9.0 DESCRIPTION OF PROJECT EFFECTS

9.1 Methodology

The assessment of residual environmental effects (effects) consists of the following steps:

- Selection of effects assessment indicators – identification of effects assessment indicators for each discipline which are used, where appropriate, to characterize how the Project could affect the environment. These effects assessment indicators have been chosen such that they represent the effects on the environment as a whole. This is presented in Section 9.1.1.
- Selection of study areas – definition of study areas to describe the geographic extent of potential environmental effects. This is presented in Section 9.1.2.
- Prediction of potential effects – based on the Project design, including mitigation, effects are predicted through modelling or qualitative analysis. It should be noted that the process of predicting effects and developing mitigation measures is inherently iterative. This is presented in Sections 9.2. to 9.15.
- Identification of mitigation measures – measures for the elimination, reduction or control of adverse environmental effects and may include restitution for any damage to the environment caused by those effects through offsetting, replacement and/or restoration. Mitigation measures are presented in Chapter 10.
- Determination of significance – based on the results of the assessment of potential effects and the application of mitigation measures, the significance of the residual effect, or the potential impact, is assessed through predetermined assessment criteria (magnitude, geographic extent, duration, frequency, reversibility and likelihood) and a significance decision tree. The determination of effects significance is presented in Chapter 11.

Residual adverse effects, or impacts, that are determined to be significant are not acceptable for the Project and further mitigation, monitoring and management measures have been incorporated in the Project to reduce the significance level of such effects.

9.1.1 Selection of Effects Assessment Indicators

The identification of potential effects is based on an analysis of the interactions of the various Project components with the physical, biological and human environments. Effects assessment indicators are aspects of the physical, biological and human environment that are particularly notable or valued because of their ecological, scientific, resource, socio-economic, cultural, health, aesthetic, or spiritual importance, and which have a potential to be adversely affected by Project development. The identification of effects assessment indicators ensures that the impact assessment is practical, concise and relevant, and indicators are chosen such that they represent the potential effects on the environment.

A physical and/or biological effects assessment indicator can be a particular habitat, an environmental feature, a particular assemblage of plants or animals, a particular species of plant or animal, or an indicator of environmental health. Data from baseline studies, literature sources and consultation activities have been used to identify indicators on the basis of their meeting one or more of the following criteria:

- Area of notable biological diversity;
- Significant habitat for locally important species;
- Significant habitat for uncommon, rare or unusual species;
- Important corridor or linkage for fish and/or wildlife movement;
- Sensitive receiving water environment;
- Species at Risk;
- Notable species or species groups;
- Indicator of environmental health;
- Important component to the function of other ecosystem elements or functions;
- Component is of economic or cultural significance;
- Component is of educational, scientific, or aesthetic interest;
- Component is of provincial, national or international significance; and
- Component is of administrative significance.

"Component is of administrative significance" is specifically included to address Metal Mining Effluent Regulations Schedule 2 aspects, where criteria normally applied to the definition of environmental effect indicators (i.e., all other bullets in the above bullet list) might not otherwise apply.

This framework allows for an integration of aspects derived from a consideration of both physical and biological environmental components, and therefore better accommodates an ecosystem approach. In general, the designation of indicators is focused on habitats, features, and specific species groups and related system interactions, rather than on individual species, with a few notable exceptions.

Human environment effects indicators are typically defined as being components of the socio-economic environment that are significant in terms of people's values and quality of life. Those indicators are selected based on whether or not the human environment component is:

- Identified or valued by the public and stakeholders who will potentially be affected by the Project and are therefore consulted in Project planning and implementation;

- Identified or valued by government agencies reviewing the environmental assessment; and
- Identified as potentially affected by the Project based on professional judgment.

The list of physical, biological and human environment effects indicators and the rationale their selection are provided in Table 9-1.

Table 9-1: Physical, Biological and Human Environment Effects Indicators

Discipline	Indicator
Physical Environment	
Air Quality	Suspended Particulate Matter (Dust) as Total Particulate Matter ($PM_{tot.}$)
Air Quality	Suspended Particulate Matter (Dust) as Particulate Matter (PM_{10}); 24 Hour Average
Air Quality	Suspended Particulate Matter (Dust) as Fine Particulate Matter ($PM_{2.5}$); 24 Hour Average
Air Quality	Suspended Particulate Matter (Dust) as Fine Particulate Matter ($PM_{2.5}$); Annual Average
Air Quality	Sulphur Oxides (SO_x), mainly as Sulphur Dioxide (SO_2)
Air Quality	Nitrogen Dioxide (NO_2); 24 Hour average
Air Quality	Nitrogen Dioxide (NO_2); 1 Hour Average
Air Quality	Arsenic; 24 Hour Average
Air Quality	Lead
Air Quality	Manganese; 24 Hour Average
Air Quality	VOCs
Air Quality	Other Key Metals
Air Quality	Hydrogen Cyanide (HCN); 24 Hour Average
Noise & Vibration	Daytime Noise Level
Noise & Vibration	Nighttime Noise Level
Noise & Vibration	Blasting Noise Level
Noise & Vibration	Blasting Vibration Level
Hydrology	Change in Flow
Water Quality	Change in Water Quality

Discipline	Indicator
Hydrogeology	Groundwater Levels (Water Table)
Biological Environment	
Terrestrial Biology	Upland Plant Community Types
Terrestrial Biology	Wetlands
Terrestrial Biology	Vegetation Species at Risk, Species of Special Concern and Provincially Rare Species
Terrestrial Biology	Ungulates
Terrestrial Biology	Furbearers
Terrestrial Biology	Migratory Birds
Terrestrial Biology	Wildlife Species at Risk
Terrestrial Biology – Transmission Line (TL)	Vegetation Communities
Terrestrial Biology - TL	Ungulates - Moose
Terrestrial Biology - TL	Furbearers - Wolves
Terrestrial Biology - TL	Furbearers - American Marten
Terrestrial Biology - TL	Furbearers - Black Bear
Terrestrial Biology - TL	Bats
Terrestrial Biology - TL	Migratory Birds
Terrestrial Biology - TL	Raptors
Terrestrial Biology - TL	Species at Risk, Species of Special Concern and Provincially Rare Species
Aquatic Biology	Aquatic Toxicity
Aquatic Biology	Commercial, Recreational and Aboriginal (CRA) Fisheries
Aquatic Biology	Aquatic Habitat
Human Environment	
Land Use	Land Use Plans and Policies
Land Use	Mineral Exploration
Land Use	Forestry
Land Use	Hunting

Discipline	Indicator
Land Use	Trapping
Land Use	Recreational and Commercial Fishing
Land Use	Cottages and Outfitters
Land Use	Navigable Waters
Land Use	Other Recreational Uses
Traditional Land Use	Plant Harvesting
Traditional Land Use	Traditional Hunting
Traditional Land Use	Fishing
Traditional Land Use	Canoeing
Traditional Land Use	Cultural, Spiritual and Ceremonial Sites
Visual Aesthetics	Change in Landscape from Receptor Locations
Visual Aesthetics	Change in Landscape from Non-Receptor Locations
Visual Aesthetics	Change in Landscape due to the Transmission Line
Archaeology	Effect on Heritage Resources
Cultural Heritage Landscapes and Built Heritage Resources	Effect on Heritage Resources
Socio-Economic	Labour Market
Socio-Economic	Business Opportunities
Socio-Economic	Government Finances
Socio-Economic	Population and Demographics
Socio-Economic	Community Health Conditions
Socio-Economic	Housing and Temporary Accommodation
Socio-Economic	Public Utilities
Socio-Economic	Education
Socio-Economic	Emergency Services
Socio-Economic	Other Community Services
Socio-Economic	Transportation

Comments were provided during review of the EIS / Draft EA Report regarding the selection of indictors. Specifically various comments requested the following be considered as environmental assessment indicators:

- groundwater quality (Appendix Z, Comments #86 and 691);
- benthic invertebrates (Appendix Z, Comments #222 and 664);
- commercial, recreational and Aboriginal fisheries (Appendix Z, Comments #247 and 551);
- Aboriginal trapping (Appendix Z, Comment #307); and
- plankton (Appendix Z, Comment #665).

IAMGOLD appreciates these suggestions and has thoroughly considered each of these requests and has provided detailed responses in Appendix Z.

9.1.2 Selection of Study Areas

The prediction of effects on the environment takes into consideration the geographic extent. Three levels have been defined: the Project footprint, the local study area and the regional study area. These areas, defined for each discipline, are presented below.

9.1.2.1 Project Footprint

The Project footprint is defined by the direct footprint of onsite Project components. The Project footprint is presented in Figure 9-1.

9.1.2.2 Local Study Area

Air Quality

The local study area generally corresponds to the area in the vicinity of the Project where most of 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 (see Figure 9-2). The local study area also includes a 1 km buffer on either side of the selected transmission line alignment.

Noise and Vibration

The noise and vibration local study area (see Figure 9-3) generally corresponds to the area in the vicinity of the Project where most of the noise and vibration effects of the Project are expected to occur. This is the area where effects may be predicted or measured within a reasonable degree of accuracy. The local study area is defined as an area that extends approximately 5 km from the main Project noise sources.

The local noise study area also includes a 1 km buffer on either side of the selected transmission line alignment.

Hydrogeology

The hydrogeology local study area includes an area beyond the location of the physical works and activities within which effects resulting from the Project may occur. The rationale for the selection of the hydrogeology local study area is that groundwater flow effects from the Project are not expected to extend beyond local watershed boundaries. As such, the local study area extends to the nearest watershed boundary beyond the proposed infrastructure and expected area of effects. The local study area is bounded by the following features:

- the Great Lakes/James Bay Watershed divide along the south and southwest;
- the Upper Mollie River Watershed to the west of the open pit;
- Mesomikenda Lake to the east; and
- the Somme River system associated with the Neville Lake Watershed to the north and northwest.

The hydrogeology local study area is shown on Figure 9-4.

Hydrology and Climate

The hydrology and climate local study area includes 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 local study area is defined by lakes and watersheds in the vicinity, and downstream of the Project infrastructure and covers an area of approximately 22,100 ha. Project effects on hydrology are not expected to occur in watersheds upstream of the planned infrastructure. As such, the hydrology local study area extends to the nearest watershed boundary beyond the proposed infrastructure, open pit, Mine Rock Area (MRA) and Tailings Management Facility (TMF). The local study area is bound by the following features:

- the Great Lakes/James Bay watershed divide along the south;
- the Chester Lake and Bagsverd Lake inflow to the west;
- Mesomikenda Lake to the east; and
- the Somme River system associated with the Neville Lake Watershed to the north and northwest.

The hydrology local study area is shown on Figure 9-5.

Water Quality

The water quality local study area includes an area where effects resulting from the Project may occur. For water quality, the local study area boundary is defined to include lakes that are located within, upstream and downstream of the Project footprint. As the water quality predictions are dependent on the flow of water, the water quality local study area is coincident with the hydrology local study area. The water quality local study area is shown on Figure 9-5.

Terrestrial Biology for the Site

The terrestrial biology local study area extends beyond the Project footprint to include the area around the Project where immediate direct and indirect effects are likely to occur on surrounding soil, vegetation and wildlife. The local study area encompasses a 2 km buffer around the Project footprint and extends to the south-west to include Chester Lake (see Figure 9-6).

Terrestrial Biology for the Transmission Line

The terrestrial biology local study area considered during baseline studies and for predicting Project effects for the transmission line alignment is defined as the area within 1 km from the centerline of the transmission line alignment (see Figure 9-7).

Aquatic Biology

The aquatic biology local study area includes areas where there is potential for measurable effects as a result of either, construction, operation or closure. Based on this definition, the local study area includes the Project site as well as downstream water bodies that may receive effluent or storm water discharge from the Côté Gold Project or may be affected by watercourse realignments. The extent of the water bodies included in the assessment was based on the currently defined Project design and the expected extent of potential changes to the aquatic environment associated with the Project (see Figure 9-8).

Land and Resource Use

Depending on the type of land and resource use, the local study areas for terrestrial or aquatic biology disciplines were used. For example, potential effects on recreational and commercial fishing are predicted in the local study area for the aquatic biology discipline (see Figure 9-8), while the terrestrial biology local study areas (see Figures 9-6 and 9-7) are used to predict the potential effects on recreational hunting.

Traditional Knowledge and Land Use

The traditional knowledge and land use local study area is defined by the potential for effects of the Project on site-specific and nearby traditional land and resource uses such as use or

knowledge of culturally important sites. Similar to land use, depending on the type of land or resource use, the study areas for terrestrial or aquatic biology disciplines were used (see Figures 9-6 to 9-8).

Archaeology and Built Heritage

The archaeology and built heritage local study area is defined by potential effects of the Project on nearby cultural heritage resources. The local study area is defined as a 2 km buffer around the Project site footprint (see Figure 9-9). The study area also includes a 1 km buffer on either side of the preferred transmission line alignment.

Visual Aesthetics

The visual aesthetics local study area (see Figure 9-10) is based on an initial analysis of Project component height and location. It was identified that an area of approximately 5 km around the Project site could potentially experience visual effects. To be conservative, this buffer was slightly expanded on the North, East and West to include receptors on Mesomikenda Lake, Annex Lake and Schist Lake. The local study area also includes a 1 km buffer on either side of the transmission line alignment.

Socio-Economics

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 (see Figure 9-11).

9.1.2.3 Regional Study Area

Air Quality

The air quality regional study area is defined as an area that extends approximately 10 km from the main Project emission sources, as illustrated in Figure 9-2. It is expected that the effects of the Project would not be measurable beyond the regional study area.

Noise and Vibration

The noise and vibration regional study area (see Figure 9-3) is defined as an area that extends approximately 10 km from the main Project noise sources. It is expected that the effects of the Project would not be measurable, audible or perceptible beyond the regional study area.

The regional noise study area also includes a 1 km buffer on either side of the selected transmission line alignment.

Hydrogeology

Effects on hydrogeology are not expected to extend beyond the watersheds encompassed by the local study area and thus a regional study area has not been defined for hydrogeology for this EA.

Hydrology and Climate

The regional study area 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 regional study area. The hydrology regional study area is shown in Figure 9-5.

Water Quality

Effects on water quality are not expected to extend beyond the watersheds encompassed by the local study area; as such, a regional study area has not been defined for water quality for this EA.

Terrestrial Biology for the Site

The terrestrial biology regional study area is defined as a 30 km buffer from the boundary of the local study area (see Figure 9-6). This area is large enough to contain all or most individuals that comprise the seasonal and annual populations of American marten, beaver, upland breeding birds, waterbirds and raptors that inhabit the area. The regional study area is expected to be large enough to contain most of the plant populations and communities that may be influenced by the Project and other developments, and to provide confident and ecologically relevant effects predictions on vegetation. At this scale, changes to vegetation and associated wildlife habitat from human development can be also used to predict effects to the abundance and distribution of wildlife populations.

Terrestrial Biology for the Transmission Line

The transmission line terrestrial biology regional study area considered during baseline studies and for predicting Project effects for the transmission line alignment include the area within 2 km from the centerline of the transmission line alignment (see Figure 9-7).

Aquatic Biology

The regional study area for aquatic biology extends 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. The spatial extent of the proposed aquatic biology regional study area is shown in Figure 9-8.

Land and Resource Use

Depending on the type of land and resource use, the regional study areas for terrestrial or aquatic biology disciplines were used (see Figures 9-6 to 9-8). For example, potential effects on recreational and commercial fishing are predicted in the regional study area for the aquatic biology disciplines, while the terrestrial biology regional study area are used to predict the potential effects on recreational hunting.

Traditional Knowledge and Land Use

The traditional knowledge and land use regional study area is defined by potential for effects of the Project on site-specific and nearby traditional land and resource uses such as use or knowledge of culturally important sites. Similar to land use, depending on the type of land or resource use, the study areas for terrestrial or aquatic biology disciplines were used (see Figures 9-6 to 9-8).

Archaeology and Built Heritage

The regional study area for archaeology and built heritage is defined as an approximately circular 30 km buffer around the Project site footprint (see Figure 9-9). The 30 km buffer is anticipated to be an appropriate spatial boundary for a desktop assessment of cultural heritage resources and for assessing Project-specific effects on archaeology and built heritage. The regional study area also includes a 2 km buffer on either side of the transmission line alignment.

Visual Aesthetics

No regional study area is required for the visual aesthetics component as no visual effects beyond the local study area are expected.

Socio-Economics

The regional study area for the socio-economic prediction of effects is defined as the area that could be influenced by the Project (see Figure 9-11). The regional study area was defined using the following criteria:

- Aboriginal or non-Aboriginal communities within reasonable commuting distance to the Project (approximately 100 to 150 km), which are expected to experience socio-economic effects from the Project;
- communities likely to provide key services and/or benefit from business opportunities resulting from the Project;
- major travel and service corridors; and
- Statistics Canada reporting units.

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.

Aboriginal communities included in the regional study area consist of:

- Flying Post First Nation;
- Mattagami First Nation;
- Brunswick House First Nation;
- Matachewan First Nation; and
- Métis Nation of Ontario – Region 3.

9.1.3 Prediction of Effects

In carrying out the environmental effects analysis, a number of analytical methods and tools have been utilized and include laboratory tests, mass balance calculations, statistical packages and various types of models. These tools and analytical methods are summarized in the following sections for each discipline. Further details can be found in the respective Technical Support Documents (TSDs).

The prediction of effects for each discipline is presented in this chapter for each phase of the Project, namely, construction, operation, closure and post-closure. The prediction of effects presented below has taken into consideration mitigation measures inherent in the Project design

as well as additional measures that have been incorporated in the Project design as a deeper understanding of the potential environmental effects was acquired. The mitigation measures for each discipline are presented in Chapter 10.

This chapter includes predictions of effects along the right-of-way for the preferred transmission line alignment (Cross-Country alignment). It should be noted that with application of best practice construction management methods, no significant residual adverse effects, or impacts, along the alignment are expected with respect to air quality, hydrogeology, hydrology, water quality and aquatic biology. Although the development of the transmission line will have some localized effects during the construction phase, with application of the aforementioned best practice construction management methods, these effects are not expect to be significant. It is common practice to not have an in depth assessment of effects to hydrogeology because there is no pathway for a transmission line to cause significant impacts on this indicator. With regards to hydrology, water quality and aquatic biology, in-water works will be avoided and/or construction activities will occur during the winter months to prevent any effects.

9.2 Air Quality

Details on the air quality prediction of effects are presented in Appendix F. A summary of the key results are presented in the following subsections.

9.2.1 Methodology

AMEC has completed an assessment of the potential air quality effects of this proposed Project in accordance with generally accepted air quality assessment methodologies.

The prediction of effects involved the following distinct steps:

- identification of the significant emissions sources associated with the Project operations phase;
- identification of the key compounds 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 compounds emitted;
- identification of the relevant regulatory air quality standards and criteria, and establishment of 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 compounds using appropriate estimation methods and established data sources;
- estimation of a representative “model Project area” to be considered within the assessment;

- preparation of a source summary table that identifies sources at the Project site which may release one or more of the key compounds emitted to the atmosphere in considerable quantities and the corresponding compounds and emission rates;
- completion of the air dispersion modelling using the U.S. Environmental Protection Agency (US EPA) AERMOD model, an approved dispersion model under Ontario Regulation (O. Reg.) 419/05; and
- comparison of the dispersion modelling output to the assessment criteria, comparing predicted off-site effects on ambient air quality with the corresponding air quality standard or criterion.

9.2.2 Results

9.2.2.1 Construction Phase

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.

9.2.2.2 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 (SO_2)) were also modelled. Nitrogen oxide (NO_x) emissions occur from the blasting, combustion of propane for process plant heating, and from the testing of back-up generators.

The modelling output is depicted in Figures 9-12 to 9-20, with the predicted ambient concentration isopleths (lines of equal concentration) for PM_{tot}, PM_{10}, $PM_{2.5}$ (both maximum 24-hour and annual), HCN, NO_2 (both 24 and 1-hour), arsenic and manganese as representative metal contaminants. 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.

As a result of the assessment presented in Appendix F, the Project meets all air quality standards to allow the Ontario Ministry of the Environment and Climate Change (MOECC) to grant approval in the form of an Environmental Compliance Approval (ECA). The modelling output will also be used to define Project boundaries, which will mitigate the potential effect described below.

The prediction of air quality determined that particulate matter levels for TSP, PM_{10}, and $PM_{2.5}$ exceeded Ambient Air Quality Criteria (AAQC) in a small area proximate to the Project site boundary. For $PM_{2.5}$, it was determined that the AAQC was exceeded one day per year (0.3%). PM_{10} exceeded the AAQC less than 4% of the time per year (approximately 14 days), and TSP exceeded less than 2% of the time (approximately 7 days). At each of the sensitive receptors (cottages) located within the local study area the particulate matter was below the AAQCs.

All other air quality assessment indicators were determined to be below the AAQCs and, in several cases, the modelled incremental amounts are below current baseline levels in the local study area during Project operation.

9.2.2.3 Closure Phase

Activities in the active closure phase are similar to those that occur during the construction phase, and it is expected that similar equipment will be used. 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. Air quality effects will be bounded by the operations phase. No specific closure phase air quality assessment was completed.

9.2.2.4 Post-Closure Phase

From an air quality perspective, post-closure phase is predominantly a monitoring activity, with occasional repair and maintenance. No significant equipment use is expected. No noticeable air

quality effects are expected from these activities. The only emissions that will be at a maximum during the post-closure phase (i.e., higher than during operations) are the gas emissions from the landfill site.

The emissions from the landfill were modelled using the accepted AERMOD air dispersion model and data files discussed in Appendix F. All compounds are significantly below either respective criteria or the *de minimus* concentration provided by MOECC (MOE, 2009). The maximum level is 3.4% of the MOECC's conservative screening level for bromodichloromethane.

9.2.3 Government, Aboriginal and Public Comments and Concerns

Table 9-2 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to air quality throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-2: Comments and Concerns on Air Quality

Consultation Comment	Response/How has the comment been addressed?
Individual identified immediate environmental impact to them would be dust (prevailing west wind), visible smoke plumes and smell (diesel fumes, blast residue).	The air quality effects assessment takes dust into consideration. As described throughout Section 9.2.2, with mitigation measures in place, dust levels will be below regulatory limits. No Project activities are expected to generate smoke plumes. Diesel engines used at the site will be well maintained. Blasting will be carried out efficiently. Therefore, diesel and explosive emissions are expected to be minimal. NO_x levels, which are related to blasting, are expected to meet regulatory limits at receptor locations.
Individual asked if IAMGOLD is looking at dust and exhaust levels.	The air quality effects assessment takes dust and exhaust emissions into consideration. As described throughout Section 9.2.2, with mitigation measures in place, dust and NO_x (which originate from exhaust) levels will be below regulatory limits.

Consultation Comment	Response/How has the comment been addressed?
Has consideration been given to the effects of air pollution such as particulates (PM_{10}, $PM_{2.5}$) on local permanent and seasonal residents and workers at the camp accommodations? On and off site monitoring may wish to be considered.	The effects of particulates on local permanent and seasonal residents are included in the air quality model. As described throughout Section 9.2.2, with mitigation measures in place, particulate levels will be below regulatory limits at receptor locations. Additionally, a human health risk assessment has been carried out, which concludes that the Project will not increase the risk to human health due to changes in air quality. The effects of particulates on workers will be considered in the construction permitting for the Project. IAMGOLD is committed to strict protection of their workforce (see IAMGOLD's Zero Harm Policy). Note that occupational health and safety is not within the scope of EAs. A conceptual monitoring program is presented in Chapter 16, and looks at offsite monitoring to confirm these conclusions.
Will the Project stop blasting under strong wind conditions?	IAMGOLD is committed to minimizing air quality effects on surrounding receptors. The air quality modeling has confirmed that meteorological conditions are favorable in the midday period. Ongoing meteorological monitoring will be carried out to identify the most suitable windows for blasting, and all blasting activities will be compliant with applicable legislation. Should wind conditions be such that blasting emissions could be harmful to receptors, IAMGOLD will not blast until these conditions have improved and it is safe to blast.

9.3 Noise and Vibration

Details on the noise and vibration prediction of effects are presented in Appendix G. A summary of the key results are presented in the following subsections.

9.3.1 Methodology

9.3.1.1 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 (L_{eq}) as required by the applicable guidelines (NPC-300; MOE 2013a). 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; MOE, 1982). Blasting noise has been predicted at sensitive receptors using the MOECC Blasting Noise and Vibration Model (NPC-119; MOE, 1982). Blasting noise has been assessed against the applicable guideline limits for compliance and was then compared to ambient noise levels in the area to determine the change in ambient noise from baseline conditions.

9.3.1.2 Vibration

Vibration levels from blasting are assessed based on the maximum peak particle velocity (PPV, mm/s), which is consistent with applicable guidelines (NPC-119). Blasting vibration has been predicted using the MOECC Blasting Noise and Vibration Model (NPC-119). The predicted blasting vibration has been assessed against the applicable criteria and is compared to ISO 2631-2 (ISO, 1985) perceptible vibration level to determine if the blast vibration may be perceptible at the receptor locations.

9.3.2 Results

9.3.2.1 Construction Phase

Construction activities at the Project site are expected at the open pit, MRA, ore processing plant, various facilities including the maintenance garage, fuel and lube facility, warehouse, administration complex, accommodations complex, explosives manufacturing and storage facility, crushing and screening plants, TMF, on-site access roads and pipelines, power infrastructure and fuel storage facilities, potable and process water treatment facilities, domestic and industrial solid waste handling facilities, water management facilities and drainage works, including watercourse realignments.

However the main construction activities are expected at the open pit, MRA and TMF areas and therefore, equipment anticipated for these locations along with the truck routes have been considered in the noise model.

For the construction phase, it is expected that daytime noise levels at receptor locations will be at, or below, baseline ambient noise levels. Nighttime noise levels may exceed baseline

ambient noise levels at some receptor locations. Figures 9-21 and 9-22 present the daytime and nighttime construction noise levels expected at receptor locations.

Blasting is expected to occur during the construction phase at the TMF, MRA and/or open pit areas, but could also be required sporadically at roads and/or watercourse realignments. Blasting is expected to occur infrequently during the construction phase. Blasting noise levels are expected to exceed baseline ambient noise levels, but will meet applicable MOECC guidelines. Blasting vibration levels may be perceptible at some receptor locations but are not expected to cause structural damage.

9.3.2.2 Operations Phase

Operational noise is generated from a variety of activities at the Project site. This includes noise from mining operations in the open pit (e.g., blasting and heavy equipment operation), processing activities (ore processing plant) and other ancillary and supporting facilities. The major noise sources that are anticipated from the mining operations at the Project include heavy equipment such as blast-hole-drills, air-track-drills, excavators, electrical shovels, track dozers, wheel loaders, wheel dozers, motor graders and on-site truck traffic. Noise emissions from the ore process plant will be minimal as most of the plant equipment is enclosed within the plant building. The primary sources of noise from the ore process plant will come from the primary crusher, dust collectors, emergency generators and substation transformers.

For the operations phase, it is expected that daytime noise levels at receptor locations will be at, or below baseline ambient noise levels. Nighttime noise levels may exceed baseline ambient noise levels at some receptor locations. Figures 9-23 to 9-26 present the daytime and nighttime operational noise levels for Year 1 and Year 7 of operations.

Blasting noise mainly includes blasting related to the open pit activities. The extraction of material from the working face of the open pit mine requires the use of explosives. This generates the potential concern of blast noise levels at the sensitive receptors. Blasting activities are currently planned to occur during the daytime only.

Blasting noise levels are expected to exceed baseline ambient noise levels, but will meet applicable MOECC guidelines. Blasting vibration levels may be perceptible to some receptor locations but are not expected to cause structural damage. Figure 9-27 presents the blasting ground vibration levels around the open pit during the operations phase.

9.3.2.3 Closure Phase

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 during the closure phase.

9.3.2.4 Post-Closure Phase

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 phase 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 night-time. No vibration effects are anticipated as no blasting activities are planned during the post-closure phase.

9.3.3 Government, Aboriginal and Public Comments and Concerns

Table 9-3 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to noise and vibration throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-3: Comments and Concerns on Noise and Vibration

Consultation Comment	Response/How has the comment been addressed?
Individual identified immediate environmental impact to them would be noise (24/7)	IAMGOLD has carried out detailed noise modeling, with the aim of identifying and, to the extent practicable, minimizing noise effects on receptors. Furthermore, IAMGOLD is fully committed to meeting all applicable noise regulations. The noise modeling results predict that some locations experience changes in noise levels, but that applicable MOECC noise levels will be met.
Has consideration been given to the effects of noise on local permanent and seasonal residents and workers at the camp accommodations? On and off site monitoring may wish to be considered.	The effects on local permanent and seasonal residents are included in the noise model. As described throughout Section 9.3.2, with mitigation measures in place, noise levels will be below regulatory limits at receptor locations. The effects of noise on workers will be considered in construction permitting for the Project. IAMGOLD is committed to strict protection of their workforce (see IAMGOLD's Zero Harm Policy). Note that occupational health and safety is not within the scope of EAs. A conceptual monitoring program is presented in Chapter 16, and looks at offsite monitoring to confirm these conclusions.

Consultation Comment	Response/How has the comment been addressed?
Individual identified concern regarding the proposed location of the tailings area which is just across the lake from some cottagers; they will surely be affected by the noise during construction.	As described in Section 9.3.2 noise modeling results predict that some locations experience changes in noise levels, but that applicable MOECC noise levels will be met.
Is IAMGOLD investigating effects of blasting on fish?	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.
Can you provide ground vibration isopleths?	Vibration isopleths are provided in Figure 9-27.

9.4 Hydrogeology

Details on the hydrogeology prediction of effects are presented in Appendix H. A summary of the key results are presented in the following subsections.

9.4.1 Methodology

A 3-dimensional groundwater flow model was 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.

9.4.2 Results

9.4.2.1 Construction Phase

Predicted changes to groundwater levels for the construction phase are limited to the immediate area of the watercourse realignment structures and excavated channels as shown on Figure 9-28. The excavation of a constructed watercourse realignment channel through high ground around the west side of the TMF will cause a decline in groundwater elevations locally of up to 10 m. However, it should be noted that water level declines due to the stream realignments are likely overestimated in the model; due to the coarseness of the model cells (100 m x 100 m) and the limited capacity of the model to resolve steep changes in topographic elevation such as those that may occur along the realignment water courses. This is particularly true of the Bagsverd Creek realignment west of the TMF, which is located between two local topographic highs. Elsewhere, predicted declines are less severe and localized to the

realignment channels and the lower Bagsverd Lake where lake levels are lowered by more than 1 m to accommodate the realignments in the Mollie River system.

9.4.2.2 Operations Phase

Predicted changes to groundwater levels at the end of the operation phase (relative to the construction phase) are shown in Figure 9-29. Many of these realignments will remain in place following closure of the Project and as such, represent the new proposed existing conditions at the Project site.

Groundwater level declines, as shown by the 1 m drawdown contour, extend up to 1.4 km to the southwest from the open pit. Downward seepage from nearby lakes and the mine rock ponds truncates the lateral extent of the groundwater level drawdown elsewhere around the open pit. The 1 m drawdown contour extends beyond the nearby realignment dams indicating that these structures are underdrained, and only minimal seepage through these dams is expected at the end of operations.

9.4.2.3 Closure and Post-Closure Phases

At closure, pumping activities will be terminated, and over time, groundwater levels will recover to approximate pre-mining conditions except in the immediate vicinity of water realignment structures where these are to remain in place.

9.4.3 Government, Aboriginal and Public Comments and Concerns

Table 9-4 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to hydrogeology throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-4: Comments and Concerns on Hydrogeology

Consultation Comment	Response/How has the comment been addressed?
Groundwater monitoring in this area may need to be carried out. The placement of piezometers and their monitoring schedule should be included.	A total of 150 geotechnical/hydrogeological boreholes have been drilled into the overburden and shallow bedrock (less than 20 m into bedrock) at 118 locations throughout the Project site. Groundwater monitoring wells (single and nested) were installed at 62 of these locations. Routine water level monitoring has occurred at approximately 50 locations three times annually since early 2012. Groundwater quality monitoring has occurred three times annually since early 2012 at 37 locations. Future monitoring measures are described in Chapter 16.

9.5 Hydrology and Climate

Details on the hydrology prediction of effects are presented in Appendix I. A summary of the key results are presented in the following subsections.

9.5.1 Methodology

Surface water flow was broadly divided into two watersheds, defined for the purposes of the study; the Mollie River watershed which drains the southern portion of the Project site (where the MRA, open pit and processing plant will be located), and the Mesomikenda Lake watershed which drains the northern portion of the Project Site (where the TMF and polishing pond will be located). Monitoring is ongoing, and for the period of mid- 2012 to mid-2013, surface water flow at the Project Site was characterized by observed discharge conditions that ranged from less than 1 L/s in headwater lakes to greater than 8,000 L/s in monitored lakes with the largest upstream contributing watersheds.

Based on the collected field data and available regional climate, topographical and land cover information, a hydrological model was constructed in GoldSim. The model was configured to simulate surface water flow and storage through the lakes in the Local Study Area. Five iterations of the model were developed to simulate hydrological response during Existing Conditions, the operations phase, post-closure phase stage I and post-closure phase stage II. The operations phase model simulated treated effluent discharge to two potential receiving waterways (Bagsverd Creek and Mesomikenda Lake). The average annual surface water flows for the operation phase and post-closure phase were compared to the Existing Conditions to provide a predicted change in surface water flow. Predicted effects associated with the construction phase were developed qualitatively.

9.5.2 Results

9.5.2.1 Construction Phase

Changes to surface water flow during the construction phase will be limited to those associated with the development of the realignment features (channels and dams). These realignment features will be designed to manage the expected range of flows and were assessed in the context of the full Project site footprint at the operations phase.

9.5.2.2 Operations Phase

For the operations phase, the greatest predicted changes in average annual surface water flow were the result of planned realignment features, where headwater lakes will be connected to larger contributing watersheds or where realignment channels replace existing lake outflow features. Along a portion of Bagsverd Creek, the loss of upstream watershed area attributable to realignment and the development of the TMF was predicted to decrease average annual surface water flow by up to 20%. This flow decrease was qualitatively considered unlikely to alter in-stream characteristics such as sedimentation, or the connection to downstream waterways beyond the existing variation in observed conditions, and a monitoring plan was developed to verify this qualitative assessment.

9.5.2.3 Closure and Post-Closure Phases

At the beginning of the closure phase, active pumping of site water ceases (other than from the seepage ponds associated with the MRA, which will continue pumping to facilitate the flooding of the open pit). Average annual surface water flow remained similar to the operations phase, a result of a similar watershed configuration. Flow in a portion of Bagsverd Creek maintained the greater than 10% decrease, predicted in the operations phase. However, this flow decrease was qualitatively considered unlikely to alter in-stream characteristics such as sedimentation, or connection to downstream waterways beyond the existing variation in observed conditions. A monitoring plan was developed to verify this qualitative assessment.

During post-closure phase stage II, active pumping will be discontinued across the Project site and the watershed realignments will be reconfigured to allow water to flow through the restored Côté Lake. Under this scenario, surface water flow was generally similar to existing conditions, except in locations that remain connected to realignment channels or downstream of watershed area change (a portion of Bagsverd Creek).

9.5.3 Government, Aboriginal and Public Comments and Concerns

Table 9-5 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to hydrology and climate throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-5: Comments and Concerns on Hydrology and Climate

Consultation Comment	Response/How has the comment been addressed?
Individual has questions regarding effluent discharge into Mesomikenda Lake, an Ontario Power Generation managed reservoir, and the impact, if any, it may have on the Mattagami River System Water Management Plan (other mining projects have required minimum flow regimes from control dams for effluent dilution).	Discharge from the mine water management system will be directed to Bagsverd Creek, upstream of Neville Lake. Initial investigations have used Neville Lake as a mixing area, and no changes to the operation of the Mesomikenda Lake dam have been suggested to date.
Individual stated they understand that Côté Lake will have to be drained, has this ever been done successfully before?	Yes, for example a lake had to be partially drained for the Diavik Diamond Mine in the Northwest Territories
Flying Post First Nation has concerns about the mine closure plans and have an opinion on draining Côté Lake/Mollie River.	The Mollie River drainage system will be maintained to the extent possible around the planned infrastructure. The potential physical and biological effect of draining Côté Lake is discussed in the EA.
Individual would like to see a map showing drainage system and flow directions in the Project area.	This figure is provided in the hydrology technical support document.
Brunswick House First Nation representative commented that he would like to see water recycled and reused.	IAMGOLD has developed a process water use plan that maximizes recycling of water on-site and minimizes the amount of freshwater required.
A dam operated by Ontario Power Generation controls the water level of Mesomikenda Lake. The environmental assessment (EA) should consider if there is potential for surface water needed for mine operations (e.g. effluent discharge, water taking) to be affected by lake level management at the dam.	The water management and operation of the Mesomikenda Lake dam was incorporated to the supporting EA hydrology study. In this study, effluent discharge and water takings were not affected by lake level management.
Individual asked if IAMGOLD would be taking any water from Mesomikenda Lake. Individual added that they don't feel the lake could handle losing any water.	IAMGOLD plans to use Mesomikenda Lake for process water. The potential effect of these removals is incorporated into the effects predictions provided in the hydrology technical support document. IAMGOLD will require a provincially issued Permit to Take Water, which will outline maximum removal rates, monitoring requirements and mitigation plans.
The MOECC requests that IAMGOLD confirm its plans to include a stormwater management plan in the EA.	Stormwater management plans will be developed when the site layout is of sufficient detail, which is generally towards the end of the feasibility studies.

Consultation Comment	Response/How has the comment been addressed?
How many lakes and streams will you change or re-route?	The realignment plan will re-route the Mollie River and Bagsverd Creek around infrastructure. To accomplish this, up to seven lakes will require a change to their existing elevation or flow conditions (Côté Lake, Chester Lake, Clam Lake, Little Clam Lake, Bagsverd Lake, Un-named Lake #2 and Weeduck Lake). Upon site closure, lakes and rivers will be returned to their existing level and drainage path, where feasible.
Do you plan for high rainfall and snow amounts?	The design of storage ponds, dams and realignments will consider regulatory flood and snowmelt events. This will be required under the *Lakes and Rivers Improvement Act*.
The Project now includes a lot of realignments, which might not work properly. The flow scheme used for the Project Description seems preferable.	The realignment flow system has been designed to maintain a hydrological gradient and watershed areas that are intended to minimize changes to those investigated under existing conditions.
What is the success rate of realignments?	These can be extremely successful. The team designing and constructing the habitat for Côté Gold has dealt with numerous other projects in northern Ontario which have performed very well. In Kapuskasing, lake and stream habitat was created to off-set the expansion of an open pit and these habitat have supported resident fish with successful spawning and recruitment each year.
What would be the shortest time possible to fill the open pit after closure?	According to simulations and assumptions completed in the hydrology technical support document, the open pit will fill to the existing elevation of Côté Lake approximately 50 to 60 years following site closure.
We don't only care about draining of Côté Lake but also effects on other lakes and streams.	The lakes and streams in the vicinity of the planned infrastructure have been assessed from a hydrological perspective.
Flow in Bagsverd must be very low at times. It seems that Mesomikenda Lake would be more suitable discharge location.	The hydrological and water quality predictions has been assessed for each location in the hydrology and water quality technical support documents.
Is there enough water in the TMF to aid fill the pit at closure?	The TMF may contain a large volume of water at closure. However, given the location of the TMF relative to the open pit, pumping would be required to transfer water a substantial distance. Pumping from the collection ponds associated with the Mine Rock Area has been assumed to assist in the filling of the open pit, TMF pumping has not been included.

9.6 Water Quality

Details on the water quality prediction of effects are presented in Appendix J. A summary of the key results are presented in the following subsections.

9.6.1 Methodology

Water quality effects predictions were completed for the construction, operations, closure and post-closure phases of the Project. The post-closure phase was divided into two stages to predict the effects to water quality while the pit is flooding (stage I), and after the pit is flooded thereby forming the Côté Pit Lake (stage II). The construction and closure phase effects were evaluated qualitatively, while a water quality model was developed to numerically predict water quality effects in the receiving and downstream environments during operations and post-closure for the average, 1:25-year dry and 1:25-year wet conditions. The spatial boundary for the water quality effects predictions is defined by the Project site footprint, adjacent water bodies and downstream extents of watersheds that encompass the Project site, which extends downstream from the Project footprint to the divide between the Great Lakes and James Bay watersheds.

To provide some context for the water quality model results, the predicted monthly average concentrations are compared to effluent limits or water quality guidelines. The predicted water qualities for the Project-site components (i.e., open pit sump, MRA runoff and seepage, low-grade stockpile runoff and seepage, mine water pond, reclaim pond and polishing pond) are compared to the provincial and federal effluent limits. For the purposes of the water quality effects predictions for the surface water receivers, the predicted concentrations are compared to the upper limit of existing conditions (further referred to as ‘baseline concentrations’). Where the predicted results exceed the baseline concentrations, the results are then presented against a single set of “Water Quality Guidelines”. The set of Water Quality Guidelines are a compilation of the most recent Ontario Provincial Water Quality Objectives and Canadian Water Quality Guidelines for each parameter. For parameters where an Ontario Provincial Water Quality Objective or Canadian Water Quality Guideline does not exist, the British Columbia Water Quality Guidelines were considered.

9.6.2 Results

9.6.2.1 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 earthworks and other activities that will disturb soil. Best management practices (BMPs) will be implemented to control erosion and sediment transport during construction, and will therefore

mitigate any Project-related effects associated with total suspended solids (TSS) in the surface water receivers.

9.6.2.2 Operations Phase

During the operations phase, the principal Project activities that could affect water quality include: mining of ore from the open pit, storage of mine rock in stockpiles at the MRA, storage of tailings in the TMF, generation of process water by the process plant, and discharge of treated effluent from the polishing pond (refer to Figure 1-2 for the site layout). The numerical water quality predictions were based on the fully developed Project site with these major features (i.e., open pit, MRA and TMF) modelled at their ultimate extents. The water quality model predictions are, therefore, conservative with respect to the early years of operations, with effects associated with the ultimate extents not likely to be realized until near the end of the operations phase.

Contact water (i.e., water that has come into contact with mine works, components and their associated infrastructure) is predicted to have near-neutral pH, as the geochemistry study suggests that the mine rock and tailings are non-acid generating, and contain major ions and metals at concentrations lower than the federal and provincial effluent discharge limits. Contact water from the MRA, low-grade stockpile, and open pit is predicted to contain ammonia and nitrate from the dissolution of residual explosives. Contact water in the TMF will be influenced by process water that is discharged from the cyanide destruction circuit, which is expected to contain residual cyanide species, ammonia and metals (i.e., copper).

The water collected from the MRA, low-grade stockpile, and open pit reports to the mine water pond, with the surplus pumped to the polishing pond (see proposed water management system in Figure 5-2). If not otherwise required for use at the site, treated effluent is discharged to the environment in accordance with the Federal *Metal Mining Effluent Regulations* (MMER). Process water mixes with tailings beach runoff and reports to the TMF (i.e., reclaim pond), where it is recycled back to the process plant. Under normal flow conditions, surplus is not expected in the TMF; therefore, the water in the reclaim pond is not pumped to the polishing pond for discharge to the environment.

During the operations phase, and extending through closure and into the post-closure phase, while the pit is flooding (stage I) and following the formation of Côté Pit lake (stage II), monthly average concentrations of major ions and some metals are predicted to be intermittently to continuously greater than the observed baseline concentrations in lakes in the immediate vicinity of Project facilities and to a lesser extent in downstream lakes in both the Mollie River and Mesomikenda Lake watersheds. Cyanide is also predicted to be greater than baseline concentrations in the Mesomikenda Lake watershed during the operations phase, closure phase and the early stage of post-closure phase, with monthly average concentrations of free cyanide being less than the Water Quality Guideline during all Project phases.

Monthly average concentrations of some major ions and metals are predicted to be marginally greater than baseline at the downstream end of the Mollie River watershed (at Dividing Lake) and at the outlet of Mesomikenda Lake during the operations, closure, and post-closure phases. Furthermore, during operations, closure, and to a lesser extent the early stage of post-closure, monthly average cyanide concentrations are expected to be marginally greater than baseline concentrations, but monthly average free cyanide concentrations are expected to be less than the Water Quality Guideline. The model results suggest that concentrations of some parameters that are marginally greater than baseline may persist within a localized area near the downstream end of the Mollie River and Mesomikenda Lake Watersheds.

During the operations phase, the model predictions suggest that the monthly average concentrations of all parameters are expected to be less than the Water Quality Guidelines at all locations in the surface water receiving environment.

9.6.2.3 Closure Phase

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 model results are reasonable, as the sources of mass load during the closure phase will not change considerably from operations. As such, the water quality at the locations in the Mollie River Watershed is expected to be similar to the predictions for the operations phase.

For the locations in the Mesomikenda Lake Watershed, applying the operations phase model results for the closure phase is conservative, as the treated effluent is no longer being discharged to the environment from the polishing pond. Rather, water from the mine water pond will be pumped to the open pit. Therefore, as the predicted effects to water quality due to discharge of treated effluent dissipate, the water quality at the locations in the Mesomikenda Lake Watershed is expected to improve over time relative to the predictions for the operations phase.

During the closure phase, the model predictions suggest that the monthly average concentrations of all parameters are expected to be less than the Water Quality Guidelines at all locations in the surface water receiving environment.

9.6.2.4 Post-Closure Phase

Overall, the water quality predicted throughout the post-closure phase (stage I) is similar to the water quality during the operations phase for the Mollie River Watershed. The exception is the concentrations of ammonia and nitrate that are predicted to be lower during the post-closure phase, as a result of the source term (explosive residuals in mine rock) that is assumed to be depleted over the course of the operations and closure phases.

Similar to the operations phase, some metals (cobalt, copper and nickel) and cyanide (total) are predicted to occur in the Mesomikenda Lake Watershed at concentrations that are above the upper limit of baseline concentrations but are below the Water Quality Guideline throughout the post-closure phase (stage I).

At the end of the Mesomikenda Lake Watershed (i.e., at the outflow of the upper basin of Mesomikenda Lake, approximately 10 km downstream of the discharge location), the concentrations of cobalt, nickel and cyanide (total) are predicted to be greater than the baseline concentrations. Therefore, like the Mollie River Watershed, there is potential for concentrations that are greater than the baseline concentrations to extend beyond the local study area. However, given that the concentrations of cobalt, nickel and cyanide (total) in Mesomikenda Lake (upper) are very near the upper range of baseline concentrations, any concentrations marginally greater than the baseline concentration would be expected to be localized near the downstream end of the Mesomikenda Lake Watershed.

For post-closure stage II, the model predictions suggest that the monthly average concentrations of all parameters are expected to be less than the Water Quality Guidelines at all locations in the surface water receiving environment.

9.6.3 Government, Aboriginal and Public Comments and Concerns

Table 9-6 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to water quality throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-6: Comments and Concerns on Water Quality

Consultation Comment	Response/How has the comment been addressed?
Individual identified concern regarding the proposed location of the tailings area which is just across the lake from some cottagers; they will surely be affected by the noise during construction and potential overflows.	The tailings pond will not report to the polishing pond for discharge to the environment. Water from the tailings pond will be reclaimed back to the mill.
Individual identified that their greatest concern was the environment and non-contaminated waters.	Water quality predictions were completed as part of a water quality effects assessment. No significant impacts were determined for water quality.

Consultation Comment	Response/How has the comment been addressed?
Individual has questions regarding effluent discharge into Mesomikenda Lake, an Ontario Power Generation managed reservoir, and the impact, if any, it may have on the Mattagami River System Water Management Plan (other mining projects have required minimum flow regimes from control dams for effluent dilution).	Mesomikenda Lake was evaluated as an option for discharge of treated effluent. After an alternatives analysis, it was determined that discharge to Bagsverd Creek was a better option, including with respect to water quality. Therefore, treated effluent will not be discharged to Mesomikenda Lake.
Individual identified concerns regarding water discharge into Mesomikenda Lake; acid levels (10%, 20% uncertain) and water (Timmins drinking water) as Mesomikenda Lake is the head waters. Individual identified that they would be very interested in seeing more information on aquatic inventories for the proposed Project area. Individual identified that they have a good understanding of the aquatic productivity of lakes, rivers and streams in the Timmins area, and suggested that the initial focus should be on preserving catchment areas of existing watersheds.	Treated effluent will not be discharged to Mesomikenda Lake. After closure, runoff from the Tailings Management Area will report to Mesomikenda Lake. However, the Tailings Management Area will be rehabilitated by this time and the water quality of the runoff post-closure is predicted to be similar to that of natural runoff.
Main concern would be water quality being affected in local communities.	Water quality downstream of the Project site, where local communities are present, is expected to be similar to background or baseline conditions.
[Will there be] cyanide effects on lake water?	Note that most of the cyanide will be destroyed before the tailings are discharged to the TMF. In addition, there will be no planned discharge from the TMF to the environment. However, there is a possibility that some cyanide, in very low concentrations will be present in the surface water in the immediate vicinity of the site. However, concentrations are predicted to be less than water quality guidelines and will be similar to background levels downstream of the site.
Individual asked if fresh water will be required for process from Mesomikenda Lake.	To the extent possible, process water will be recycled through on-site reservoirs. There will be a requirement to draw some amount of make-up water from Mesomikenda Lake for process purposes.
Will water (overflow) being dumped into Mesomikenda be drinkable?	Treated effluent will not be discharged to Mesomikenda Lake.
Will there be long term monitoring of the site to ensure that closure procedures are effective in protecting the environment and human health both on the site and in the surrounding area?	Water quality monitoring will be conducted prior to, during and after operations to assist with operational and closure plans that are protective of environmental and human health.

Consultation Comment	Response/How has the comment been addressed?
Will there be a schedule of monitoring to ensure that erosion is not occurring over time?	Site inspections and monitoring of total suspended solids will be completed as part of the overall erosion protection plan. Best management practices will be used as part of erosion protection.
Committee member asks if the tailings pond would get a liner or would it pollute the groundwater.	The tailings pond will not be lined. Rather, a seepage collection system will be constructed to intercept seepage downgradient of the tailings area. The seepage will be pumped back to the tailings pond.
Committee members asked how close to Mesomikenda Lake the tailing ponds would be located and if the tailings ponds would parallel Mesomikenda Lake and how close to the west arm they would be.	The eastern-most edge of the Tailings Management Area is located approximately 1 km from Mesomikenda Lake. The northern-most edge of the Tailings Management Area is located approximately 4 to 5 km from the western arm of Mesomikenda Lake.
Individual asked geologist about tailings discharge and he said not in Lake Mesomikenda. Bagsverd Creek is ok as it will filter by time it gets to west arm.	Mesomikenda Lake was evaluated as an option for discharge of treated effluent. After an alternatives analysis, it was determined that discharge to Bagsverd Creek was a better option, including with respect to water quality.
Should the MRA be designed such that it would be able to deal with ARD 'just in case'?	Based on the currently available data, the mine rock is not characteristic of acid generating (ARD) material. Therefore, there is no reason at this time to design the MRA to mitigate ARD.
Would the bottom of the open pit lake be saline?	The bottom of the open pit lake is likely to have higher concentrations of dissolved solids than the water at surface, as the water will stratify while the pit floods over the 50 to 60 year period after closure. However, the concentrations will not likely increase to levels that would be considered to be saline.
Would like to know what the key issues are with discharge quality.	The water quality of discharge will meet the provincial and federal effluent discharge limits. The key issue is that due to low water flows in the receptor, for some parameters, a mixing zone will be required to meet provincial and federal surface water quality objectives.
How will negative impacts from TMF seepage be prevented?	A seepage collection system will be constructed to intercept seepage downgradient of the tailings area. The seepage will be pumped back to the tailings pond.
Will methyl mercury be an issue with TMF seepage?	Mercury is not anticipated to be a contaminant of concern.

Consultation Comment	Response/How has the comment been addressed?
Will Unnamed Lakes fill with sediments from the Bagsverd Creek realignment?	The intent of the realignments is to maintain flow through the watersheds and lakes, and flow may increase through the Un-named Lakes. Sediment transport through the Bagsverd Creek realignment will depend on the design, substrate and flow rates.
How many water samples have been taken to date?	Up to May 2013, 241 samples of surface water have been analyzed for water quality parameters as part of the surface water baseline study. Additional samples have since been collected.
Why is phosphorus elevated in baseline water quality?	It is believed that phosphorous is elevated in the baseline water quality due to the method used for some of the laboratory analyses. Recent sampling rounds have used an alternate analysis method which is considered more accurate. This has shown lower concentrations when compared to the original method.

9.7 Terrestrial Biology for the Site

Details on the Project site vegetation and wildlife predictions of effects are presented in Appendices K and L, respectively. A summary of the key results are presented in the following subsections.

9.7.1 Methodology

An analysis of the potential Project related effects on identified effects assessment indicators 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 were used to predict effects of the Project on flora and fauna and their habitat within the local study area.

Decreases in habitat area can directly influence vegetation and wildlife population sizes by reducing the carrying capacity of the environment. Habitat loss includes the direct removal or alteration of habitat due to the Project and other developments. In addition to direct loss of habitat, the application of the Project and other developments results in fragmentation of the existing landscape. Fragmentation can influence several ecological processes including plant and animal dispersal between fragments, animal movement between foraging areas and increased disturbance and predation along habitat edges. In addition to direct habitat effects, wildlife habitat quality may change in the vicinity of the Project. Local-scale habitat quality may be affected by sensory disturbance (e.g., light, noise, presence of humans).

A change in the hydrology has the potential to cause direct mortality to plants, reduce reproductive success, and decrease interspecific competitive advantage for available resources, which in turn may transform the type of plant communities being supported by that habitat. An assessment of likely effects from changes in habitat quantity and quality was based on a calculation of the amount of habitat potentially altered or lost in the regional study area. Mean baseline and application water levels were calculated for water bodies affected by the Project. This data was considered in combination with predicted changes to the lake areas and watercourse lengths to assess the effect of changes to downstream flows on vegetation.

It is recognised that local-scale habitat quality for wildlife may be affected by sensory disturbance from the Project (e.g., light, noise, presence of humans). The predicted effects from changes in habitat quality due to sensory disturbance from the Project on wildlife were qualitatively assessed by reviewing existing scientific literature and government publications.

9.7.2 Results

9.7.2.1 Construction Phase

Upland Plant Community Types

Construction of the Project is anticipated to remove 1,800 ha of the habitat that supports upland plant communities, which represents a 13% loss in the local study area and 0.4% of the upland plant community habitat in the regional study area.

Dewatering of water bodies and realignment of watercourses in the local study area may affect the abundance of the upland plant community by changing the quality of the supporting habitat. Changes are anticipated to be measurable at the local scale but are expected to have a negligible effect on the upland plant community abundance and distribution in the regional study area. 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.

Wetlands

Wetlands consist of open bog, treed bog, treed fen, and wetland cover types. Project construction is anticipated to remove 185 ha of the habitat that currently supports wetlands, which represents a 2% loss in the local study area and a 1.5% loss of the wetland habitat in the regional study area.

Dewatering of water bodies and realignment of watercourses in the local study may affect the quantity of wetlands. Approximately 90% of the wetlands existing in the regional study area will remain unaffected by the Project, with affected wetlands making up less than 1% of the total available habitat in the regional study area. In addition, 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 with a duration of greater than 15 years when natural flows are reverted following post-closure stage II.

The shorelines around Chester Lake and the south arm of Bagsverd Lake are expected to increase due to the establishment of the watercourse realignments, inundating the adjacent communities. Consequently, a small area of wetland is expected to become lake habitat (i.e., 45 ha; 0.3% of existing wetland habitat). This loss is a conservative estimate because upland plant communities surrounding the flooded areas will become more suitable for supporting wetlands over time. Consequently, changes are anticipated to be measurable at the local scale but are expected to have no measurable effect on wetland abundance and distribution in the regional study area relative to natural fluctuations that occur from wet and dry cycles.

Effects from the Project on the abundance and distribution of wetlands are expected to be measurable but are not predicted to influence the ability of wetlands to be self-sustaining. Wetlands are common throughout the regional study area and there should be sufficient undisturbed habitat in the regional study area for the continued persistence of wetlands.

Plants with Special Conservation Status or Provincial Rarity

No plants with special conservation status or rarity in the province have been reported in the regional study area and none were observed during the 2012 and 2013 field programs. As a result, the Project is predicted to have no measurable effects on this assessment indicator.

Ungulates: Moose

Suitable potential summer habitat for moose was determined to be dense mixed forest, dense deciduous forest, regenerating, treed bog, treed fen, and wetland habitats. Potential suitable winter habitat was determined to be dense coniferous and dense mixed forest.

The Project is anticipated to remove 1,074 ha (0.4% in the regional study area) and 1,106 ha (0.6% in the regional study area) of summer and winter moose habitat, respectively. 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. 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 should 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. 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.

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 should be sufficient undisturbed habitat in the regional study area for a self-sustaining population.

Furbearers: Black Bear, Eastern Wolf, American Marten, and Beaver

Potential suitable habitats for eastern wolf were determined to be dense coniferous forest, dense mixed forest, dense deciduous forest, regenerating, treed bog, treed fen, and wetland habitats. Potential suitable habitats for black bear were determined to be dense deciduous forest, dense mixed forest, regenerating, wetland, and sparse forest habitats. Suitable habitat for American marten in the regional study area was considered to be dense coniferous forest, dense mixed forest, dense deciduous forest, treed bog, and treed fen habitats. Potential suitable habitats for beaver within the regional study area were determined as dense deciduous forest, dense mixed forest, and regenerating habitats that were within 200 m of wetlands and other water bodies.

Site construction will remove an estimated 355 ha of suitable beaver habitat. Between 1,074 and 1,266 ha of suitable black bear, eastern wolf, and American marten habitat will also be removed. This represents a loss between 0.4% and 0.6% of suitable wolf, bear, American marten, and beaver habitat in the regional study area.

Measurable changes in the movement and behaviour of wolf, bear, marten, and beaver 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, respectively. Effects are anticipated to continue from the construction phases 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.

Effects from the Project on black bear and eastern 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 measureable effect on the abundance and distribution of American marten and beaver populations in the regional study area. Populations are likely increasing or stable, and there should be sufficient undisturbed habitat in the regional study area for self-sustaining populations.

Upland Migratory Birds

Nine upland breeding bird species with breeding ranges that overlap the regional study area are currently listed or recommended to be listed under provincial or federal legislation. Bobolink (*Dolichonyx oryzivorus*) and eastern meadowlark (*Sturnella magna*) are protected under the

Endangered Species Act (2007). Chimney swift (*Chaetura pelagica*), Canada warbler (*Cardellina canadensis*), common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus borealis*), and whip-poor-will (*Caprimulgus vociferous*) are species that are protected provincially under the *Endangered Species Act* (2007) and federally under Schedule 1 of the *Species at Risk Act* (SARA, 2012). Rusty blackbird (*Euphagus carolinus*) is protected under Schedule 1 of the SARA. Although barn swallow (*Hirundo rustica*) is not currently protected under provincial or federal legislation, it has been recommended by the Committee on the Status of Endangered Wildlife in Canada (2013) to be listed as Threatened under SARA (2012).

Bobolink and eastern meadowlark nest in open areas such as grasslands, hay fields, alfalfa fields, and pastures. Although barn swallows historically nested in caves and hollow trees, presently they primarily breed on human-made structures that are close to open meadows and fields. There was no agricultural land identified in the regional study area. As such, bobolink, eastern meadowlark, and barn swallow are considered to have a low potential for occurrence in the regional study area and Project-related changes to habitat loss, alteration, and fragmentation to these species are anticipated to be negligible.

Chimney swifts nest in chimneys and natural habitat features, such as caves and hollow trees which cannot be determined from the Land Cover Data Base (MNR, 2000). However, 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).

Whip-poor-will and common nighthawk are nightjar species that require similar habitat for nesting. Whip-poor-wills were heard at two locations during whip-poor-will and common nighthawk surveys in 2012. No common nighthawks were recorded during the surveys. Survey sites where the whip-poor-wills were heard were located in dense coniferous forest. However, the birds were heard greater than 50 m from observers and so habitat may be different where the whip-poor-wills were located. Potential suitable habitat for common nighthawk and whip-poor-will (nightjars) was considered to exist in sparse forest habitat. The Project is predicted to remove 0.5% of potential suitable habitat for nightjars in the regional study area. Whip-poor-will sites are not proximal to the preferred transmission line corridor.

Potential suitable habitat for olive-sided flycatcher was considered to be sparse forest, recently logged, and recently burn habitat. The Project is predicted to remove 0.6% of potential suitable olive-sided flycatcher habitat in the regional study area.

Data from baseline upland breeding bird surveys shows that Canada warbler had the highest density in recent logged/regenerating habitat, followed by dense mixed forest. Canada warblers were not recorded in other habitat types. Potential suitable Canada warbler habitat was considered to be dense mixed forest, dense deciduous forest, dense coniferous forest, treed

bog, treed fen, and regenerating habitats. The Project is predicted to remove 0.4% of potential suitable Canada warbler habitat in the regional study area.

No rusty blackbirds were observed during upland breeding bird surveys but this species was recorded during general wildlife surveys at the Project site and during wetland surveys in the local study area. The Project is predicted to remove 1.5% of potential rusty blackbird habitat in the regional study area.

Habitat loss and fragmentation in the regional study area is below the thresholds (e.g., 40% habitat loss) identified for highly mobile species (such as most birds). As such, habitat for listed upland breeding bird species in the regional study area 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. 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.

The Project is anticipated to have no measurable effect (olive-sided flycatcher) or measurable effects that are within the adaptive capability and resilience limits (Canada warbler, rusty blackbird, nightjars) on the abundance and distribution of listed upland breeding bird species' populations. Recently harvested areas may have a positive influence on olive-sided flycatchers and provide suitable habitat for nightjars. Although harvesting operations have mostly removed dense mixed and dense coniferous forest habitat, these are the most common habitat types in the regional study area and effects to species that rely on these habitats are anticipated to be small.

Waterbirds

Breeding habitat for waterbirds was considered to be wetlands, treed fen within 200 m of wetlands and water bodies, and shorelines of large lakes (100 m buffer). The Project is predicted to remove 0.8% of waterbird habitat.

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. 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 the regional study area.

The Project is predicted to have no measurable effect on the abundance and distribution of waterbird populations in the regional study area.

Raptors

The majority of raptor species in northern Ontario nest in large trees, which are typically found in mature upland forest habitats (e.g., dense coniferous forest, dense deciduous forest, dense mixed forest, and sparse forest). One exception is short-eared owl (*Asio flammeus*), 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 coniferous forest, dense deciduous forest, dense mixed forest, and sparse forest. Other habitat features, such as cliffs, may also be selected by raptors for nesting but these habitats are uncommon within the local study area.

The Project is predicted to remove 0.4% of potential suitable tree-nesting raptor habitat. The Project is not predicted to remove any potential suitable short-eared owl habitat.

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 the local study area. Eventually, the flooded open pit may attract waterbirds, and increase local prey abundance for some raptors (e.g., peregrine falcon and bald eagle (*Haliaeetus leucocephalus*)). 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 regional study area.

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 Project and other types of human development are expected to have no measurable effect on raptor populations.

Species at Risk, Species of Special Concern, and Provincially Rare Species

During the summer, bats occupy a variety of day and night roosts including buildings, caves, and trees. These habitat features cannot be determined from the Land Cover Data Base but suitable habitat was considered to be present in dense coniferous forest, dense deciduous forest, dense mixed forest, and sparse forest habitats. The Project is anticipated to remove 1,233 ha (0.4%) of potential bat habitat.

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 eastern wolf, listed upland breeding birds, waterbirds and raptors are provided above.

9.7.2.2 Operations Phase

Effects predicted during the construction phase are expected to continue during the operations phase.

9.7.2.3 Closure and Post-Closure Phases

Upland Plant Community Types

The MRA will be partially vegetated during closure. However, a permanent decrease in upland plant community habitat of 3% of the local study area and 0.1% of the regional study area is expected. Effects from habitat loss and fragmentation are expected to be partially reversible with a duration of greater than 15 years after Project closure. However, these local changes represent less than 1% of the total available habitat within the regional study area and are therefore anticipated to have no measurable effect on the abundance and distribution of upland plant populations and communities in the regional study area.

The Project is expected to have no measurable residual effect on upland plant community abundance and distribution.

Wetlands

The open pit is expected to be refilled within 50 to 80 years of the start of the post-closure phase (see Chapter 5). However, the effects to plant populations and communities associated with the open pit are expected to be partially reversible with a duration of greater than 15 years after Project closure. Vegetation has to re-establish on the margins of the open pit, which will likely happen after water levels are constant.

Effects from the Project on the abundance and distribution of wetlands are expected to be measurable but are not predicted to influence the ability of wetlands to be self-sustaining. Wetlands are common throughout the regional study area and there should be sufficient undisturbed habitat in the regional study area for the continued persistence of wetlands.

Plants with Special Conservation Status or Provincial Rarity

No plants with special conservation status or rarity in the province have been reported in the regional study area and none were observed during the 2012 and 2013 field programs. As a result, the Project is predicted to have no measurable effects on this assessment indicator.

Ungulates: Moose

Sensory disturbance until the end of the closure phase 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. 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 should be partially reversible towards 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. 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.

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 should be sufficient undisturbed habitat in the regional study area for a self-sustaining population.

Furbearers: Black Bear, Eastern Wolf, American Marten, and Beaver

Measurable changes in the movement and behaviour of wolf, bear, marten, and beaver 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, respectively. Effects are anticipated to continue from the construction phases 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.

Effects from the Project on black bear and eastern 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 measureable effect on the abundance and distribution of American marten and beaver populations in the regional study area. Populations are likely increasing or stable, and there should be sufficient undisturbed habitat in the regional study area for self-sustaining populations.

Upland Migratory Birds

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 generally to be lower within 1 km of human developments. 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.

The Project is anticipated to have no measurable effect (olive-sided flycatcher) or measurable effects that are within the adaptive capability and resilience limits (Canada warbler, rusty blackbird, nightjars) on the abundance and distribution of listed upland breeding bird species' populations. Recently harvested areas may have a positive influence on olive-sided flycatchers and provide suitable habitat for nightjars. Although harvesting operations have mostly removed dense mixed and dense coniferous forest habitat, these are the most common habitat types in the regional study area and effects to species that rely on these habitats are anticipated to be small.

Waterbirds

Measurable changes in the movement and behaviour of waterbirds are predicted near the Project as bird abundance may be lower within 1 km human developments. Effects are anticipated to continue from the construction phase up until the end of the closure phase at the Project site, and 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 the abundance and distribution of waterbird populations from the Project are anticipated to have no measurable effect on waterbird populations in the regional study area.

The Project is predicted to have no measurable effect on the abundance and distribution of waterbird populations in the regional study area.

Raptors

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 the local study area. Eventually, the flooded open pit may attract waterbirds, and increase local prey abundance for some raptors (e.g., peregrine falcon and bald eagle (*Haliaeetus leucocephalus*)). 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 regional study area.

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 Project and other types of human development are expected to have no measurable effect on raptor populations.

Species at Risk, Species of Special Concern, and Provincially Rare Species

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 eastern wolf, listed upland breeding birds, waterbirds and raptors are provided above.

9.7.3 Government, Aboriginal and Public Comments and Concerns

Table 9-7 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to terrestrial biology throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-7: Comments and Concerns on Terrestrial Biology

Consultation Comment	Response/How has the comment been addressed?
Cumulative effects on wildlife considering future expansions and other projects in the area need to be considered.	IAMGOLD agrees with this comment. These aspects are considered in more detail in Chapter 14.
Do you know where all the beavers and muskrats are?	IAMGOLD has carried out baseline studies at and around the Project Site for many years. With this data at hand IAMGOLD has a good understanding of wildlife habitat areas. For more detail see the baseline study report, which is appended to the Terrestrial Biology TSD.

9.8 Terrestrial Biology for the Transmission Line

Details on the transmission line terrestrial biology prediction of effects are presented in Appendix M. A summary of the key results are presented in the following subsections.

9.8.1 Methodology

An analysis of the potential Project related effects on identified effects assessment indicators 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 were used to predict effects of the Project on flora and fauna and their habitat within the local study area.

9.8.2 Results

9.8.2.1 Construction Phase

Vegetation Communities, Plants with Special Conservation Status or Rarity in the Province, and Traditional Use Plants

Development of the Cross-Country transmission line alignment (TLA) footprint would result in the removal of 549.2 ha of vegetated land including 232.9 ha of deciduous mixed forest, 170.3 ha of coniferous forest and 146 ha of coniferous swamp. Although a further 26 ha of wetland and aquatic communities occur in the proposed Cross-Country TLA footprint, these areas will be fully spanned (clear spanned) and as such there will be little to no direct footprint of the TLA within these habitats. Therefore, little to no aquatic or wetland habitat (excluding the coniferous swamp) will be directly affected (lost) from the construction of the Cross-Country TLA. However, there is the potential for wetlands, waterbodies and watercourses to be indirectly affected through sedimentation during construction (during forest clearing), although this can be minimized by implementing standardized industry best management practices.

Natural revegetation of the TLA ROW following decommissioning will restore many of these communities. With the implementation of mitigation measures and natural revegetation upon decommissioning, there will be no detectable effect to vegetation communities relative to baseline conditions. There is a history of forestry and fire in the regional study area and this is reflected in the vegetation structure. Vegetation communities include young and mature stands of Trembling Aspen, Balsam Poplar and to a lesser extent White Birch, Balsam Fir and White Spruce, all of which are considered pioneer species, colonizing recently disturbed areas. Logging has taken place in several areas within the regional study area, as well as in the surrounding landscape.

Ungulates (Moose)

Overall, construction of the Cross-Country TLA will result in the removal of 549.2 ha of terrestrial habitat. The TLA directly effects 24 ha of Moose overwintering habitat and 208.8 ha of area identified with the potential to sustain high Moose aquatic carrying capacities. Open wetland communities such as marsh or fen habitat comprise of 22.2 ha of this footprint; however, open water and wetland communities are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

Loss of terrestrial and wetland habitats and/or portions of associated key habitat areas for Moose including aquatic feeding and over wintering areas is not expected to result in any direct mortalities of Moose. These habitats are common throughout the local and regional study areas and Moose will be able to use these features 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 within the regional study area. Predation and hunting rates on local Moose populations may occur under the expanded ROW and associated access road network. The increases in predation may have effects on local Moose but this result is not expected to occur at the population level as there is an existing ROW already present that local wolves may already be using. These effects would occur during the life of the Project and are reversible during closure of the Project when the expanded portion of the ROW is re-vegetated.

Furbearers (Wolves, Black Bear, American Marten)

Clearing of forest and wetland communities along the Cross-Country TLA is 549.2 ha of which 170.3 ha will be coniferous forest, 232.9 ha will be deciduous/ mixed forest and 146 ha will be coniferous swamp. Potential wolf rendezvous sites including open bogs, marshes and open forest are present within the local and regional study areas. These habitats are common throughout the local and regional study areas and vegetation removal is not anticipated to have long term negative effects on local populations. As an existing ROW is being utilized, local wolf, Black Bear, and marten populations are expected to have adapted to the local setting and no appreciable effect on furbearer behaviour is expected. Widening the ROW and providing additional access routes could potentially improve hunting efficiency as ease of movement and greater visibility could result. Vegetation clearing activities may result in temporary displacement of local individuals due to sound and human activity disturbance.

Vegetation removal at the southern portion of the Cross-Country TLA, in an area not previously disturbed, will contribute to increased landscape fragmentation within the regional study area and at larger scales. Loss of terrestrial and wetland habitats and/or portions of associated key habitat areas for wolves such as denning and/or rendezvous sites are not expected. Vegetation clearing activities may result in temporary displacement while longer term displacement of wolves could occur. This new corridor may increase 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. Noise may act to temporarily influence local wolf - prey dynamics in the local study area during construction.

Bats

A total of 130 ha of suitable vegetation community types for bat roosting habitat will be cleared for Project development, although these 130 ha have not been deemed to be significant roosting habitat, as per the Ontario Ministry of Natural Resources and Forestry (MNRF) guidelines (MNR, 2000; 2011). Despite the clearing of a 45 m ROW for implementation of the TLA, large tracts of forest will continue to maintain interior forest habitat. The majority of deciduous forest within the Cross-Country TLA local study area is middle aged to mature aspen-birch hardwood forest that contains a low density of snags and cavity trees, thus cleared forest is unlikely to affect critical roosting habitat for cavity-roosting species. These larger forest complexes are also likely to have one or more foraging habitat features within them, including wetlands that help maintain the quality of available roosting habitat therein.

Increased local vehicular traffic is anticipated and the probability of vehicle - bat collisions will remain low. Few increases in barrier effects of roadways near the foraging habits of bat species (woodland edges, over water and above the height of most vehicles) are expected occur and an increase in edge habitat caused by the clearing of the ROW may provide an increase in low to moderate quality foraging habitat for local bat species.

Upland Migratory Birds

Construction of the Cross-Country TLA will result in the removal of 549.2 ha of terrestrial habitat. In a local context, the removal of this habitat is notable, but no population level effects are expected for migratory bird species within the local study area or regional study area. Results of 2013 baseline studies indicate that abundant migratory bird breeding and foraging habitat, in the form of coniferous, mixed and deciduous forests, and wetlands, will remain within the regional study area.

Large tracks of uncut forest are more likely to contain mature interior forest, comprised of a greater diversity of plant and wildlife species, compared to small isolated woodlands, and also provide interior woodland habitat to woodland area sensitive species. However, habitat fragmentation and the loss of interior woodland habitat along the Cross-Country TLA will be minimal due to the existing ROW. Furthermore, the continued presence of large tracts of interior forest habitat throughout the regional study area moderates the adverse effects caused by construction activities. The loss of this terrestrial habitat is not expected to result in any direct mortalities of birds, nor in a decrease in reproductive effort of any bird species if clearing takes place outside of the breeding bird season (outside of April 1 – July 31), and if proper mitigation measures are implemented.

Raptors

Vegetation clearing for implementation of the Cross-Country TLA is anticipated to remove 403.2 ha of forested land capable of providing woodland raptors nesting habitat. It is anticipated

that Project activities will have few adverse effects on the raptor nests located along the Cross-Country TLA local study area. Raptor species currently nesting within the footprint are relatively tolerant to anthropogenic disturbance. 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 and Common Ravens are already using the existing ROW as such.

Species at Risk, Species of Special Concern and Provincially Rare Species

Vegetation clearing during construction and operation may result in the loss of woodland habitat that provides habitat for cavity-roosting bats as well as migratory or hibernating bat species. Some foraging habitat will be affected, though this habitat type is not expected to be a limiting factor in the region. A total of 130 ha of suitable vegetation community types for bat roosting habitat will be cleared for Project development, although these 130 ha have not been deemed to be significant roosting habitat, as per MNRF guidelines (MNR, 2000; 2011). Despite the clearing of a 45 m ROW for implementation of the TLA, large tracts of forest will continue to maintain interior forest habitat. The majority of deciduous forest within the Cross-Country TLA local study area is middle aged to mature aspen-birch hardwood forest that contains a low density of snags and cavity trees, thus cleared forest is unlikely to affect critical roosting habitat for cavity-roosting species. These larger forest complexes are also likely to have one or more foraging habitat features within them, including wetlands which help maintain the quality of any available roosting habitat therein.

Results of baseline studies indicated Eastern Whip-poor-will are not present along the Cross-Country TLA and suitable breeding habitat for this species is not expected to occur.

Baseline studies indicate that Canada Warbler is not present within the Cross-Country TLA local study area. Clearing along the Cross-Country TLA would remove 233 ha of deciduous/mixed forest which provides nesting and foraging habitat for this SAR.

Common Nighthawk, Olive-sided Flycatcher, and Rusty Blackbird were not observed within the Cross-Country TLA local study area. The overall amount of suitable habitat for Olive-sided Flycatcher and Rusty Blackbird lost along the Cross-Country TLA footprint would include 146 ha of coniferous swamp. Additional wetland communities used by these species are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

Although no Snapping Turtles were recorded within the Cross-Country TLA local study area, it is possible that this species is present along waterways, lakes and wetlands in the areas. However, no impact to this species or its habitat is anticipated as wetland communities occurring within the Project footprint are to be spanned by the Project activities and direct vegetation removal in these areas is not expected.

Although increased local vehicular traffic may increase the probability of wildlife-vehicle collisions, enforced speed limits, road signs warning of wildlife and inclusion of wildlife safety into mine safety training inductions will greatly reduce this risk.

9.8.2.2 Operations Phase

The effects predicted during the construction phase will continue during the operations phase of the Project.

9.8.2.3 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, including raptors. Forest regeneration can take upwards of 60 years to regenerate. The effects predicted during the construction and operations phase will continue but to a lesser extent as time passes. Eventually, it is expected that the Project effects on vegetation and wildlife will be fully reversible along the transmission line.

9.8.2.4 Post-Closure Phase

The effects of the Project during the post-closure phase are expected to be similar to what is described during the closure phase.

9.8.3 Government, Aboriginal and Public Comments and Concerns

Few concerns have been expressed by stakeholders relative to terrestrial biology effects assessment indicators. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

9.9 Aquatic Biology

Details on the aquatic biology prediction of effects are presented in Appendix N. A summary of the key results are presented in the following subsections.

9.9.1 Methodology

Potential effects were considered for each phase of the Project for the three aquatic environment effects assessment indicators (see Table 9-1):

- aquatic toxicity;
- commercial, recreational and Aboriginal fisheries; and
- aquatic habitat.

Aquatic Toxicity

The protection of aquatic species is predicated on exposure to water quality which will not cause impairment. Water quality guidelines are established in Canada (Canadian Water Quality Guidelines (CWQG); CCME, 2013) and Ontario (Provincial Water Quality Objectives (PWQO); OMOEE, 1994) for the protection of fish and aquatic life. These guidelines are typically more stringent than drinking water guidelines and thus are generally protective of both uses. In recent years, Environment Canada has revised water quality guidelines based on current toxicity literature for some substances (CCME, 2013). The rationale and supporting documents for many of the PWQO are now dated (i.e., based on literature from the 1970s and 1980s) and may not provide the best basis for assessing potential effects to aquatic life. Therefore, the most recent federal or Ontario guideline was used in this assessment. In instances where there were no federal or Ontario guidelines, guidelines from another Canadian jurisdiction were used, if available. In some instances, baseline (pre-mining) concentrations are naturally higher than these guidelines (aluminum, iron, total phosphorus and zinc). Therefore, predicted water quality concentrations have been compared to single benchmark 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.

However, since baseline concentrations have no relevance to aquatic toxicity, toxicity reference values (TRVs) were developed for substances for which no guideline value exists (i.e., calcium, manganese, sodium, and strontium) and were used for the prediction of effects. In instances where predicted concentrations were greater than guidelines, the predicted concentrations were also compared to toxicity effect thresholds for both acute (short-term) and chronic endpoints, as appropriate.

Water quality predictions were provided for the lakes within the Mollie River and Neville-Mesomikenda lake watersheds that will receive drainage from the Project site. These represent areas of potential water quality influence from the Côté Gold Project (i.e., water bodies where effluent or storm water discharge is proposed). For each phase of Project development, predicted median and maximum concentrations were summarized for any parameters that exceeded the water quality benchmark. Any value greater than twice the water quality benchmark was flagged.

Predictions of potential effects on sediment quality, due to the Project, have not been completed, but are implicitly considered through the water quality effects assessment and mitigation planning. Changes to sediment quality will be the result of: 1) geochemical processes that form precipitates directly on the sediments or colloids in the water column that become part of the sediments through sedimentation and settling processes, and 2) discharge of a

suspended solid load that results in the accumulation of mineralic grains over the existing sediments. However, it is expected that changes to sediment quality associated with total TSS loads will be limited based on federal and provincial metal mining sector effluent discharge requirements (MMER).

Effects to sediment quality that are caused by geochemical processes will depend on changes to the water quality, and only substantial changes to water quality will result in meaningful change to sediment quality. Effects to biota are addressed through the assessment of predicted water quality, which should also address any potential changes to sediment quality.

Commercial, Recreational and Aboriginal Fisheries

Some fish species residing within the local study area 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 within the local study area are northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), whitefish (*Coregonus clupeaformis*) and smallmouth bass (*Micropterus dolomieu*). The populations of these species have been used in completing the prediction of effects on sport fish. Throughout the phases of the Project, these populations must be able to maintain access to, and have sufficient quantities of critical habitat for the key life history stages (i.e., spawning, juvenile rearing, adult foraging and overwintering). It is important to note that the protection of fish from potential contaminant effects has been addressed through the aquatic toxicity indicator discussed above.

Project activities were considered for their potential to impair commercial, recreational and Aboriginal (CRA) fisheries within the local study area. 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 water course realignments;
- effluent and storm water discharges may affect fish through impaired water quality (addressed through aquatic toxicology (see above));
- impingement of fish through fresh water intake structures; and
- the development of watercourse realignments within the local study area 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).

Blasting in, or adjacent to fish habitats may generate a disturbance, injury and/or death to fish and their habitats (Wright and Hopky, 1998) and these effects can sometimes occur a

considerable distance away from the blast location. Fisheries and Oceans Canada (DFO) has provided a guideline of a 100 kPa for various fish habitat and a 13 mm/sec vibration guideline for various spawning habitat (Wright and Hopky, 1998).

To address the potential for effects to fish associated with blast charges in the open pit during construction and operation, a prediction of noise and vibration effects was conducted (see Appendix G). This prediction determined setback distances from the open pit to fish habitat based on expected blast charges during construction and operation, as well as providing the protective setback distances cited in Wright and Hopky (1998). Setback distances were calculated for both the construction and operations phase based on the maximum charge size in kilograms per delay during each phase. These setback distances were extrapolated based on the relationship between the weight of explosive charge to the distance of the setback required to protect fish habitat and fish spawning as provided by Wright and Hopky (1998). The calculated setbacks were compared to the proposed distances from the open pit to water bodies that support fish and the fish habitat.

Fresh water, required during operations for the ore processing plant and potable water, will be drawn from Mesomikenda Lake. The intake of water has the potential to affect fish within Mesomikenda Lake through entrainment and/or impingement in the intake structure. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. DFO has developed a Fresh Water Intake End of Pipe Fish Screen Guideline to provide protection of migratory and resident fish (DFO, 1995). The standards within this guideline will be used to identify required mitigation and potential effects to resident fish within Mesomikenda Lake.

Fresh water, required during operations for the ore processing plant and for potable water will be drawn from Mesomikenda Lake. The intake of water has the potential to affect fish within Mesomikenda Lake through entrainment and/or impingement in the intake structure. The Department of Fisheries and Oceans Canada have developed a Fresh Water Intake End of Pipe Fish Screen Guideline to provide protection of migratory and resident fish (DFO, 1995). The standards within this guideline will be used to identify required mitigation and potential effects to resident fish within Mesomikenda Lake.

Changes in habitat were based on conceptual fish habitat compensation measures and baseline habitat and fish community assessments such that the life history requirements of resident sport fish species were compared to the changes in habitat relative to the assessment indicators.

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 local study area. Changes to both lentic (lakes and ponds) and lotic (streams) habitat within the local study area were considered. The predicted loss of habitat (after realignments) 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 local study area.

The watercourse realignments have the potential to affect fish habitat and fish communities within the affected watersheds. IAMGOLD will need to develop habitat compensation plans in support of a Fisheries Act Authorization that will be required. While the compensation plans are not yet finalized, design concepts have been developed. The proposed watercourse realignments and conceptual fish habitat compensation plans have been used as the basis for the assessment of effects to aquatic habitat. Furthermore, predicted changes in water flow (see Section 9.5) were also considered in the prediction of potential effects to fish habitat.

9.9.2 Results

9.9.2.1 Construction Phase

Aquatic Toxicity

During the construction phase, there is a risk that water quality may be impaired due to high TSS in runoff. IAMGOLD will implement best management practices to control runoff and minimize TSS effects (see Section 9.6). Concentrations above background may occur temporarily. No other effects to aquatic life are expected.

Commercial, Recreational and Aboriginal Fisheries

The most dominant sport fish species in the local study area are northern pike and yellow perch although walleye, smallmouth bass and lake whitefish are also quite common. These fish are generally limited to the lakes and larger streams within the local study area (i.e., water bodies less than 2 m typically do not support large-bodied fish due to limited overwintering habitat). Generally, the abundance of northern pike and yellow perch habitat within the local study area supports the dominance of these species. There is adequate habitat to support smaller populations of walleye, smallmouth bass and lake whitefish in the local study area although spawning habitat for walleye is limited.

There will be some potential for elevated TSS in watercourses downstream of Project construction. Elevated TSS can affect fish and aquatic life through effects to habitat (i.e., smothering of spawning substrates), at critical life stages (i.e., egg incubation and young-of-the-year rearing). It is expected that through the implementation of best management practices for erosion control and timing of the construction periods relative to life history stages of resident fish, potential effects will be largely mitigated, and no residual effects to fish communities and

populations are expected. Monitoring of the effectiveness of these mitigation measures will be required.

During the construction phase, as many fish as possible will be collected and relocated from all habitats that will be lost due to the development of Project components. However, it will not be possible to collect and move all fish and therefore, some individuals will likely be affected during construction. The timing of fish relocations will be scheduled with respect to fish life history requirements (e.g., spawning periods) and conditions in the watershed (e.g., water temperature). These will need to be considered to minimize stress to the fish, increase survival rate and reduce any loss of year class. The constructed fish habitat associated with the watercourse realignments is expected to provide spawning, rearing and adult foraging habitat for the resident fish, particularly northern pike and yellow perch. Therefore, no loss of fish communities or populations is expected. Effects are anticipated to be limited to individual fish with no expected effects to communities or populations.

The construction of the watercourse realignments will result in the flooding of former terrestrial lands. It is possible that the decay of terrestrial vegetation will result in the production of methyl mercury that will be taken up by resident fish. This could reduce the value of recreational fishing within the watershed although it would not be expected to harm the fish themselves. The removal of vegetation prior to flooding will reduce the potential for methyl mercury production. There are currently fish consumption advisories for mercury in lakes within the local study area, (MOE, 2013b) and therefore, the potential to affect the recreational value of these lakes would be minor.

Blasting from the open pit, which may occur occasionally during the construction phase, may affect fish habitat and spawning in adjacent water bodies during construction and the early years of operation. Based on estimated setbacks there is potential for spawning disruption in the south basin of Clam Lake (see Figure 9-30). It is expected that fish may avoid this area for spawning due to the noise and vibration, although effects on the fish themselves (i.e., physiological effects) are not expected. However, the area potentially affected will either be overprinted by the construction of dams or is largely profundal (deep) and provides limited spawning habitat for the resident fish within this lake. The dominant fish in Clam Lake are smallmouth bass and there is an abundance of spawning habitat for this species along the west and north shore. Therefore, while some disruption to fish associated with blasting will occur during construction and the early years of operation (i.e., until the pit is deeper than 350 m from the lake bottom) these effects will likely be limited to individuals and not result in a community or population level effect.

Aquatic Habitat

Fish habitat within the local study area will be affected by the construction of retention dams and watercourse realignments required to accommodate the removal of Côté Lake and the development of the open pit as well as the TMF (see Figure 1-2 Site Layout). The watercourse

realignments will be designed to compensate for habitat lost within the local study area and to ensure productive capacity within the local study area is maintained. The objective of habitat compensation 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 erosion). 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 compensation design as appropriate. The compensation plans 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).

Based on the proposed watercourse realignments, it is anticipated that there will be a small reduction in lotic (stream) habitat (1,900 m or 1.6% of stream length) and a small increase in lentic (lake) habitat (29,000 m^2 or 0.1% of lake area) within the local study area. The net change in habitat is very small in the context of the local study area and is not expected to result in a loss of productive fish habitat. The dominant species within the local study area are found in both lentic and lotic habitat and thus the shift to slightly more lentic habitat should not affect their productivity. Furthermore, much of the lentic habitat to be created will be littoral habitat suited to northern pike and yellow perch (the dominant fish within the local study area). Efforts will be made to create walleye spawning habitat in each of the Mollie and Neville Lake watersheds, which should enhance the productive capacity of walleye within these watersheds.

9.9.2.2 Operations Phase

Aquatic Toxicity

Concentrations in the Mollie River watershed are predicted to be less than water quality benchmarks or TRVs for all substances, under all flow scenarios and Project phases except for total phosphorus. Total phosphorus may be overstated in the predictions due to elevated baseline analytical results. Thus, no effects to aquatic life are expected in the Mollie River associated with water quality.

Within the Neville-Mesomikenda Lake watershed potential effects are restricted to the initial effluent mixing zone where maximum concentrations of several substances (aluminum, arsenic, calcium, cadmium, copper, iron, magnesium, total phosphorus, strontium, uranium, vanadium and zinc) are expected to exceed water quality benchmarks. Predicted concentrations of most of these substances are less than short-term CWQG or toxicity thresholds. Predicted maximum copper, iron and zinc concentrations have the potential to cause impairment to fish and aquatic life within the mixing zone. However, these predicted effects do not consider potential ameliorating influence of receiving water chemistry (e.g., hardness, Dissolved Organic Carbon

or pH). IAMGOLD will evaluate the site water quality to seek opportunities to better define acceptable concentrations through site specific water quality objectives (SSWQO; e.g., the use of the Biotic Ligand Model for copper). Should potential effects continue to be anticipated after SSWQOs are developed, IAMGOLD will implement treatment of effluent to ensure concentrations within the mixing zone are below toxicity thresholds for all substances in all flow conditions. Following either the development of SSWQO or treatment, water quality in the mixing zone is anticipated to be below toxicity thresholds. Water quality in Mesomikenda Lake is predicted to be below water quality benchmarks for all substances, under all flow conditions. Following mitigation, no effects to aquatic life are expected in the Neville-Mesomikenda Lake watershed. Monitoring of receiving environment quality will be required to confirm predicted conditions.

Commercial, Recreational and Aboriginal Fisheries

As described above (see Section 9.9.2.1) the constructed fish habitat associated with the watercourse realignments is expected to provide spawning, rearing and adult foraging habitat for the resident fish, particularly northern pike and yellow perch. However, during the first year of operations, the watercourse realignments and constructed habitats may not yet be fully functional and some resident fish may experience some interruption in access to, or quality of constructed habitats. These effects are expected to be short in duration (i.e., one season) and can be somewhat mitigated through the promotion of vegetation growth within the watercourse realignments. Effects are anticipated to be limited to individual fish with no expected effects to communities or populations.

Blasting from the open pit will occur regularly during the operations phase. Therefore the effects to sport fish due to blasting will continue throughout this phase.

Fresh water required for the ore processing plant and the potable water supply will be taken from Mesomikenda Lake. The intake of fresh water from the lake has the potential to affect resident fish through entrainment and/or impingement. In order to minimize the effects to resident fish, the water intake structure will be designed to not interfere with fish passage, constrict the channel width, or reduce flows and will be equipped with screens to prevent entrainment or impingement of fish. The design and installation of intake end of pipe fish screens will address the requirements for screens provided by DFO (1995).

It is expected that through the implementation of mitigation measures, potential effects to resident fish will be minimized. It is still possible that effects to individual fish will occur but effects to the fish communities or populations within Mesomikenda Lake are not expected.

Aquatic Habitat

During the operations phase, the Project will reclaim much of the water within the TMF which will result in a reduction in flow within Bagsverd Creek. It is possible that the lower flow may expose some fish habitat within Bagsverd Creek especially shallow riffle areas located near the mouth of the creek. A survey of the stream morphology will be conducted prior to construction to assess the potential for exposure of habitat and/or barriers to fish passage. If required, the streambed will be modified to ensure an adequate depth of water for fish to utilize habitat and allow for passage. Therefore, the effects to fish habitat associated with reductions in flow are expected to be minimal.

The habitat alterations established during the construction phase (i.e., watercourse realignments) will continue throughout the operations phase.

9.9.2.3 Closure and Post-Closure Phases

Aquatic Toxicity

During the closure phase, there is a risk that water quality may be impaired due to high TSS in runoff. IAMGOLD will implement best management practices to control runoff and minimize TSS effects (see Section 9.6). Concentrations above background may occur temporarily.

During both the closure and post-closure phases, predicted concentrations are expected to be less than water quality benchmarks and/or established TRVs with the exception of total phosphorus. As noted previously, total phosphorus may be overstated in the predictions due to elevated baseline analytical results. Water quality in Mesomikenda Lake is predicted to be below water quality benchmarks for all substances, under all flow conditions. Following mitigation, no effects to aquatic life are expected in the Neville-Mesomikenda Lake watershed.

Commercial, Recreational and Aboriginal Fisheries

There is a risk that water quality may be impaired due to high TSS in runoff during site decommissioning activities. IAMGOLD will implement best management practices to control runoff and minimize TSS effects (see Section 9.6). Concentrations above background may occur temporarily.

The water intake structures will be decommissioned and removed during the closure phase.

During post-closure, the pit will fill with water and when water quality is acceptable, the newly created pit lake will be reconnected to the Mollie River watershed. In addition, some watercourse realignments will be removed to allow Clam Lake to flow into the pit lake and return the Mollie River watershed to its original size. These newly created habitats may take several seasons to become established in terms of vegetation and aquatic food base and as a result

fish may experience a reduction in access to and the quality of habitats during this time. However, similar to construction, these effects are expected to be short in duration. Since habitat for various life stages of the key sport fish is not limited within the local study area 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 one or more growing seasons or actively vegetated prior to commissioning, promoting more established habitats. This mitigation should reduce any potential disruption to the fish within the local study area. A monitoring program will be developed to assess the successful implementation of the watercourse realignments.

Aquatic Habitat

The habitat alterations established during the construction phase will continue throughout the closure phase. No additional alterations of aquatic habit are expected.

During the post-closure phase the open pit will be filled and eventually reconnected to the Mollie River which will provide an additional 144,000 m^2 of lentic habitat. This habitat will provide overwintering and cooler water habitat for species such as lake whitefish, but given the depth of the open pit, it is not anticipated to be very productive lake habitat.

During the closure phase, the TMF will discharge to Mesomikenda Lake and thus the flow in Bagsverd Creek will continue to be lower than baseline, in perpetuity. Modifications to the streambed made prior to operations, if required, should continue to support fish utilization of habitats and fish passage. Therefore, the effects to fish habitat associated with reductions in flow are expected to be minimal.

9.9.3 Government, Aboriginal and Public Comments and Concerns

Table 9-8 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to aquatic biology throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-8: Comments and Concerns on Aquatic Biology

Consultation Comment	Response/How has the comment been addressed?
Individual identified that they would be very interested in seeing more information on aquatic inventories for the proposed Project area.	Minnow Environmental Inc. has conducted the aquatic baseline studies. These have included the assessment of habitat conditions in 24 water bodies (lakes, ponds, rivers and streams). This work was conducted in 2012 and 2013. The 2012 baseline report is available and provides mostly fish community and habitat information on the lakes and streams potentially influenced by the Project. The 2013 studies included additional fishing and fish habitat work as well as sediment sampling and benthic invertebrate sampling in all potentially affected lakes and streams. .
Individual identified that they have a good understanding of the aquatic productivity of lakes, rivers and streams in the Timmins area, and suggested that the initial focus should be on preserving catchment areas of existing watersheds.	The realignment of surface water flow around the planned development considered the maintenance of flow through the existing watersheds. The majority of the flow systems will stay the same except for a small portion of Bagsverd Lake. The South Arm of Bagsverd Lake will receive flow from Clam Lake and then be directed south into Wee Duck Lake. There will be less than 5% watershed loss through each of the main drainage courses at the site (the Mollie River and Mesomikenda Lake).
Main concern would be the disturbance of the lake and everything in it. When the lake and contents are re-located, how does IAMGOLD know if that lake will be able to thrive again?	Côté Lake will not be re-located; rather habitat will be created in other areas of the watershed to off-set the loss of Côté Lake. The habitat created will be designed to meet the requirements of the resident fish (for example, spawning, rearing-juvenile, adult and overwintering). There are many excellent examples of successful fish habitat creation.
Will you affect much, if any of fish spawning area?	It is expected that spawning habitat will increase as shallow flooded areas good for northern pike and yellow perch spawning will increase and walleye spawning habitat which is currently very limited will be created and enhanced in some of the new stream habitats.
How successful are man-made channel realignments in creating habitat?	These can be extremely successful. The team designing and constructing the habitat for Côté Gold has numerous other projects in northern Ontario which have performed very well. In Kapuskasing, lake and stream habitat was created to off-set the expansion of an open pit and these habitat have supported resident fish with successful spawning and recruitment each year.

Consultation Comment	Response/How has the comment been addressed?
When you rescue fish won't they just take space from other fish?	The productive capacity of the lakes and streams that fish will be relocated to is sufficiently high that the additional fish should not impact the condition of the existing residents.
Why not just fish and consume the fish from Côté Lake, rather than relocate?	Protection of fish is required by the *Fisheries Act* and provincial regulations. The Ministry of Natural Resources may permit other uses of the fish that will be captured in Côté Lake.
Moving fish from Côté Lake may bring diseases to other lakes.	The fish in Côté Lake have access to other habitats up and downstream and as such do not represent unique fish to the other lakes in the system in terms of disease and genetic influences.
Is IAMGOLD investigating effects of blasting on fish?	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.

9.10 Land and Resource Use

Details on the land and resource use prediction of effects are presented in Appendix O. A summary of the key results are presented in the following subsections.

9.10.1 Methodology

Information gathered from other environmental disciplines (such as wildlife, vegetation, aquatics, noise, air quality and human health) informed the prediction of effects. Where applicable, effects were also determined using geographic information systems (GIS) analysis of the interface of the Project footprint with a specific land use management unit or planning area. Effects were also determined based on land and resource user interviews in which current land and resource uses and potential Project effects were discussed.

9.10.2 Results

9.10.2.1 Construction Phase

Small portions of Ontario's Living Legacy Land Use Strategy Areas will overlap with Project components. However, this is not expected to create any land use conflicts. The Project is located within the Mattagami Region Source Water Protection Planning zones. Based on the feedback received from the MOECC and IAMGOLD's prediction of effects on water quality, it is expected that there will be no adverse effects on Timmins drinking water supply.

The transmission line alignment, as well as portions of some components of the Project site infrastructure, will be situated on mining claims owned by other entities. Therefore, exploration activities on these claims may be affected by the Project development. However, this will not impede the ability to exercise mineral exploration activities. Some areas will be more accessible due to Project development allowing easier access for exploration activities.

Sanatana Resource Inc. (Sanatana) submitted a comment on the EIS / Draft EA Report stating "Sanatana's long standing position that the proposed easements for the project will materially impact Sanatana. IAMGOLD continues to be of the opinion that adjacent mineral rights holders, including the mineral claims held jointly with Sanatana, will not be impacted by Project development and operations.

The Project, including the transmission line alignment, will overlap several small portion of surrounding Forest Management Units. This overlap will not substantially limit forestry resources or the ability to conduct forestry activities.

Similarly, a number of hunting, trapline and fishing areas overlap with the Project site and TLA alternatives. 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. In addition, although the Project overlaps one Wildlife Management Unit, one Bear Management Area and a number of traplines, this overlap will not limit the ability to carry out hunting, trapping and fishing activities in the area.

The Project will not overprint any cottage properties. Some cottagers are expected to experience changes in background air quality, noise and vibration levels from traffic. However, these levels are expected to meet applicable regulations. The Project will not negatively affect the use of water for swimming or freshwater take. The Project will not limit the use of the area by existing cottagers.

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 clientele related to accommodations for temporary visitors/workers/contractors at the Project site. The Project will not limit the use of the area by existing outfitters.

There are no anticipated effects to the use of powerboats on Mesomikenda Lake. The 4M Canoe Route includes Three Duck Lakes, Weeduck Lake and Bagsverd Creek. IAMGOLD will establish a suitable portage/connection such that the 4M Canoe Route will still be usable. In addition, IAMGOLD will work with any potential canoe route users to identify suitable conditions for crossing the controlled-access lakes. With these measures in place, the 4M Canoe Route will remain usable during the construction phase. It is possible that some canoers will avoid this route, since the MRA and TMF will be visible from Three Duck Lakes, Weeduck Lake and Bagsverd Lake. In summary, although the Project overlaps a portion of the 4M Canoe Route, it is not expected to limit the use of these canoe routes/waterways once the construction activities are completed.

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. However, there is very limited use of the Project site area for these recreational uses. Therefore, the Project will not limit the use by outdoor recreation enthusiasts. Some snowmobilers may be affected during the short-term construction of the transmission line.

9.10.2.2 Operations Phase

To a large extent, effects predicted during the construction phase will continue during the operations phase. Due to regular operations of the ore processing plant, occasional exceedances of the ambient air quality criteria for NO_x and particulate matter can be expected along the 4M Canoe While the concentrations predicted by modelling do not pose an unacceptable risk to people who travel through these areas, those with pre-existing respiratory conditions may experience enhanced symptoms during periods of heavy industrial activity. Therefore, IAMGOLD will continue work with any potential canoe route users to identify suitable conditions for crossing the controlled-access lakes. Controlled access is likely to include restrictions on overnight camping in Three Duck Lakes and Weeduck Lake.

It is expected that there will no longer be effects for snowmobilers or other recreational users along the transmission line.

9.10.2.3 Closure Phase

At the commencement of the closure phase, effects will be similar to effects during the operations phase. These effects are expected to gradually decrease as reclamation of the Project occurs. At the end of the closure phase, there will be no residual effects on land use policies and plans, mineral exploration, recreational and commercial fishing, cottagers and outfitters, canoeing and navigable waters and other recreational uses.

9.10.2.4 Post-Closure Phase

During post-closure, affected areas will continue to re-naturalize and therefore habitat will be re-established. Access restrictions will be removed once the open pit is flooded and re-integrated into the watershed. As habitat is re-established, effects on forestry, hunting and trapping are expected to cease.

9.10.3 Government, Aboriginal and Public Comments and Concerns

Table 9-9 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to land and resources use throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-9: Comments and Concerns on Land and Resource Use

Consultation Comment	Response/How has the comment been addressed?
IAMGOLD held an open house on May 22, 2013 in Mattagami First Nation reserve to provide an overview of the Draft ToR. During this session, an individual from Mattagami First Nation commented that the Project would stop people from enjoying the land (such as fishing, camping, hunting, etc.). During this session, another individual from Mattagami First Nation inquired about the traplines and the effects the Project would have on harvesting quotas (specifically for GO035, which is not in the regional study area).	Note that effects on fishing, hunting, canoeing and trapping are addressed in Sections 9.10 and 9.11. In short, it is understood that the Project will have effects on fishing, hunting and canoeing, but, with mitigation in place, these effects are not expected to prevent people from enjoying these activities in the area.
IAMGOLD has engaged with many cottagers from Mesomikenda Lake. During a November 20, 2012 conference call with the Mesomikenda Cottagers Association, concerns raised include decreased future access to the Project site area due to Project site activities; and increased activity (boating) on Mesomikenda Lake due to increased Project site activities.	IAMGOLD has designed the Project as compact as possible to minimize changes in access to the area. The Project is not expected to affect access to cottages. It is not expected that boating activities will increase on Mesomikenda Lake due to Project activities (see Section 9.10.2).

Consultation Comment	Response/How has the comment been addressed?
IAMGOLD held an open house on May 21, 2013 in Sudbury to provide an overview of the Draft ToR. During this session, an individual commented that the 4M Canoe Route will be lost as a result of the Project.	IAMGOLD will establish a suitable portage/connection such that the 4M Canoe Route will still be usable. In addition, IAMGOLD will work with any potential canoe route users to identify suitable conditions for crossing the controlled-access lakes. With these measures in place, the 4M Canoe Route will remain usable during the all phases of the Project. It is possible that some canoers will avoid this route, since the MRA and TMF will be visible from Three Duck Lakes, Weeduck Lake and Bagsverd Lake. In summary, although the Project overlaps a portion of the 4M Canoe Route, it is not expected to limit the use of these canoe routes/waterways once the construction activities are completed.
During a November 8, 2012 meeting the Ministry of Natural Resources (now MNRF) identified that while no Ontario Federation Snowmobile Club trails exist at the Project site; snowmobilers are using portage trails and forestry roads throughout the site area including a line between Mesomikenda Lake and Chester Road.	IAMGOLD will work with local snowmobile associations and groups to mitigate interferences as much as possible.

9.11 Traditional Knowledge and Land Use

Details on the traditional land use prediction of effects are presented in Appendix P. A summary of the key results are presented in the following subsections.

9.11.1 Methodology

Information gathered from other environmental disciplines (such as wildlife, vegetation, fisheries, noise and air, and human health) informed the prediction of effects on traditional land and resource use. For example, if there was an effect on moose population, then there could be a resulting effect on traditional moose hunting in the area. Other effects were determined using GIS analysis of the interface of the Project footprint on a specific traditional land use. Best professional judgement was used in carrying out the prediction of effects, incorporating information from available sources, including opinions and perspectives expressed by Aboriginal communities throughout the EA process. Discussions with Aboriginal communities on managing effects will be ongoing and may be adjusted as better understanding of Aboriginal perspectives on effects develops.

9.11.2 Results

9.11.2.1 Construction Phase

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.

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.

The Project footprint does not overlap any Sensitive Area lakes identified in the Traditional Knowledge/Traditional Land Use (TK/TLU) study. However, the Cross-Country TLA will potentially cross Sensitive Area lakes. With the effects management strategies identified, it is not expected that the Project will impede the ability to carry out fishing activities in traditional areas.

The TK/TLU study has identified a portage route (assumed to be a canoe route) that follows the chain of lakes that surround the Project and includes Chester lake, Clam Lake, Bagsverd Lake, Weeduck Lake, Three Duck Lakes (Upper, Middle, and Lower). Project activities will result in controlled access (e.g., restrictions on overnight camping) to the traditional portage route; however, this is not expected to impede the use for canoeing or portaging.

The TK/TLU study 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 be 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. 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. 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 local or regional study area.

9.11.2.2 Operations Phase

To a large extent, effects predicted during the construction phase will continue during the operations phase with the following exceptions:

- blueberry harvesting along the transmission line corridors may be enhanced compared to existing conditions;
- the development of the transmission line corridor through a closed forest will open up the canopy, creating edges that encourage the growth of shrubs, preferred by moose, which may increase the potential to hunt moose in the area;

- human presence, which may perturb wildlife along the transmission line alignment, the fresh water line and associated access road, will be reduced compared to the construction phase; and
- the new transmission line alignment corridor may attract non-traditional hunters to hunt in the area that is currently used for hunting by the Mattagami First Nation. This could in turn negatively affect traditional hunting.

9.11.2.3 Closure Phase

During the closure phase, most of the Project infrastructure will be removed. The TMF and MRA 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.

9.11.2.4 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.

9.11.3 Government, Aboriginal and Public Comments and Concerns

Table 9-10 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to traditional knowledge and land use throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-10: Comments and Concerns on Traditional Knowledge and Land Use

Consultation Comment	Response/How has the comment been addressed?
The Executive Director of the Wabun Tribal Council has commented in an email on 16 September 2013 that: "The Chiefs and Councils, as well as the membership have maintained that the impacts from this Project will be felt well beyond the immediate Project area and will be cumulative."	IAMGOLD maintains an open dialogue with the Mattagami and Flying Post First Nations as well as the Wabun Tribal Council and has indicated to them that they are interested in hearing further information to better understand and address these concerns. Note that cumulative effects are addressed in Chapter 14.
During a meeting held with Mattagami First Nation on October 15, 2013, a concern was raised that if the Project goes ahead, the First Nation will lose some areas that will never be returned to pre-disturbance conditions.	IAMGOLD maintains an open dialogue with the Mattagami and Flying Post First Nations as well as the Wabun Tribal Council and has indicated to them that they are interested in hearing further information to better understand and address these concerns. IAMGOLD understands the concern and has established closure procedures, that, over time, will allow the majority of the Project footprint, to return to a condition similar to pre-disturbance conditions (see Section 5.16).

9.12 Built Heritage

Details on the built heritage prediction of effects are presented in Appendix Q. A summary of the key results are presented in the following subsections.

9.12.1 Methodology

For the purposes of the prediction of effects on built heritage and cultural heritage landscape, the following tasks were undertaken:

- identification of major historical themes and activities of the study area in the Townships of Chester and Neville through historical research and a review of topographic and historic mapping;
- review of the survey of lands within and adjacent to the proposed Project site;
- identification of cultural heritage landscapes and built heritage resources within the study area through the analysis of major historical themes and activities and historic mapping; and
- identification of proposed changes in the regional study area and the potential effects on built heritage and cultural heritage landscapes.

9.12.2 Results

Twelve cultural heritage landscapes and 19 built heritage resources were identified within the regional study area. Built heritage resources include structural remains related to early mining activities. Among the cultural heritage landscapes are: five remnants of Culturally Modified Trees that served as Aboriginal and early Euro-Canadian trail markers; and seven remains of early trail systems, reflected today in open corridors through wooded areas. With the exception of movable items, such as barrels and wagon hubs, etc., all of the heritage resources listed in Table 9-11 are considered to have cultural heritage value or interest.

The planned Project activities will not affect or threaten these features or resources. The identified features or resources are near proposed Project components, but outside of their immediate footprints and are considered to be at an acceptable distance from these to not be affected.

Table 9-11: Cultural Heritage Landscapes and Built Heritage Resources

Resource Category	Location	Brief Description
CHL	Trail Marker	The remnant of a square stump that served as a marker of what had been a portage route
CHL	Trail Marker	The remnant of a Culturally Modified Tree with a blaze marking at what had been a portage route
CHL	Portage Route along Three Duck Lakes	A landing location for what had been a portage route
CHL	Portage Route from the middle Three Duck Lakes to the pond to the east	A clearing in a wooded area of what had been a portage route
CHL	Portage Route	A clearing in a wooded area of what had been a portage route
CHL	Portage Route	A clearing in a wooded area of what had been a portage route
CHL	Portage Route	An approach to a clearing at the edge of a lake that marked what had been a portage route
CHL	Portage Route	The remnant of a Culturally Modified Tree with a blaze marking at what had been a portage route
CHL	Portage Route	An approach to a clearing at the edge of a lake that marked what had been a portage route
CHL	Portage Route from Bagsverd to Three Duck Lakes	The remnant of a Culturally Modified Tree with a blaze marking at what had been a portage route

Resource Category	Location	Brief Description
CHL	Portage Route from Bagsverd to Three Duck Lakes	The remnant of a Culturally Modified Tree with a blaze marking at what had been a portage route
CHL	Portage Route	A clearing in a wooded area of what had been a portage route
BH	Shannon Cabin Site	The remnants of a barrel stove
BH	Shannon Cabin Site	The remnants of a cross cut saw
BH	Clam Lake, Gold Mining Company Site	Cabin ruins
BH	Clam Lake, Gold Mining Company Site	Cabin ruins
BH	Headframe Point site	Ruins of the hoist room foundation
BH	Young-Shannon Mine, near Côté Lake	Ruins of the former mill site
BH	Young-Shannon Mine, near Côté Lake	Ruins of the corner of the mill
BH	Young-Shannon Mine, near Côté Lake	Remnants of part of a steam engine that once powered the mill
BH	Gosselin Mining Site	Ruins of a row boat
BH	Gosselin Mining Site	Remnants of a wagon hub
BH	Gosselin Mining Site	A large rusted barrel
BH	Gosselin Mining Site	The cookery ruins
BH	Gosselin Mining Site	The cookery ruins
BH	Gosselin Mining Site	The bunkhouse ruins
BH	Gosselin Mining Site	The wall ruins of the bunkhouse

Resource Category	Location	Brief Description
BH	Gosselin Mining Site	The remains of the bunkhouse door
BH	Gosselin Mining Site	The remains of a window
BH	Gosselin Mining Site	Ruins of the privy/ outhouse
BH	Cryderman Site	Ruins of a small building

*CHL: Cultural Heritage Landscape
**BH: Built Heritage

9.12.3 Government, Aboriginal and Public Comments and Concerns

Comments received on the EIS / Draft EA Report with respect to built heritage are addressed in detail in Appendix Z.

9.13 Archaeology

Details on the archaeology prediction of effects are presented in Appendix R. A summary of the key results are presented in the following subsections.

9.13.1 Methodology

Stage 1 and Stage 2 archaeological resource assessments were carried out to determine the effect of the Project on archaeological resources.

The Stage 1 Archaeological resource assessment was carried out as a two-fold process. The first part of the assessment involved background research and predictive modelling of the Project area. Sources used for the background research include Annual Report Volumes (from the then Ontario Department of Mines), historic and current air photography, a review of any related information available online or in online journal servers, and a review of related histories found in our office library and digital reference collection.

The predictive modelling of the Project study area was carried out using landscape variables to preferentially select those areas with low sloping, well-drained terrain located nearby to modern waters. These variables were applied across the referent landscape to find all of those areas that meet the weighted variables. The final map was used to guide fieldwork activities. The Ministry of Tourism Culture and Sports (MTCS) checklist for archaeological potential was consulted, and returned positive results for archaeological potential within the Project area.

The fieldwork component of the Stage 1 investigation was carried out to follow-up on the earlier background information research and the predictive modelling. This fieldwork served to locate several of the historic mining camps / prospects and to confirm areas of archaeological potential.

The Stage 2 archaeological resource assessment involved sub-surface testing using shovels, screens and trowels to expose and investigate the soils for artefacts in areas of archaeological potential. This work involved digging pits on a 5 metre grid, to a depth sufficient to expose and confirm sterile mineral soils, and then screening all soil through a 6 mm hardware mesh in an effort to find artefacts. Once artefacts were identified the grid interval of pits was intensified to determine the nature of the archaeological deposit.

If it is established that an archaeological site exists in a particular area, the location and information must be filed with the Archaeological Data Coordinator at MTCS so that the archaeological site can be registered with the Province. Stage 3 and 4 site specific assessments are carried out to establish the maximum areal limits of the site and to either excavate or protect the archaeological site.

9.13.2 Results

Construction of the Project may affect archaeological sites through the disturbance and/or removal of soils during construction and/or operation which potentially contain the remains of pre-contact archaeological sites. The Project may also affect early 20th century archaeological heritage features. The activities that could have the greatest effect on archaeological resources include: clearing, grubbing, stripping, excavation and blasting primarily during construction as well as the expansion of stockpiles and the TMF during operations which will permanently cover the ground surface. Depending on the final site design some of the proposed Project facilities are expected to overprint some of the archaeological sites described in this document.

The archaeological significance of the areas potentially affected by the proposed Project was determined through Stage 2 archaeological assessments undertaken by Woodland Heritage Services Limited (Woodland Heritage Services Limited, 2013). Stage 2 archaeological assessments within the Project and the local study area, located eighteen pre-contact archaeological sites, ten historic archaeological sites and nine ancient trails and portages were located and recorded for a total of 37 archaeological sites and heritage features located.

The Ontario *Heritage Act* and MCTS *Standards and Guidelines for Consultant Archaeologists* (2011) prohibit displaying specific locations of archaeological sites on maps that the public may access. This assists to deter the unauthorized collection of artefacts and damage to archaeological sites enhancing protection and preservation.

Pre-contact archaeological sites are an important cultural and community resource for Aboriginal people as they represent a connection to ancestors, provide evidence of prior land use and occupation, and can assist in the understanding of past land and resource use, and way of life. Aboriginal people have expressed interest in the archaeological work that has been undertaken in the Project area. These sites have been registered under the Ontario *Heritage Act* as significant due to their antiquity and rarity.

A number of historic mining exploration archaeological sites have been identified which provide evidence of early mineral exploration in northeastern Ontario, which began around 1900. The Project area mining sites are dated to the early 1930's, the earliest substantial prospecting period in this historic mining camp area. Sites that date to the first European settlement are considered to have cultural heritage value and interest according to the Ontario Standards and Guidelines.

Implementation of the mitigation measures in association with the ongoing investigations is expected to gather information and otherwise offset any potential adverse effects to heritage resources.

IAMGOLD acknowledges that the Côté Gold Project study area exhibits marine archaeological potential the same as all secondary inland water bodies in the province of Ontario. However, given that there are no documented marine archaeological sites within or near the Project area, and that there have been no marine archaeological concerns expressed by the public, marine archaeology will be addressed through monitoring during the construction phase. The monitoring will be undertaken as spot checks of newly exposed shorelines throughout the drawdown process and for the final exposed lake or river bottom. This will be completed only for Côté Lake and portions of the Mollie River and Three Duck Lakes. Other lakes will not be drained and therefore will not require monitoring. The monitoring commitment is detailed in Chapter 16.

9.13.3 Government, Aboriginal and Public Comments and Concerns

Comments received on the EIS / Draft EA Report with respect to archaeology are addressed in detail in Appendix Z.

9.14 Visual Aesthetics

Details on the visual aesthetics prediction of effects are presented in Appendix S. A summary of the key results are presented in the following subsections.

9.14.1 Methodology

Two fieldwork campaigns were carried out to capture the existing winter and summer visual landscapes. Twenty receptor locations were visited during the winter field campaign based on the initial selection of potential receptors. The number of receptors was reduced to nine during

the summer field campaign based on the results of the viewshed analysis, which indicated that the additional receptor locations had no potential to be visually affected by the Project.

The components that were initially identified to have the potential to be seen from receptor locations included: the low-grade ore stockpile, the TMF and the MRA. Details of these components are provided in Chapter 5. With further understanding of the existing topography and tree heights in the vicinity of the Project, only the MRA was identified as having a potential to be seen from receptor locations due to its height. All three Project components identified above have been considered when predicting the visual effects on other areas that could be used by other stakeholders.

In order to determine whether the proposed low-grade ore stockpile, TMF and/or MRA would be visible from specific receptor locations, a hypothetical 3D surface was generated with the current design specifications for the stockpiles and TMF dams, existing LiDAR data as well as information on the estimated canopy height in the vicinity of the Project.

Using the 3D model and the baseline photographs, altered photographs were generated to show an accurate representation of how the Project will affect the visual footprint from the nine receptor locations. The renderings were created using a photo editing/enhancement software to make the visible portion of the MRA look realistic. The result is a potential visual effect portrayal of what the MRA could look like at the end of the operations phase.

9.14.2 Results

9.14.2.1 Construction Phase

Activities performed at the Project site during the construction phase do not have the potential to affect the visual landscape of nearby receptors such as cottages. Activities that may have potential to affect landscape during the construction phase for land users include watercourse realignments and dam construction on Bagsverd Lake, Chester Lake, Clam Lake and Upper Three Duck Lake. This is expected to result in a perceptible change in landscape, but should not affect enjoyment of the viewscape.

The transmission line constructed during the construction phase 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.

9.14.2.2 Operations Phase

The MRA, TMF and low-grade ore stockpile will be constructed gradually during the operations phase of the Project. To simplify the visual aesthetics model, one scenario was modelled, which is when the Project components have reached maximum 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.

Generally, the visual landscapes will be more affected during the summer months as the MRA will often be somewhat camouflaged by the snow in the winter season (see Photographs 9-1 and 9-2).

Photograph 9-1: Example of Winter Photograph Rendering

Photograph 9-2: Example of Summer Photograph Rendering

Based on the mitigation and management measures, which includes the removal of receptor C16, the effect of the Project on the visual landscape during the operations phase will be perceptible to six receptor locations (see Figure 9-31), but will not affect enjoyment of the viewscape.

Modelling results also indicate that the Project components may be partially visible from one or more of the following lakes: Clam Lake, Chester Lake, Three Duck Lakes, Bagsverd Lake, Delaney Lake, Unnamed Lake #1 and portions of Unnamed Lake #2, Schist Lake, Dividing Lake and Mesomikenda Lake (see Figure 9-32). This visual effect is likely to be perceptible but will not affect enjoyment of the viewscape.

The transmission line constructed during the construction phase will be visible within the ROW 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.

9.14.2.3 Closure Phase

During the closure phase, mitigation inherent in the Project design includes partial vegetation of the MRA, especially on the faces of the MRA that will be seen by receptors. The revegetation will improve the look of the MRA and in turn will become part of the natural landscape. It is anticipated that the effect of the Project on the visual landscape during closure will be perceptible but will not affect enjoyment of the viewscape.

The transmission line constructed during the construction phase will be visible within the ROW 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.

9.14.2.4 Post-Closure Phase

During the post-closure phase, the vegetation on the MRA planted during the closure phase, will continue to grow and the MRA will increasingly become part of the natural landscape. Further details on the closure plan for the MRA are included in Chapter 5. The effects of the Project on the visual landscape during post-closure will be perceptible but will not affect enjoyment of the viewscape.

9.14.3 Government, Aboriginal and Public Comments and Concerns

Table 9-12 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to visual aesthetics throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-12: Comments and Concerns on Visual Aesthetics

Consultation Comment	Response/How has the comment been addressed?
Visual aesthetics is of particular interest for the cottagers near the Project, as the Project has the potential to alter the visual landscapes. During conversations with cottagers near the Project, visual aesthetics was identified as an important part of the enjoyment of the natural environment. Additionally, during an inter-ministerial meeting, government agencies specifically asked whether IAMGOLD was modelling the visual effects of the Project, which indicates interest in the subject.	In response to these comments and concerns, a detailed assessment of effects on visual aesthetics has been carried out. The detailed results, including photo renderings, are provided in Appendix S. In summary, as per Section 9.14.2 above, based on the mitigation and management measures, the effect of the Project on the visual landscape during the operations phase will be perceptible to six receptor locations (see Figure 9-31), but will not affect enjoyment of the viewscape.

Consultation Comment	Response/How has the comment been addressed?
Agencies also requested that future tree cutting plans be taken into consideration in the modelling.	EACOM is in charge of the forest management area where the Project is located. EACOM put together a 5-year Forest Management Plan, which is accessible on their website (EACOM, 2013). None of the forestry activities planned for the next 5 years will have any effect on the visual modelling, given the location of the forest harvest as well as the location of receptors.
During consultation activities, Aboriginal communities showed interest in the results of the visual aesthetics prediction of effects. Specifically, Aboriginal communities want to understand where Project components will be visible from, and how this may affect them. Aboriginal communities are not only interested in visual effects on receptors but also from other land near the Project.	Figure 9-32 shows what Project features are visible from areas in the local study area. More details on visual aesthetics are presented in Appendix S.
An individual identified that one of the immediate environmental effects to them would be the night sky being ruined by site lighting.	A light assessment has not been completed for this EA. The design details required to complete a light assessment will be available once the feasibility study is completed. As per above, the most visible feature of the Project will be the MRA, which will not be illuminated. Consideration will be given in the design of the Project to minimize the effect of Project lights on the night sky.

9.15 Socio-Economics

Details on the socio-economics prediction of effects are presented in Appendix T. A summary of the key results are presented in the following subsections.

9.15.1 Methodology

The Project's economic effects have been estimated using the provincial input/output economic multipliers for Ontario as provided by the Industry Accounts Division of Statistics Canada. These multipliers describe how a change in final demand for the output of one particular industry would affect economic activity in the entire province. The multipliers show the direct, indirect, and induced effects on Gross Domestic Product, labour income and jobs that would be associated with a $1 change in economic output.

Change in final demand was estimated based on a multiple of the projected workforce compared to similar (open-pit gold) mining operations in Ontario. Economic effects were then calculated using the multipliers for the "gold and silver ore mining" industry (Code BS212220).

Annual effects were calculated from the residual of construction and closure effects. For construction and closure, the change in final demand is modelled in terms of total value of spending on construction in Ontario using multipliers drawn from similar projects for direct effects and from the “other engineering construction” industry (Code BS23C500) for indirect and induced effects. No estimate currently exists for closure costs; these costs were assumed to be proportional to capital costs in a ratio drawn from comparable (open-pit gold) mining operations in Ontario.

The input/output economic multipliers were used to estimate direct, indirect and induced impacts. Direct impacts include the labour, goods and services that are needed to construct and operate the Project and include workers at the Project site as well as people working offsite to produce goods and services. Indirect impacts occur when other industries increase their output in response to the demands of the directly affected industries. For example, companies that directly provide the steel needed for construction will, in turn, have increased demands for raw materials (e.g., coal and iron ore) that will indirectly affect these industries. Induced impacts measure the extent to which spending by workers, whose wages are directly or indirectly affected by the Project, will result in increased production of consumer goods and services.

Effects on social effects assessment indicators were defined 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.

9.15.2 Results

9.15.2.1 Construction Phase

Over the construction phase, residual effects on labour markets are positive and highly distinguishable in the regional study area. 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 within Year -1[1]. 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 regional study area and 40% from elsewhere in the province of Ontario. Jobs created by the Project will be relatively lucrative; people from the regional study area directly employed in the construction of the Project are expected to earn an average of $148,645 annually in labour compensation, 3.0 times the urban regional study area average median earnings of those working full-time and 5.0 times the average median earnings for all those persons aged 15 and over.

[1] For the purpose of the socio-economic prediction of effects, Year -2 is the first year of construction and Year-1 is the second year of construction.

The Project is expected to have a positive, highly distinguishable effect on business opportunities in the local and regional study areas, spending approximately $648 million on goods and services in the construction phase. This is an estimate of spending in the region over the construction phase based on benchmarks. Businesses in the regional study area can supply every major input demanded by the Project. For government revenues the effect is also expected to be positive and outside normal variation, some $160 million in provincial and federal government revenues through direct economic activity and $240 million through direct, indirect and induced economic activity.

Based on forecasts of population change and a model of demographic impacts from the Project, populations in the local and regional study areas are estimated to grow as a result of the Project, although for the urban centres of Timmins and Sudbury (expected to receive 208 migrants each when construction begins in Year -2) the effects make up less than 0.01% of the total population and are not expected to be noticeable. For Gogama, the Project is expected to reverse the trend of population decline, increasing the population by an estimated 27 to 37 people over the construction phase. For Mattagami First Nation the effect on population over the construction phase is expected to be between 35 and 52 people, if there is the infrastructure to accommodate them. This is considered a positive, highly distinguishable effect and may result in the need for investment by the community or government that lasts for the construction phase.

Existing housing stocks in urban areas are sufficient to meet the demand from newcomers, amounting to less than 0.5% of existing housing stock for any given year. The residual effect is therefore within the normal range of variability for housing. In contrast, the demand for housing in the local study area communities is distinguishable: demand for housing in Gogama is expected to increase by approximately 7 to 11 homes in Year -2 and by two to three homes the following year, based on the 2011 housing stock of 131 homes. The supply of surplus housing in the area is anticipated to be adequate to meet demand; 39% of the total housing stock in the Unorganized North Sudbury Subdivision (which contains Gogama) was not occupied by usual residents in 2011 (about 669 units), although many of these are cottage units which may not be inhabitable year-round. Gogama currently faces infrastructure issues that could limit the construction of new housing in the community in this phase. Demand for new housing in the first year of the construction phase on the Mattagami First Nation reserve is expected to rise by between 7 to 11 homes due to the Project. Currently a waiting list exists for band-owned housing. Off-reserve workers wishing to live in the community would be expected to finance construction through a band-guaranteed mortgage or to purchase housing from another member. This bottleneck may result in a change in the distribution of population effects away from the First Nation. Residual housing effects in the local study area, while considered positive, are distinguishable and will require investment by the community or government to address these during the construction phase (Years -2 to -1).

The Project is not expected to have measurable effects on the health of regional and local populations. Efforts to avoid and mitigate the potential negative effects of increased population

on emergency services, particularly in local study area communities, are expected to reduce effects to a level where they would not require additional community or government response or investment. Residual 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. While increased demands for community services are likely to occur and be distinguishable in Gogama and Mattagami First Nation reserve, these would be considered positive for recreation services and negative for social services in local study area communities (for shelters, victims' services, child care and health care). This effect is expected to last during construction and first years of the operations phases until community service providers adjust service levels to meet the needs of the population.

Population changes in Timmins and Sudbury are not expected to have a noticeable effect on demand for public utilities. In Gogama and the Mattagami First Nation reserve, where populations are expected to increase in the construction phase, there will be additional demands on public utility infrastructure. There are no concerns or capacity issues with provision of public utilities on the Mattagami First Nation reserve and therefore the residual effect is expected to be measurable but not distinguishable from normal variation and is expected to last for the life of the Project.

The residual effect on primary and secondary education is considered positive since it results in a slight increase in enrolment in elementary schools in the local study area and in enrolment in high schools in the regional study area (Timmins and Sudbury). The residual effect on post-secondary education is also positive and could result in increased capacity of the local and regional workforce to access Project employment. These effects are considered positive, manageable within current system capacities and are within the normal range of variability.

Project-related traffic volumes are forecasted to increase on Highway 144, by 16 additional vehicle trips per day on average. According to these estimates, at most an increase of just under 3% could occur on Highway 144 in the section between Highway 560 and 661 where vehicles would be turning off Highway 144 at Sultan Industrial Road to access the Project site. These turning movements are occurring on a portion of Highway 144 where service levels are considered most favourable. An increase in traffic will also marginally increase the potential for vehicle collisions (less than 1 per year on average) for the duration of the construction phase. These volumes will be higher during peak construction months, but are on average, manageable and within the service capacities of the Highway in all sections evaluated. The effects on traffic are considered distinguishable but within the normal range of variability and are expected to last throughout the Project although at lower levels in the operations, closure and post-closure phases than in the construction phase.

9.15.2.2 Operations Phase

Residual effects are such that the Project's operations phase is expected to make a strong and positive contribution to direct, indirect and induced employment; incomes and the development

of human capital. On average annually, the Project will 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 regional study area median earnings: average projected earnings (including only wages and benefits) per direct employee from the regional study area of $153,800 are 3.0 times the current regional study area average median earnings for full time workers. 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 13, although the magnitude is expected to lessen thereafter.

The Project is forecasted 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 regional study area 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.

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 regional study area is therefore considered highly distinguishable.

The total effects on migration relative to baseline population projections from Years 1 to 15 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. These effects, however, make up less than 0.01% of the total population in both cities and are not likely to be noticeable. For Gogama and the Mattagami First Nation the effect on population is that it will stabilize after Years 5 and 6. This is considered a positive, but not distinguishable over the operations phase.

Existing housing stocks in Timmins and Sudbury are sufficient so that the number of homes taken by newcomers during the operations phase is expected to be less than 0.1% of existing housing stock for any given year. In Timmins, the effect is not sufficient to reverse falling demand due to a projected ongoing decline in population. Within the local study area effects peak at less than 1.0% of the existing housing stock in Years 2 and 3. In Gogama, the Project helps increase housing demand on a community that would otherwise have a projected decline

in population. In the Mattagami First Nation reserve, the Project modestly expands demand for housing until Years 5 and 6, supporting a projected increase for a rising population. After Years 5 and 6 the on-site workforce is expected to decline and with it a projected decline in housing demand to baseline levels. In Gogama, these declines peak at between two and four houses annually in Years 14 and 15. In the Mattagami First Nation reserve the declines in housing demand amounts to between two and four homes annually in Years 14 and 15, an effect partially minimized by the continued natural growth of population in the community. If a local shortage of housing occurs then, the effect may be to reduce the housing waiting list. The effect on local study area communities would be considered negative and noticeable, but do not require a community response or investment into the last few years of operations.

Effects on community health are expected to be within the normal range of variability. No residual public utilities effects in either the local or regional study area communities are anticipated. The Project site will have its own supply of power and potable water, sewage treatment systems, and solid waste disposal system, and therefore additional demands from on-site activities are not anticipated. No residual effects on the highway transportation system are anticipated.

Even though there will be an accommodations complex at the Project site, an increase in the number of families within the local study area communities is foreseen. This growth may have a distinguishable positive effect that is within the normal range of variability on sustaining or growing primary school enrolments in Timmins, Gogama and on the Mattagami First Nation reserve, while enrolment in schools in Sudbury are estimated to be virtually unnoticed. Similarly, even with effects management strategies applied, and new training needs for IAMGOLD workers hired throughout the operations phase to replace leaving or retiring workers, some sustained demands for post-secondary education could occur. This would be a positive effect that is within the normal range of variability that lasts until the end of the operations phase.

Efforts to avoid and mitigate the potential negative effects on emergency services of increased population and income, particularly in local study area communities, are expected to reduce effects to noticeable but manageable levels. The effect is expected to last for the life of the Project and possibly into the first few years of the post-closure phase. Demands in these communities for child care services will be addressed by discussing potential Project related effects on child care needs in the local study area communities and implementing appropriate management measures (which may include on-site child care, and shorter work shifts for women or single-parent families). Effects within the local study area are expected to be distinguishable but within the normal range of variability and last throughout the life of the Project.

9.15.2.3 Closure and Post-Closure Phases

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. Following closure there is expected to be much fewer (related to ongoing monitoring or site maintenance) jobs associated with the Project. Effects management strategies can minimize stresses from job losses associated with Project closure, but it cannot reverse the end of most employment effects from the Project. Workers who held jobs during the Project will retain human capital, in the form of experience and training which can then be utilized in seeking employment on other mining projects. Despite these positive effects, reductions in expenditures and employment relative to the operations phase are expected to have an overall negative effect on labour markets until they adjust and return to baseline conditions. The effect is distinguishable and outside the normal range of variability.

Effects management strategies can help businesses develop the capacity to serve new clients after 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 be retained by these companies and 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 adjust to return to baseline conditions. Overall the residual effect is considered negative, distinguishable and outside the normal range of variability but is not expected to require a government response or investment in businesses.

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 there is some tax revenues 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 seen as a temporary negative effect as government revenues return to baseline conditions. These effects are within the normal range of variability.

With Project closure community populations are expected to return to baseline conditions although populations may be higher if workers choose to remain in the community either to commute to a different mine, to follow a different career or to retire. The residual effect is considered indistinguishable in Timmins and Sudbury but clearly distinguishable in Gogama and the Mattagami First Nation, although not substantive enough to require an additional community response.

Community health service provision available during the operations phase is expected to be adequate to address demands in closure and post-closure phases. Over time, these potential

effects are considered negative and measureable but do not require additional community or government response. They will diminish and become indistinguishable in the post-closure phase as populations return to baseline conditions.

Housing prices would decline with closure and remain low through the post-closure phase, although effects would differ between communities. In the cities of Sudbury and Timmins, with large and liquid housing markets, the effect is expected to be measurable but within the normal range of variability, particularly since workforce reductions are spread over many years. On the Mattagami First Nation reserve, the effect is reduced by the projected growth in the population, and housing sales between members may alleviate long-standing housing shortages. In Gogama there is a risk that additional supplies of residential housing could be developed over the operational life that in this phase would create a challenge of local oversupply. These effects are expected to last throughout the closure and post-closure phases.

No residual public utilities effects are anticipated. There will be a decline in primary school enrolment and an increase in demands for post-secondary training to transition workers to other employment. The effects on the education systems in regional study area communities are likely to be clearly noticeable, but not to require a community or government response. No residual effects on transportation are anticipated in the closure and post-closure phases.

Efforts to avoid and mitigate the potential negative effects on emergency services of declining employment and population, particularly in local study area communities are expected to reduce effects to within the normal range of variability of established service levels. The effect is expected to last until the end of the closure phase and possibly into the first few years of the post-closure phase.

Decreased employment may lead to personal and family stresses during the transition to new jobs, and through loss of income which may result in an increase in demand for some community services. Community service provision available during the operations phase is expected to be adequate to address demands in closure and post-closure phases. Over time, these potential effects are expected to lessen as the population adjusts and are considered negative, and measureable, but do not require additional community or government response. These effects are expected to diminish and become indistinguishable in the post-closure phase.

9.15.3 Government, Aboriginal and Public Comments and Concerns

Table 9-13 lists a summary of government, Aboriginal and public comments and concerns that have been received with regards to socio-economics throughout the consultation process for this EA. Note that all comments received during the preparation of the EIS / Draft EA are located in Appendix D and comments received on the EIS / Draft EA Report are addressed in detail in Appendix Z.

Table 9-13: Comments and Concerns on Socio-Economics

Consultation Comment	Response/How has the comment been addressed?
Job and business opportunities were discussed in meetings and open houses and were noted as important to local citizens, stakeholders, First Nations and Métis groups. Comments shared included the importance of informing stakeholders and Aboriginal communities of contracting opportunities and training programs. Related to employment, access to and from the Project site was important for Mattagami First Nation members who live on the reserve but don't drive.	IAMGOLD maintains an open dialogue with the local and Aboriginal communities and has indicated to them that they are interested in hearing further information to better understand and address these concerns. As part of the mitigation strategies IAMGOLD is committing to providing contracting, employment and training opportunities. In addition, IAMGOLD will consider providing bus transportation for employees.
A housing shortage in Timmins is of concern for the Cochrane District Social Services Administration Board, specifically related to affordable housing and homelessness. The Cochrane District Social Services Administration Board stated in an interview that homelessness in Timmins is a downside of prosperity.	To minimize effects on housing, an on-site camp will be provided by IAMGOLD. Other mitigation measures with regards to housing are provided in Table 10-3.
On February 2, 2013, IAMGOLD met with various Gogama committees and discussed Project details. A Gogama Local Service Board representative inquired if the proposed transmission line was to be dedicated and maintained by the mine.	IAMGOLD identified that the transmission line would be owned and maintained by IAMGOLD, and that maintenance would most likely be contracted out.
IAMGOLD held an open house in February 2013 in Sudbury, Ontario to present an overview of the IAMGOLD draft Project Description. At the open house, a local cottager identified several concerns including the potential for an increase in traffic both on the road and in water. In February 2013, IAMGOLD met with the Federal Economic Development Initiative for Northern Ontario (FedNor) to introduce the Project and solicit input on the development of their education, training, and skills development strategy. At the meeting, FedNor suggested that IAMGOLD be mindful of safety issues on the highway to and from Sudbury and Timmins.	Note that effects on traffic are addressed in detail in Appendix T. Effects on traffic are also addressed in Section 9.15.2 above. Project-related traffic volumes are forecasted to increase on Highway 144, by 16 additional vehicle trips per day on average. According to these estimates, at most an increase of just under 3% could occur on Highway 144 in the section between Highway 560 and 661 where vehicles would be turning off Highway 144 at Sultan Industrial Road to access the Project site. The effects on traffic are considered distinguishable but within the normal range of variability and are expected to last throughout the Project although at lower levels in the operations, closure and post-closure phases than in the construction phase. IAMGOLD is mindful of safety issues on Highway 144 and will implement appropriate mitigation measures (see Table 10-3).

9.16 Changes to the Environment

Sections 9.2 to 9.15 describe the changes that may be caused by the Project on the physical, biological and human environments, which take into consideration mitigation measures, presented in Chapter 10. This section identifies changes that are directly linked or necessarily incidental to any federal decisions that would permit the Project to be carried out.

9.16.1 Changes to Components of the Environment within Federal Jurisdiction

As described in Sections 9.7 and 9.8, the Project has the potential to affect migratory birds. More specifically, the following Project activities may potentially affect species that are covered by the *Migratory Birds Convention Act*:

- clearing of the TLA and the Project site will displace potential habitat areas;
- general site activities during all Project phases may deter bird species from using the area; and
- vehicle collisions may result in accidental bird fatalities.

As described in Section 9.9, the Project has the potential to affect fish, fish habitat and aquatic species. More specifically, the following Project activities may potentially affect species that are covered by the *Fisheries Act*:

- draining of Côté Lake will require species relocation to surrounding habitat;
- construction of watercourse realignments and retention dams will alter the surface areas and conditions of existing aquatic habitat;
- blasting may cause water overpressure which may affect fish spawning;
- construction of the TMF, MRA, access road creek crossings and water works for water intake structures have the potential to cause disruption to creeks and/or ponds supporting fish that are part of, or support a fishery;
- the intake of water can potentially affect flow conditions;
- the discharge of water can potentially affect flow conditions and water quality; and
- interception of site runoff can affect flow conditions.

9.16.2 Changes to the Environment that would Occur on Federal or Transboundary Lands

The Project is not anticipated to cause changes to the environment on federal or transboundary lands.

9.16.3 Changes to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions

The activities described in Section 9.16.1 that could potentially affect fish, fish habitat and/or aquatic species may require authorizations under the *Fisheries Act*. Additionally, Project activities which interfere with navigation in non-scheduled waters in the *Navigation Protection Act* may be subject to the common law right of navigation. IAMGOLD intends to use the 'opt-in' process to have any potential interference with navigation reviewed and sanctioned under the Navigation Protection Act.

9.17 Effects of Changes to the Environment

9.17.1 Effects of Changes to the Environment on Aboriginal Peoples

Effects on traditional land use are described in Section 9.11. Additionally, effects on socio-economics described in Section 9.15 may apply to Aboriginal peoples. It is predicted that the Project will benefit certain Aboriginal peoples but also has the potential to negatively affect certain Aboriginal groups.

Potential benefits include employment and procurement opportunities for local Aboriginal groups and businesses. These opportunities will likely result in capacity building and on-the-job training. Additionally, the population living in Mattagami First Nation reserve is expected to increase as a result of the Project. As a result, it is expected that there will be a higher demand in new housing on the Mattagami First Nation reserve.

Based on the knowledge acquired to date through a TK/TLU study, it is expected that the Project may, to a certain extent, affect traditional activities including canoeing, hunting, harvesting and fishing. In consultation meetings, Aboriginal groups have voiced concerns that construction of the Project will irrevocably change the natural balance of the Project area. It is not expected that the Project will affect human health conditions of Aboriginal peoples.

9.17.2 Effects of Changes to the Environment that are Directly Linked or Necessarily Incidental to Federal Decisions

The changes described in Section 9.16.3 are not expected to have effects on health and socio-economic conditions, physical and cultural heritage, or structures, sites or things that are of historical, archaeological, paleontological or architectural significance.