



7.0 CUMULATIVE EFFECTS ASSESSMENT

7.1 DEFINITION OF CUMULATIVE EFFECTS

The CEAA 2012 states that:

19.(1) The environmental assessment of a designated project must take into account the following factors: (a) the environmental effects of the designated project, including the environmental effects of malfunctions or accidents that may occur in connection with the designated project and any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out.

The *Canadian Environmental Assessment Agency Guide for Addressing Cumulative Effects* (CEA Agency, 1999) defines cumulative effects as:

The effect on the environment which results from effects of a project when combined with those of other past, existing and imminent projects and activities.

It further states that:

To a limited extent, federal and other environmental assessments already address cumulative environmental effects. For example, most examine the baseline environmental conditions, which include the cumulative environmental effects of past and existing projects and activities. However, consideration should also be given to the cumulative environmental effects resulting from the interactions among the environmental effects of the proposed project with those of future projects and activities.

The Operational Policy Statement Assessment Cumulative Environmental Effects under the CEAA 2012 (CEA Agency, 2013) states:

CEAA 2012 requires that each EA of a designated project take into account any cumulative environmental effects that are likely to result from the designated project in combination with the environmental effects of other physical activities that have been or will be carried out.

It further states that:

A cumulative environmental effects assessment of a designated project must include future physical activities that are certain and should generally include physical activities that are reasonably foreseeable.

7.2 SCOPE OF CUMULATIVE EFFECTS ASSESSMENT

7.2.1 Spatial and Temporal Scale

For the purposes of the Project's cumulative effects assessment, Treasury has focused on potential cumulative effects on the existing environmental and socioeconomic baseline relative to identified projects and activities that are predicted to occur (or are reasonably foreseeable) in the next 10 years. Three spatial scales will be evaluated: LSA and RSA (primarily biophysical); 40-km radius centred on Project pit (primarily socioeconomic).



7.2.2 Identification of Cumulative Effects Valued Components

In selecting cumulative effects VCs, Treasury started with all previously evaluated VCs (independent of their significance). To provide a more focused cumulative effects assessment, Treasury focused on those residual effects on VCs that were rated as either Level II (could be reasonably expected to occur) or Level III (will occur) for likelihood. In some instances (e.g., habitat loss), Treasury opted to combine VCs and effects for the cumulative effects assessment that were analyzed as independent VC/effects in Section 6.0.

The following VCs and potential effects were assessed for the cumulative effects assessment:

- Terrain and Soils
 - Alteration of visual aspects of landscape
 - Overburden/topsoil disturbance
 - Alteration of soil chemistry
- Noise
 - Increased ambient noise levels from traffic and operations
 - Disturbance effects on wildlife
- Light
 - Light trespass to nearby occupied properties
 - Wildlife attraction to novel light sources
- Air Quality
 - Alterations of air quality parameters
- Climate
 - GHG emissions during construction and operations
- Surface Water Quality and Quantity
 - Alteration of water chemistry
 - Flow rate fluctuations in downstream watercourses and waterbodies
- Groundwater Quality and Quantity
 - Reduction in production in private wells as a result of dewatering cone
 - Alterations in water quality resulting from seepage from TSF, stockpiles and WRSA
 - Groundwater contributions to surface flow patterns.
- Wildlife and Wildlife Habitat
 - Habitat loss for terrestrial wildlife (including Species at Risk);
 - Direct mortality of wildlife as a result of Project interactions
- Fish and Fish Habitat
 - Direct and indirect effects resulting from changes in water quality
 - Direct and indirect effects resulting from changes in water quantity
- Wetlands and vegetation
 - Loss of wetland area
 - Alteration of flow affecting wetland function
 - Presence of rare species
- Land Use
 - Limitations on land and resource use



- Alteration of traffic patterns
- Economic Considerations
 - Effects on housing market
 - Effects on employment and income
- Aboriginal and Treaty Rights
 - Changes in water quality and potential health effects
 - Limitations on the gathering of country foods
 - Limitations on hunting and trapping
 - Limitations on fishing

7.2.3 Identified Planned Projects

7.2.3.1 Mining and Exploration

Most of the crown land within the cumulative effects study areas is under active claims of Treasury. Other dispositions are surrounding the Project footprint, but additional information was not available (MNDFM 2014). There are no active mines within the LSA, RSA, or 40-km radius (OMA 2014a). In addition, there are no identified advanced mineral exploration-stage Projects located with the cumulative effects study areas (OMA 2014b) nor any recently released public notices regarding development beyond exploration (CEA 2014).

Due to the lack of existing or planned mining projects within the cumulative effects study areas, mining and exploration projects are not expected to contribute to cumulative effects in the foreseeable future. Therefore, a cumulative effects assessment in this context would not be of significant value at this time. Should additional mines be proposed or planned in the Project vicinity, their proponents will need to undergo their own EA process, including the assessment of cumulative effects. Currently, these potential projects cannot be regarded as certain or reasonably foreseeable projects.

7.2.3.2 Forestry

The economy of communities within the cumulative effects study areas have been tied to forestry and pulp and paper for generations. The RSA falls within the Dryden Forest Management Unit. The current 10-year Forest Management Plans 2011- 2021 (FMP) show a planned harvest of approximately 11,952 ha.

7.2.3.3 Transportation

The Ministry of Northern Development and Mines (MNDM) has published the Northern Highways Program for projects to be constructed from 2013-2017 (MNDM, 2013). None of the major projects slated for 2015-2017 construction and completion fall within the cumulative effects study areas.

7.2.3.4 Electricity

Hydro One maintains a list of transmission system projects in northwestern Ontario (Hydro One 2014); however, none of these projects are located within the cumulative effects study areas. As such, Hydro One projects are not expected to contribute to cumulative effects.

Wataynikaneyap Power has proposed a 300-km 230-kV transmission line from south of Dincorwic to Pickle Lake, Ontario that falls within the defined spatial boundaries of the cumulative effects study area. As the route for this project has not been finalized, it is difficult to quantify the scale of any potential impact to biophysical resources.



The potential contribution of the Pickle Lake transmission corridor to cumulative effects is currently unquantifiable. If this project is executed in accordance with current regulatory frameworks it is not expected to contribute to a cumulative negative effect on the VCs defined for the Project.

7.2.3.5 Municipalities

The development of local infrastructure and minor road upgrades are expected in communities within the cumulative effects study area (i.e., Dryden and Wabigoon). No large scale projects (>\$ 500,000) are anticipated (Meridian Planning Consultants 2007).

7.3 CUMULATIVE EFFECTS ASSESSMENT

7.3.1 Terrain and Soils

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on terrain and soils. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Table 7.3.1).

7.3.2 Noise

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on the noise environment. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Table 7.3.1).

7.3.3 Light

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on the light environment. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Table 7.3.1).

7.3.4 Air Quality

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on air quality. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Table 7.3.1).

7.3.5 Climate

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on the climate. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Table 7.3.1).

7.3.6 Surface Water Quality and Quantity

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on surface water quality and quantity. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Sections 6.4.1.6 and 6.4.1.7; Table 7.3.1).

7.3.7 Groundwater Quality and Quantity

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on groundwater quality and quantity. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Sections 6.4.1.8 and 6.4.1.9; Table 7.3.1).



7.3.8 Wildlife and Wildlife Habitat

In the context of the existing management plan for the Dryden Forest Management Unit, the amount of forest cover to be removed during the Project amounts to 1.7% of the total slated for harvest. Given that reforestation will follow Project closure (in a forested landscape characterized by disturbance), the Project contribution to cumulative effects on forest communities and, by extension, wildlife and wildlife habitat is equivalent to the Project-focused assessment (Section 6.4.1.10; Table 7.3.1).

No additional industrial activities are planned for the cumulative effects study area that would have similar potential direct effects (e.g., mortality) on wildlife and wildlife habitat. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Section 6.4.1.10; Table 7.3.1).

7.3.9 Fish and Fish Habitat

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on fish and fish habitat. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Section 6.4.1.11; Table 7.3.1).

7.3.10 Wetlands and Vegetation

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on wetlands and vegetation. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Section 6.4.1.12; Table 7.3.1).

7.3.11 Land and Resource Use

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on land and resource use. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Section 6.4.2.1; Table 7.3.1).

7.3.12 Economic Considerations

Community populations within the cumulative effects study areas are expected to grow as a result of the Project. This is considered a positive effect that may result in the need for investment by communities or government. The scale of potential population changes is not expected to have a noticeable effect on demand for public services.

During the first two phases of the Project there will be an increase in employment and income (e.g., hiring of local and regional labour) and increased revenues resulting from Project purchases from local and regional contractors and businesses. These same factors will decrease in the closure phase of the Project, but will remain higher than they were prior to Project initiation (i.e., a net positive residual effect). It is possible that the labour needs of the Project will exceed local skilled labour availability and, as a result, the Project may attract workers to the region, with attendant effects on the housing market and other economic markers. Although a housing pinch may be felt in the early stages of Project development, the economic contribution of the Project to the regional area should stimulate the housing market in the long term, as well as other regional economic metrics. The application of appropriate mitigation and monitoring strategies (e.g., skills transfer training) will maximize the positive cumulative economic effects of the Project (Sections 6.4.2.2 and 6.4.2.3; Table 7.3.2).

7.3.13 Aboriginal and Treaty Rights

No additional industrial activities are planned for the cumulative effects study area that would have similar potential effects on Aboriginal and Treaty Rights. Therefore, the cumulative effects assessment is the same as the Project effects assessment (Section 6.4.2.5; Table 7.3.2).



Table 7.3.1 Environmental Cumulative Effects Matrix for the Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Terrain and Soils	Natural viewscales from nearby residences and lakes interrupted by WRSA, TSF, overburden storage area and low-grade stockpile.	Construction and Operations	Contouring of WRSA and TSF during construction and closure to blend with surrounding terrain; progressive reclamation to cap and vegetate WRSA during operations. Overburden storage area to be used as cover material during reclamation.	Level I - There is no measurable residual effect.	Level III - Residual effect extends into the RSA	Level II - Residual effect will extend beyond construction period.	Level III - Residual effect occurs frequently or continuously	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur
		Closure		Level I - There is no measurable residual effect.	Level I - No anticipated adverse environment effects beyond TSF	Level I - Residual effect is not measurable beyond closure period (3 years).	Level II - Residual effect expected to occur intermittently and decline as vegetation cover is established.	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
Noise	Increase in traffic noise due to movements of construction vehicles.	All	Use new, low-noise mobile equipment; time construction activities to minimize effects.	Level I - Noise levels anticipated within applicable federal and provincial regulations and guidelines	Level II - Residual effect extends into LSA	Level I - Residual effect is not expected to be measurable beyond the construction period.	Level II - Residual effect expected to occur intermittently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
	Disturbance effects on local wildlife.	All	Minimize project footprint; Minimize activity of project personnel outside of Project areas and infrastructure. Utilize proper waste management strategies to minimize wildlife attraction	Level 1 - There is no measurable residual effect to population abundance and distribution.	Level II - Residual effect extends into LSA	Level II - Residual effect will extend beyond construction period.	Level II - Residual effect expected to occur intermittently	Level I - Effect is readily reversible following closure.	Not significant	Level II - Could reasonably be expected to occur



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VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Light	Light trespass to nearby occupied properties.	All	Limit Project lighting to areas required for safe operations; orient Project lighting towards the interior of the Project area; where possible, use down-shaded lighting on Project buildings and infrastructure.	Level I - Light levels anticipated within applicable federal and provincial regulations and guidelines	Level II - Residual effect extends into LSA	Level II - Residual effect will extend beyond construction period.	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible following closure.	Not significant	Level III - Will occur.
	Wildlife attraction to novel light sources.	All	Limit Project lighting to areas required for safe operations; orient Project lighting towards the interior of the Project area; where possible, use down-shaded lighting on Project buildings and infrastructure.	Level 1 - There is no measurable residual effect to population abundance and distribution.	Level II - Residual effect extends into LSA	Level II - Residual effect will extend beyond construction period.	Level II - Residual effect expected to occur intermittently	Level I - Effect is readily reversible following closure.	Not significant	Level II - Could reasonably be expected to occur
Air Quality	Potential increase in the ambient concentrations of airborne contaminants (e.g., TSP, PM10, PM2.5, NOx, SOx, CO)	Construction	Implement industry best practices to minimize emissions (e.g. Blasting to be conducted in a phased manner that optimizes the amount of explosives, and that minimizes the area being blasted; Material will be loaded into haul trucks in a manner that minimizes the drop height; Ensure that all engines are properly maintained and all emission control systems are in good working order; Water and chemical suppressants will be used for dust control).	Level I - Emissions above background but within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint	Level I - Emissions above background but within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint.	Level I - Residual effect is not expected to be measurable beyond the construction period.	Level I - Residual effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level I - Unlikely to occur



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
		Operations		Level II - Emissions have the potential to exceed federal or provincial guidelines for areas beyond project footprint, resulting in potential for meaningful adverse environmental effects to resources (land, water, biota) or residents outside the project footprint.	Level II - Emissions have the potential to exceed federal or provincial guidelines for areas beyond project footprint, resulting in potential for meaningful adverse environmental effects to resources (land, water, biota) or residents outside the project footprint.	Level I - Residual effect is not expected to be measurable beyond the operations period.	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
		Closure		Level I - Emissions above background but within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint	Level I - Emissions above background but within applicable federal and provincial regulations and guidelines; or if guidelines exceeded, effects limited to the project footprint	Level I - Residual effect is not expected to be measurable beyond the construction period.	Level I - Residual effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level I - Unlikely to occur
Climate	Climate change effects resulting from Project GHG emissions.	Construction and Operations	Project power provided by existing capacity within the power grid rather than onsite generation.	Level 1 - There is no measurable residual effect	Level III - Residual effect extends into the RSA	Level II - Residual effect will extend into operations period.	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible following closure.	Not significant	Level III - Will occur.
Surface Water Quality	Physical alteration of the surrounding landscape could result in increased sediment loading to receiving waters associated with the Project which could result in increased total suspended solids (TSS) in surface waters.	All	Implement an EMP with measures to minimize potential for release of deleterious substances and include a Spill Response plan. Equipment used should be well-maintained and carry appropriately stocked spill kits. Operators should be trained in their use and have a spill response plan in place. Disturbed soils should be stabilized where possible to limit potential for erosion and sediment mobilization.	Level II - Activity has the potential to effect water quality in receiving waters that could exceed applicable federal and provincial regulations and guidelines	Level II - Potential to adversely affect drinking water uses, aquatic life, and/or wildlife in the LSA	Level I - Residual effect is not measurable beyond construction period.	Level I - Effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur; however, mitigation measures outlined in an EMP are designed to reduce likelihood of occurrence.



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Alteration of water quality could occur from accidental release of deleterious substances (e.g., chemical/fuel spills).	All	Implement an EMP with measures to minimize potential for release of deleterious substances and include a Spill Response plan. Equipment used should be well-maintained and carry appropriately stocked spill kits. Operators should be trained in their use and have a spill response plan in place. Disturbed soils should be stabilized where possible to limit potential for erosion and sediment mobilization.	Level II - Activity has the potential to effect water quality in receiving waters that could exceed applicable federal and provincial regulations and guidelines	Level II - Potential to adversely affect drinking water uses, aquatic life, and/or wildlife in the LSA	Level I - Residual effect is not measurable beyond construction period.	Level I - Effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur; however, mitigation measures outlined in an EMP are designed to reduce likelihood of occurrence.
Surface Water Quantity	Increased flows in Blackwater Creek in years 1 -3 due to increases in the runoff coefficient of developed areas and discharge from the secondary treatment plant, including mine dewatering and process water	Operations	Developed areas with increased runoff coefficients will be contained and directed to tailings management area for secondary treatment and release to Blackwater Creek and later the pit lake.	Level I - No surface water quantity effects in receiving waters anticipated as flow changes are within natural variation and channel capacity	Level I - No anticipated adverse environment effects beyond Blackwater Creek	Level 1 - Residual effect is not measurable beyond early operation period (3 years).	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible over a relatively short period	Not significant	Level III - Will occur.
	Increased peak flows in Blackwater Creek due to increases in the runoff coefficient of reclaimed areas	Closure	Convert seepage ditches and collection ponds to wetland areas to retain runoff and reduce runoff coefficient. Pit lake will function as reservoir further reducing peak flows. Encourage recolonization of disturbed areas by surrounding forest.	Level I - No surface water quantity effects in receiving waters anticipated as flow changes are within natural variation and channel capacity	Level I - No anticipated adverse environment effects beyond Blackwater Creek	Level 1 - Residual effect is not measurable beyond early closure period (3 years).	Level I - Residual effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Decreased flows in Blackwater Creek in years 4 -12 due to redirection of runoff from developed areas and discharge from the secondary treatment plant to facilitate pit filling	Operations	None	Level I - No surface water quality effects in receiving waters anticipated as flow changes are within long-term natural variation	Level I - No anticipated adverse environment effects beyond Blackwater Creek	Level 1 - Residual effect is not measurable beyond early operation period (4 - 12 years).	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible over a relatively short period	Not significant	Level III - Will occur.
	Decreased flows in Hoffstrom's Bay tributary in due to raw water needs for process plant	Operations	Installation and operation of secondary treatment plant to recirculate treated mine water to process plant and reduce raw water needs.	Level I - No surface water quality effects in receiving waters anticipated as flow changes are within long-term natural variation and historic use of tributary as a water source	Level I - No anticipated adverse environment effects beyond Hoffstrom's Bay tributary	Level 1 - Residual effect is not measurable beyond early operation period.	Level III - Residual effect occurs frequently or continuously	Level I - Effect is readily reversible over a relatively short period	Not significant	Level III - Will occur.
Ground Water Quality	Groundwater quality impacted by accidental point source releases of environmental contaminants of concern.	All	Minimize project footprint; Minimize activity of project personnel outside of Project areas and infrastructure. Utilize proper waste management strategies to minimize wildlife attraction	Level III - Introduction of non-native contaminant	Level I - Residual effect is expected to be limited to release area.	Level I - Residual effect is not measurable beyond construction period assuming site remediation measures are implemented.	Level I - Effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period when remediation measures are implemented.	Not significant	Level II - Could reasonably be expected to occur; however, spill prevention measures and response plan will minimize likelihood.



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Groundwater quality impacted by seepage from WRSA, TSF and low grade ore stockpile.	Operations and Closure	Seepage collection ditches will be installed around the WRSA, TSF, and low-grade ore stock pile and any water collected will be returned to the tailings storage facility for treatment prior to release.	Level I - No ground water quality effects in receiving waters anticipated within applicable federal and provincial regulations and guidelines	Level I - No anticipated adverse environment effects beyond the collection ditches	Level 1 - Residual effect is not measurable beyond operation period (12 years).	Level I - Residual effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
Ground Water Quantity	Groundwater quantity impacted by disturbance of recharge and/or discharge areas.	All	None	Level I - No measurable residual effect due to limited scale of development within groundwater basin.	Level I - Residual effects limited to the project footprint.	Level III - Change in groundwater recharge within project footprint will be permanent.	Level III - Residual effect within project footprint is permanent.	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur
	Groundwater discharge to creeks and wetlands impacted by operation of groundwater dewatering system	Operations	Minimize project footprint.	Level I - No measurable residual effect.	Level III - Residual effect extends into the RSA	Level III - Residual effect is expected to persist, but decrease in intensity for 20 years following suspension of groundwater dewatering efforts.	Level III - Residual effect will be continuous, decreasing in intensity over a period of 20 years.	Level I - Effect is readily reversible over time.	Not significant	Level II - Could reasonably be expected to occur



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	Expansion of groundwater drawdown cone could potentially lead to reduced or loss of production in private wells surrounding the mine site.	Operations	Ground water monitoring wells between mine site and private wells will provide early warning if ground water quantity dropping off. Mitigation includes installation of deeper wells for private users or installation of alternative domestic water supply as necessary.	Level III - Residual effect is outside of range of natural variation.	Level III - Residual effect extends into the RSA	Level III - Residual effect is expected to persist, but decrease in intensity for 20 years following suspension of groundwater dewatering efforts.	Level III - Residual effect will be continuous, decreasing in intensity over a period of 20 years.	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur
	Slow recovery of groundwater drawdown cone could limit development of private wells surrounding the mine site.	Closure	Mitigation measures implemented during operations will be maintained until dewatering cone reversed.	Level II - Residual impacts would be less than during period of dewatering system operation.	Level II - Residual impacts would extend throughout the LSA for an extended period (up to 20 years).	Level III - Recovery of groundwater elevations in drawdown cone is expected to be up to 20 years.	Level II - Residual effect is expected to decrease over time.	Level I - Effect gradually reverse once mine dewatering ceases	Not significant	Level II - Could reasonably be expected to initially occur but will fully reverse over time.
Wildlife and Wildlife Habitat	Habitat removal	Construction	Minimize project footprint; Minimize activity of project personnel outside of Project areas and infrastructure	Level II - Activity has the potential to affect population abundance and distribution	Level III - Residual effect extends into the RSA	Level I - Residual effect is not measurable beyond construction period.	Level III - Residual effect occurs frequently or continuously	Level II - Residual effect is partially reversible	Not significant	Level III - Will occur.
	Direct mortality from vehicular collision or other human activity (e.g., habitat clearing)	All	Time major habitat clearing activities to avoid critical seasonal windows. Minimize construction of new roads. Enforce speed limits on Project roads. No hunting/trapping by Project personnel. Awareness training.	Level 1 - There is no measurable residual effect to population abundance and distribution	Level II - Residual effect extends into LSA	Level I - Residual effect is not measurable beyond construction period.	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Fish	Mortality of individuals due to changes in water quality from increased sediment loads from runoff and/or release of deleterious substances (e.g., chemical/fuel spills)	Construction	Implement an EMP with measures to minimize potential for release of deleterious substances and include a Spill Response plan. Equipment used should be well-maintained and carry appropriately stocked spill kits. Operators should be trained in their use and have a spill response plan in place. Disturbed soils should be stabilized where possible to limit potential for erosion and sediment mobilization.	Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level II - Residual effect extends into LSA	Level 1 - Residual effect is not measurable beyond construction period (3 years).	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur.
		Operations		Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level II - Residual effect extends into LSA	Level III - Residual effect may extend beyond 10 years after operation initiation	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur
	Mortality of individuals because of physical activities that occur within or adjacent to a watercourse (e.g., access roads, tailing area dam construction, pit excavation).	Construction	Minimize work within watercourses. Schedule works to occur during reduced risk periods (i.e., outside of spawning, hatching etc.). Conduct fish salvage where possible.	Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level II - Residual effect extends into LSA	Level 1 - Residual effect is not measurable beyond construction period (3 years).	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur
		Operations		Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect may extend beyond 10 years after operation initiation	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur



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				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
		Closure		Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level 1 - Residual effect is restricted to Project footprint	Level 1 - Residual effect is not measurable beyond closure period.	Level I - Residual effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level II - Could reasonably be expected to occur
	Noise and vibration disturbances to fish from heavy equipment operation.	All	EMP should include measures to reduce potential impacts of noise and vibration (e.g., utilizing well-maintained equipment operated at optimum loads).	Level I - There is no measurable residual effect to fishery as fish will typically exhibit avoidance behaviour.	Level 1 - Residual effect is restricted to Project footprint	Level 1 - Residual effect is not measurable beyond construction period (3 years).	Level II - Residual effect expected to occur intermittently	Level I - Residual effect is reversible.	Not significant	Level III - Will occur.
Fish Habitat	Decreased habitat quality due to changes in water quality from increased sediment loads (increased turbidity/suspended solids) and/or release of deleterious substances (chemical/fuel spills).	Construction	Project should include an EMP with measures to minimize potential for release of deleterious substances and include a Spill Response plan. Equipment used should be well-maintained and carry appropriately stocked spill kits. Operators should be trained in their use and have a spill response plan in place. Disturbed soils should be stabilized where possible to limit potential for erosion and sediment mobilization. Habitat compensation, as per the <i>Fisheries Act</i> , will be provided.	Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level II - Residual effect extends into LSA	Level II - Residual effect may extend up to 10 years after project initiation.	Level I - Residual effect expected to occur infrequently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur
		Operations		Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level II - Residual effect extends into LSA	Level III - Residual effect could persist beyond 10 years of project initiation.	Level I - Residual effect expected to occur infrequently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur



Table 7.3.1 Environmental Cumulative Effects Matrix for the Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
		Closure		Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level II - Residual effect extends into LSA	Level II - Residual effect may extend up to 10 years after project initiation.	Level I - Residual effect expected to occur infrequently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur
	Physical disturbance to or loss of aquatic habitat by equipment working in or adjacent to a waterbody.	Construction and Operations	Minimize work within watercourses. Schedule works to occur during reduced risk periods (i.e., outside of spawning, hatching etc.). Conduct fish salvage where possible. Habitat compensation, as per the Fisheries Act will be provided. Appropriately size and embed culverts or construct bridges where appropriate.	Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect could persist beyond 10 years of project initiation.	Level III - Residual effect occurs frequently or continuously	Level II - Residual effect is partially reversible	Not significant	Level III - Will occur.
		Closure		Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect could persist beyond 10 years of project initiation.	Level I - Residual effect expected to occur infrequently	Level II - Residual effect is partially reversible	Not significant	Level III - Will occur.
	Changes to water quantity and subsequent habitat availability/quality in Thunder Lake due to Makeup Water Pipeline.	Construction	Conduct operations as efficiently as possible to minimize requirement for additional water inputs. Habitat compensation, as per the Fisheries Act will be provided.	Level II - Activity has the potential to measurably affect productive capacity of local fishery.	Level II - Residual effect extends into LSA	Level II - Residual effect may extend up to 10 years after project initiation.	Level II - Residual effect expected to occur intermittently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur



Table 7.3.1 Environmental Cumulative Effects Matrix for the Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
		Operations		Level II - Activity has the potential to measurably affect productive capacity of local fish habitat.	Level III - Residual effect extends into the RSA	Level III - Residual effect could persist beyond 10 years of project initiation.	Level II - Residual effect expected to occur intermittently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur
Vegetation and Wetlands	Reduced water quality benefits associated with filtering effects of wetland vegetation (including rare species); impact streams by reducing floodwater attenuation and long-term storage by wetland plants and soils; and diminish groundwater infiltration.	Construction	Avoid wetland habitats to the extent possible. Identify locations for restoration of wetland functions and values.	Level I - Wetlands are common in this area and localized loss of some functions and values is less than significant.	Level I - The extent of impacts to wetlands is confined to the project area.	Level III - Short of active mitigation, effect is permanent.	Level I - Effect expected to occur infrequently	Level III - Residual effect is not reversible.	Not significant	Level III - Will occur.
	May store polluted runoff and create attractive nuisance.	Operations	Divert runoff from operations area to isolated tailings pond.	Level I - Effect is not anticipated to be measurable	Level I - Effect should be confined to a localized area	Level II - Residual effect may extend up to 10 years after operation initiation	Level II - Effect could occur during rainfall or snowmelt.	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
	Losses of wetlands incurred during construction, and residual contamination that may have occurred during operations, may remain for the long term.	Closure	Prior to project, perform assessment to determine wetland functions and values. Using the functional assessment as a baseline, develop plan to restore wetland functional values after closure.	Level II - Activity has the potential to measurably affect fish and wildlife habitat, and hydrologic functions.	Level II - Residual effect extends into LSA	Level II - Residual effect may extend up to 10 years after project initiation.	Level I - Residual effect expected to occur infrequently	Level II - Residual effect is partially reversible	Not significant	Level II - Could reasonably be expected to occur



Table 7.3.2 Socio-Economic Cumulative Effects Matrix for The Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Land and Resource Use	Potential obstruction, loss and/or usage of trapping areas associated with the mine footprint	All	Limit mine footprint; Reclamation and Closure Plan implementation; ensure ongoing communication with local stakeholders	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level I - Residual effect is confined to the Project footprint.	Level III - Residual effect likely to persist beyond closure	Level III - Residual effect expected to occur regularly or continuously	Level III - Residual effect is not reversible	Not significant	Level II - Could reasonably be expected to occur
	Change in local ambience due to noise, vibration and decreased aesthetics at mine site	All	Noise Management Plans, Emergency and Spill Response Plans ensure ongoing communication with local stakeholders	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level II - Residual effect is confined to the LSA.	Level II - Medium-term, residual effect throughout operations and closure.	Level III - Residual effect expected to occur regularly or continuously	Level II - Residual effect is reversible in the long-term.	Not significant	Level II - Could reasonably be expected to occur
	Direct effects associated with Project traffic and improved access	All	Transportation and Access Management Plan.	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level III - Residual effect extends to the RSA.	Level II - Medium-term, residual effect throughout operations and closure.	Level III - Residual effect expected to occur regularly or continuously	Level II - Residual effect is reversible in the long-term.	Not significant	Level II - Could reasonably be expected to occur
Housing	Changes in in- and out-migration affect housing demand and change the housing market	All	Work with Government to minimize in-migration	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level III - Residual effect extends to the RSA.	Level I - Residual effect extends throughout the construction phase	Level III - Residual effect expected to occur regularly or continuously	Level I - Effect is readily reversible over a relatively short period	Not significant	Level III - Will occur, or is likely to occur



Table 7.3.2 Socio-Economic Cumulative Effects Matrix for The Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Employment	Proposed Project spending would generate employment	All	Preferred hiring for local and regional labour	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level III - Residual effect extends to the RSA.	Level I - Residual effect extends throughout the construction phase	Level III - Residual effect expected to occur regularly or continuously	Level I - Residual effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
Income	Project spending would generate income for employees and supply industries	All	Effects are positive so no mitigation necessary	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level II - Residual effect is confined to the LSA.	Level I - Residual effect extends throughout the construction phase	Level III - Residual effect expected to occur regularly or continuously	Level I - Residual effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur
Economic Development	Increases in Gross Domestic Product, employment, and government revenues due to capital expenditures	All	Not mitigated at a provincial level	Level I - Residual effect that occurs might or might not be detectable, but is within the normal range of variability.	Level III - Residual effect extends to the Province	Level I - Residual effect extends throughout the construction phase	Level III - Residual effect expected to occur regularly or continuously	Level I - Residual effect is readily reversible over a relatively short period	Not significant	Level III - Will occur, or is likely to occur



Table 7.3.2 Socio-Economic Cumulative Effects Matrix for The Goliath Gold Project

VC	Potential Effect	Project Stage	Proposed Mitigation	Residual Effects Characterization					Significance of Project contribution to cumulative effects (assuming implementation of mitigation)	Likelihood of Occurrence
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Aboriginal Peoples	Water quality and health effects	All	Implement an EMP with measures to minimize potential for release of deleterious substances and include a Spill Response plan. Equipment used should be well-maintained and carry appropriately stocked spill kits. Operators should be trained in their use and have a spill response plan in place. Disturbed soils should be stabilized where possible to limit potential for erosion and sediment mobilization.	Level II - Activity has the potential to effect water quality in receiving waters that could exceed applicable federal and provincial regulations and guidelines	Level II - Potential to adversely affect drinking water uses, aquatic life, and/or wildlife, in the LSA	Level I - Residual effect is not measurable beyond construction period.	Level I - Effect expected to occur infrequently	Level I - Effect is readily reversible over a relatively short period	Not significant	Level II - Could reasonably be expected to occur; however, mitigation measures outlined in an EMP are designed to reduce likelihood of occurrence.
	Gathering of Country Foods	All	Minimize project footprint; Minimize activity of project personnel outside of Project areas and infrastructure; Maintain outflow water quality standards to maintain wetland health.	Level 1 - There is no measurable residual effect to abundance and distribution of country foods.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect could persist beyond 10 years of project initiation.	Level III - Residual effect expected to occur regularly or continuously	Level II - Residual effect is partially reversible.	Not significant	Level III - Will occur, or is likely to occur
	Hunting and Trapping	All	None	Level 1 - There is no measurable residual effect on hunting and trapping opportunities.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect could persist beyond 10 years of project initiation.	Level III - Residual effect expected to occur regularly or continuously	Level II - Residual effect is partially reversible.	Not significant	Level III - Will occur, or is likely to occur
	Fishing	All	Measures proposed for water quality.	Level 1 - There is no measurable residual effect on fishing opportunities.	Level 1 - Residual effect is restricted to Project footprint	Level III - Residual effect could persist beyond 10 years of project initiation.	Level III - Residual effect expected to occur regularly or continuously	Level II - Residual effect is partially reversible.	Not significant	Level III - Will occur, or is likely to occur