APPENDIX 5A

Residual Effects Characterization Definitions

APPENDIX 5A - RESIDUAL EFFECTS CHARACTERIZATION

Chapter 11 provides a discussion of how planned Project Expansion activities could impact the assessment, residual effects predictions, and mitigation and monitoring requirements described in the Valentine Gold EIS for the Vegetation, Wetlands, Terrain and Soils; Avifauna; and Other Wildlife VCs. The chapter summarizes the effects assessment and verifies that the Project Expansion does not change the residual effects characterizations or the significance of residual effects for these VCs. In doing this, Chapter 11 relies on the residual effects characterizations definitions; significance definitions; and potential effects, pathways and measurable parameters presented for each of these VCs in the Valentine Gold EIS. For ease of review, these definitions are presented below in Sections 1.1 to 1.3 (note: these are identical to those in the EIS).

Similarly, the discussion of the socioeconomic VCs (Community Services and Infrastructure; Community Health; Employment and Economy; Land and Resource Use; and Indigenous Groups) presented in Chapter 12 relies on the definitions that are provided below (from the Valentine Gold EIS) in Sections 1.4 to 1.8.

1.1 VEGETATION, WETLANDS, TERRAIN AND SOILS

Table 1 presents definitions for the characterization of residual environmental effects on vegetation, wetlands, terrain and soils as presented in the Valentine Gold EIS. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 1 Characterization of Residual Effects on Vegetation, Wetlands, Terrain and Soils

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters for the vegetation, wetlands, terrain and soils relative to baseline **Positive –** a residual effect that moves measurable parameters in a direction beneficial to vegetation, wetlands, terrain and soils relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to vegetation, wetlands, terrain and soils relative to baseline

Table 1 Characterization of Residual Effects on Vegetation, Wetlands, Terrain and Soils

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change from baseline conditions. **Low –** a measurable change of less than 5% of • habitat for SAR or SOCC in the ELC study area (ELCA) • the total area of wetland in the ELCA • soil quality / quantity with respect to end land-use capability • terrain (unique landform features) and terrain stability **Moderate –** measurable change greater than 5% but not exceeding 25% of • habitat for SAR or SOCC in the ELCA • the total area of wetland in the ELCA • soil quality / quantity with respect to end land-use capability • terrain (unique landform features) and terrain stability **High –** measurable change of greater than 25% of • habitat for SAR or SOCC in the ELCA • the total area of wetland in the ELCA • soil quality / quantity with respect to end land-use capability even without mitigation • terrain (unique landform features) and terrain stability
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects interact with those of other projects in the RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short term** – residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium term** – residual effect extends through the operation phase (12 years) **Long term** – residual effect extends beyond the operation phase (>12 years) **Permanent –** recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed

Table 1 Characterization of Residual Effects on Vegetation, Wetlands, Terrain and Soils

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

1.1.1 Significance Definition

A significant adverse residual effect on vegetation and wetlands is defined as one that:

- Threatens the long-term persistence or viability of a vegetation species in the RAA, including effects that are contrary to or inconsistent with the goals, objectives, or activities of provincial or federal recovery strategies, action plans and management plans (i.e., change from a non-listed species to a species of management concern)
- Threatens the long-term persistence or viability of a vegetation community in the RAA, including effects that are contrary to or inconsistent with the goals, objectives or activities of provincial or federal recovery strategies, action plans and management plans
- Results in a non-conformance with section 5.1 of the NL Policy for Development in Wetlands or a loss of more than 10% of wetland area within the RAA
- A significant adverse residual effect on terrain and soils is defined as one that:
- Alters soil quality or quantity such that successful rehabilitation to self-sustaining ecosystems with an average capability relative to that present at existing conditions are prevented
- The function of ecologically or culturally important landforms is substantially altered
- Unstable terrain is affected such that successful slope stability mitigation measures do not prevent and/or protect as per regulatory guidelines such as the NL Mining Act and the NL EPA

1.1.2 Potential Effects, Pathways and Measurable Parameters

Table 2 lists the potential Project effects on vegetation, wetlands, terrain and soils and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 2 Potential Effects, Effect Pathways and Measurable Parameters for Vegetation, Wetlands, Terrain and Soils

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in species diversity	• Direct disturbance (loss), change in habitat	• Occurrences and population attributes of traditional use plant resources important to Indigenous groups • Occurrences and population attributes of provincially or federally listed plant SAR • Occurrences and population attributes of non-native invasive plant species • Occurrences and population attributes of rare plants
Change in community diversity	• Direct disturbance (loss), change in abiotic factors	• Areal extent (hectares [ha]) of ecological communities or vegetation types
Change in wetland function	• Direct disturbance (loss), change in hydrology	• Areal extent (ha) of loss or disturbance to wetland ecosystems (by class and vegetation structure) • Indicators of wetland functions as evidenced by change in areal extent of wetlands or change in wetland type resulting from a change in hydrology
Change in soil quality	Potential decreases in soil quality resulting from: • Admixing, compaction, or decreased fertility • Compaction from heavy machinery traffic during post-closure and operation • Contamination of soils due to particulate deposition (Project air emissions, fugitive dustfall) and chemical spills • Change in soil chemistry, including acidification	• Soil baseline characteristics (i.e., physical and chemical parameters) • Admixing or loss of structure • Compaction and rutting risk • Soil chemistry changes (i.e., nutrient and metal levels) from trace metal uptake, dust accumulation, soil acidification • Rehabilitation suitability ratings
Change in soil quantity	Potential soil volume losses (availability and volume of stored soils) from: • Soils handling and transport • Loss of suitable sites for soil development as a result of pit wall creation or new permanent water features • Erosion following removal of vegetation and disturbance during construction • Burial under spoil sites (i.e., waste rock, tailings) • Creation of permanent pit features	• Erosion potential ratings (wind and water) • Soil stripping volume and replacement depth • Burial and areas of no soil stripping and flooding (e.g., sedimentation ponds if not stripped)

Table 2 Potential Effects, Effect Pathways and Measurable Parameters for Vegetation, Wetlands, Terrain and Soils

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in terrain (landforms) and terrain stability	• Loss of unique landform features (e.g., eskers, fragile / sensitive landscapes associated with ecosystems and wildlife habitat areas)	• Presence and extent of unique landform features identified from existing conditions
	Increase in terrain instability including: Potential effects on the stability of terrain in Project facilities and infrastructure due to mass movement processes Potential changes to occurrence, frequency and distribution of terrain (slope stability) mass movement processes	• Identification of potential terrain hazards (mass movement processes)

1.2 AVIFAUNA

Table 3 presents definitions for the characterization of residual environmental effects on avifauna. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 3 Characterization of Residual Effects on Avifauna

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters for avifauna relative to existing conditions **Positive –** a residual effect that moves measurable parameters in a direction beneficial to avifauna relative to existing conditions **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to avifauna relative to existing conditions
Magnitude	The amount of change in avifauna habitat	***Change in Habitat*** **Negligible –** no measurable change in habitat for avifauna, including SAR **Low –** Project changes less than 10% of high and moderate value habitat in the ELCA for representative avifauna species, or less than 5% of high and moderate value habitat in the ELCA for representative avifauna SAR **Moderate –** Project changes 10-20% of high and moderate value habitat in the ELCA for representative avifauna species, or 5-10% of high and moderate value habitat in the ELCA for representative avifauna SAR

Table 3 Characterization of Residual Effects on Avifauna

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		High – Project changes more than 20% of high and moderate value habitat in the ELCA for representative avifauna species, or more than 10% of high and moderate value habitat in the ELCA for representative avifauna SAR ***Change in Mortality Risk*** **Low –** a substantial change in the abundance of avifauna in the LAA is not anticipated, although temporary local shifts in distribution in the LAA could occur **Moderate –** a substantial change in the abundance and/or distribution of avifauna in the LAA might occur, although a measurable change in the abundance of avifauna in the RAA is not anticipated **High –** a substantial change in the abundance and/or distribution of avifauna in the RAA could occur
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event –** occurs once **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium-term –** residual effect extends through the operation phase (12 years) **Long-term –** residual effect extends beyond the operation phase (>12 years) **Permanent –** recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing conditions and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activit **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

1.2.1 Significance Definition

A significant adverse residual effect on avifauna is defined as one that threatens the long term persistence, viability or recovery of an avifauna species population in the RAA, including effects that are contrary to or inconsistent with the goals, objectives or activities of recovery strategies, action plans and management plans.

1.2.2 Potential Effects, Pathways and Measurable Parameters

Table 4 lists the potential Project effects on avifauna and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments (EAs) for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 4 Potential Effects, Effect Pathways and Measurable Parameters for Avifauna

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in habitat	• Direct and/or indirect loss or alteration of habitat due to vegetation clearing, sensory disturbance and/or edge effects	• Amount (ha) of avifauna habitat directly or indirectly (qualitative) lost or altered for representative species, including SAR with the most potential to be affected by the Project.
Change in mortality risk	• Direct change in mortality risk due to vegetation clearing activities, vehicular collisions, and indirect change in mortality risk due to predation and harvest pressure	• Estimated change in mortality risk is assessed qualitatively through: – Change in traffic volumes during the life of the Project – Interactions with Project infrastructure, vehicles and equipment – Increase in predation, hunting and/or poaching because of improved access or other habitat changes

1.3 OTHER WILDLIFE

Table 5 presents definitions for the characterization of residual environmental effects on other wildlife. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 5 Characterization of Residual Effects on Other Wildlife

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters for the other wildlife relative to existing conditions **Positive –** a residual effect that moves measurable parameters in a direction beneficial to other wildlife relative to existing conditions **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to other wildlife relative to existing conditions
Magnitude	Change in habitat	**Negligible –** no measurable change in high or moderate ranked habitat for other wildlife, including SAR and SOCC **Low –** Project changes less than 10% of other wildlife habitat in the ELCA, or less than 5% of habitat for other wildlife SAR and SOCC in the ELCA **Moderate –** Project changes 10-20% of other wildlife habitat in the ELCA, or 5-10% of habitat for other wildlife SAR and SOCC in the ELCA **High –** Project changes more than 20% of other wildlife habitat in the ELCA, or more than 10% of habitat for other wildlife SAR and SOCC in the ELCA
Magnitude	Change in mortality risk	**Negligible –** no measurable change in mortality risk of other wildlife in the LAA **Low –** a measurable change in mortality risk of other wildlife in the LAA is not anticipated, although individuals may be affected **Moderate –** a measurable change in mortality risk of other wildlife in the LAA might occur, however a measurable change in mortality risk in the RAA is not anticipated **High –** a measurable change in mortality risk of other wildlife in the RAA may occur
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects interact with those of other projects in the RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** – occurs once **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short term** – residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium term** – residual effect extends through the operation phase (12 years) **Long term** – residual effect extends beyond the operation phase (>12 years) **Permanent** – recovery to baseline conditions unlikely

Table 5 Characterization of Residual Effects on Other Wildlife

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present

1.3.1 Significance Definition

A significant adverse residual effect on other wildlife and their habitat is defined as one that threatens the long-term persistence, viability, or recovery of a wildlife species population in the RAA, including effects that are contrary or inconsistent with the goals, objectives or activities of the federal recovery strategy for bats (ECCC 2015), provincial recovery plan for marten (the Newfoundland Marten Recovery Team 2010), or other action plans and management plans.

1.3.2 Potential Effects, Pathways and Measurable Parameters

Table 6 lists the potential Project effects on other wildlife and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 6 Potential Effects, Effect Pathways and Measurable Parameters for Other Wildlife

Potential Environmental Effect	Effect Pathways	Measurable Parameter(s) and Units of Measurement
Change in Habitat	• Direct and/or indirect loss or alteration of habitat due to: – vegetation clearing – sensory disturbance (e.g., avoidance) – edge effects	• Amount (km^2) of wildlife habitat directly lost for focal species (Table 12.1), including for SAR that may be present in the RAA: – little brown bat – marten • Quantitatively and qualitatively, amount of wildlife habitat indirectly lost for focal species (Table 12.1)

Table 6 Potential Effects, Effect Pathways and Measurable Parameters for Other Wildlife

Potential Environmental Effect	Effect Pathways	Measurable Parameter(s) and Units of Measurement
Change in Mortality Risk	• Direct and/or indirect change in mortality risk due to: – vegetation clearing activities – vehicular collisions – human-wildlife conflicts – predation and harvest pressure	• Change in mortality risk is assessed qualitatively through: – Change in traffic volumes during the life of the Project – Likelihood of interactions with Project infrastructure, vehicles, and equipment – Change in predator-prey dynamics and harvest pressure

1.4 COMMUNITY SERVICES AND INFRASTRUCTURE

Table 7 presents definitions for the characterization of residual environmental effects on community services and infrastructure. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 7 Characterization of Residual Effects on Community Services and Infrastructure

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters for community services and infrastructure relative to baseline **Positive –** a residual effect that moves measurable parameters in a direction beneficial to community services and infrastructure relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to community services and infrastructure relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change. **Low —** capacity of community services and infrastructure will be at or near to existing conditions **Moderate —** demand for community services and infrastructure approaches current capacity, standard or threshold however will not result in a reduction in standards of service **High —** demand for community services and infrastructure exceeds current capacity, standard or thresholds that result in a reduction in standards of service

Table 7 Characterization of Residual Effects on Community Services and Infrastructure

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA/RAA –** residual effects extend into the LAA/RAA and interact with those of other projects in the LAA/RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium-term –** residual effect extends through operation and maintenance **Long-term –** residual effect extends beyond the life of the project **Permanent –** recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Resilient** – community services and infrastructure have capacity to accommodate increased demand. **Not Resilient** – community services and infrastructure have limited capacity to accommodate increased demand.

1.4.1 Significance Definition

A significant adverse residual effect on community services and infrastructure is one that results in demands on services or infrastructure above and beyond current capacity, such that standards of service are routinely and persistently reduced below current levels for an extended period such that they are unlikely to recover to existing conditions.

1.4.2 Potential Effects, Pathways and Measurable Parameters

Table 8 lists the potential Project effects on community services and infrastructure and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 8 Potential Effects, Effect Pathways and Measurable Parameters for Community Services and Infrastructure

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in local housing and temporary accommodations	Demand on local housing and temporary accommodations may be affected by Project activities and Project-related population growth.	• Availability of accommodations (vacancy rates, inventory levels) • Cost of accommodation ($) • Shelter-to-income ratio
Change in local services and infrastructure	Demand on local services and infrastructure may be affected by Project activities and Project-related population growth.	• Construction and operation labour force • Number of hospital beds • Police officers / 100,000 population • Physicians / 100,000 population • Road volume (vehicles/day) • Capacity of air transportation infrastructure • Teacher:student ratio

1.5 COMMUNITY HEALTH

Table 9 presents definitions for the characterization of residual environmental effects on community health. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 9 Characterization of Residual Effects on Community Health

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no measurable change **Positive –** a residual effect that moves measurable parameters in a direction beneficial to community health relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to community health relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change **Low –** the Project will have a measurable effect on community health, although within the range of normal variation in baseline conditions **Moderate –** the Project will have a measurable effect on community health that exceeds the normal variation in baseline conditions, although can be managed using existing resources **High –** the Project will have a measurable effect on community health, which will exceed the management capacity of existing resources

Table 9 Characterization of Residual Effects on Community Health

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA/RAA –** residual effects extend into the LAA/RAA and interact with those of other projects in the LAA/RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short term –** residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium term –** residual effect extends through operation **Long term –** residual effect extends beyond the life of the Project **Permanent** - recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present **Resilient –** community has a moderate to high capacity to recover from a perturbation, with consideration of the existing level of disturbance. **Not Resilient –** community has a low capacity to recover from a perturbation, with consideration of the existing level of disturbance.

1.5.1 Significance Definition

A significant adverse residual effect on community health is one that results in:

- deterioration of health and well-being over an extended period that cannot be managed or mitigated through adjustments to programs, policies, plans, or other mitigation; and/or
- a reduction in the quality of ambient air, water, country foods, or sound at levels predicted to result in exposures that are higher than the health-based guidelines established by regulatory organizations, and are likely to result in a substantive change in the health of communities.

1.5.2 Potential Effects, Pathways and Measurable Parameters

Table 10 lists the potential Project effects on community health and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent EAs for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 10 Potential Effects, Effect Pathways and Measurable Parameters for Community Health

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in community well-being	• Project-related employment and income • Project-related change in population	• Project employment estimates (local and non-local workers) • Provincial health characteristics • Community Well-being (CWB) Index • Crime Severity Index (CSI) • Metrics related to capacity of health services (i.e., number of hospital beds, doctor / patient ratio)
Change in physical health conditions	• Project activities causing a change in access to and availability of country foods to harvest • Emissions and discharges from the Project resulting in air, sound, and, water, quality changes, which could affect human health through direct exposure (e.g., inhalation of air) and indirect exposure (e.g., ingestion of contaminated food) to contaminants • A reduction in the value and perceived quality of country foods	• Change in hunting, trapping or plant harvesting activities (qualitative) • Concentrations (µg/m^3 in air, µg/L in water) or levels (dBA, % highly annoyed for sound)

The assessment of Project emissions and discharges on health conditions, although conducted specifically for Indigenous groups in Chapter 17 (Indigenous Groups), also applies to non-Indigenous residents.

1.6 EMPLOYMENT AND ECONOMY

Table 11 presents definitions for the characterization of residual environmental effects on employment and economy. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 11 Characterization of Residual Effects on Employment and Economy

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long term trend of the residual effect	**Neutral –** no net change in measurable parameters for the employment and economy relative to baseline **Positive –** a residual effect that moves measurable parameters in a direction beneficial to employment and economy relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to employment and economy relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible –** no measurable change in employment and economy from existing conditions **Low –** a measurable change in employment and economy but residual effects cannot be distinguished from existing conditions within normal range of variability **Moderate –** a measurable change but not likely to pose a serious risk or benefit to employment and economy **High –** Measurable change that is likely to pose a serious risk or benefit to employment and economy
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects extend into the RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short term –** residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium term –** residual effect extends through the operation phase (12 years) **Long term –** residual effect extends beyond the operation phase (greater than 12 years) **Permanent –** recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Resilient –** VC is able to assimilate the additional change **Not Resilient –** VC is not able to assimilate the additional change because of having little tolerance to imposed stresses due to fragility or near a threshold

1.6.1 Significance Definition

For the potential effects 'change in regional labour force,' 'change in regional business,' and 'change in economic activities of outfitters,' a significant adverse residual effect is defined as one that is:

- Distinguishable from current conditions and trends, and cannot be managed or mitigated through adjustments to programs, policies or plans, or through other mitigation. A significant adverse effect occurs if there are residual adverse effects disproportionately experienced by one or more identified sub-populations.

For the potential effect 'change in economy,' a significant adverse residual effect is defined as one that:

- Occurs if Project operation results in an economic loss, causing a decline in provincial GDP for four or more quarters.

The residual effects assessment considers both positive and adverse effects after mitigation and other management measures are implemented. However, a significance determination is made for adverse effects only.

1.6.2 Potential Effects, Pathways and Measurable Parameters

Table 12 lists potential Project effects on employment and economy and provides a summary of the Project effect pathways and measurable parameters and units of measurement used to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

Table 12 Potential Effects, Effects Pathways and Measurable Parameters for Employment and Economy

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in regional labour force	• The Project's demand for labour will affect the regional labour supply • Loss of Project employment following completion of decommissioning, rehabilitation and closure will affect the regional labour supply	• Qualified labour supply (persons) and existing wage levels • Project employment (jobs and FTEs)
Change in regional business	• Project spending will affect regional businesses • Loss of Project spending following completion of decommissioning, rehabilitation and closure will affect the regional labour supply	• Value of local and regional spending and related employment • Project contribution to increased competition for labour and wage inflation

Table 12 Potential Effects, Effects Pathways and Measurable Parameters for Employment and Economy

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in economic activities of outfitters	• Site clearing may result in the loss of area available for outfitters • Project presence, physical activities and site management activities may affect access to and/or the quality of the experience of outfitting activities	• Change in resource quality and quantity • Change in access to resources • Market value of affected resources
Change in economy	• Project employment and spending will affect the economy • Loss of Project employment and spending following completion of decommissioning, rehabilitation and closure will affect the economy	• GDP ($) • Tax revenue ($)

1.7 LAND AND RESOURCE USE

Table 13 presents definitions for the characterization of residual environmental effects on Land and Resource Use VC. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 13 Characterization of Residual Effects on Land and Resource Use

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters for the land and resource use relative to baseline **Positive –** a residual effect that moves measurable parameters in a direction beneficial to land and resource use relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to land and resource use relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing (baseline) conditions	**Negligible –** no measurable change in current land and resource use capacity **Low –** a small, measurable change in land and resource use capacity, however land and resource use activities can take place at or near current levels **Moderate –** a measurable change in land and resource use capacity that is greater than low, however land and resource use activities can take place at or near current levels **High –** a measurable change in land and resource use capacity, such that land and resource use activities cannot take place at or near current levels

Table 13 Characterization of Residual Effects on Land and Resource Use

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects interact with those of other projects in the RAA
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects are unlikely to affect land and resource use **Applicable –** seasonal aspects may affect land and resource use
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event** **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to construction or decommissioning, rehabilitation and closure phases **Medium term –** residual effect extends through the operation phase (12 years) **Long term –** residual effect extends beyond the operation phase (greater than 12 years) **Permanent** - recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Resilient –** VC is able to assimilate the additional change **Not Resilient –** VC is not able to assimilate the additional change because of having little tolerance to imposed stresses due to fragility or near a threshold

1.7.1 Significance Definition

A residual effect on land and resource use is considered significant if:

- The Project does not comply with established federal, provincial, or municipal land use designations, policies, or by-laws
- The Project will create a change or disruption that restricts or degrades present land and resource use capacity within the RAA to a point where activities cannot continue at or near current levels over the long term and where compensation is not possible

1.7.2 Potential Effects, Pathways and Measurable Parameters

Table 14 lists potential Project effects on land and resource use and provides a summary of the Project effect pathways and measurable parameters and units of measurement used to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments (EAs) for mining projects in NL and other parts of Canada, comments provided during engagement, and professional judgment.

It is anticipated that the Project has the potential to change land use, resource use and recreational activities during construction, operation, and decommissioning, closure and rehabilitation phases. Routine Project activities and components may be incompatible with land use designations, and/or affect the viability of, restrict access to, or cause loss of areas used for resource activity and/or recreational use. Resource and recreational users may consequently be displaced to other nearby areas, increasing competition for resource and recreational uses. Decommissioning, closure and rehabilitation activities have the potential to reverse adverse effects related to some local use of land and resources and may ultimately restore access.

Table 14 Potential Effects, Effects Pathways and Measurable Parameters for Land and Resource Use

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in land use	• Project presence and site activities may affect use / future development • Project activities and components may create disturbance effects to nearby properties / cabin owners (i.e., noise, dust, visual)	• Change / restriction of land use (km²) • Change in sound levels (decibels [dBA]) • Change in air quality (µg/m³ of particulate matter) • Proximity to land use sites (km)
Change in resource use	• Disruption to resource harvesting (i.e., hunting, trapping, fishing) success from effects to resource accessibility and availability (i.e., behavioural changes / mortality of targeted species) • Project activities and components may create sensory disturbance effects (i.e., noise, dust, visual) to resource users, affecting the quality of outdoor experience • Project may reduce productive forest land	• Attribute data on overlapping uses (e.g., hunting, trapping) within area affected (ha) • Change or disruption affecting resource use (km²) • Sensory disturbance to target species from change in traffic volumes during the life of the Project and likelihood of interactions with Project infrastructure, vehicles and equipment • Sensory disturbance to resource users due to change in sound levels (dBA) and air quality (µg/m³ of particulate matter) • Area of commercial forest (km²); reduction of annual allowable cut (AAC) (m^3/ha/year)

Table 14 Potential Effects, Effects Pathways and Measurable Parameters for Land and Resource Use

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in recreational use	• Project clearing may result in the loss of area available for recreational use • Project presence and activities may reduce access to or quality of recreational use (i.e., noise, dust, visual)	• Area of current recreation use overlapped by the Project (km²) • Qualitative use of area • Access to recreational areas • Change in sound levels (dBA) • Change in air quality (µg/m³ of particulate matter)

1.8 INDIGENOUS GROUPS

Table 15 presents definitions for the characterization of residual environmental effects on Indigenous groups. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

Table 15 Characterization of Residual Effects on Indigenous Groups

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual effect	**Neutral –** no net change in measurable parameters to Indigenous groups relative to baseline **Positive –** a residual effect that moves measurable parameters in a direction beneficial to Indigenous groups relative to baseline **Adverse –** a residual effect that moves measurable parameters in a direction detrimental to Indigenous groups relative to baseline
Magnitude	The degree of change for each residual effect	***Indigenous Health Conditions*** **Negligible –** No measurable change from existing conditions to Indigenous health conditions and Project-related environmental exposures are less than the target benchmarks established by a recognized health organization **Low –** Measurable change from existing conditions, however, is below environmental and/or regulatory criteria, and Project-related environmental exposures marginally exceed target benchmarks established by a recognized health organization **Moderate –** A measurable change from existing conditions that exceeds the target benchmarks established by a recognized health organization and/or may result in a long-term, substantive change in human health **High –** A measurable change from existing conditions that exceeds the target benchmarks established by a recognized health organization and/or is likely to result in long-term, substantive change in human health
		Indigenous Socio-Economic Conditions

Table 15 Characterization of Residual Effects on Indigenous Groups

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
		Negligible – No measurable change in land or resource use capacity; use or access to, or interference with infrastructure; and/or baseline levels of local employment, goods and services, and economic activity **Low –** Means: • Land and resource use and capacity can take place at or near similar levels as baseline • Capacity of community services and infrastructure will be at or near to existing conditions • A measurable change in employment and economy, however, residual effect cannot be distinguished from existing conditions within normal range of variability **Moderate –** Means: • Baseline land, resource use and capacity conditions can continue to occur with some reductions or restrictions • Demand for community services and infrastructure approaches current capacity, standard or threshold, however, will not result in a reduction in standards of service • Measurable change, however, not likely to pose a serious risk or benefit to employment and economy **High –** Means: • Baseline land, resource use and capacity conditions cannot take place at similar levels as under baseline conditions • Demand for community services and infrastructure exceeds current capacity, standard or thresholds that result in a reduction in standards of service • Measurable change that is likely to pose a serious risk or benefit to employment and economy
		Current Use and Physical and Cultural Heritage **Negligible –** no measurable change to availability and access to resources, culturally important sites, or the cultural value of sites currently used for traditional purposes **Low –** the residual effect will not reduce the ability to access or use resources and sites for traditional purposes. Current use is able to continue at current levels, with minor alteration of behavior required to continue current traditional practices **Moderate –** the residual effect will reduce the ability to access or use resources and sites for traditional purposes. Current use is able to continue at a reduced level or with some restrictions on current practice and some alteration of behavior to continue current use and traditional practices **High –** the residual effect will substantially diminish or remove the ability to access or use resources and sites for traditional purposes or substantially increase the difficulty and or travel distance to conduct traditional practices. Current use cannot continue or cannot continue without substantial changes to current practices and substantial restriction on ability to engage in current practice and use

Table 15 Characterization of Residual Effects on Indigenous Groups

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Geographic Extent	The geographic area in which a residual effect occurs	**Project Area –** residual effects are restricted to the Project Area **LAA –** residual effects extend into the LAA **RAA –** residual effects interact with those of other projects in the RAA
Timing	Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.	**Not Applicable –** seasonal aspects are unlikely to affect Indigenous groups **Applicable –** seasonal aspects may affect Indigenous groups
Frequency	Identifies how often the residual effect occurs and how often during the Project or in a specific phase	**Single event –** effects occur once **Multiple irregular event –** occurs at no set schedule **Multiple regular event –** occurs at regular intervals **Continuous –** occurs continuously
Duration	The period of time required until the measurable parameter or the VC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived	**Short-term –** residual effect restricted to no more than the duration of the construction phase (18 to 24 months) or decommissioning, rehabilitation and closure phase **Medium-term –** residual effect extends through the operation phase (12 years) **Long-term –** residual effect extends beyond the operation phase (greater than 12 years) **Permanent** - recovery to baseline conditions unlikely
Reversibility	Describes whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible –** the residual effect is likely to be reversed after activity completion and rehabilitation **Irreversible –** the residual effect is unlikely to be reversed
Ecological and Socio-economic Context	Existing condition and trends in the area where residual effects occur	**Undisturbed –** area is relatively undisturbed or not adversely affected by human activity **Disturbed –** area has been substantially previously disturbed by human development or human development is still present **Resilient –** VC is able to assimilate the additional change **Not Resilient –** VC is not able to assimilate the additional change because of having little tolerance to imposed stresses due to fragility or near a threshold

1.8.1 Significance Definition

Under CEAA 2012, there is a requirement to make a determination of significance for residual environmental effects on Indigenous groups. The lack of laws, policies, management plans, or standard industry practice regarding thresholds for effects on the factors that may affect Indigenous groups makes selecting and applying significance thresholds challenging. The subjective nature of describing and understanding the importance of effects on Indigenous health, Indigenous socio-economic conditions, current use, and Indigenous physical and cultural heritage means that selected thresholds might not evenly apply across Indigenous groups and circumstances. Indigenous groups themselves may have differing views on the meaning of significance that reflect oral history traditions and holistic understandings of natural phenomena.

In consideration of the descriptors listed in Table 17.1, the following threshold has been established to define a significant adverse residual effect on Indigenous groups.

For the purposes of this effects assessment, a significant adverse residual effect on Indigenous groups is defined as a Project-related environmental effect that results in one or more of the following:

- Long-term loss of traditional use resources or access to lands relied on for current use practices or current use sites and areas, such that current use is critically reduced or eliminated from the LAA; this could also include substantial disruption to current use activities and practices where biological resources, or physical sites may not be significantly affected in the LAA
- Adverse effects on socio-economic conditions of affected Indigenous groups, such that there are associated detectable and sustained decreases in the quality of life of a community, including for subpopulations within a community, as applicable
- A reduction in the quality of air, water, country foods, or sound at levels predicted to result in exposures that are higher than the health-based guidelines established by regulatory organizations, and are likely to result in a substantive change in human health

1.8.2 Potential Effects, Pathways and Measurable Parameters

The selection of effects included in the assessment for Indigenous groups was based on the Federal EIS Guidelines (Appendix 1A), potential Project interactions, and key issues and concerns identified during the engagement process. It is anticipated that the Project could result in associated effects to Indigenous health through changes in air quality, noise, water quality, and country foods. There is also potential for health and socio-economic effects to Indigenous peoples through lack of availability and/or access to country foods to harvest, or effects to the perceived quality of country foods. Project activities may result in the disruption to physical and cultural heritage from the loss of or change in access to heritage sites and traditional cultural and spiritual sites and areas due to the changes in the environment as a result of the Project. Project activities may not be compatible with current use activities occurring in the area and may result in loss of access to areas currently used for hunting, trapping, fishing and/or gathering. Adverse effects on current use could indirectly lead to changes in health, socio-economic, and well-being conditions, or cultural heritage of affected Indigenous groups.

The assessment of Project-related effects on Indigenous groups therefore focuses on the following potential effects:

- Change in current use
- Change in Indigenous health conditions
- Change in Indigenous socio-economic conditions
- Change in physical and cultural heritage

These potential effects are the primary outcomes which may result from the interaction of Project components and activities with Indigenous land and resource use activities that occur within the Project area or the LAA.

Effect pathways and measurable parameters used in the assessment of these effects are provided in Table 16. Measurable parameters are qualitative or quantitative measurements of potential Project effects and provide means to characterize potential effects to Indigenous groups. Measurable parameters used in qualitative analyses are defined in the absence of metrics or standards to support quantitative analyses.

Table 16 Potential Effects, Effect Pathways and Measurable Parameters for Indigenous Groups

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Current Use	• Project activities causing a change in quantity, quality, and/or availability of harvested species • Project activities altering or restricting access to current use resources or areas • Disturbance of cultural or spiritual sites or areas from Project activities	• Area (ha) of Crown lands taken up by the Project • Change in access to harvesting areas or navigable waters (qualitative) • Change in quantity, quality, or availability of resources and habitat (e.g., mortality or change in migration pattern of culturally significant species) (qualitative) • Change in fishing, hunting or trapping activities (qualitative) • Loss or alteration of trails and travel ways (qualitative) • Loss or alteration of current use harvesting, habitation, and cultural or sacred sites and areas (qualitative) • Indirect effects on the experience of Indigenous peoples which adversely alter the perceived value and cultural importance of current use lands and resources (qualitative)

Table 16 Potential Effects, Effect Pathways and Measurable Parameters for Indigenous Groups

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change in Indigenous Health Conditions	• Project activities causing a change in access to and availability of country foods to harvest • Emissions and discharges from the Project resulting in air, sound, and, water, quality changes, which could affect the health of Indigenous groups through direct exposure (e.g., inhalation of air) and indirect exposure (e.g., ingestion of contaminated food) to contaminants • A reduction in the value and perceived quality of country foods	• Change in hunting, trapping or plant harvesting activities (qualitative) • Concentrations (µg/m^3 in air, µg/L in water) or levels (dBA, %highly annoyed for sound)
Change in Indigenous Socio-Economic Conditions	• Project activities causing a change in revenue for a community, through: – a change in physical access restrictions – a change in species distribution and abundance – creation of sensory disturbance effects (i.e., noise, dust, visual) which can influence the quality of experience (e.g., tourism) – creation of competition from other industries or commercial harvest • Project workforce may increase demand for services that Indigenous peoples use, including fire and police, health • Project-related construction and operation may increase traffic on roadways • Project-related employment and income	• Area (ha) of Crown lands taken up by the Project • Change in commercial hunting or trapping activities (qualitative) • Change in community revenues (qualitative) • Loss of food sources (qualitative) • Sensory disturbance to resource users due to change in sound levels (dBA) and air quality (µg/m³ of particulate matter) • Perceived quality of life and well-being (qualitative) • Project employment estimates (local and non-local workers)

Table 16 Potential Effects, Effect Pathways and Measurable Parameters for Indigenous Groups

Potential Environmental Effect	Effect Pathway	Measurable Parameter(s) and Units of Measurement
Change to Physical and Cultural Heritage	• Project activities causing loss or disturbance to site contents and site contexts through ground disturbance vehicle traffic and use of workspaces during construction activities • Change to values or attributes of cultural and spiritual landscapes or areas that make it important • Indirect effects (i.e., sensory disturbances) on the experience of Indigenous peoples which adversely alter the perceived values of current use sites or areas	• Change to the number or condition of heritage sites • Change to traditional cultural and spiritual landscapes or areas (qualitative) • Note: The experience of Indigenous peoples on the land, cultural identity, opportunities for intergenerational knowledge transmission, and spiritual connections represent intangible values, which are largely subjective and conditional, reflecting beliefs, perceptions, values, and qualitative experience. Given the complexities involved, it is not possible to establish meaningful and applicable measurable parameters or assess intangible values to current assessment conventions. Effects on intangible values, however, are discussed narratively and considered in assessment conclusions.