and respond to Project effects on Aboriginal and non-Aboriginal populations. Ongoing consultation with affected Aboriginal communities and stakeholders.*	n/a	Construction through Closure phases	n/a	New monitoring measure. This is a new monitoring measure added post-EA submission in response to comments received during the EA review period. This measure was added to the updated Appendix Y EA Commitment Tables and shared with the CEA Agency, MOECC and Indigenous groups in February 2016.
Socio-economic	Number, skill sets and positions held by local, First Nation and Métis persons and contractors at the Project site (direct employment with IAMGOLD as well as contract employment)	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Construction through Closure phases Annually for the life of the Project	n/a	The monitoring measure has not changed from the EA.
Socio-economic	Number of employees moving into regional study area communities from outside of the region.	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Construction through Closure phases Annually for life of the Project	n/a	The monitoring measure has not changed from the EA.

Discipline	Parameter	Monitoring Method	Standard	Frequency / Timeframe	Location	Comparison between EA and EER measures
Socio-economic	Number of employees taking cultural awareness training as part of their on-boarding procedure.	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Construction through Closure phases Annually for life of the Project	n/a	The monitoring measure has not changed from the EA.
Socio-economic	Number of local employees or local applicants obtaining IAMGOLD-funded training to access Project employment.	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Construction through Closure phases Annually for life of the Project	n/a	The monitoring measure has not changed from the EA.
Socio-economic	Number of local employees obtaining upgrade training to access higher-paid positions with IAMGOLD.	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Construction through Closure phases Annually for life of the Project	n/a	The monitoring measure has not changed from the EA.
Socio-economic	Number of local employees making successful transition to new work after closure	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Starting towards the end of the Operations phase as production levels decline until completion of the Closure phase	n/a	The monitoring measure has not changed from the EA.
Socio-economic	Number of local or First Nation and Métis companies hired for decommissioning and closure contracts	Database system maintained by IAMGOLD Human Resources or others as required.	n/a	Closure phase	n/a	The monitoring measure has not changed from the EA.

6.0 CONCLUSION

Overall, effects predictions for the socio-economic indicators studied during the EA and re-visited as part of the EER process have not changed, except for the duration of effects, which are anticipated to last an additional two years given the change from 15 to 17 years of mine operations. As such, the EA effects predictions remain valid and appropriate to the EER.

A review of 2016 Census profiles for each of the study area communities was completed as part of the work undertaken to complete this technical memorandum in order to qualitatively determined whether or not potential changes to community demographics may affect or influence conclusions regarding the appropriateness of the EA effects conclusions in light of the EER. While some changes have occurred in population sizes within communities, the changes are minimal and do not affect the effects conclusions established in the EA.

IAMGOLD recognizes that managing socio-economic effects requires a collaborative approach with responsibility shared amongst itself, communities and people, governments and Indigenous communities. In response to comments and questions about potential socio-economic effects and management of effects, IAMGOLD committed to work collaboratively with potentially affected Indigenous communities to develop a socio-economic / community management plan to address socio-economic / community effects identified through the EA process and/or at later stages of the Project.

Socio-economic mitigation, enhancement and monitoring strategies proposed in the EA are not affected by the updates to the Project, nor are any additional mitigation, enhancements or monitoring strategies required beyond those indicated in Tables 4-1 and 5-1 which were proposed in response to comments received during the EA process. These updated mitigation and monitoring measures were communicated to regulatory authorities and Wabun Tribal Council in February 2016.

7.0 REFERENCES

Statistics Canada. 2017. Census of Population. Census Profile (98-316-X). Accessed January 2018 from http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

8.0 GLOSSARY AND ABBREVIATIONS

CEA Agency	Canadian Environmental Assessment Agency
EA	Environmental Assessment
EER	Environmental Effects Review
Indigenous (previously referred to as Aboriginal in the EA)	In the context of the Côté Gold Project, includes both First Nation and Métis people
km	kilometre
LSA	Local Study Area
MTO	Ministry of Transportation
MOU	Memorandum of Understanding
n/a	Not applicable
O.Reg.	Ontario Regulation
RSA	Regional Study Area
tpd	metric tonnes per day

APPENDIX I

EXECUTIVE SUMMARY

Côté Gold Project
Environmental Effects Review Report
UTM – Socio-Economic
May 2018
EAB: EA 05-09-02; EAIMS: 13022; CEAA: 80036

IAMGOLD Corporation (IAMGOLD) proposes to construct, operate and eventually rehabilitate a new open pit gold mine (Côté Gold Project) located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. In 2014, Amec Foster Wheeler assessed potential Project-related effects on the socio-economic environment. This assessment considered baseline socio-economic conditions established in and reported on within the Socio-economic Technical Support Document contained within the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment (EA) Report.

Since the submission of the EA, IAMGOLD has further considered feedback received from government regulators, technical experts, local stakeholders and Indigenous communities regarding the Project. The feedback has contributed to IAMGOLD evaluating changes which resulted in the optimization of the Project design through an Environmental Effects Review (EER). Specific comments relevant to socio-economic considerations received from First Nations and Métis following submission of the EA related to:

- Monitoring Project-related socio-economic effects on Indigenous and non-Indigenous populations;
- Interest in training, employment and business opportunities; and
- Benefits to local communities.

IAMGOLD has addressed these comments through additional or modified mitigation, enhancement and monitoring activities, bringing the total number of socio-economic mitigation or enhancement measure commitments to 39 and socio-economic monitoring commitments to eight. These measures are relevant to the Construction, Operations and Closure phases of the Project.

Key changes to the Project considered for the purposes of this EER which are relevant to the socio-economic environment include:

- A reduced processing rate from 60,000 tonnes per day (tpd) to 36,000 tpd; and
- an increase in the anticipated life of mine from 15 years to 17 years.

Other aspects of the Project relevant to the socio-economic environment which are anticipated to remain the same include:

- Length of Construction phase: two years;
- Construction workforce size of 1,000 to 1,200;
- Capital expenditures during construction estimated at $1,047 million; and
- Operations workforce size of approximately 500.

Optimizations to the Project, which have reduced the footprint, are not relevant to the assessment of socio-economic indicators and as such are not discussed in this technical memorandum.

The spatial and temporal boundaries considered for potential Project-related socio-economic effects are unchanged compared to the EA. The Socio-economic local study area includes communities that are closest to the Project site and could therefore experience more direct socio-economic Project effects. The local study area is comprised of Gogama and Mattagami First Nation reserve (Mattagami Indian Reservation #71) and the portion of Highway 144 that connects these communities with the Project site.

The regional study area for the socio-economic prediction of effects is defined as the area that could be influenced by the Project. Regional study area communities include Gogama, City of Timmins, City of Greater Sudbury, Unorganized North Sudbury Subdivision and Unorganized Timiskaming West. The portion of Highway 144 that connects the Project site with the City of Timmins to the north and City of Greater Sudbury to the south is also considered part of the regional study area. It is recognized that although some socio-economic influences may be felt outside of the regional study area (for example, procurement of equipment in other parts of Canada or internationally), the primary socio-economic effects are expected to be experienced in the local and regional study areas.

Indigenous communities included in the regional study area consist of:

- Flying Post First Nation;
- Brunswick House First Nation;
- Matachewan First Nation; and
- Métis Nation of Ontario – Region 3.

The socio-economic effects assessment indicators have not changed compared to the EA.

The Project's economic effects were estimated in the EA using the provincial input / output economic multipliers for Ontario as provided by the Industry Accounts Division of Statistics Canada. Although changes were made to the proposed Project description, the capital cost remains the same. A qualitative update / confirmation of predicted effects was undertaken for each of the indicators.

Effects on social indicators were predicted by understanding the current baseline conditions, analyzing existing pressures on these indicators, predicting the expected changes on those indicators due to the Project and predicting whether the indicators could handle these changes.

Following EA approval, additional statistical information about the study area communities became available. A qualitative review of the additional statistical data was taken into account when reviewing the EA effects predictions for each of the social indicators discussed in Section 3.0.

Overall, effects predictions for the socio-economic indicators studied during the EA and re-visited as part of the EER process have not changed, except for the duration of effects, which are anticipated to last an additional two years given the change from 15 to 17 years of mine operations. As such, the EA effects predictions remain valid and appropriate to the EER.

A review of 2016 Census profiles for each of the study area communities was completed as part of the work undertaken to complete this technical memorandum in order to qualitatively determined whether or not potential changes to community demographics may affect or influence conclusions regarding the appropriateness of the EA effects conclusions in light of the EER. While some changes have occurred in population sizes within communities, the changes are minimal and do not alter the effects conclusions established in the EA.

IAMGOLD recognizes that managing socio-economic effects requires a collaborative approach with responsibility shared amongst itself, communities and people, governments and Indigenous communities. In response to comments and questions about potential socio-economic effects and management of effects, IAMGOLD committed to work collaboratively with potentially affected Indigenous communities to develop a socio-economic / community management plan to address socio-economic / community effects identified through the EA process and/or at later stages of the Project.

Socio-economic mitigation, enhancement and monitoring strategies proposed in the EA and subsequent comment periods are not affected by the updates to the Project, nor are any additional mitigations, enhancements or monitoring strategies required beyond those indicated in Tables 4-1 and 5-1 which were proposed in response to comments received during the EA process. These updated mitigation and monitoring measures were communicated to regulatory authorities and Wabun Tribal Council in February 2016.

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B-14: Updated Technical Memorandum: Archaeology and Built Heritage

Memorandum

To:	Steve Woolfenden	**From:**	Ryan Primrose
Company:	IAMGOLD Corporation		Woodland Heritage Services Limited
cc:	Stephan Theben (SLR Consulting)	**Date:**	May 25, 2018 (revised September 06, 2018)
Subject:	**CÔTÉ GOLD PROJECT ENVIRONMENTAL EFFECTS REVIEW REPORT**		
	UPDATED TECHNICAL MEMORANDUM: ARCHAEOLOGY AND BUILT HERITAGE		

1.0 INTRODUCTION AND PROJECT OVERVIEW

The Côté Gold Project (the Project) is a pre-feasibility level gold project located in the Chester and Yeo Townships, District of Sudbury, in northeastern Ontario, approximately 20 kilometres (km) southwest of Gogama, 130 km southwest of Timmins, and 200 km northwest of Sudbury. IAMGOLD proposes to construct, operate and eventually rehabilitate a new open pit gold mine on the property. Following the receipt of the Environmental Assessment Decision for the Project, issued by the Federal Minister of Environment and Climate Change Canada in 2016, IAMGOLD are proposing to optimize the Project and an Environmental Effects Review (EER) is being prepared. The optimized project is referred to as 'the Project'.

This updated technical memorandum has been prepared by Woodland Heritage Services and is one of a series of technical memoranda to support the EER for the Project. In addition to this memorandum, the following memoranda have been prepared and used to support the EER:

- Updated Geochemical Characterization;
- Updated Technical Memorandum: Noise and Vibration;
- Updated Technical Memorandum: Air Quality
- Updated Technical Memorandum: Hydrogeology;
- Updated Technical Memorandum: Hydrology and Climate;
- Updated Technical Memorandum: Water Quality;
- Updated Technical Memorandum: Terrestrial Biology;

- Updated Technical Memorandum: Aquatic Biology;
- Updated Technical Memorandum: Land and Resource Use;
- Updated Technical Memorandum: Traditional Land Use;
- Updated Technical Memorandum: Human and Ecological Health Risk;
- Updated Technical Memorandum: Visual Aesthetics; and
- Updated Technical Memorandum: Socio-Economic.

1.1 Archaeology

The archaeological and cultural heritage fieldwork was done in support of the Federal Amended Environmental Impact Statement and Provincial Environmental Assessment Report (hereafter referred to as the 'EA') and was carried out in advance of the development of IAMGOLD's Côté Gold Project. Based on an evolving Project design, IAMGOLD has elected to evaluate changes in the Project effects through an EER. The study considers indicators assessed through the EA, where changing Project effects could have the potential to warrant an update to the conclusions of the EA. This memorandum updates the archaeological assessment for the Project.

Since 2010, Woodland Heritage Services Limited (WHS) and Woodland Heritage Northeast Limited (WHNE) have undertaken multiple Stage 1 to Stage 4 archaeological assessments in an effort to assess the archaeological potential of the lands to be developed, identify any archaeological sites, evaluate their cultural heritage value or interest (CHVI), and recommend appropriate protection and mitigation strategies according to those outlined in the Ministry of Tourism, Culture and Sport's (MTCS) *2011 Standards and Guidelines for Consultant Archaeologists*.

The vast majority of the fieldwork undertaken on the Côté Gold Property has directly involved members of Mattagami, and during the 2012 and 2013 field seasons, a member of Flying Post First Nation. The engagement with MFN and FPFN took the form of a series of meetings to initiate the work, and follow up meetings and presentations to discuss the results. During the Stage 2, Stage 3, and Stage 4 work members of MFN and FPFN worked directly alongside Woodland Heritage Services and Woodland Heritage Northeast carrying out the archaeological work. This ranged from shovel test pitting through to advanced excavation techniques. Currently MFN is involved in the 2018 Stage 3 and 4 excavation work at site. Additionally, an artifact transfer committee has been established to coordinate the transfer of the collections to Mattagami First Nation. This committee is formed of several MFN members with support from Woodland Heritage and IAMGOLD.

To date, 28 Stage 1 to Stage 4 projects have been undertaken for IAMGOLD's Côté Gold Project by WHS and WHNE as part of the former and ongoing Environmental Assessment work in advance of the development of the mine and its associated infrastructure. Since the release of the EA in 2013, new projects as part of the mine site redesign have included one Stage 1 background assessment, one Stage 2 sub-surface testing assessment, and one Stage 3 site monitoring assessment (Table 1-1). Additional archaeological work has been scheduled for the 2018 field season, including six Stage 3 excavations required by the MTCS to determine the level of CHVI for archaeological sites identified in 2017.

Prior to the initiation of any fieldwork, the site files and catalogued reports at WHS and the offices of the Archaeological Data Coordinator at the MTCS were checked to determine if any pre-contact or historic archaeological sites had been previously recorded either in or near the study area. One archaeological site registered before 2010 is located within 20 km of the study area, CkHk - 2 in the vicinity of Gogama. All archaeological fieldwork is performed in advance of any new ground-disturbing activities and is undertaken to the standards outlined in the MTCS's *2011 Standards and Guidelines for Consultant Archaeologists*.

Between 2010 and 2017, 24 pre-contact archaeological sites, 11 historic archaeological sites and 9 ancient trails and portages (one of which was also registered as a pre-contact archaeological site) were located and recorded for a total of 43 archaeological sites and heritage features. This includes the identification and registration of six archaeological sites since the release of the EA in 2013 (Table 2-1). As required by MTCS regulations, the 35 archaeological sites (24 pre-contact and 11 historic), have been registered with Province of Ontario and each has been assigned a Borden Number in the provincial sites database. It should be noted that upon analysis the relative Cultural Heritage Value or Interest has been revised so that several of the previously registered sites, no longer require mitigation or protection (see Table 2-2). As registered sites, they are afforded protection under the Ontario Heritage Act and must not be disturbed until clearance is obtained from the MTCS. Sub-surface disturbances and/or the removal of artifacts is not permitted on or within 20 metres (m) of a registered site and an additional 50 m monitoring zone is implemented, for a total protected area buffer radius of 70 m. However, this 70 m protective buffer can be reduced to 10 m following a Stage 3 assessment (MTCS 2011:§7.8.5 and §7.9.5). Details of the current status of the archaeological sites are available in Table 2-2.

Table 1-1: Updated Listing of All Archaeological Assessments Undertaken as Part of the Côté Gold Project

WHS and WHNE Report Number	Report Title	MTCS Project Number
R2017-27	Stage 3 Monitoring of the Drilling of an Exploration Hole Near Archaeological Site CjHl-33 (Upper Three Duck Lake 2) in Chester Township (unsurveyed), Sudbury District, Ontario	P208-0156-2017
R2017-03	A Stage 2 Archaeological Resource Assessment of IAMGOLD's Ongoing Study Areas of Mineral Claims and Exploration Activities in Chester and Yeo Townships (all unsurveyed), Sudbury District, Ontario	P208-0142-2017

WHS and WHNE Report Number	Report Title	MTCS Project Number
J2016-46	A Stage 1 Archaeological Resource Assessment of IAMGOLD's Ongoing Study Areas of Mineral Claims and Exploration Activities in Chester, Yeo, Neville, and Potier Townships (all unsurveyed), Sudbury District, Ontario	P016-0444-2016
J2013-23	Stage 2 Archaeological Resource Assessment of Additional IAMGOLD Mine Site Areas, in Chester, Neville, and Potier Townships, in the District of Sudbury, Ontario	P022-012-2013
J2013-11	Stage 4 Archaeological Assessment of the Two Pike Point Site (CjHl-11) as Part of the Côté Lake Project in Chester Township, Sudbury District, Ontario	P022-011-2013
J2013-11	Stage 4 Archaeological Assessment of the Shannon Cabin (CjHl-25) as Part of the Côté Lake Project in Chester Township, Sudbury District, Ontario	P022-0025-2013
J2013-11	Stage 4 Archaeological Assessment of the Chester 5 Site (CjHl-7) as Part of the Côté Lake Project in Yeo Township, Sudbury District, Ontario	P022-017-2013
J2013-11	Stage 4 Archaeological Assessment of the Chester 3 Site (CjHl-5) as Part of the Côté Lake Project in Yeo Township, Sudbury District, Ontario	P022-016-2013
J2013-11	Stage 4 Archaeological Assessment of the Chester 1 Site (CjHl-4) as Part of the Côté Lake Project in Chester Township, Sudbury District, Ontario	P022-015-2013
J2013-10	Stage 3 Archaeological Resource Assessment of Three Post-Contact Sites, Côté Gold Project Area in Chester and Yeo Townships, District of Sudbury	P208-044-2012 P208-045-2012 P208-046-2012 P208-047-2012 P208-048-2012 P208-049-2012 P208-050-2012 P208-051-2012 P208-053-2012 P208-0097-2013
J2013-05	Stage 1 Archaeological Resource Assessment of a Proposed 230 kV Transmission Line from Côté Gold Project to Timmins, in the District of Cochrane, Ontario	P022-018-2013
J2012-10, 11, 34	Three Stage 1 and 2 Archaeological and Cultural Heritage assessments of the IAMGOLD Côté Gold Project Area, in Chester, Yeo, and Neville Townships (All Un-surveyed), Sudbury District, Ontario	P016-340-2012 P016-341-2012 P016-355-2012
J2011-28	Stage 1 and 2 Archaeological and Cultural Heritage assessment of the Trelawney Advanced Exploration Project, southwest of Gogama, Sudbury District, Ontario	P016-320-2011

WHS and WHNE Report Number	Report Title	MTCS Project Number
J2011-11	Stage 1 and 2 Archaeological and Cultural Heritage assessment of a proposed aggregate extraction area (Pit #3) in Chester Township, southwest of Gogama, Sudbury District, Ontario	P016-315-2011
J2011-10	Stage 1 and 2 Archaeological and Cultural Heritage assessment of a proposed aggregate extraction area (Pit #2) in Chester Township, southwest of Gogama, Sudbury District, Ontario	P016-316-2011
J2011-09	Stage 1 and 2 Archaeological and Cultural Heritage assessment of a proposed aggregate extraction area (Pit #1) in Chester Township, southwest of Gogama, Sudbury District, Ontario	P016-314-2011
J2010-05	Stage 1 Archaeological and Cultural Heritage Assessment of the Chester Township Project	P016-260-2010

2.0 SUMMARY OF RECENT FIELDWORK AND FINDS

2.1 Spatial Boundaries of Recent Fieldwork Activities

The study boundaries for the 2010-2017 archaeological assessments were generally limited to footprint of Côté Gold Project and those areas that were proposed to be impacted by the development of the Project and its associated infrastructure. These areas have been located principally within Chester, Yeo, Potier, Neville Townships, with the following townships being associated with the two proposed transmission lines: Benneweis, Champagne, Londonderry, Garibaldi, Miramichi, Connaught, Cabot, Burrows, Mattagami, Emerald, Gouin, Neville, St. Louis, Jack, Carter, Stetham, Hazen, Roblin, and Hassard Townships, in the District of Sudbury; Doyle and McKeown Townships, in the District of Timiskaming; and Thorneloe, Price, Ogden, and Mountjoy Townships, in the District of Cochrane.

All fieldwork since the submission of the EA was undertaken using the boundaries of the most up-to-date version of the development plans available to WHS and WHNE. Fieldwork activities were undertaken in areas where development plans indicated potential sub-surface impacts within 50 m of modern water sources (i.e. lakes, rivers, streams, etc) and 150 m of features of archaeological potential other than modern water sources (i.e. building foundations). The fieldwork activities since 2013 were undertaken in Chester, Yeo, Neville, and Potier Townships in the District of Sudbury.

2.2 Summary of Recent Fieldwork and Finds

Since 2013, three archaeological assessments have been undertaken by WHS and WHNE on the IAMGOLD property, including a Stage 1 background and field assessment, a Stage 2 sub-surface assessment, and a Stage 3 site monitoring assessment. The archaeological sites newly identified since the release of the EA have been listed in Table 2-1. Table 2-2 provides an updated listing of all archaeological sites, and their respective assessment conditions, identified during the duration of assessment work directly involved with the Côté Gold Project.

Previously a built heritage assessment was carried out for the Côté Gold Project. At the conclusion of the study, it was determined that no further concerns were present with regard to built heritage environments. If in the future additional built heritage features are located, they will be assessed by a built heritage specialist.

2.2.1 2016 Stage 1 Assessment (P016-0444-2016)

2.2.1.1 Assessment Results

The 2016 Stage 1 archaeological resource assessment was undertaken by WHS and involved background research, predictive modelling, and a field inspection of the accessible areas which may be impacted by the Project. The background research reviewed early historic maps of the property as well as all existing archaeological work carried out for the property. Predictive models were used to locate areas of archaeological potential within the proposed development area. This modelling made efforts to locate level areas proximal to open water while eliminating poorly-drained areas, steep slopes, and areas of land which are difficult to access by water. The field inspection served to document, assess, and confirm the areas of suspected archaeological potential, as well as locate any historic structural remains.

Fifteen areas of suspected archaeological potential were identified through the predictive modelling of the assessment area in 2016. As not all areas could be directly observed during the Stage 1 property inspection, the predictive model and background research served to identify areas of suspected archaeological potential on multiple lakes, ponds, creeks, and wetlands within the proposed tailings management area, waste rock facility, new lake, seepage collection ponds, process plant, and along the main access road extension. It is expected that the areas of archaeological potential determined through predictive modelling will be revised through future the on-ground Stage 2 assessment work.

The on-ground Stage 1 work resulted in the identification of a prospecting camp east of Moore Lake. Based on the Stage 1 background research, this prospecting camp, known as the Cryderman camp, is composed of at least four structures, and may be associated with the nearby 30-foot (9.1 m) deep Moore shaft. The field assessment confirmed the location of three separate foundations and identified a number of historic artifacts on the ground surface including fuel cans, parts of a boiler (or steam-works), and other unidentified cans among other artifacts dating to the early part of the 1900s.

The Cryderman camp was established by Russel Cryderman, one of the first prospectors to stake claims in the Gogama area. As such, this camp would have been one of the earliest Euro-Canadian sites in the local area, and through its association with early Euro-Canadian industry, the Cryderman Camp 2 archaeological site is considered to have confirmed cultural heritage value or interest. Subsequent to its relocation, this site was registered with the Ontario Archaeological Site Database (OASD) and assigned the Borden number CjHl-35 (WHS, 2017).

2.2.1.2 Assessment Recommendations

Following the identification of multiple areas of archaeological potential on the subject property, recommendations were made for the Stage 2 test pitting of all areas to be potentially impacted by development. The following two recommendations were made:

1. For all identified areas of confirmed and suspected archaeological potential which intersect the currently proposed development area of IAMGOLD's Côté Gold Project, a Stage 2 archaeological assessment is recommended. The Stage 2 assessment strategy should include a test pit survey, with test pits dug to a minimum of 30 centimetres in diameter placed at 5 m intervals within 50 m of water in all areas of archaeological potential to be impacted by development. Test pits should be excavated by hand and extend minimally 5 centimetres into sterile subsoil, screened through 6-millimetre hardware mesh screens, and backfilled. The Stage 2 assessment strategy should be

consistent with Sections 2.1.2 and 2.1.5 of the 2011 MTCS Standard and Guidelines for Consultant Archaeologists.

2. Should additional areas, or modifications to the existing areas be required, these may be subject to additional archaeological resource assessment work not detailed in this report (WHS, 2017:29).

2.2.2 2017 Stage 2 Assessment (P208-0142-2017)

2.2.2.1 Assessment Results

The 2017 Stage 2 archaeological resource assessment was undertaken by WHNE and involved the sub-surface testing of areas of archaeological potential identified in 2016 where sub-surface disturbances are anticipated by the 2017 proposed mine site configuration.

At the conclusion of the Stage 2 survey work, a total of five new pre-contact archaeological sites were located and one previously-registered site was revisited to determine if it would be adversely impacted by the future development activities. Of the five new sites, three were identified on the upper lake of Three Duck Lakes, one on Weeduck Lake, and one immediately north of Chester Lake on the east side of the Mollie River. All new sites were identified based on the presence of the remains of stone tool manufacture, including two sites where stone tools themselves were recovered. Generally, it is felt that all of the sites represent small pre-contact sites, but their true extent and nature cannot be known with certainty until Stage 3 site-specific assessment work has been carried out as per MTCS requirements.

These sites were registered in the OASD as Mollie River 1, Weeduck Lake 1, Upper Three Duck Lake 1, Upper Three Duck Lake 2, and Upper Three Duck Lake 3, and assigned the Borden numbers CjHl-30, CjHl-31, CjHl-32, CjHl-33, and CjHl-34, respectively (WHNE, 2017).

2.2.2.2 Assessment Recommendations

Following the identification of five archaeological sites during the Stage assessment, recommendations were made for the Stage 3 excavation of the sites in order to accurately determine their site boundaries and relative CHVI. The following six recommendations were made:

1. The Mollie River 1 (CjHl-30) archaeological site has an unknown cultural heritage value or interest due to the low recoveries of informal and undiagnostic artifacts. As the artifact recoveries meet the minimum requirements to be considered an archaeological site, the MTCS Standards and Guidelines require that a Stage 3 site-specific assessment be recommended. According to Table 3.1 in the Standards and Guidelines, the test excavation should involve the excavation of a minimum of four 1 x 1 m units on a 5 m grid centred over the site, and one 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological

material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, all direction provided by the Standards and Guidelines for Consultant Archaeologists (MTCS, 2011) concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed.

2. The Weeduck Lake 1 (CjHl-31) archaeological site, has suspected cultural heritage value or interest based on Table 3.2 in the MTCS Standards and Guidelines. As such, a Stage 3 site-specific assessment is recommended. According to Table 3.1 in the MTCS Standards and Guidelines the test excavation should involve the excavation of a minimum of four 1 x 1 m units on a 5 m grid centred over the site, and one 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, all direction provided by the Standards and Guidelines for Consultant Archaeologists (MTCS, 2011) concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed.

3. The Upper Three Duck Lake 1 (CjHl-32) archaeological site, has confirmed cultural heritage value or interest based on Table 3.2 in the MTCS Standards and Guidelines. As such, a Stage 3 site-specific assessment is recommended. According to Table 3.1 in the MTCS Standards and Guidelines the test excavation should involve the excavation of a minimum of 18 1 x 1 m units on a 5 m grid centred over the site, and four 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, all direction provided by the Standards and Guidelines for Consultant Archaeologists (MTCS, 2011) concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed.

4. The Upper Three Duck Lake 2 (CjHl-33) archaeological site, has confirmed cultural heritage value or interest based on Table 3.2 in the MTCS Standards and Guidelines. As such, a Stage 3 site-specific assessment is recommended. According to Table 3.1 in the MTCS Standards and Guidelines the test excavation should involve the excavation of a minimum of four 1 x 1 m units on a 5 m grid centred over the site, and one 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, all direction provided by the Standards and Guidelines for Consultant Archaeologists (MTCS, 2011)

concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed.

5. The Upper Three Duck Lake 3 (CjHl-34) archaeological site, has confirmed cultural heritage value or interest based on Table 3.2 in the MTCS Standards and Guidelines. As such, a Stage 3 site-specific assessment is recommended. According to Table 3.1 in the MTCS Standards and Guidelines the test excavation should involve the excavation of a minimum of four 1 x 1 m units on a 5 m grid centred over the site, and one 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, all direction provided by the Standards and Guidelines for Consultant Archaeologists (MTCS, 2011) concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed.

6. As all five of the pre-contact sites are considered to be undisturbed Indigenous archaeological sites, and all contain artifacts of potential interest to First Nation communities, local Indigenous communities must be engaged when formulating Stage 3 mitigation strategies. These discussions should be built upon in advance and during the Stage 3 excavation of the various archaeological sites within the Côté Gold Project (WHNE 2017:39-41).

2.2.3 2017 Stage 3 Assessment (P208-0156-2017)

2.2.3.1 Assessment Results

The 2017 Stage 3 assessment was undertaken by WHNE and included the monitoring of drilling activities within the 50 m monitoring zone of an archaeological site identified in early 2017, Upper Three Duck Lake 2 (CjHl-33). Site visits were made during November and December to monitor the vegetation clearing, earth moving, and drilling activities in the vicinity of the archaeological site to ensure that no archaeological resources would be adversely impacted.

As a result of the monitoring activities, it was determined that no in-situ archaeological resources had been impacted, although fire-cracked rocks of unconfirmed origin were recovered from a roadside berm, which was likely created during the original construction of the road. When the fire-cracked rocks were located, the area was marked with flagging tape and all drilling activities were restricted to the previously-disturbed area in order to minimize further impacts to potential archaeological resources. No additional archaeological resources were identified (WHNE 2018).

2.2.3.2 Assessment Recommendations

Following the Stage 3 monitoring assessment of the CjHl-33 site, the Stage 3 excavation recommendations previously outlined in the 2017 Stage 2 report were revised to include the investigation of the roadside berm on the south side of the road. The revised recommendation now reads:

1. The Upper Three Duck Lake 2 (CjHl-33) archaeological site has confirmed cultural heritage value or interest based on Table 3.2 in the MTCS 2011 Standards and Guidelines for Consultant Archaeologists. As such, a Stage 3 site-specific assessment is recommended. According to Table 3.1 in the Standards and Guidelines, the test excavation should involve the excavation of a minimum of four 1 x 1 m units on a 5 m grid centred over the site, and one 1 x 1 m unit representing a 20% infill unit focusing on an area of interest. The testing grid must be expanded until no further archaeological material is recovered. Additional units must be excavated at 5 m and 10 m from the edge of the archaeological deposit to ensure that all archaeological resources related to the site have been located. Additionally, sub-surface work should include the investigation of the roadside berm to investigate the nature of what may be archaeological materials which may have been removed from their original contexts and relocated towards the west. All direction provided by the MTCS 2011 Standards and Guidelines for Consultant Archaeologists concerning the fieldwork methods and reporting requirements for Stage 3 site-specific assessments must be followed (WHNE 2018:20).

Table 2-1: Archaeological Sites Identified Since 2013

Site Name	Borden Number	Location	Age and Cultural Determination (Preliminary Determination)
Mollie River 1	CjHl-30	Mollie River at outlet of Chester Lake	Pre-Contact
Weeduck Lake 1	CjHl-31	South side of Weeduck Lake	Pre-Contact
Upper Three Duck Lake 1	CjHl-32	North side of Upper Three Duck Lake	Pre-Contact
Upper Three Duck Lake 2	CjHl-33	Northeast side of Upper Three Duck Lake	Pre-Contact
Upper Three Duck Lake 3	CjHl-34	North side of Upper Three Duck Lake	Pre-Contact
Cryderman Camp 2	CjHl-35	East of Moore Lake	Post-Contact, Early 20th Century

Table 2-2: Updated Listing of Archaeological Sites and Features Located Within the Project Study Area

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Pre-Contact Archaeological Sites					
Flat Rock Site (CjHl-2) Mollie River	Stage 1, Stage 2, Stage 3	107	Multiple bifacial and unifacial tools including knives, a chisel, a drill, and a burin	Quartz-based pre-contact archaeological site found on a level bedrock outcrop on the Mollie River (Figure 1-9).	No further CHVI
Makwa Point (CjHl-3) Clam Lake	Stage 1, Stage 2	4	Quartz debitage	Quartz-based pre-contact archaeological site on an island in Clam Lake (Figure 1-6).	No further CHVI
Chester 1 (CjHl-4) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	556	Multiple bifacial and unifacial tools, two Innes-style projectile points, end scrapers, cores, utilized flakes, abrader, possible net sinker, one juvenile mammalian bone.	Primarily quartz-based pre-contact archaeological site with a minor post-contact component located on a point in Chester Lake. Excavations suggest the site may date to the late Shield Archaic Period and a Woodland Period component may be present (Figure 1-12).	No further CHVI

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Chester 3 (CjHl-5) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	3,194	Multiple bifacial and unifacial tools, cores, scrapers, awls, gravers, a hammerstone, and a leg hold trap.	Primarily quartz-based pre-contact archaeological site with a minor post-contact component located on a point in Chester Lake. Excavations and comparisons with similar sites in the area suggest the site may date to the late Shield Archaic Period and a Woodland Period component may be present (Figure 1-11).	No further CHVI
Chester 4 (CjHl-6) Chester Lake	Stage 1, Stage 2	55	Primarily typical post-contact artifacts as well as pre-contact items including a chert biface and a quartz utilized flake	Archaeological site on a point on Chester Lake with a pre- and post-contact component. It appears there are two areas of occupation at this site (Figure 1-11).	No further CHVI
Chester 5 (CjHl-7) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	377	Stone tools including a possible projectile point, a ground stone tool, cores, a scraper, and small mammalian bone fragment.	Pre-contact archaeological site located on an expansive, level, sandy area with well drained soils at the T-intersection of Chester Lake containing quartz and chert artifacts (Figure 1-11).	No further CHVI
Chester 6 (CjHl-8) Chester Lake	Stage 1, Stage 2	1	Chert debitage	Pre-contact archaeological site on a point at the T-intersection of Chester Lake (Figure 1-11).	No further CHVI

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Lookout Site (CjHl-9) Chester Lake	Stage 1, Stage 2	n/a	n/a	This site is a prominent rock outcrop providing excellent visibility to the west and south along the lake. Additionally, a shelf area mid-way up the outcrop contained several large rocks oriented roughly parallel to each other. In these rocks, quartz flakes / detritus were observed (no quartz is present within the outcrop). It is felt this area may be an offering site. This needs to be confirmed by First Nation Elders (Figure 1-11).	**Continued CHVI (will not be affected by proposed development activities)**
Upper Duck Pine Point (CjHl-10) Upper Three Duck Lake	Stage 1, Stage 2	7	Chert and quartz debitage	Pre-contact archaeological site identified on a small bedrock point on Upper Three Duck Lake (Figure 1-8).	**Continued CHVI**
Two Pike Point (CjHl-11) Upper Three Duck Lake	Stage 1, Stage 2, Stage 3, Stage 4	1,533	Stone tools including microblades, scrapers, utilized flakes, a projectile point, a graver, and a hammerstone, as well as several native pottery fragments, small bone fragments, and ochre.	Primarily quartz-based pre-contact archaeological site with a minor post-contact component identified on an east-facing bedrock point on Upper Three Duck Lake. The site dates to the Woodland Period although there may be an Archaic component as well (Figure 1-7).	No further CHVI

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Côté Lake 1 (CjHl-12) Côté Lake	Stage 1, Stage 2, Stage 3	383	Bifacial and unifacial tools including a drill, a chisel, an awl, a graver, and a wedge.	Primarily quartz-based pre-contact archaeological site on a bedrock outcrop near the outlet of the Mollie River. The site is largely disturbed and of unproven temporal provenience (Figure 1-7).	No further CHVI
Côté Lake 2 (CjHl-13) Côté Lake	Stage 1, Stage 2	11	Quartz debitage	Pre-contact archaeological site identified on a bedrock outcrop on Côté Lake (Figure 1-7).	No further CHVI
Rocky Narrows 1 (CjHl-14) Mollie River	Stage 1, Stage 2	14	Quartzite and quartz debitage	Pre-contact archaeological site identified on a bedrock outcrop on the Mollie River (Figure 1-9).	No further CHVI
Rocky Narrows 2 (CjHl-15) Mollie River	Stage 1, Stage 2, Stage 3	4	Debitage	Pre-contact archaeological site identified on a bedrock outcrop on the Mollie River. Chert flakes were recovered during the Stage 2 assessment although follow-up Stage 3 testing did not recover any artifacts (Figure 1-9).	No further CHVI
Rocky Island Campsite (CjHl-16) Bagsverd Lake	Stage 1, Stage 2	42	Quartz, quartzite, and chert debitage as well as bone fragments.	Primarily quartz-based pre-contact archaeological site identified on a rocky island on Bagsverd Lake (Figure 1-4).	**Continued CHVI (will not be affected by proposed development activities)**

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Table Point Site (CjHl-17) Bagsverd Lake	Stage 1, Stage 2	49	Bifacial and unifacial tools including scrapers, utilized flakes, and a quartz wedge, as well as bone fragments	Pre-contact archaeological site on a bedrock point on Bagsverd Lake composed of quartz, chert, and chalcedony (Figure 1-4).	**Continued CHVI (will not be affected by proposed development activities)**
Bagsverd Creek 1 (CjHl-27) Bagsverd Creek	Stage 1, Stage 2	19	Native pottery and bone fragments	Pre-contact archaeological site on a south-facing point on an unnamed lake west of Bagsverd Creek. Based on the presence of pottery fragments, the site likely dates to the Woodland Period (Figure 1-3).	**Continued CHVI (will not be affected by proposed development activities)**
Bagsverd Creek 2 (CjHl-28) Bagsverd Creek	Stage 1, Stage 2	4		Site identified on rock knoll along Bagsverd Creek. Due to the suspect nature of the recovered artifacts, the CHVI is considered to be low (Figure 1-3).	No further CHVI
Bagsverd Creek 4 (CkHl-3) Bagsverd Creek	Stage 1, Stage 2	n/a	Kaolin pipe fragments	This site is also known as the Somme River Portage, a pre- and post-contact travel route. Although Stage 2 test pitting was not undertaken, the site was confirmed based on historic documentation and registered to protect it from potential future road developments (Figure 1-2).	**Continued CHVI (will not be affected by proposed development activities)**

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Mollie River 1 (CjHl-30) Mollie River	Stage 1, Stage 2	5	Debitage	Small pre-contact archaeological site identified on the Mollie River containing fire-damaged artifacts (Figure 1-9).	**Continued CHVI**
Weeduck Lake 1 (CjHl-31) Weeduck Lake	Stage 1, Stage 2	26	Debitage	Chert-based pre-contact archaeological site identified on the south side of Weeduck Lake. Artifacts may represent a single knapping event (Figure 1-8).	**Continued CHVI**
Upper Three Duck Lake 1 (CjHl-32) Upper Three Duck Lake	Stage 1, Stage 2	9	Chipped greywacke semi-lunar knife	Primarily chert-based pre-contact archaeological site identified on the north side of Upper Three Duck Lake (Figure 1-8).	**Continued CHVI**
Upper Three Duck Lake 2 (CjHl-33) Upper Three Duck Lake	Stage 1, Stage 2	51	Debitage and a suspected hearth feature	Chert-based pre-contact archaeological site identified on the north side of Upper Three Duck Lake (Figure 1-8).	**Continued CHVI**

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Upper Three Duck Lake 3 (CjHl-34) Upper Three Duck Lake	Stage 1, Stage 2	2	Scraper	Chert-based pre-contact archaeological site identified on the north side of Upper Three Duck Lake (Figure 1-8).	**Continued CHVI**
Historic Archaeological Sites					
Clam Lake Gold Mining Company (CjHl-18) Clam Lake	Stage 1, Stage 2	1	Broken rock hammer; shafts, pits, and trenches identified; buildings and a garbage dump identified	Twentieth century post-contact archaeological site identified on two islands and the shore of Clam Lake (Figure 1-6). A centre shaft was identified on the west side of the north island and a structure was identified on the southwest side of the island. This island is covered in blast rock with some scattered pieces of metal. A second shaft is located directly on the west edge of the south island. The bedrock has been squared off and a shaft was sunk in the water on the edge of the island. The west shore of Clam Lake has a large trench, many small pits, as well as buildings that consist of a main camp with a shed and a garbage dump to the west of the building. A broken rock hammer was also found.	No further CHVI

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Chester Lake 2 (CjHl-19) Chester Lake	Stage 1, Stage 2, Stage 3	82	Saddle notch cabin with deep cellar and many historic artifacts	Twentieth century post-contact archaeological site identified on a west-facing point on Chester Lake. A mostly complete cook stove was found as well as many glass bottles.	No further CHVI
Gosselin Mining Site (CjHl-20) Upper Three Duck Lake	Stage 1, Stage 2	n/a	Three cabin foundations as well as an old wooden boat (York or Pointer style)	Post-contact archaeological site identified on the east side of Middle Three Duck Lake (Figure 1-8).	**Continued CHVI (currently unknown if road upgrade activities will encroach upon the site)**
Sheppard Mining Site (CjHl-21) Middle Three Duck Lake	Stage 1, Stage 2, Stage 3	596	A cookery, sleep cabin and outhouse	Twentieth century post-contact archaeological site identified on the west side of Lower Three Duck Lake (Figure 1-10).	**Continued CHVI (currently unknown if road upgrade activities will encroach upon the site)**
Headframe Point (CjHl-22) Clam Lake	Stage 1, Stage 2	n/a	Three mine shafts	Twentieth century post-contact archaeological site identified on the east side of Clam Lake. Two shafts, one capped and one flooded, were identified on the point while a third was identified on the mainland. The company which owned and operated these shafts is in question (Figure 1-6).	**Continued CHVI (will not be affected by proposed development activities)**

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Large Pit Mine Site (CjHl-23) Clam Lake	Stage 1, Stage 2	n/a	Trench and large blasted pit with associated waste rock pile	Post-contact feature related to mineral exploration and mining identified on the west side of Clam Lake. The company which ran this site is not known. The archaeological nature of this site is suspect (Figure 1-6)	No further CHVI
Weeduck Cabin Site (CjHl-24) Weeduck Lake	Stage 1, Stage 2	n/a	5 x10 m cabin, shed, and outhouse along with a woodstove and midden	Twentieth century post-contact archaeological site identified on the north side of Weeduck Lake (Figure 1-8).	No further CHVI
Shannon Cabin (CjHl-25) Little Clam Lake	Stage 1, Stage 2, Stage 3, Stage 4	1,440	Log cabin, storage shed, and cellar; phonograph loudspeaker, leg hold traps, mammalian bone fragments	Twentieth century post-contact archaeological site identified on the northeast side of Little Clam Lake. Based on the excavation of this site, it appears to be a typical prospecting camp which later succumbed to a fire (Figure 1-6).	No further CHVI
Cryderman Site (CjHl-26) Lower Three Duck Lake	Stage 1, Stage 2	52	Cabin, possible dynamite shed, and typical post-contact artifacts; pre-contact artifacts include quartzite and quartz cores	Twentieth century post-contact archaeological site with a minor pre-contact component identified on a point on the east shore of Lower Three Duck Lake (Figure 1-5).	**Continued CHVI (will not be affected by proposed development activities)**

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
Bagsverd Creek 3 (CjHl-29) Bagsverd Creek	Stage 1, Stage 2	25	Windowpane glass, nails, indelible marker, quartz shatter	Twentieth century post-contact archaeological site with a possible pre-contact component and portage identified along Bagsverd Creek (Figure 1-2)	**Continued CHVI (will not be affected by proposed development activities)**
Portages and Trails					
Bagsverd Lake Outlet Portage	-	-	-	This short portage is located on the north end of Bagsverd Lake at the constricted inlet of Bagsverd Creek. The narrow passage acts as a chokepoint and is naturally blocked by fallen vegetation, requiring a portage to travel between the two.	Outside of current development.
Bagsverd Lake South Arm Portage	-	-	-	This portage extends between the south arm of Bagsverd Lake and a small pond. Although the middle part of the trail has been destroyed by past logging activities, the part of the trail close to Bagsverd Lake contained a well-defined treadway.	Only the landing areas could be located, central portion not found. No impacts are anticipated at the landing areas.
Three Duck Lake Outlet Portage	-	-	-	A portage leads from the southernmost section of lower Three Duck Lake into the Mollie River, bypassing a short set of rapids.	Outside of current development.

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Artifacts Recovered to Date (Total)	Notable Finds	Brief Site Description	Current Status
The Somme River Portage (CkHl-3)	-	-	-	An east west portage associated with archaeological materials on the Somme River before draining into Neville Lake. A road currently crosses the portage. Also noted in the pre-contact archaeological site table.	Outside of current development.
Bagsverd Creek 3 (CjHl-29)	-	-	-	This is a portage associated with an archaeological site along the north side of Bagsverd Creek, also noted in the historic archaeological site table.	Outside of current development.
Upper Duck to Middle Duck Portage	-	-	-	This portage is located between the upper and middle Three Duck Lake and is associated with two separate treadways. Three culturally modified trees are present on the north portage terminus and four on the south portage terminus.	No new impacts anticipated.
Bagsverd to Weeduck Portage	-	-	-	This is a historic portage which was widened to provide access to vehicles and trailers. It follows the shortest distance between the two lakes.	No new impacts anticipated.
Middle Duck East Portage	-	-	-	A trail was identified on a small bay on the east side of Middle Three Duck Lake travelling east towards a smaller lake.	Outside of current development.
Mollie River to Chester Lake Portage	-	-	-	This portage extends between the northeastern most point of Chester Lake and the Mollie River, bypassing a swift, shallow, and rocky section of the Mollie River. On-ground work identified portions of the portage although past logging activities have obscured others.	Outside of current development.

3.0 MITIGATION MEASURES AND SITE MANAGEMENT

Mitigation measures are means to prevent, reduce or control adverse environmental effects of a project, and include restitution for any damage to the environment caused by those effects through replacement, restoration, compensation or any other means. The mitigative measures used to prevent adverse impacts to archaeological sites on the IAMGOLD property generally include the completion of Stage 1 to Stage 4 archaeological assessments in order to document the sites, assess their relative CHVI, and mitigate potential impacts through either excavation or avoidance and protection. Stage 4 excavation results in the complete excavation of the archaeological site and the removal of its CHVI while Stage 4 avoidance and protection maintains the site's level of CHVI and protects it through the use of active (i.e. barriers, signage, etc.) and passive (i.e. buffers) site protection measures.

Table 3-1 provides the general mitigation measures applicable to the EER and indicates if the mitigation measures have changed or stayed the same from the EA. Table 3-2 provides a site-specific update to the mitigation and management measures for all archaeological sites identified during assessment work for the Côté Gold Project.

Furthermore, WHS and WHNE are actively working with Mattagami First Nation (MFN) and Flying Post First Nation (FPFN) to coordinate the transfer of all artifacts recovered, analyzed, and reported on during the 2010-2017 assessments to a curation and storage facility in accordance with MTCS protocols. MTCS collection transfer forms will be completed by the surrendering licensee(s) as well as MFN and FPFN. The artifact collections shall be curated to the best possible standards in a public institution.

Below is the advice on compliance with legislation from MTCS:

1. Advice on compliance with legislation is not part of the archaeological record. However, for the benefit of the proponent and approval authority in the land use planning and development process, the report must include the following standard statements:

a. This report is submitted to the Minister of Tourism and Culture as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism and Culture, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b. It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest , and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the Ontario Heritage Act.

c. Should previously undocumented archaeological resources be discovered, they may be a new
archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the Ontario Heritage Act.

d. The Cemeteries Act, R.S.O. 1990 c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

2. Reports recommending further archaeological fieldwork or protection for one or more archaeological sites must include the following standard statement: "Archaeological
sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence."

Table 3-1: General Mitigation Measures – Archaeology

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Archaeology	Construction through Closure	Disturbance to archaeological sites	Archaeological assessments Stages 1, 2, 3 and 4, as required	Archaeological assessment at identified areas when sub-surface impacts are anticipated; monitoring, as required, of secondary impacts (i.e. erosion) when present	MTCS Regulations	General approach to site mitigation (i.e. completion of Stage 1-4 archaeological assessments, as required) has not changed from the EA. Site-specific mitigation measures and future work recommendations have been updated from the EA (see Table 3-2).

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Archaeology	Construction through Closure	Storage of artifacts	Transfer excavated artifacts to a public storage and curation facility for long-term protection	Active consultation with MFN to coordinate the transfer of all artifact collections in accordance with MTCS protocols after analysis has been completed along with a community presentation. An MTCS collection transfer form will be completed by the surrendering licensee(s) and MFN and collections shall be curated to such standards in a public institution or other location as approved by MTCS.	MTCS Regulations	Mitigation measure updated. Changes in MTCS protocols regarding the curation and storage of artifacts state that collections must now be curated in public institutions, or other locations approved by MTCS. As such, discussions with MFN are in progress to identify suitable public institution(s) and coordinate the transfer of artifact collections

Discipline	Project Phase	Issue / Concern / Interaction	Mitigation Measure	Description / Commitment	Standard	Comparison between EA and EER measures
Archaeology	Construction phase	Exposure of potential marine archaeological resources or values	Monitor the dewatering of Côté Lake, as per previous requirements of MTCS.	A licensed archaeologist is required to monitor the dewatering event.	n/a (as requested by the MOECC and agreed to by MTCS)	New mitigation measure. Approach to inspecting newly-exposed shorelines not previously included in archaeology section of EA Technical Support Document.

Table 3-2: Site-Specific Mitigation Measures and Future Work for Archaeological Sites

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Flat Rock Site (CjHl-2) Mollie River	Stage 1, Stage 2, Stage 3	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Makwa Point (CjHl-3) Clam Lake	Stage 1, Stage 2	No further CHVI (significance revised from EA due to small site size, low productivity, and poor artifact quality)	Completed mitigation – No further work required	None – site has no provincial significance (updated from EA to reflect the revised CHVI)
Chester 1 (CjHl-4) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Chester 3 (CjHl-5) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Chester 4 (CjHl-6) Chester Lake	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Chester 5 (CjHl-7) Chester Lake	Stage 1, Stage 2, Stage 3, Stage 4	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Chester 6 (CjHl-8) Chester Lake	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)
Lookout Site (CjHl-9) Chester Lake	Stage 1, Stage 2	**Continued CHVI**	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (updated from EA to reflect passive protection measures)
Upper Duck Pine Point (CjHl-10) Upper Three Duck Lake	Stage 1, Stage 2	**Continued CHVI** (revised from EA to reflect results of 2017 Stage 2 assessment)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (updated from EA to reflect passive protection measures)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Two Pike Point (CjHl-11) Upper Three Duck Lake	Stage 1, Stage 2, Stage 3, Stage 4	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Côté Lake 1 (CjHl-12) Côté Lake	Stage 1, Stage 2, Stage 3	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Côté Lake 2 (CjHl-13) Côté Lake	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)
Rocky Narrows 1 (CjHl-14) Mollie River	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	Future Work Recommendations	Description of Protection (EA updates in bold)
Rocky Narrows 2 (CjHl-15) Mollie River	Stage 1, Stage 2, Stage 3	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Rocky Island Campsite (CjHl-16) Bagsverd Lake	Stage 1, Stage 2	**Continued CHVI** (site significance revised from EA to reflect the site's productivity and size)	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (updated from EA to reflect revised CHVI)
Table Point Site (CjHl-17) Bagsverd Lake	Stage 1, Stage 2	**Continued CHVI**	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone (unchanged from EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	Future Work Recommendations	Description of Protection (EA updates in bold)
Bagsverd Creek 1 (CjHl-27) Bagsverd Creek	Stage 1, Stage 2	**Continued CHVI**	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone (unchanged from EA)
Bagsverd Creek 2 (CjHl-28) Bagsverd Creek	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)
Bagsverd Creek 4 (CkHl-3) Bagsverd Creek	Stage 1, Stage 2	**Continued CHVI** (revised from EA to reflect Stage 2 report recommendations)	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (updated from EA to reflect revised CHVI)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	Future Work Recommendations	Description of Protection (EA updates in bold)
Mollie River 1 (CjHl-30) Mollie River	Stage 1, Stage 2	**Continued CHVI** (new site identified in 2017)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)
Weeduck Lake 1 (CjHl-31) Weeduck Lake	Stage 1, Stage 2	**Continued CHVI** (new site identified in 2017)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)
Upper Three Duck Lake 1 (CjHl-32) Upper Three Duck Lake	Stage 1, Stage 2	**Continued CHVI** (new site identified in 2017)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Upper Three Duck Lake 2 (CjHl-33) Upper Three Duck Lake	Stage 1, Stage 2	**Continued CHVI** (new site identified in 2017)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)
Upper Three Duck Lake 3 (CjHl-34) Upper Three Duck Lake	Stage 1, Stage 2	**Continued CHVI** (new site identified in 2017)	Passive site protection measures in place, Stage 3 work scheduled for 2018	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)
Clam Lake Gold Mining Company (CjHl-18) Clam Lake	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)

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Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	Future Work Recommendations	Description of Protection (EA updates in bold)
Chester Lake 2 (CjHl-19) Chester Lake	Stage 1, Stage 2, Stage 3	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Gosselin Mining Site (CjHl-20) Upper Three Duck Lake	Stage 1, Stage 2	Continued CHVI	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone (unchanged from EA)
Sheppard Mining Site (CjHl-21) Middle Three Duck Lake	Stage 1, Stage 2, Stage 3	Continued CHVI	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 10 m of site	**No active protection measures, passive protection measures include 10 m no-work buffer zone** (updated from EA to reflect reduced buffer width implemented following Stage 3 assessment)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Headframe Point (CjHl-22) Clam Lake	Stage 1, Stage 2	**Continued CHVI** (revised from EA upon reassessing significance)	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (updated from EA to reflect the revised CHVI)
Large Pit Mine Site (CjHl-23) Clam Lake	Stage 1, Stage 2	No further CHVI	Completed mitigation – No further work required	None – site has no ongoing significance (unchanged from EA)
Weeduck Cabin Site (CjHl-24) Weeduck Lake	Stage 1, Stage 2	No further CHVI (revised from EA to reflect the recent age of the structures and the low site significance)	Completed mitigation – No further work required	None – site has no ongoing significance (updated from EA to reflect the revised CHVI)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Shannon Cabin (CjHl-25) Little Clam Lake	Stage 1, Stage 2, Stage 3, Stage 4	No further CHVI	Completed mitigation – No further work required	None – site has been excavated (unchanged from EA)
Cryderman Site (CjHl-26) Lower Three Duck Lake	Stage 1, Stage 2	Continued CHVI	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone (unchanged from EA)
Bagsverd Creek 3 (CjHl-29) Bagsverd Creek	Stage 1, Stage 2	Continued CHVI	Passive site protection measures in place, additional Stage 3 and/or Stage 4 work required if development impacts are planned within 70 m of site	No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone (unchanged from EA)

Site Name, Borden Number, and Location	Fieldwork Carried Out to Date	Status and Mitigative Measures		
		Current CHVI Status (EA updates in bold)	**Future Work Recommendations**	**Description of Protection (EA updates in bold)**
Cryderman Camp 2 (CjHl-35) East of Moore Lake	Stage 1	Continued CHVI	Passive site protection measures in place, additional Stage 2, Stage 3, and/or Stage 4 work required if development impacts are planned within 70 m of site Stage 2	**No active protection measures, passive protection measures include 20 m no-work buffer zone and 50 m monitoring zone** (new site not previously included in EA)

4.0 CONCLUSION

Following recent archaeological work undertaken since the completion of the EA, new archaeological sites have been identified and revisions have been made to the CHVI statuses and mitigative measures for a number of previously-identified archaeological sites. Site management and protection strategies have been revised accordingly and future work has been recommended where applicable.

With regard to built heritage, no further concerns exist at this time, and no additional built heritage assessment work is planned.

Additionally, changes in MTCS protocols regarding the transfer of artifacts were identified which require artifact collections to be curated in public institutions. As such, consultations are currently underway with MFN and FPFN to identify an appropriate public institution and to coordinate the transfer of artifact collections to said institution.

It is felt that the site management and mitigation strategies as well as the future work recommendations outlined in this document will effectively protect or mitigate the archaeological sites and values identified throughout the course of the Côté Gold Project and will help alleviate potential future archaeological concerns.

5.0 REFERENCES

Ministry of Tourism, Culture and Sport (MTCS). 2011. Standards and Guidelines for Consulting Archaeologists. Queen's Printer for Ontario.

Woodland Heritage Services Limited (WHS). 2016. A Stage 1 Archaeological Resource Assessment of IAMGOLD's Ongoing Study Areas of Mineral Claims and Exploration Activities in Chester, Yeo, Neville, and Potier Townships (all unsurveyed), Sudbury District, Ontario. Technical Report, J2016-46, MTCS PIF # P016-0444-2016.

Woodland Heritage Northeast Limited (WHNE). 2017. A Stage 2 Archaeological Resource Assessment of IAMGOLD's Ongoing Study Areas of Mineral Claims and Exploration Activities in Chester and Yeo Townships (all unsurveyed), Sudbury District, Ontario. Technical Report, R2017-03, MTCS PIF # P208-0142-2017.

Woodland Heritage Northeast Limited (WHNE). 2018. Stage 3 Monitoring of the Drilling of an Exploration Hole Near Archaeological Site CjHl-33 (Upper Three Duck Lake 2) in Chester Township (unsurveyed), Sudbury District, Ontario. Technical Report, R2017-27, MTCS PIF # P208-0156-2017.

6.0 GLOSSARY AND ABBREVIATIONS

CHVI	Cultural Heritage Value or Interest
EA	Environmental Assessment
EER	Environmental Effects Review
FPFN	Flying Post First Nation
km	kilometre
m	metre
MFN	Mattagami First Nation
MTCS	Ministry of Tourism, Culture and Sport
OASD	Ontario Archaeological Sites Database
WHNE	Woodland Heritage Northeast Limited
WHS	Woodland Heritage Services Limited

FIGURES

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Figure 1-1: Key map for the individual area maps showing the current status of various sites.

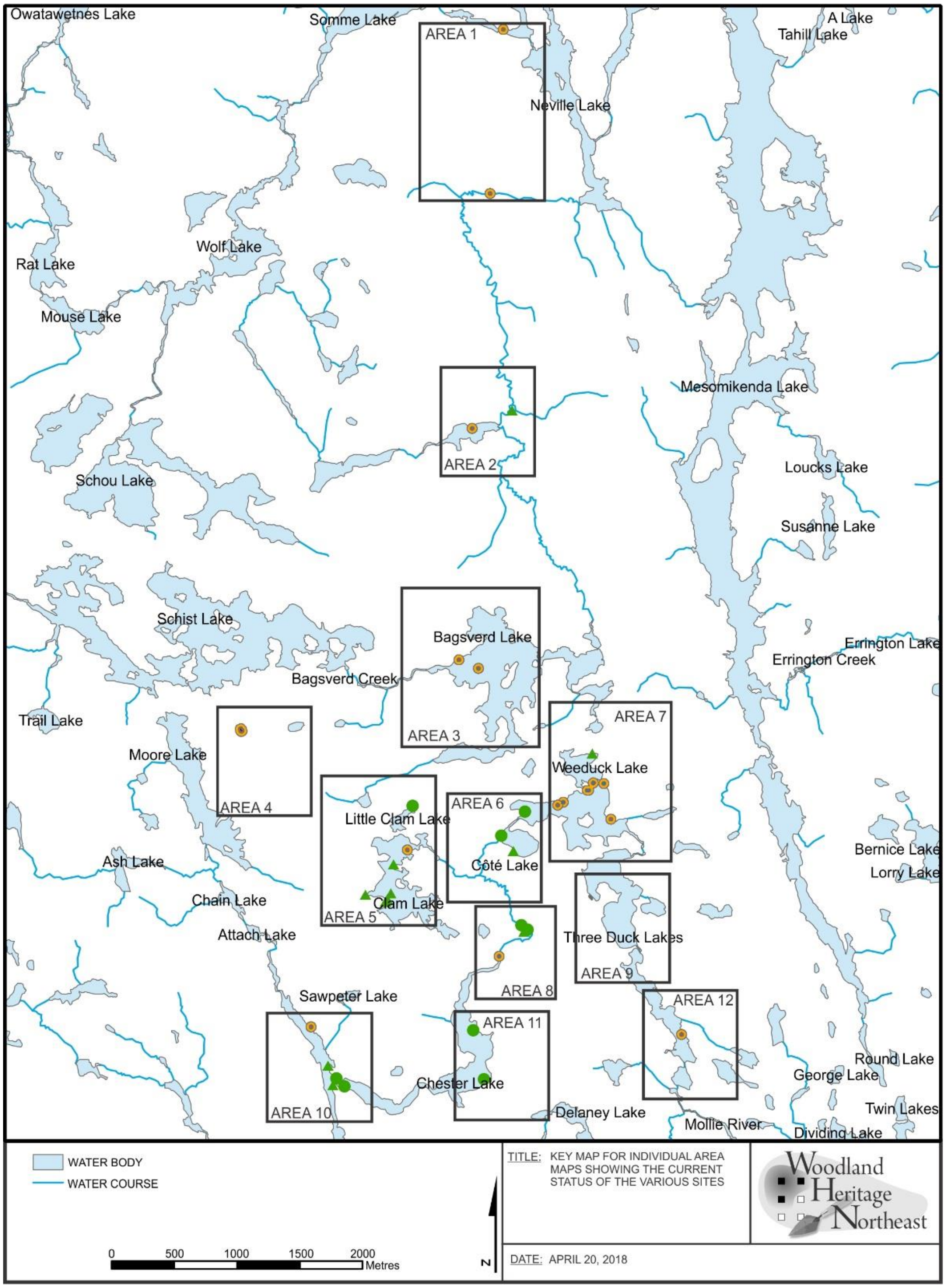

Figure 1-2: Map showing the current status of archaeological sites identified within the Côté Gold Project.

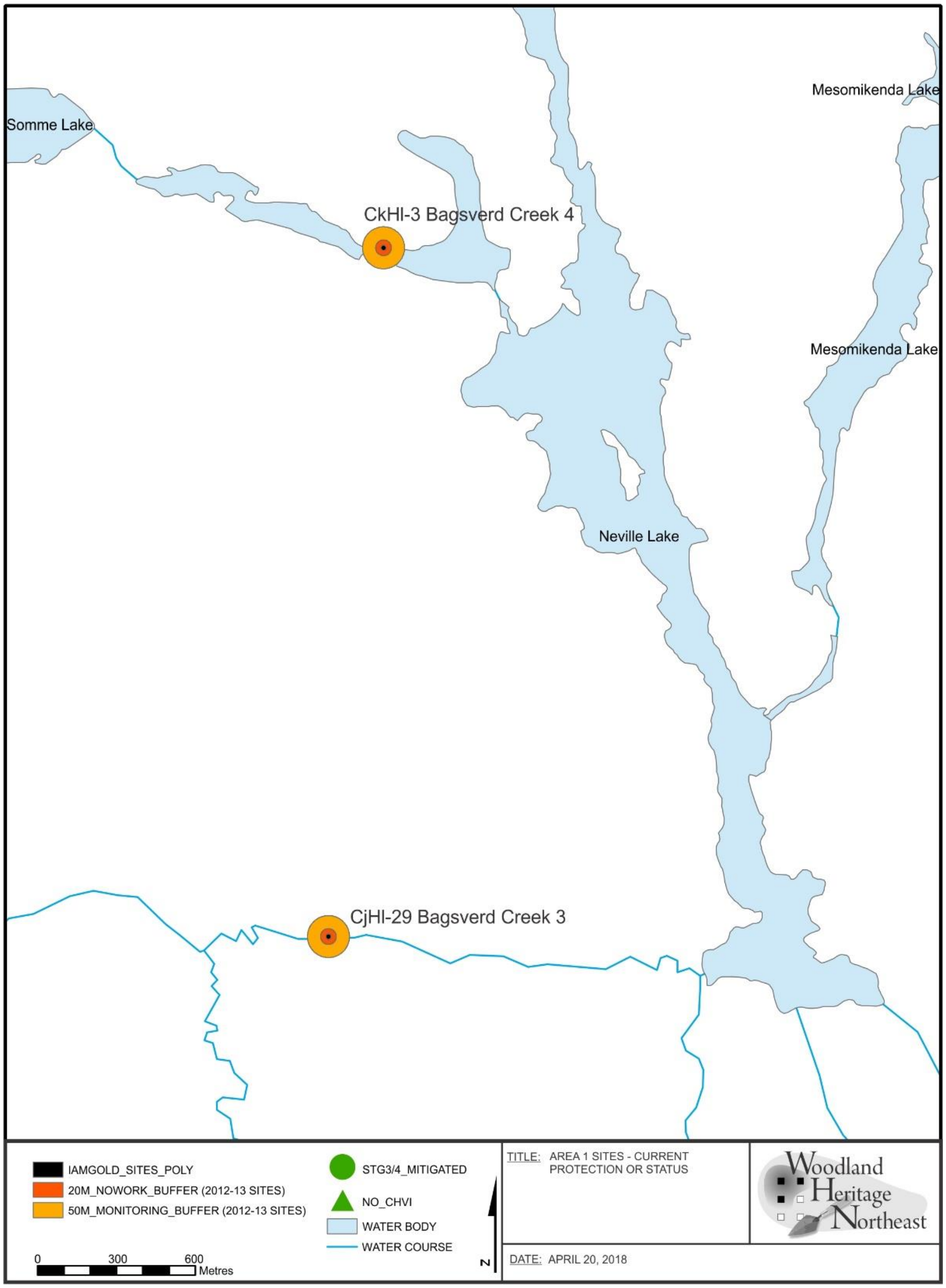

Figure 1-3: Map showing the current status of archaeological sites identified within the Côté Gold Project.

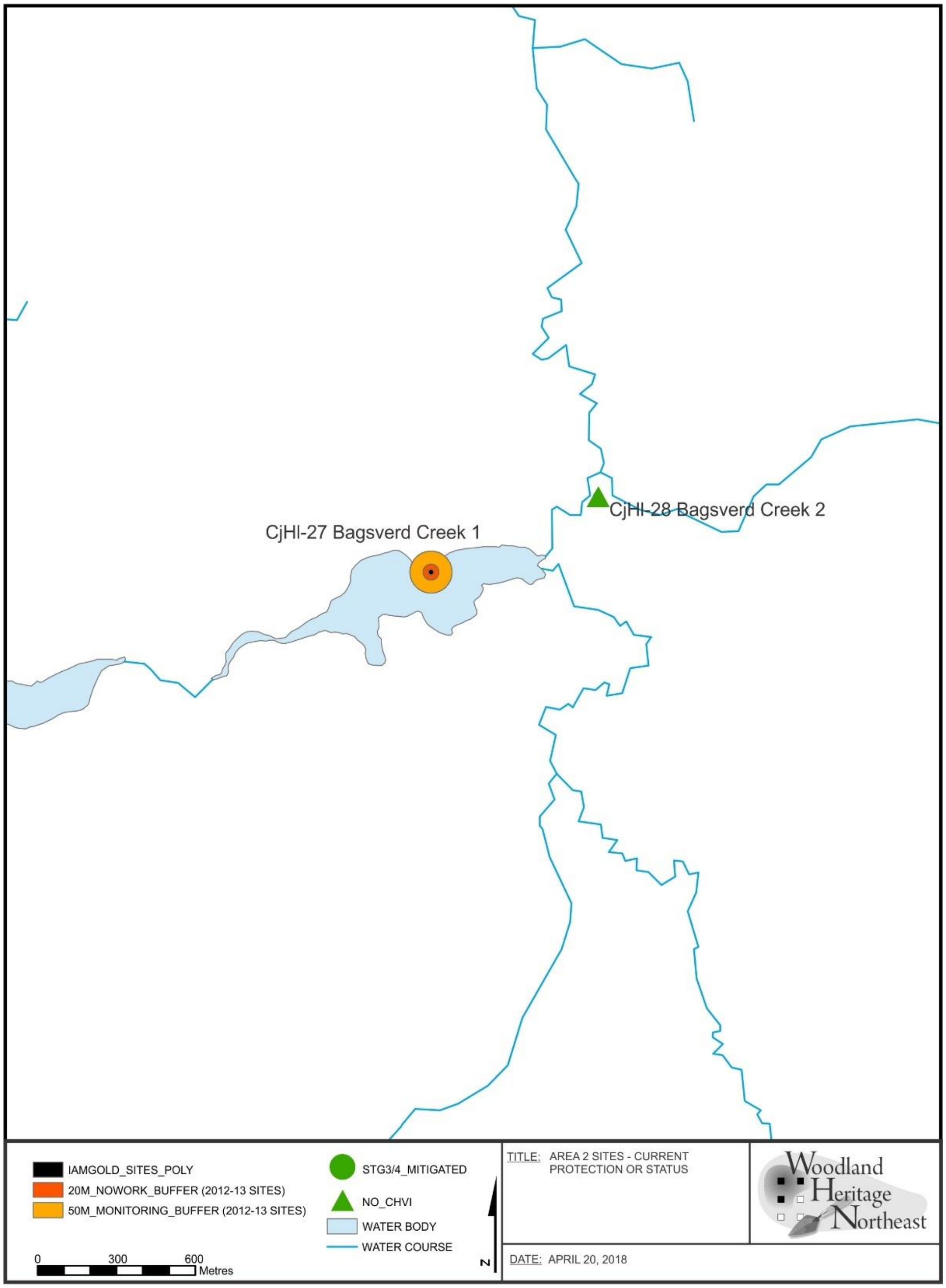

Figure 1-4: Map showing the current status of archaeological sites identified within the Côté Gold Project.

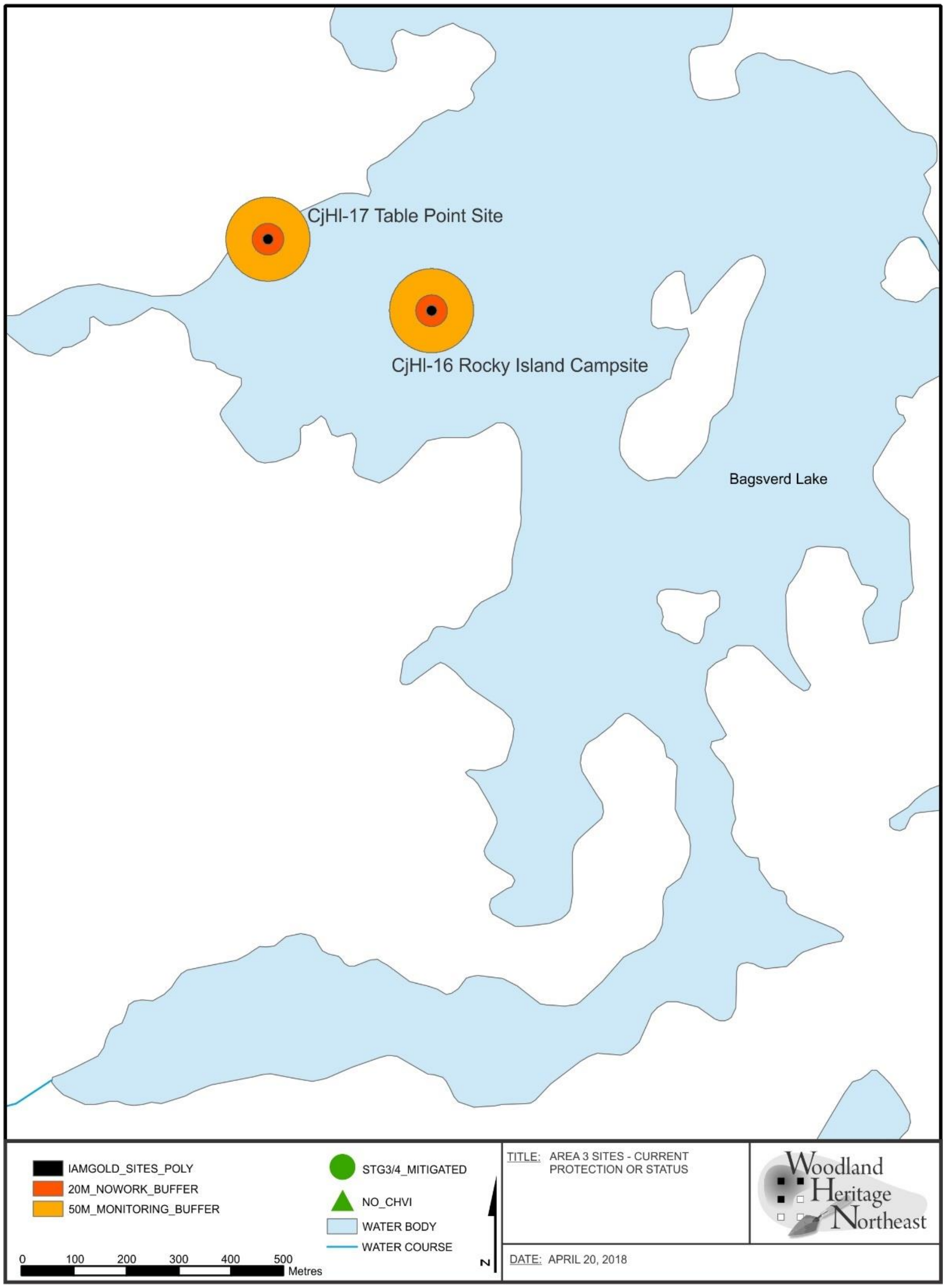

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Figure 1-5: Map showing the current status of archaeological sites identified within the Côté Gold Project.

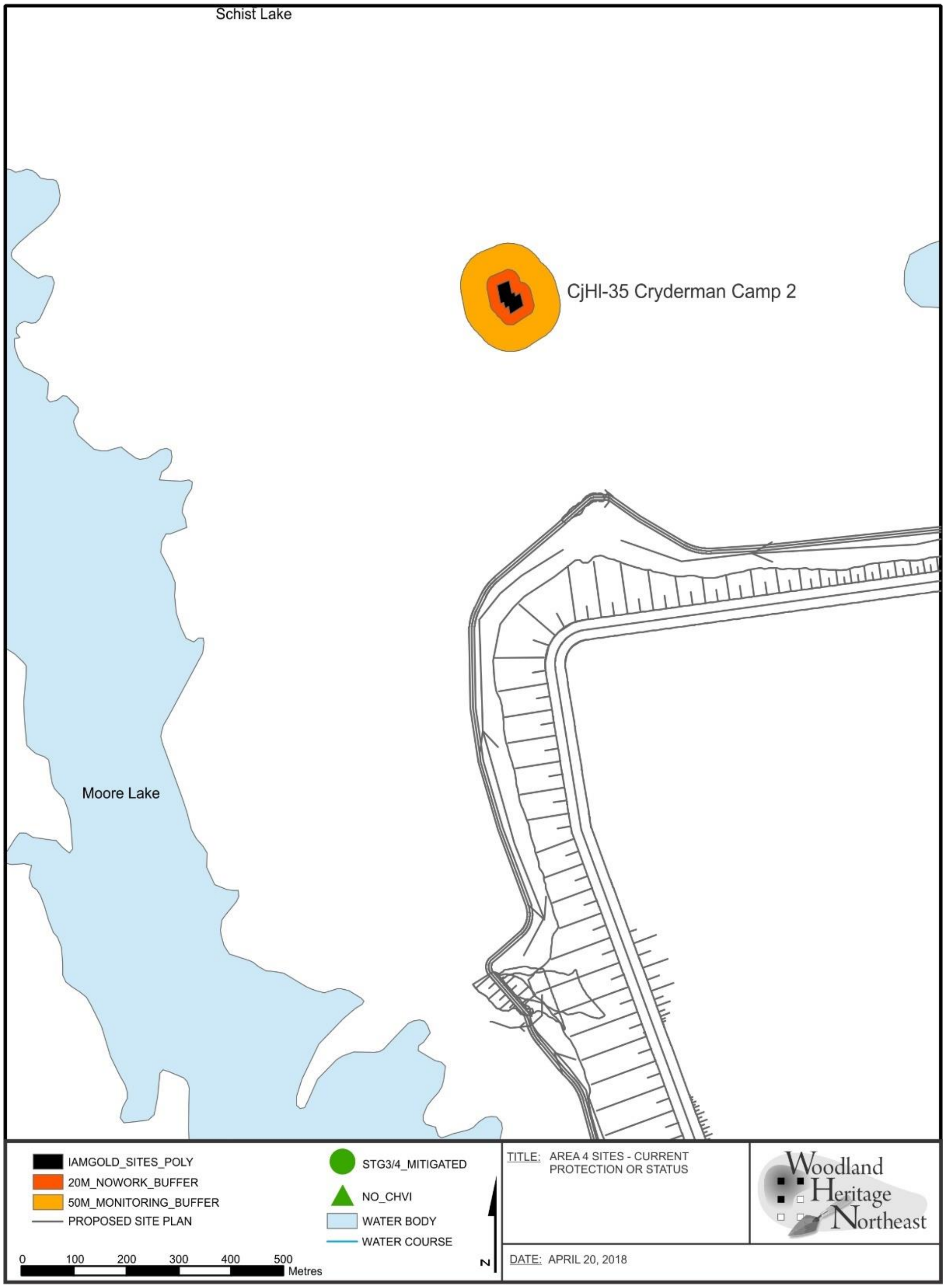

Figure 1-6: Map showing the current status of archaeological sites identified within the Côté Gold Project.

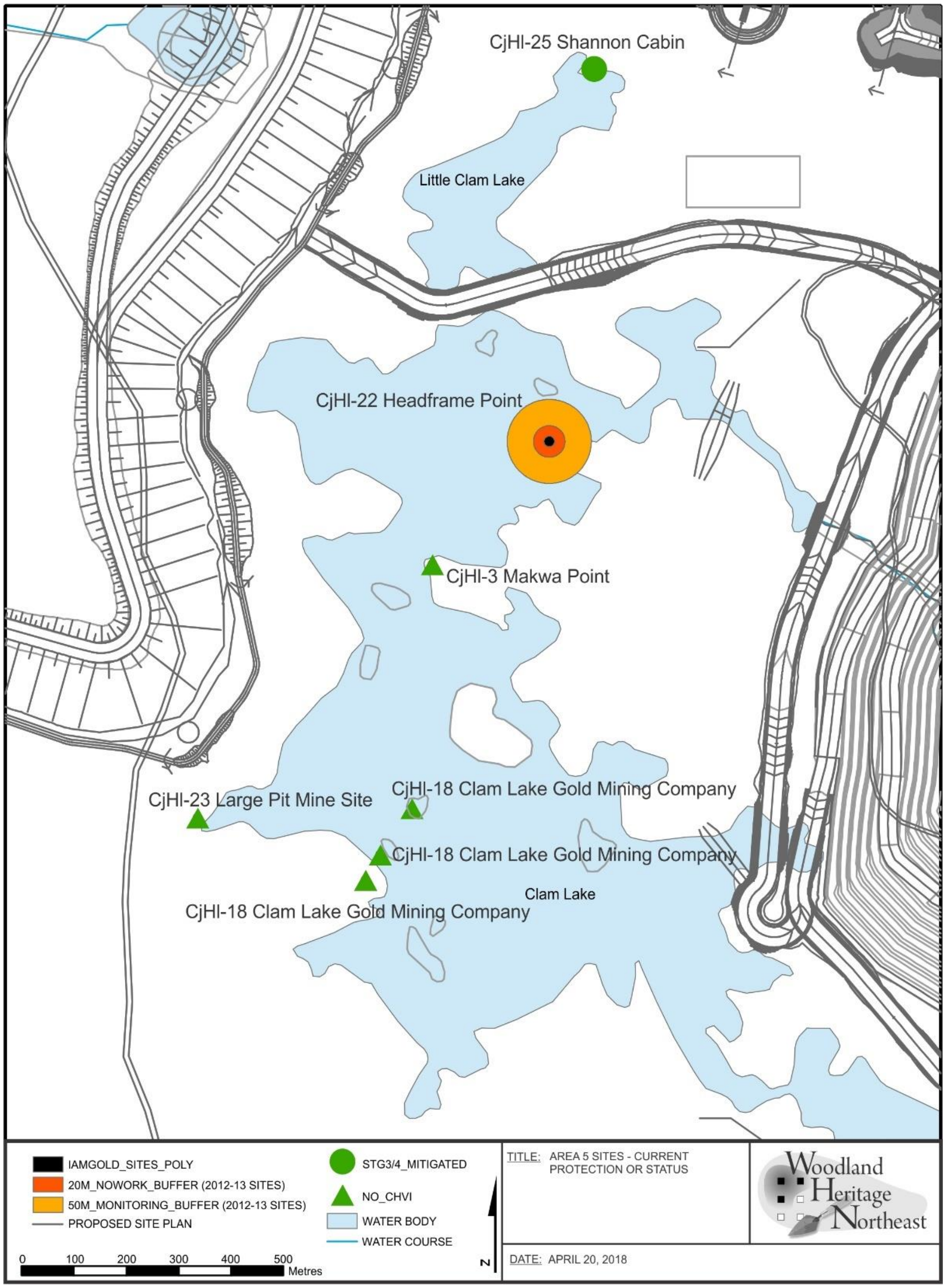

Figure 1-7: Map showing the current status of archaeological sites identified within the Côté Gold Project.

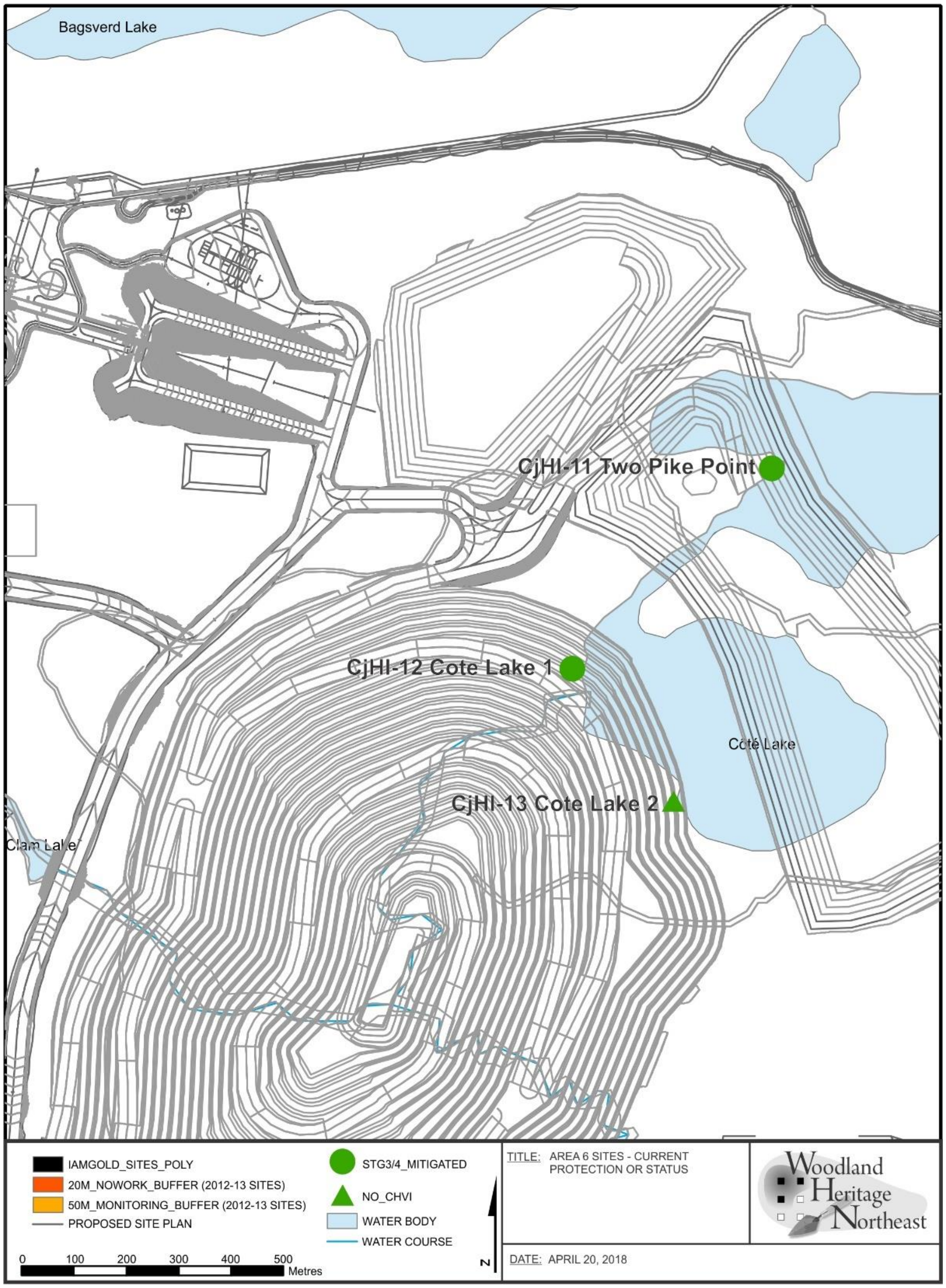

Figure 1-8: Map showing the current status of archaeological sites identified within the Côté Gold Project.

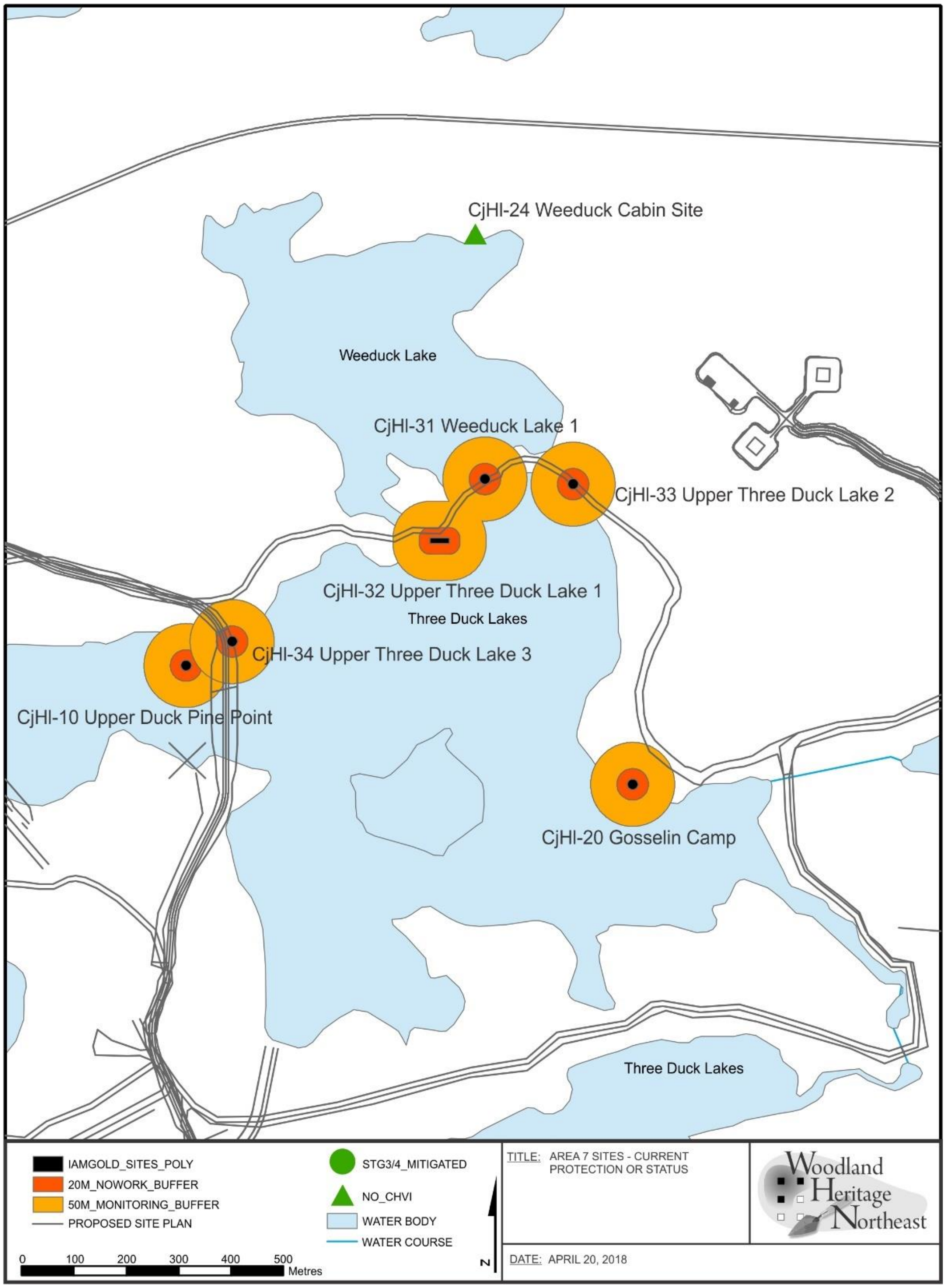

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Figure 1-9: Map showing the current status of archaeological sites identified within the Côté Gold Project.

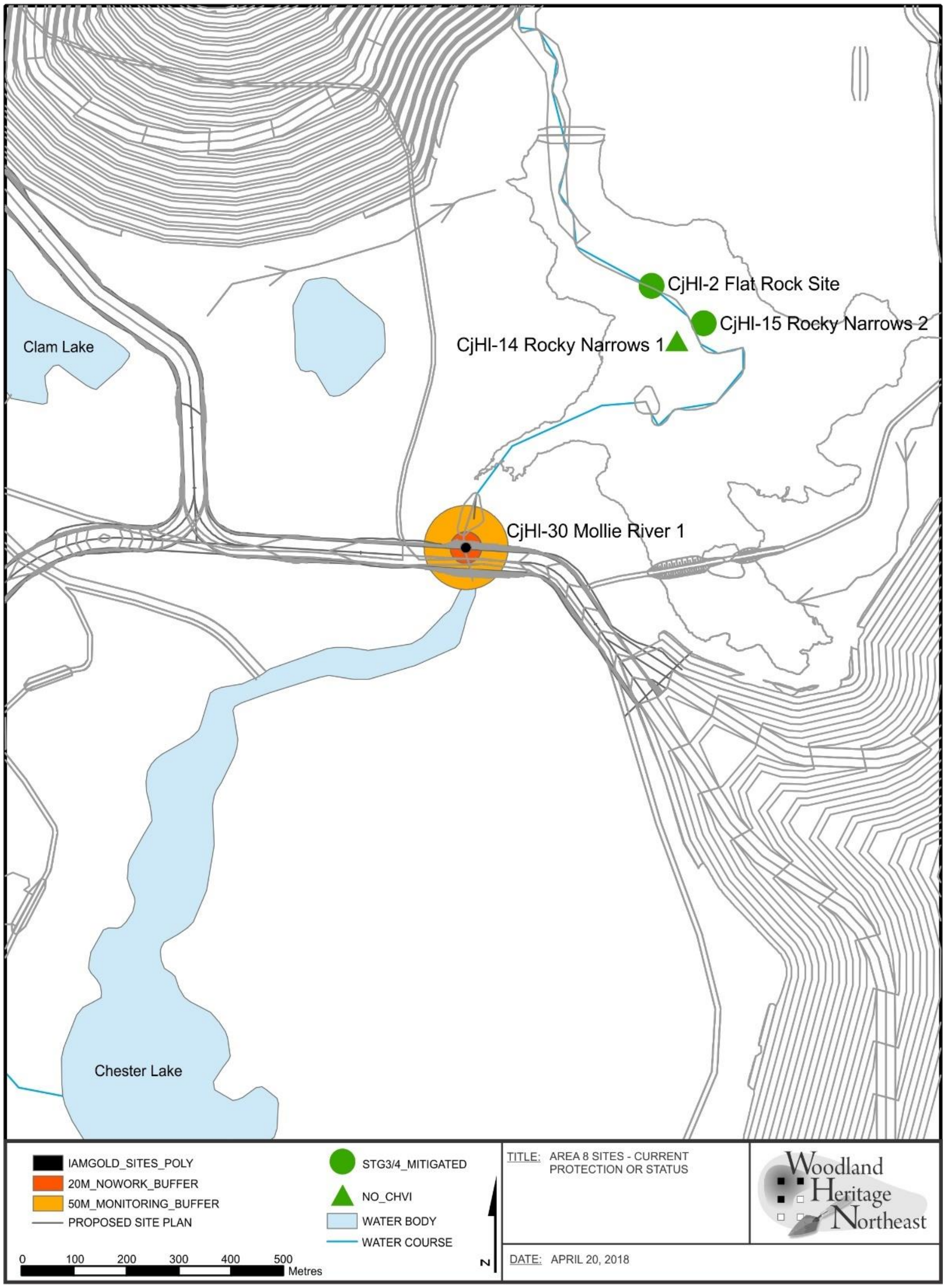

Figure 1-10: Map showing the current status of archaeological sites identified within the Côté Gold Project.

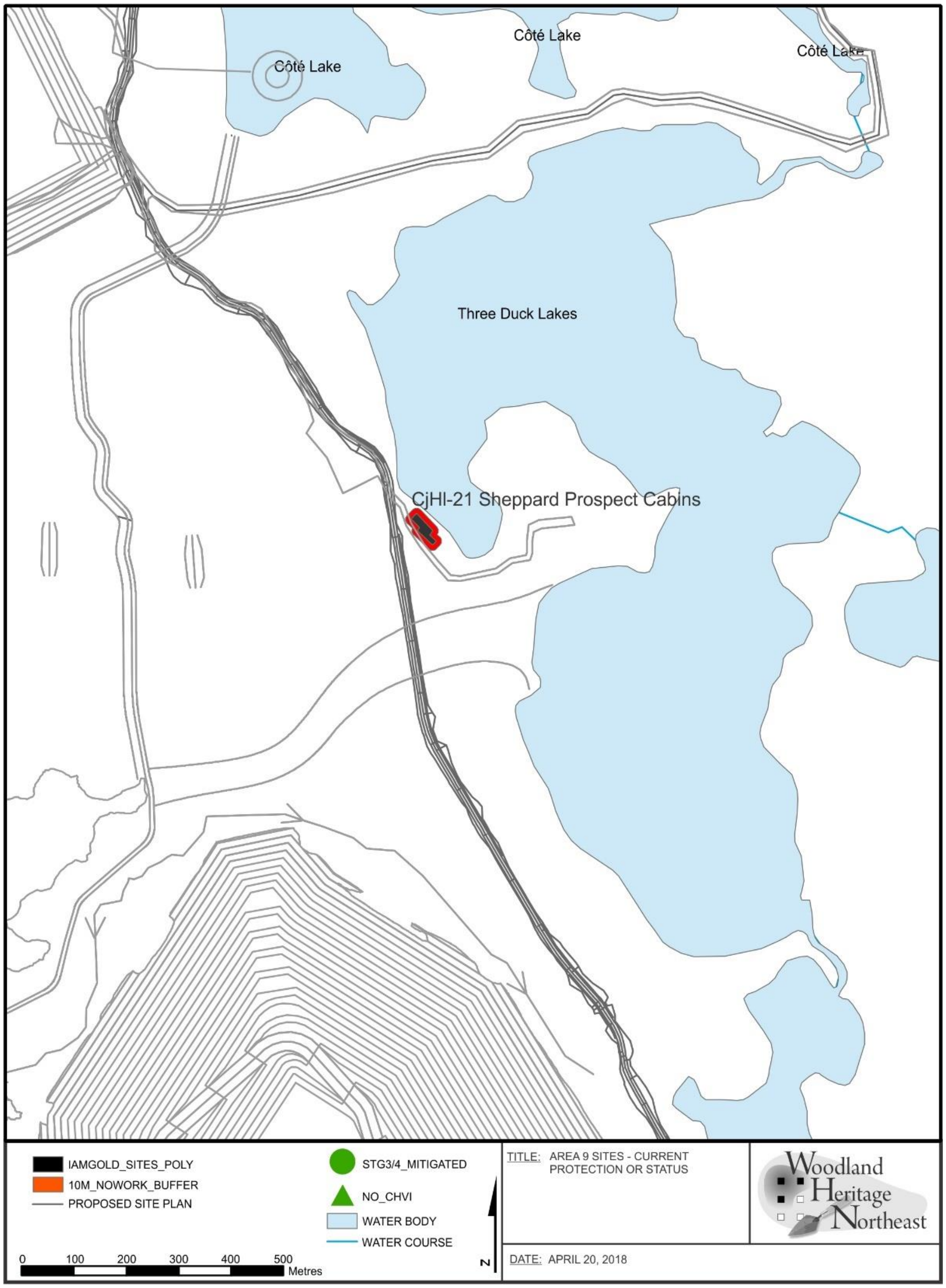

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Figure 1-11: Map showing the current status of archaeological sites identified within the Côté Gold Project.

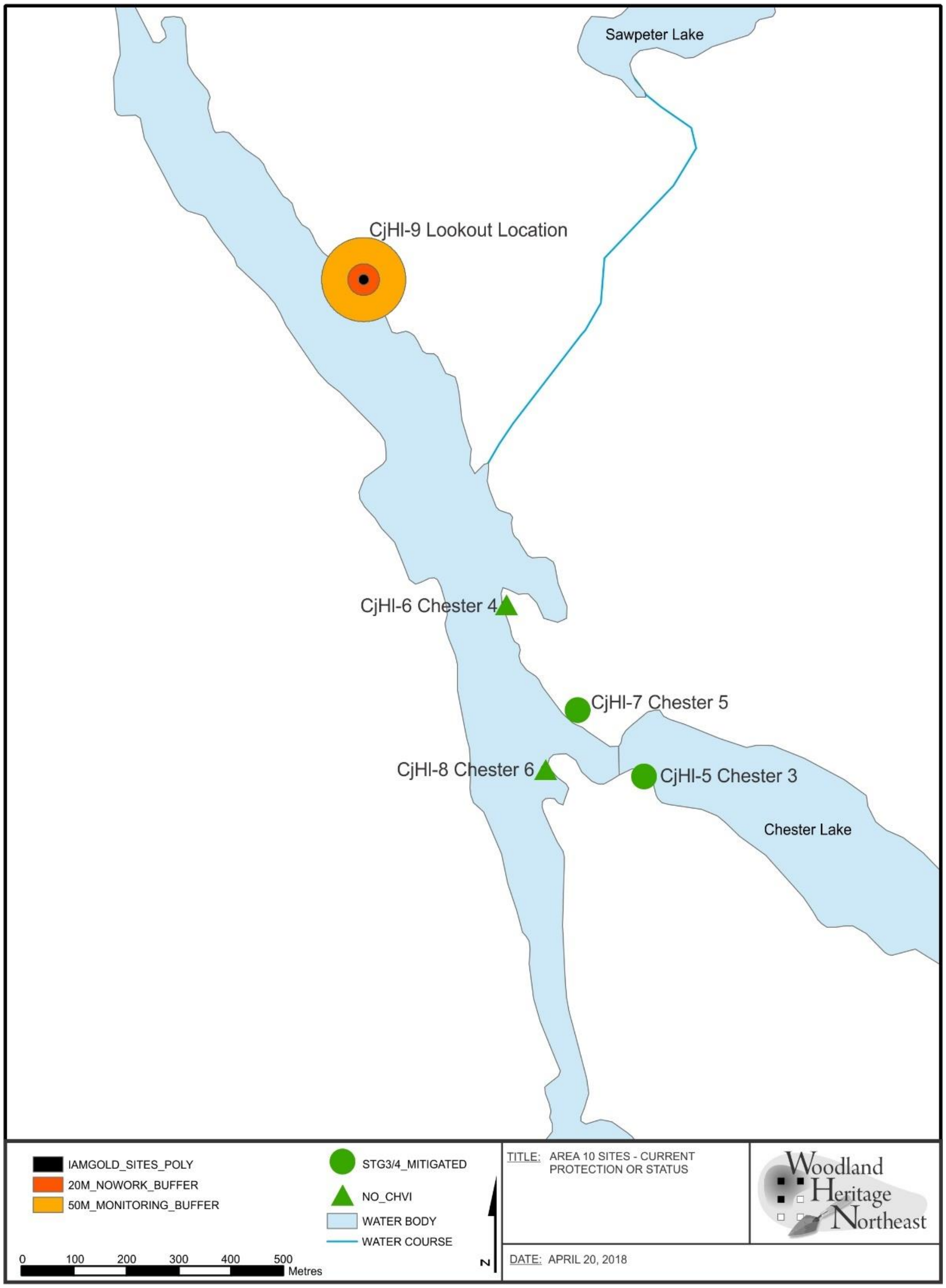


Figure 1-12: Map showing the current status of archaeological sites identified within the Côté Gold Project.

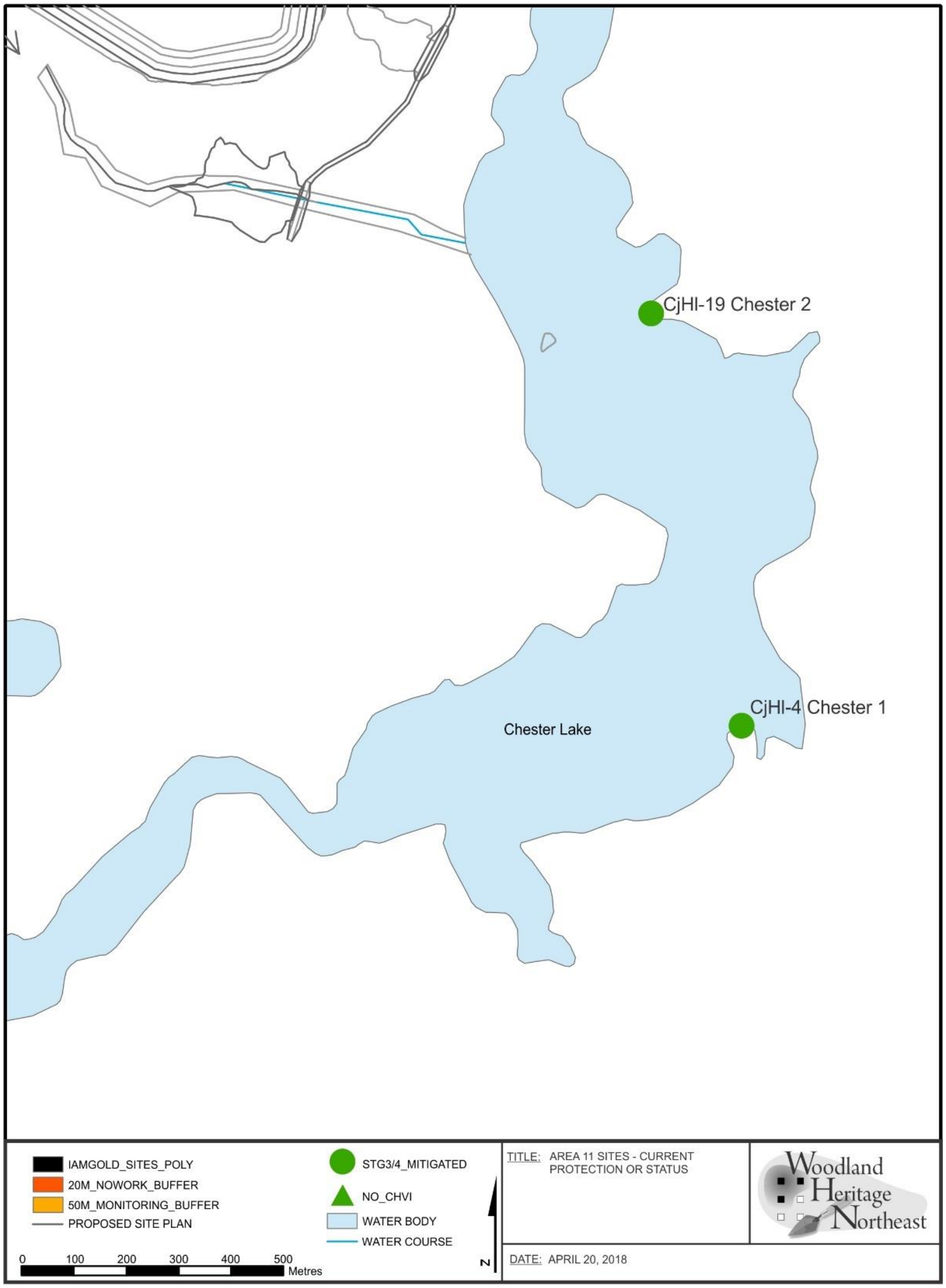


Figure 1-13: Map showing the current status of archaeological sites identified within the Côté Gold Project.

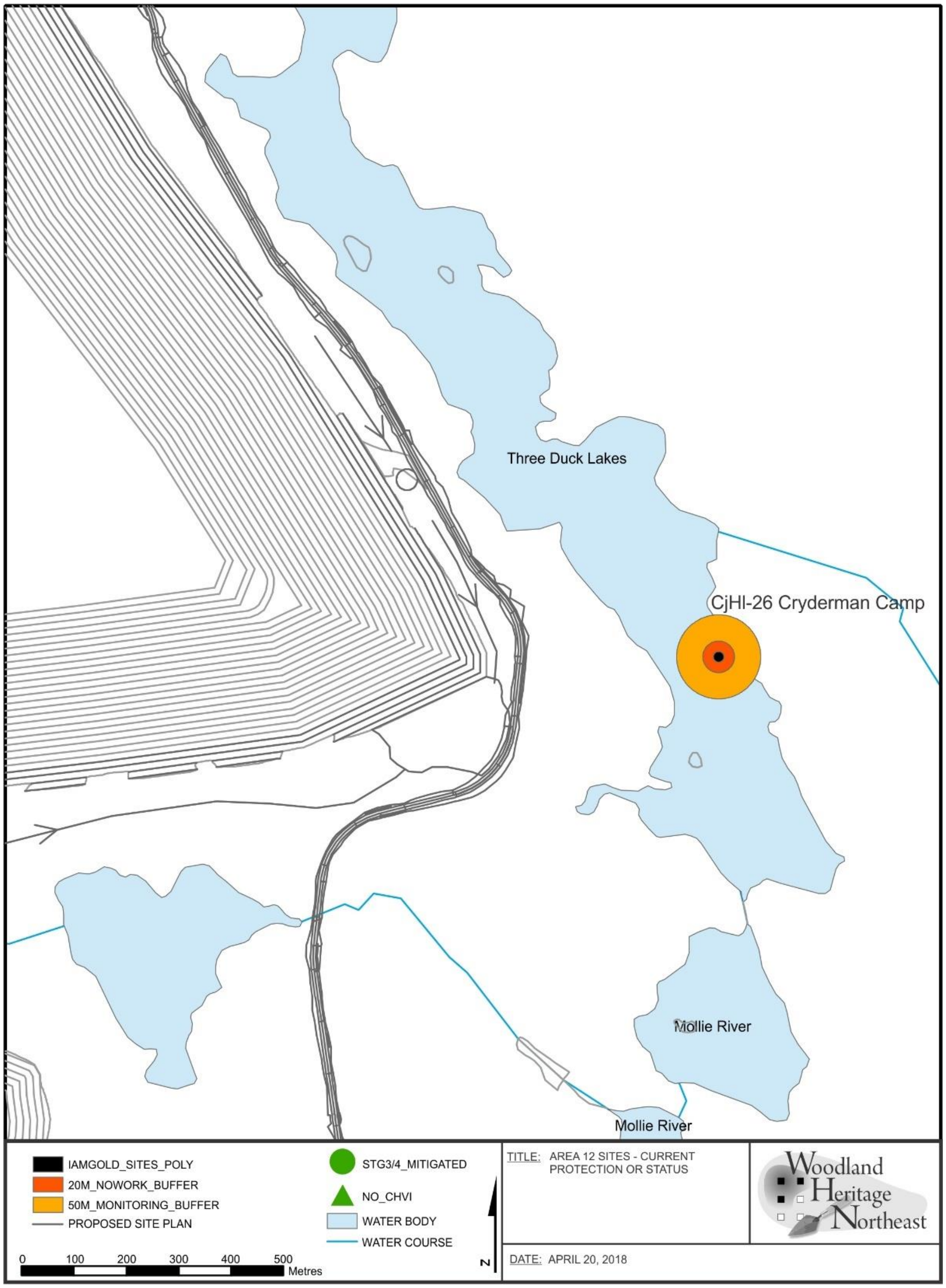


Figure 1-14: Map showing the portages identified within the Côté Gold Project (North area).

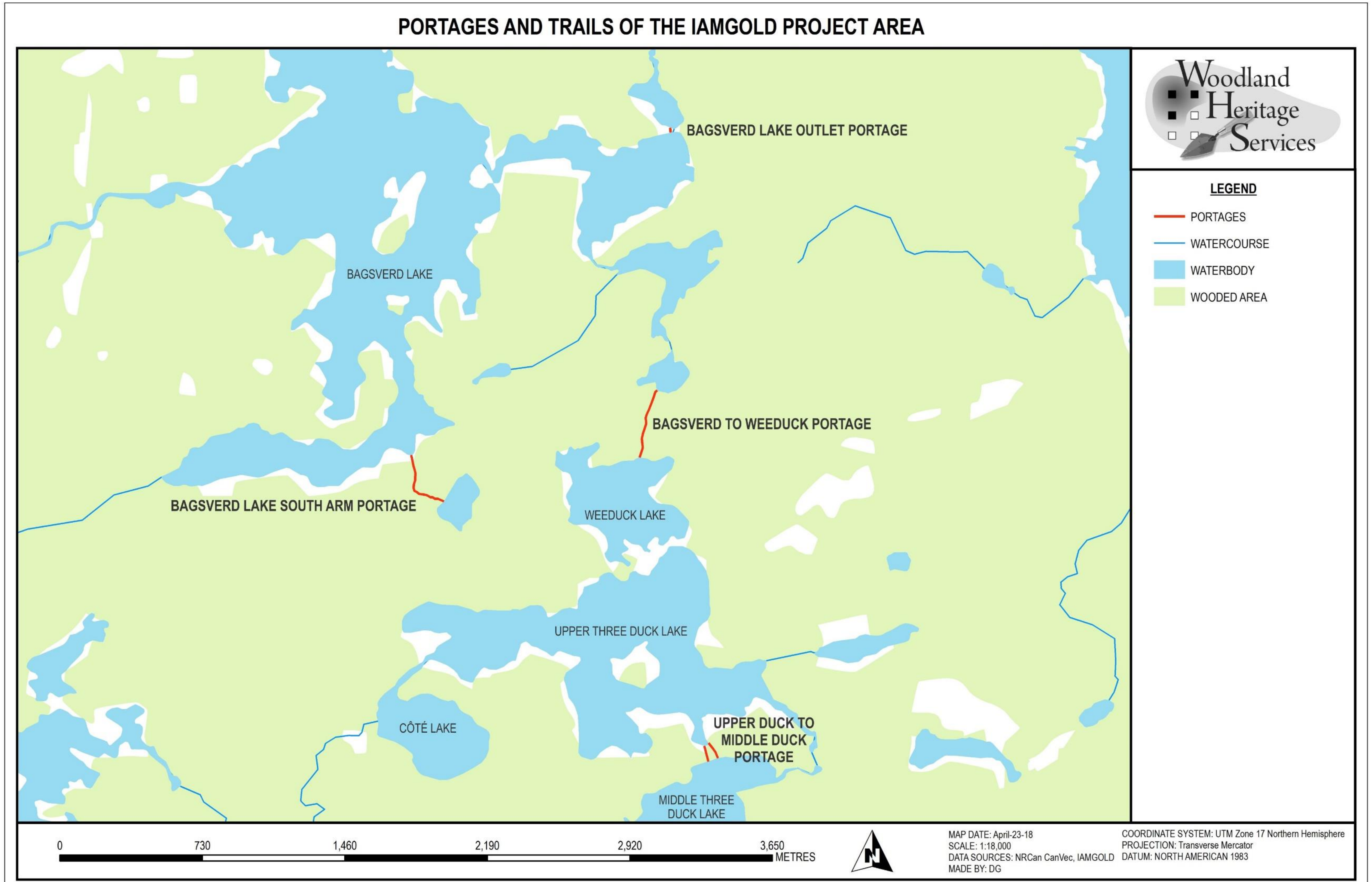
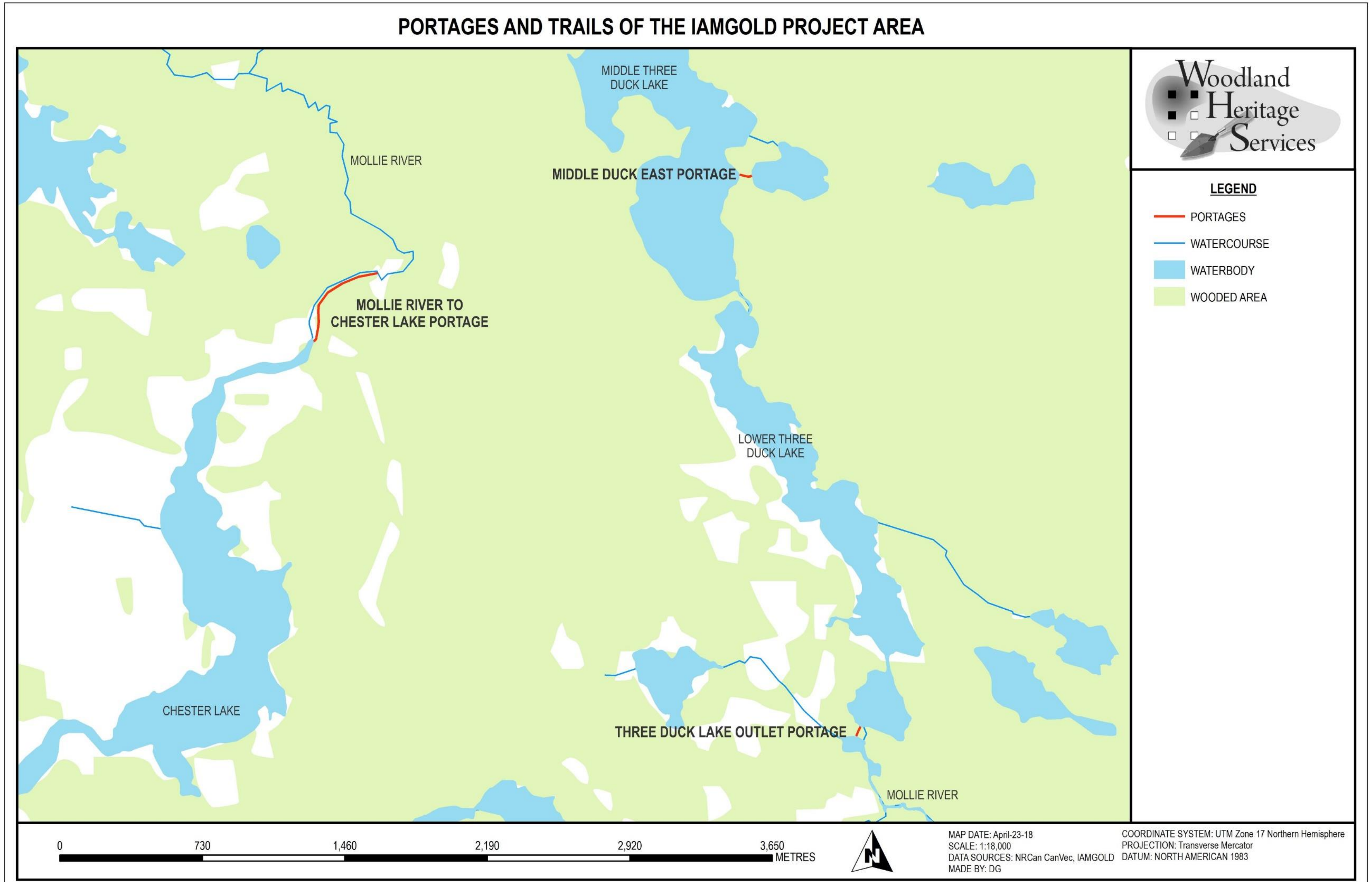


Figure 1-15: Map showing the portages identified within the Côté Gold Project (South area).



APPENDIX I
EXECUTIVE SUMMARY

Throughout the past 8 years various archaeological assessments have been carried out on properties associated with IAMGOLD's Côté Gold Project. Several of the studies resulted in the location of previously unknown archaeological sites, both pre-contact and post-contact. While many of these sites have been mitigated or are outside the area of development, several remain which require further archaeological work.

It is unknown at this time if additional Stage 4 mitigation work will be required as this is dependent on the results from the Stage 3 assessment. The sites which have been selected for Stage 3 work in 2018 include: Mollie River 1 which is located at the outlet of the Mollie River from Chester Lake; Upper Duck Pine Point and Upper Three Duck Lake 3, located in the vicinity of the proposed dam across Upper Three Duck Lake; and Upper Three Duck Lake 1 and 2 as well as Weeduck Lake 1 located in the area between Upper Three Duck Lakes and Weeduck Lakes.

Several of the sites, located during earlier studies, have continued cultural heritage value or interest (CHVI), but currently lie outside of the planned development. These sites include: the Lookout Site on Chester Lake; the Rocky Island Campsite and the Table Point Site located on Bagsverd Lake; Bagsverd Creek 1, 3 and 4, located on sections or tributaries of Bagsverd Creek; Headframe Point Site on Clam Lake; the Cryderman Site on Lower Three Duck Lake; and finally, the Cryderman Camp located to the east of Moore Lake. Should the development plans change at some time in the future these sites may require additional archaeological assessment work.

The 2018 work is ongoing and has seen the completion of 3 Stage 3 site-specific assessments. We are currently undertaking Stage 4 excavation work on two of the archaeological sites with the help of Mattagami First Nation, on Upper Three Duck Lake 3 and Upper Duck Pine Point. This work will be completed in the fall of 2018. The vast majority of the fieldwork undertaken on the Côté Gold Property has directly involved members of Mattagami, and during the 2012 and 2013 field seasons, a member of Flying Post First Nation.