



8.0 DETERMINATION OF SIGNIFICANCE

8.1 Methodology for Assigning Significance for Residual Effects

Section 13.1 of the EIS Guidelines (CEAA, 2013) describe the elements that should be considered when determining environmental significance under CEAA 2012. These include the following:

-) Magnitude;
-) Geographic extent;
-) Timing and duration;
-) Frequency;
-) Reversibility;
-) Ecological and social context; and
-) Existence of environmental standards, guidelines or objectives for assessing the impact.

The guideline indicates that for those where a significant effect is identified, "...the EIS will set out the probability (likelihood) that they will occur". This is consistent with general environmental assessment practice that conservatively assumes that all potential effects, except those related to accidents, will occur (i.e., they have a likelihood of 1).

Each of these individual elements are described in the following sections, while the approach used for combining the effects are described in Section 6.1.

8.1.1 Magnitude

The three general levels of magnitude used in assessing residual effects are:

-) Level I – No measurable residual effect.
-) Level II – Residual effect is measurable but within range of natural variation
-) Level III – Residual effect is outside range of natural variation

Although these levels of magnitude represent reasonable descriptions of the levels of magnitude, they are not specific to a particular component, VC or indicators. In the Round 1 IRs there were multiple questions related to providing specific levels of magnitude by component or VC (e.g.,



TMI_3-EA(1)-03). To specifically address this IR, and other similar IRs, the following sections describe the levels of magnitude on a component-by-component basis.

8.1.1.1 Terrain and Soils

Section 6.1.3.1 introduced the three VCs used for evaluating the effects of the Project on terrain and soils, namely; natural landscapes, overburden, and soils chemistry. Of these, residual adverse effects were only identified for the natural landscapes VC. Specifically, only the waste rock storage area (WRSA) was considered to represent a residual adverse effects, as this would be the one feature on the site that would be visible from Thunder Lake, to the west of the Project area. In assigning levels of magnitude for the residual adverse effects on natural landscapes, considerations was given to the indicators and measures identified in Section 6.1.3.1, and set out in Table 8.1.1.1-1.

Table 8.1.1.1-1: Indicators and Measures for the Natural Landscapes VC

| Valued Components (VCs) | Indicators | Measures |
|-------------------------|---|---|
| Natural Landscapes | Uniqueness of surface features from surrounding terrain | Are surface features different in shape or appearance from natural features |

The area around the Project is considered to have gently undulating terrain, with elevations ranging between 370 and 430 masl (Appendix M to the EIS). Therefore, tall features, and features with sharply sloping sides could look out of place within the current landscape. For the purposes of assigning levels of magnitude, a feature is considered to be tall if it more than half the variation in the local terrain (i.e., 30 m). A very tall feature would be one that is taller than the variation in the local terrain (i.e., 60 m). The area around the Project is covered with a range of land cover types (see response TMI_145-WL(1)-02), mostly vegetated cover with some small areas of barren rock outcrops. Therefore, features that are vegetated are less likely to appear to stand out from the surrounding areas. Using this information, an approach for assigning the levels of magnitude for natural landscapes was developed, and is provided in Table 8.1.1.1-2.

Table 8.1.1.1-2: Levels of Magnitude for Terrain and Soils

| Valued Components (VCs) | Levels of Magnitude | | |
|-------------------------|--|--|--|
| | Level I | Level II | Level III |
| Natural Landscapes | Feature causing effect:) 30 m above high) not fully vegetated Feature causing effect:) 60 m high) fully vegetated | Feature causing effect:) 30–60 m high) not fully vegetated | Feature causing effect:) > 60 m high |



8.1.1.2 Geology and Geochemistry

As described in Section 6.1.3.2, the assessment of geology and geochemistry considered a single VC, pit lake water quality. The following parameters were used as indicators for the pit lake water quality VC:

- J Aluminum (Al);
- J Antimony (Sb);
- J Arsenic (As);
- J Beryllium (Be);
- J Boron (B);
- J Cadmium (Cd);
- J Chromium (Cr);
- J Cobalt (Co);
- J Copper (Cu);
- J Iron (Fe);
- J Lead (Pb);
- J Mercury (Hg);
- J Molybdenum (Mo);
- J Nickel (Ni);
- J Selenium (Se);
- J Silver (Ag);
- J Thallium (Tl);
- J Uranium (U);
- J Vanadium (V); and
- J Zinc (Zn).

The levels of magnitude for pit lake water quality were determined using regulatory criteria that were developed to provide protections for aquatic life. The specific criteria selected were the Provincial Water Quality Objectives (PWQO) for the protection of aquatic life. These Criteria are provided in Table 8.1.1.2-1.

Table 8.1.1.2-1: Assessment Criteria for Pit Water Quality

| Indicator | Provincial Water Quality Objectives PWQO (mg/L) |
|-----------|--|
| Aluminum | 0.075 |
| Antimony | 0.020 |
| Arsenic | 0.100 |
| Beryllium | 0.011 |
| Boron | 0.200 |
| Cadmium | 0.0002 |
| Chromium | 0.0089 |
| Cobalt | 0.0009 |
| Copper | 0.005 |
| Iron | 0.300 |
| Lead | 0.020 |



Table 8.1.1.2-1: Assessment Criteria for Pit Water Quality (continued)

| Indicator | Provincial Water Quality Objectives PWQO (mg/L) |
|------------|--|
| Mercury | 0.0002 |
| Molybdenum | 0.040 |
| Nickel | 0.025 |
| Selenium | 0.100 |
| Silver | 0.0001 |
| Thallium | 0.0003 |
| Uranium | 0.005 |
| Vanadium | 0.006 |
| Zinc | 0.030 |

As a single PWQO criteria is available for each indicator, only two levels of magnitude were assigned. There was no Level II magnitude assigned for pit lake water quality. The general approach for assigning levels of magnitude is provided below:

-) Level I: predicted effects were less than or equal to assessment criteria;
-) Level II: there was no Level II assigned for the pit water quality VC; and
-) Level III: predicted effects were greater than the assessment criteria.

The levels of magnitude for the various pit lake water quality indicators were establishing using the assessment criteria identified in Table 8.1.1.2-2.

Table 8.1.1.2-2: Levels of Magnitude for Pit Lake Water Quality

| Valued Component | Indicator | Units | Levels of Magnitude | | |
|------------------------|------------|-------|---------------------|----------|------------|
| | | | Level I | Level II | Level III |
| Pit Lake Water Quality | Aluminum | mg/L | PL 0.075 | NC | PL >0.075 |
| | Antimony | mg/L | PL 0.020 | NC | PL >0.020 |
| | Arsenic | mg/L | PL 0.100 | NC | PL >0.100 |
| | Beryllium | mg/L | PL 0.011 | NC | PL >0.011 |
| | Boron | mg/L | PL 0.200 | NC | PL >0.200 |
| | Cadmium | mg/L | PL 0.002 | NC | PL >0.002 |
| | Chromium | mg/L | PL 120 | NC | PL >120 |
| | Cobalt | mg/L | PL 0.0089 | NC | PL >0.0089 |
| | Copper | mg/L | PL 0.0009 | NC | PL >0.0009 |
| | Iron | mg/L | PL 0.005 | NC | PL >0.005 |
| | Lead | mg/L | PL 0.005 | NC | PL >0.005 |
| | Mercury | mg/L | PL 0.300 | NC | PL >0.300 |
| | Molybdenum | mg/L | PL 0.020 | NC | PL >0.020 |
| | Nickel | mg/L | PL 0.0002 | NC | PL >0.0002 |
| | Selenium | mg/L | PL 0.040 | NC | PL >0.040 |
| | Silver | mg/L | PL 0.025 | NC | PL >0.025 |
| Thallium | mg/L | PL 13 | NC | PL >13 | |



Table 8.1.1.2-2: Levels of Magnitude for Pit Lake Water Quality (continued)

| Valued Component | Indicator | Units | Levels of Magnitude | | |
|------------------|-----------|-------|---------------------|----------|------------|
| | | | Level I | Level II | Level III |
| | Uranium | mg/L | PL 0.030 | NC | PL >0.030 |
| | Vanadium | mg/L | PL 0.100 | NC | PL >0.100 |
| | Zinc | mg/L | PL 0.0001 | NC | PL >0.0001 |

Notes:

- (1) In the above table, "PL" represents the pit lake discharge water quality that will discharge to Blackwater Creek
- (2) NC indicates 'no criteria' was assigned to assess magnitude

8.1.1.3 Noise

As described in Section 6.1.3.3, the assessment of noise effects from the Project considers the following four VCs:

-) Ambient noise levels;
-) Noise disturbance to wildlife (including SAR);
-) Blasting noise levels; and
-) Noise related health effects.

To the extent possible, the levels of magnitude for Project noise effects were determined with consideration for established regulatory criteria when possible. The general approach for assigning levels of magnitude were as follows:

-) Level I: predicted noise effects were at, or below, background;
-) Level II: predicted noise effects exceed background but less than established criteria; and
-) Level III: predicted noise effects exceed established criteria.

For the ambient noise VC, the criteria selected were those provided by the Ministry of Environment and Climate Change "Stationary Source" guidelines set out in MOE Publication NPC-300 (Ontario MOE, 2013) for Class 3 areas (rural or recreational). These guidelines state that one-hour sound exposures (A-Weighted hourly L_{EQ} values) from stationary noise shall not exceed that of the background, where the background is defined as the sound level present in the environment produced by noise sources other than those associated with the project under assessment. The MOE Publication NPC-300 sound level limits at the façade (or plane of window) are outlined as follows:

-) The higher of 45 dBA or background noise, during the daytime hours (0700 to 1900h);



-) The higher of 40 dBA or background noise, during the evening hours (1900 to 2300h); and
-) The higher of 40 dBA or background noise, during the night-time hours (2300 to 0700h).

The MOE Publication NPC-300 sound level limits at an outdoor point of reception (POR) are applicable during the daytime and evening hours only. These limits are summarized as follows:

-) The higher of 45 dBA or background sound, during the daytime hours (0700 to 1900h); and
-) The higher of 40 dBA or background sound, during the evening hours (1900 to 2300h).

For simplicity, the most stringent of these criteria (i.e., 40 dBA) were selected for use in assigning magnitude for this VC.

High levels of environmental noise can also affect wildlife, including species at risk (SAR), causing changes in behaviour or avoidance of affected areas, for at least temporary periods of time. For the “noise effects to wildlife” VC, it was necessary to turn to literature to identify suitable criteria for use in the noise assessment. The assessment of effects of the Project on the “noise effects to wildlife” VC focused on determining whether the predicted noise levels were above the identified criteria or not. For understanding how the predicted noise effects to affect wildlife the reader is referred to the information presented in the wildlife and wildlife habitat components in Section 6.12.

One criteria that was considered was the value suggested in the Round 1 IRs, specifically AE-(1)-30. The IR indicates that Environment Canada’s ‘Incidental Take of Migratory Birds in Canada’ website identifies that migratory birds are typically disturbed by sound levels exceeding 50 dBA. Such disturbance could contribute to adverse effects on migratory birds and SAR. However, this is not the only literature relevant to the subject, with recent projects evaluated by CEAA have also considering the subject.

The recent Rainy River Project EIS (newgold, 2013) described the types of effects noise could have on wildlife particularly birds. The most common effect they identified was masking of important communication signals. The EIS went on to indicate that “...sound masking has been shown to occur at sound emissions levels of 50 to 60 dBA (Dooling and Popper 2007)”. A threshold of 50 dBA was used to determining areas that could potentially represent reductions in habitat suitability.

An extensive literature search was also made as part of the recent regulatory process for the Deep Geologic Repository (DGR) project. The findings (OPG, 2013) identified 27 separate publicly available studies and reports dealing with issues related to noise effects on livestock and wildlife, but found that “...species-specific information on the response to increases in background noise for SAR in Ontario was not readily available.” The findings (OPG, 2013) went on to indicate



that “the literature review relied on information regarding species that can be considered comparable to the SAR of interest”. Some other findings include the following:

-) Exposure to constant noise has been documented to lead to habituation even if the levels are high (54 dB);
-) Birds adapt to relatively noisy environments by changing their vocalization (Brumm 2004);
-) Birds can acclimatize to relatively high background noise (54 dB) (GOLDER 2012);
-) Birds are often more disturbed by sporadic activities than continuous noise (GOLDER 2012);
-) American bullfrog have been documented to modify their call structure by altering the call frequency level and increasing call bandwidth (Wilson 2012); and
-) Literature suggest species respond to increased noise through avoidance or habituation.

Based on the above, the criteria selected for evaluating the “noise effects on wildlife” VC was 50 dBA, which is consistent with the value recommended in the Round 1 IRs (AE-(1)-30), and the value used in the Rainy River Project EIS (newgold, 2013). However, the effects of noise on wildlife often relate to displacement. To capture potential displacement, the predicted effects of the Project to the noise effects on wildlife VC, are described using the areal extent with predicted noise levels in excess of the 50 dBA threshold.

In evaluating the effects on the “blasting noise” VC, criteria established by the MOECC were available for use. Guidance for noise from blasting is taken mainly from two publications, NPC-119 (MOE, 1978) and Guidelines on Information Required for the Assessment of Blasting Noise and Vibration (MOE, 1985).

Blasting noise is assessed using the peak sound pressure level measured in linear (un-weighted) decibels (dB). The MOECC publication NPC-119 introduces two limits, the cautionary limit, and the peek pressure level limit. The cautionary limit is 120 dB and can be applied in cases where there is no monitoring of sound levels from blasting. The peek pressure limit is 128 dB, and can only be used when sound level monitoring is conducted during blasting. The cautionary limit of 120 dB is used in defining magnitude of the peak sound pressure level indicator.

Blasting vibration is assessed using the peak particle velocity indicator, measured in cm/s. The MOECC publication NPC-119 limits vibration from blasting to 1.00 cm/s at a sensitive receptor location. This value was used for determining levels of magnitude for the peak particle velocity indicator.

In identifying appropriate criteria for evaluating the “noise related health effects” VC, guidance was taken from Health Canada publications.



The framework for assigning levels of magnitude for noise are set out in Table 8.1.1.3-1.

Table 8.1.1.3-1: Levels of Magnitude for Noise

| Valued Components (VCs) | Indicators | Measures | Levels of Magnitude | | |
|---|-----------------------------------|----------|------------------------------|-----------------------------------|---------------|
| | | | Level I | Level II | Level III |
| Ambient noise | Equivalent noise, L_{EQ} | dBA | $L_{EQ} < \text{background}$ | $\text{background} < L_{EQ} < 45$ | $L_{EQ} > 45$ |
| Noise disturbance to wildlife (including SAR) | Equivalent noise, L_{EQ} | dBA | $L_{EQ} < \text{background}$ | $\text{background} < L_{EQ} < 50$ | $L_{EQ} > 50$ |
| Blasting noise levels | Peak sound pressure, PSP | dB | $PSP = 0$ | $0 < PSP < 120$ | $PSP > 120$ |
| | Peak particle velocity, PPV | cm/s | $PPV = 0$ | $0 < PPV < 1$ | $PPV > 1$ |
| Noise related health effects | Absolute sound pressure, L_{DN} | dBA | $L_{DN} < \text{background}$ | $\text{background} < L_{DN} < 75$ | $L_{DN} > 75$ |
| | Change in percent highly annoyed | in %HA | No change | $0\% < \text{Change} < 6.5\%$ | $> 6.5\%$ |

8.1.1.4 Light

As described in Section 6.1.3.4, the effects of the Project on light were evaluated using a single VC, light trespass. The prediction of the effects of the Project on light trespass were detailed in Section 6.5 where it was demonstrated that there would be no adverse effect of the Project on light. As there were no predicted adverse effects, there will be no residual adverse effects to carry forward for consideration of significance, and no need to establish a framework for assigning magnitude.

8.1.1.5 Air Quality

As described in Section 6.1.3.5, the assessment of air quality effects from the Project considers the following single VC:

-) Air quality.

To the extent possible, the levels of magnitude for Project air quality effects were determined with consideration for established regulatory criteria. The general approach for assigning levels of magnitude were as follows:

-) Level I: predicted air quality effects were indistinguishable from background;
-) Level II: predicted air quality effects were above background values, but less than or equal to the assessment criteria; and
-) Level III: predicted air quality effects exceed the assessment criteria.



Section 4 of the Environmental Air Quality Assessment (RWDI, 2014e) identifies that the following regulatory criteria were considered when identifying the assessment criteria used when assigning the levels of magnitude for air quality:

-) Canadian Ambient Air Quality Standards (CAAQS);
-) National Ambient Air Quality Objectives (NAAQO); and
-) Ontario Ambient Air Quality Criteria (AAQC).

In selecting the assessment criteria used for assigning the levels of magnitude for air quality, the most stringent of the available regulatory criteria were chosen (Section 4.4 of the Environmental Air Quality Assessment [RWDI, 2014e]). The available criteria are listed in Table 8.1.1.5-1, with the relevant criteria selected as the assessment criteria highlighted in the table. These include the following:

-) **AAQC:** TSP (24-hour, annual), PM₁₀ (24-hour), dustfall (30-day, annual), NO₂ (1-hour, 24-hour), airborne metals (24-hour)
-) **CAAQS:** PM_{2.5} (24-hour, annual); and
-) **NAAQS:** SO₂ (1-hour, 24-hour, annual) CO (1-hour, 8-hour), TSP (24-hour, annual), NO₂ (1-hour, 24-hour).

Table 8.1.1.5-1: Criteria Considered in Evaluating Effects for Air Quality

| Compound | Averaging Period | Federal Ambient Air Quality Objectives | | | Canadian Ambient Air Quality Standards | Ontario Ambient Air Quality Objectives | Assessment Criteria |
|-------------------------|-----------------------|--|------------|-----------|--|--|---------------------|
| | | Desirable | Acceptable | Tolerable | | | |
| TSP | 24-hour | — | 120 | 400 | — | 120 | 120 |
| | Annual | 60 | 70 | — | — | 60 | 60 |
| PM ₁₀ | 24-hour | — | — | — | — | 50 | 50 |
| | Annual | — | — | — | 28, 27 ⁽¹⁾ | — | 27 |
| PM _{2.5} | 24-hour | — | — | — | — | — | — |
| | Annual | — | — | — | 10, 8.8 ⁽¹⁾ | — | 8.8 |
| Dustfall ⁽²⁾ | 30 day | — | — | — | — | 7 | 7 |
| | Annual | — | — | — | — | 4.6 | 4.6 |
| CO | 1-hour | 15,000 | 35,000 | — | — | 36,200 | 15,000 |
| | 8-hour ⁽⁴⁾ | 6,000 | 15,000 | 20,000 | — | 15,700 | 6,000 |
| NO ₂ | 1-hour | — | 400 | 1000 | — | 400 | 400 |
| | 24-hour | — | 200 | 300 | — | 200 | 200 |
| SO ₂ | 1-hour | 450 | 900 | — | — | 690 | 450 |
| | 24-hour | 150 | 300 | 800 | — | 275 | 150 |
| | Annual | 30 | 60 | — | — | 55 | 30 |
| Arsenic | 24-hour | — | — | — | — | 0.3 | 0.3 |
| Barium | 24-hour | — | — | — | — | 10 | 10 |
| Beryllium | 24-hour | — | — | — | — | 0.1 | 0.1 |



Table 8.1.1.5-1: Criteria Considered in Evaluating Effects for Air Quality (continued)

| Compound | Averaging Period | Federal Ambient Air Quality Objectives | | | Canadian Ambient Air Quality Standards | Ontario Ambient Air Quality Objectives | Assessment Criteria |
|-------------|------------------|--|------------|-----------|--|--|---------------------|
| | | Desirable | Acceptable | Tolerable | | | |
| Cadmium | 24-hour | — | — | — | — | 0.025 | 0.025 |
| Chromium | 24-hour | — | — | — | — | 0.1 | 0.1 |
| Cobalt | 24-hour | — | — | — | — | 0.5 | 0.5 |
| Lead | 24-hour | — | — | — | — | 0.5 | 0.5 |
| Manganese | 24-hour | — | — | — | — | 0.4 | 0.4 |
| Nickel | 24-hour | — | — | — | — | 0.2 | 0.2 |
| | Annual | — | — | — | — | 0.04 | 0.04 |
| Phosphorous | 24-hour | — | — | — | — | 0.35 ⁽²⁾ | 0.35 |
| Platinum | 24-hour | — | — | — | — | 0.03 | 0.03 |
| Rhodium | 24-hour | — | — | — | — | 2 | 2 |
| Thallium | 24-hour | — | — | — | — | 0.4 ⁽²⁾ | 0.4 |
| Titanium | 24-hour | — | — | — | — | 0.2 | 0.2 |
| Uranium | 24-hour | — | — | — | — | 0.3 | 0.3 |
| | Annual | — | — | — | — | 0.06 | 0.06 |
| Vanadium | 24-hour | — | — | — | — | 0.24 | 0.24 |

Notes:

- (1) The Canadian Ambient Air Quality Standards for PM_{2.5} will be reduced to 27 (24-hour) and 8.8 (annual) after 2020. For the purposes of assessing air quality effects, the more stringent levels were used as the assessment criteria.
- (2) These values correspond with the Jurisdictional Screening Level (JSL) values.

The levels of magnitude for the various air quality indicators were established using the assessment criteria identified in Table 8.1.1.5-1. Table 8.1.1.5-2 sets out these levels of magnitude for each of the air quality indicators and averaging periods. These were applied to the maximum predictions at the sensitive receptor locations (Section 6.6), which correspond to the “community-oriented locations” identified by CCME (2000) as the location where ambient air regulations should be applied.

Table 8.1.1.5-2: Levels of Magnitude for Air Quality

| Valued Component | Indicator (averaging period) | Measure | Levels of Magnitude | | |
|------------------|------------------------------|---|----------------------|------------------|------------|
| | | | Level I | Level II | Level III |
| Air Quality | TSP (24-hour) | µg/m ³ | P ⁽¹⁾ 33 | 33 < P 120 | 120 < P |
| | TSP (annual) | µg/m ³ | P 14 | 14 < P 60 | 60 < P |
| | PM ₁₀ (24-hour) | µg/m ³ | P 15 | 15 < P 50 | 50 < P |
| | PM _{2.5} (24-hour) | µg/m ³ | P 10 | 10 < P 27 | 27 < P |
| | PM _{2.5} (annual) | µg/m ³ | P 4.3 | 4.3 < P 8.8 | 8.8 < P |
| | Dustfall (30 day) | g/m ² /30-day ⁽²⁾ | P = 0 ⁽³⁾ | 0 < P 7.0 | 7.0 < P |
| | Dustfall (annual) | g/m ² /30-day ⁽²⁾ | P = 0 | 0 < P 4.6 | 4.6 < P |
| | CO (1-hour) | µg/m ³ | P 1,248.0 | 1,248 < P 15,000 | 15,000 < P |
| | CO (8-hour) | µg/m ³ | P 1,248.0 | 1,248 < P 6,000 | 6,000 < P |
| | NO ₂ (1-hour) | µg/m ³ | P 33 | 33 < P 400 | 400 < P |
| | NO ₂ (24-hour) | µg/m ³ | P 33 | 33 < P 200 | 200 < P |
| | SO ₂ (1-hour) | µg/m ³ | P 4 | 4 < P 450 | 450 < P |
| | SO ₂ (24-hour) | µg/m ³ | P 4 | 4 < P 150 | 150 < P |
| | SO ₂ (annual) | µg/m ³ | P 1 | 1 < P 30 | 30 < P |



Table 8.1.1.5-2: Levels of Magnitude for Air Quality (continued)

| Valued Component | Indicator (averaging period) | Measure | Levels of Magnitude | | |
|------------------|------------------------------|-------------------|---------------------|-----------------|-----------|
| | | | Level I | Level II | Level III |
| | Arsenic (24-hour) | µg/m ³ | P 0.005 | 0.005 < P 0.300 | 0.300 < P |
| | Barium (24-hour) | µg/m ³ | P = 0 | 0 < P 10 | 10 < P |
| | Beryllium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.100 | 0.100 < P |
| | Cadmium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.025 | 0.025 < P |
| | Chromium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.100 | 0.100 < P |
| | Cobalt (24-hour) | µg/m ³ | P = 0 | 0 < P 0.500 | 0.500 < P |
| | Lead (24-hour) | µg/m ³ | P 0.005 | 0.005 < P 0.500 | 0.500 < P |
| | Manganese (24-hour) | µg/m ³ | P 0.019 | 0.019 < P 0.400 | 0.400 < P |
| | Nickel (24-hour) | µg/m ³ | P = 0 | 0 < P 0.2 | 0.2 < P |
| | Nickel (annual) | µg/m ³ | P = 0 | 0 < P 0.04 | 0.04 < P |
| | Phosphorous (24-hour) | µg/m ³ | P = 0 | 0 < P 0.350 | 0.350 < P |
| | Platinum (24-hour) | µg/m ³ | P = 0 | 0 < P 0.030 | 0.030 < P |
| | Rhodium (24-hour) | µg/m ³ | P = 0 | 0 < P 2 | 2.000 < P |
| | Thallium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.400 | 0.400 < P |
| | Titanium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.200 | 0.200 < P |
| | Uranium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.3 | 0.3 < P |
| | Uranium (annual) | µg/m ³ | P = 0 | 0 < P 0.06 | 0.06 < P |
| | Vanadium (24-hour) | µg/m ³ | P = 0 | 0 < P 0.240 | 0.240 < P |

Notes:

- (1) In the above table, "P" represents the maximum cumulative prediction at the sensitive receptor locations.
- (2) The measure for both dustfall (30-day) and dustfall (annual) is g/m²/30 days. In the case of dustfall (annual) the values are averaged over the period of 1 year.
- (3) Where no background value was available, a value of zero (0) was assumed.

8.1.1.6 Climate

Section 6.1.3.5 describes the two VCs used for evaluating the effects of the Project on climate, namely; Project GHG emissions, and changes in climate due to the Project. Residual adverse effects were identified for the Project GHG emissions VC in Section 6.7.7. There were no residual adverse effects for the changes in climate due to the Project VC. In defining the levels of magnitude for the Project GHG emissions, consideration was given to the established regulatory frameworks for managing GHG emissions in Ontario, specifically, Ontario Cap and Trade Program (O.Reg. 144/16). Under those regulations, two thresholds are established on the basis of the annual GHG emissions. Facilities that emit more than 10,000 tonnes annually (t/y) of equivalent carbon dioxide (eCO₂) exceed the reporting limit under the regulation. Facilities that will emit more than 25,000 t/y of eCO₂ considered a "large emitter of GHGs". Table 8.1.1.6-1 lists the approach for assigning levels of magnitude for Project GHG emissions.

Table 8.1.1.6-1: Levels of Magnitude for Climate

| Valued Components (VCs) | Levels of Magnitude | | |
|-------------------------|-------------------------------|------------------------------------|----------------------------------|
| | Level I | Level II | Level III |
| Project GHG emissions | < 10,000 t/y eCO ₂ | 10,000–25,000 t/y eCO ₂ | > 25,000 t/y of eCO ₂ |



8.1.1.7 Surface Water Quality

As described in Section 6.1.3.7, the assessment of surface water quality effects from the Project considers surface water quality as the single VC. The following parameters were used as indicators for the surface water quality VC:

- | | |
|-------------------|-------------------------------|
|) Aluminum (Al); |) Lead (Pb); |
|) Antimony (Sb); |) Mercury (Hg); |
|) Arsenic (As); |) Molybdenum (Mo); |
|) Beryllium (Be); |) Nickel (Ni); |
|) Boron (B); |) Nitrate (NO ₃); |
|) Cadmium (Cd); |) Phosphorus (P); |
|) Chloride (Cl); |) Selenium (Se); |
|) Chromium (Cr); |) Silver (Ag); |
|) Cobalt (Co); |) Thallium (Tl); |
|) Copper (Cu); |) Uranium (U); |
|) Cyanide (CN); |) Vanadium (V); and |
|) Iron (Fe); |) Zinc (Zn). |

The levels of magnitude for surface water quality effects of the Project were determined with consideration for established regulatory criteria for the protection of aquatic life. The selection of assessment criteria Provincial Water Quality Objectives (PWQO) for the protection of aquatic life. In the case of indicators where no PWQO were available (i.e., chloride and nitrate), the Canadian Water Quality Guidelines (CWQG) were used as the assessment criteria.

The assessment criteria for evaluating effects on surface water quality are provided in Table 8.1.1.7-1.

Table 8.1.1.7-1: Criteria Considered in Evaluating Effects for Surface Water Quality

| Indicator | PWQO (mg/L) | CWQG (mg/L) | Assessment Criteria (mg/L) |
|-------------------------|-------------|-------------|----------------------------|
| Aluminum | 0.075 | — | 0.075 |
| Antimony | 0.020 | — | 0.020 |
| Arsenic | 0.100 | — | 0.100 |
| Beryllium | 0.011 | — | 0.011 |
| Boron | 0.200 | — | 0.200 |
| Cadmium | 0.0002 | — | 0.0002 |
| Chloride ⁽¹⁾ | — | 120 | 120 |



Table 8.1.1.7-1: Criteria Considered in Evaluating Effects for Surface Water Quality (continued)

| Indicator | PWQO (mg/L) | CWQG (mg/L) | Assessment Criteria (mg/L) |
|------------------------|-------------|-------------|----------------------------|
| Chromium | 0.0089 | — | 0.0089 |
| Cobalt | 0.0009 | — | 0.0009 |
| Copper | 0.005 | — | 0.005 |
| Cyanide | 0.005 | — | 0.005 |
| Iron | 0.300 | — | 0.300 |
| Lead | 0.020 | — | 0.020 |
| Mercury | 0.0002 | — | 0.0002 |
| Molybdenum | 0.040 | — | 0.040 |
| Nickel | 0.025 | — | 0.025 |
| Nitrate ⁽¹⁾ | — | 13 | 13 |
| Phosphorus | 0.030 | — | 0.030 |
| Selenium | 0.100 | — | 0.100 |
| Silver | 0.0001 | — | 0.0001 |
| Thallium | 0.0003 | — | 0.0003 |
| Uranium | 0.005 | — | 0.005 |
| Vanadium | 0.006 | — | 0.006 |
| Zinc | 0.030 | — | 0.030 |

Notes: ⁽¹⁾ No PWQO criteria for chloride and nitrate. These parameters were evaluated against CWQG

As a single criteria is available for each parameter, only two levels of magnitude were assigned. There were no Level II magnitudes used for surface water quality. The general approach for assigning levels of magnitude were as follows:

-) Level I: predicted effects were greater than existing conditions but less than relevant criteria;
-) Level II: there was no Level II assigned for the surface water quality VC; and
-) Level III: predicted effects were greater than the relevant criteria.

The levels of magnitude for the various surface water quality indicators were established using the assessment criteria identified in Table 8.1.1.7-2.

Table 8.1.1.7-2: Levels of Magnitude for Surface Water Quality

| Valued Component | Indicator | Units | Levels of Magnitude | | |
|-----------------------|-----------|--------------|---------------------|------------|------------|
| | | | Level I | Level II | Level III |
| Surface water quality | Aluminum | mg/L | E < P 0.075 | NC | P > 0.075 |
| | Antimony | mg/L | E < P 0.020 | NC | P > 0.020 |
| | Arsenic | mg/L | E < P 0.100 | NC | P > 0.100 |
| | Beryllium | mg/L | E < P 0.011 | NC | P > 0.011 |
| | Boron | mg/L | E < P 0.200 | NC | P > 0.200 |
| | Cadmium | mg/L | E < P 0.002 | NC | P > 0.002 |
| | Chloride | mg/L | E < P 120 | NC | P > 120 |
| | Chromium | mg/L | E < P 0.0089 | NC | P > 0.0089 |
| Cobalt | mg/L | E < P 0.0009 | NC | P > 0.0009 | |



Table 8.1.1.7-2: Levels of Magnitude for Surface Water Quality (continued)

| Valued Component | Indicator | Units | Levels of Magnitude | | |
|------------------|------------|-------|---------------------|----------|------------|
| | | | Level I | Level II | Level III |
| | Copper | mg/L | E < P 0.005 | NC | P > 0.005 |
| | Cyanide | mg/L | E < P 0.005 | NC | P > 0.005 |
| | Iron | mg/L | E < P 0.300 | NC | P > 0.300 |
| | Lead | mg/L | E < P 0.020 | NC | P > 0.020 |
| | Mercury | mg/L | E < P 0.0002 | NC | P > 0.0002 |
| | Molybdenum | mg/L | E < P 0.040 | NC | P > 0.040 |
| | Nickel | mg/L | E < P 0.025 | NC | P > 0.025 |
| | Nitrate | mg/L | E < P 13 | NC | P > 13 |
| | Phosphorus | mg/L | E < P 030 | NC | P > 0.030 |
| | Selenium | mg/L | E < P 0100 | NC | P > 0.100 |
| | Silver | mg/L | E < P 0.0001 | NC | P > 0.0001 |
| | Thallium | mg/L | E < P 0.0003 | NC | P > 0.0003 |
| | Uranium | mg/L | E < P 0.005 | NC | P > 0.005 |
| | Vanadium | mg/L | E < P 0.006 | NC | P > 0.006 |
| | Zinc | mg/L | E < P 0.030 | NC | P > 0.030 |

Notes:

- (1) In the above table, "P" represents the surface water quality prediction at a location (i.e., node) modelled in the receiving environment
- (2) E indicates existing surface water quality in the receiving environment
- (3) NC indicates 'no criteria' was assigned to assess magnitude

8.1.1.8 Surface Water Quantity

Residual adverse effects of the Project on surface water quantity were predicted for two of the three indicators used for evaluating the effects of the Project (Section 6.1.3.8), specifically increase in surface water flows and decrease in surface water flows. No residual adverse effects were predicted for the change in lake levels indicator. Table 8.1.1.8-1 lists the approach for assigning levels of magnitude for the VC surface water quantity.

Table 8.1.1.8-1: Levels of Magnitude for Surface Water Quantity

| Valued Components (VCs) | Indicator | Levels of Magnitude | | |
|-------------------------|---------------------------------|-----------------------------|---------------------------------------|------------------------------|
| | | Level I | Level II | Level III |
| Surface water quantity | Increase in surface water flows | 15% change in annual flows | > 15% and 30% change in annual flows | >30% change in annual flows |
| | Decrease in surface water flows | 15% change in monthly flows | > 15% and 25% change in monthly flows | >25% change in monthly flows |

The levels of magnitude for evaluating surface water quantity effects of the Project were determined with consideration for the hydrology of the Project and did not consider the effects of aquatic habitat which would be captured in Section 8.1.1.14 for the assignment of magnitude with for wetlands and vegetation.



8.1.1.9 Groundwater Quality

As described in Section 6.1.3.9, a single VC, groundwater quality, was used for evaluating the effects on groundwater quality. As described in Section 6.10.7, there were no residual adverse effects predicted for groundwater quality, when all of the mitigation measures associated with the Project are considered. As there were no predicted residual adverse effects to carry forward for consideration of significance, and no need to establish a framework for assigning magnitude.

8.1.1.10 Groundwater Quantity

As described in Section 6.1.3.10, the potential effects of the Project on the groundwater quantity VC considered two indicators, namely; decreasing elevations in private water well, and decreasing contribution to surface flows patterns. As described in Section 6.11.7, there were no residual adverse effects predicted for decreasing elevations in private water wells once the planned mitigation is considered. The potential effects predicted for private water wells can be fully mitigated by deepening those wells, where appropriate Treasury Metals will be required to provide sureties to the government as part of the permitting process to provide for mitigation to water wells that may be affected. A residual adverse effects was predicted for decreasing contributions to surface water flows in the watershed for Thunder Lake Tributary 2 and Thunder Lake Tributary 3. These effects remain even after the consideration of mitigation measures. Table 8.1.1.10-1 lists the approach used for assigning the levels of magnitude for the decreases in surface flows resulting from changes in groundwater quantity. The thresholds are comparable to the values used for evaluating the decreases in surface water quantity (Section 8.1.1.8), but rely on decreases in the annual average flows as the groundwater modelling used does not provide results with monthly resolution.

Table 8.1.1.10-1: Levels of Magnitude for Groundwater Quantity

| Valued Components (VCs) | Indicator | Levels of Magnitude | | |
|-------------------------|---|------------------------------|-------------------------------------|------------------------------|
| | | Level I | Level II | Level III |
| Groundwater quantity | Decreasing contributions to surface flow patterns | <10% change in monthly flows | 10% and 25% change in monthly flows | >25% change in monthly flows |

8.1.1.11 Wildlife and Wildlife Habitat

As described in Section 6.1.3.11, the effects of the Project on wildlife and wildlife habitat were described using eight valued components (VCs), namely; Wildlife Species at Risk, Ungulates, Furbearers, Upland Birds, Wetland Birds, Small Mammals, Reptiles and Amphibians, and Invertebrates. In order to assign a level of magnitude to the residual adverse wildlife and wildlife habitat effects, the total area of the habitat removed or altered/disrupted was compared to the amount of habitat available throughout the wildlife LSA. A comparison to the RSA was not conducted for most species, as the percentages of habitat lost or altered/disrupted would be negligible at that scale. The one exception to this was the ungulate VC. Moose utilize habitat at a



landscape scale, as opposed to the other species used as indicators, who utilize habitat at the stand level or smaller. Therefore, affected moose habitat was compared to moose habitat in the RSA. A loss of 10% was classified as a Level I because the boreal forest is constantly undergoing changes due to succession, wildfire and other natural disturbances. Therefore, a change in habitat of 10 % at the LSA scale would be well within the natural range of variation. Greater than 25% loss of habitat was ranked as Level III because habitat loss of that magnitude at the LSA scale would be outside the natural range of variation and could have serious implications for species at that scale. A loss of habitat between these two levels was classified as Level II, as it would be approaching the upper end of the natural range of variation in habitat availability. The levels of magnitude are set out in Table 8.1.1.11-1.

Table 8.1.1.11-1: Levels of Magnitude for Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Levels of Magnitude (as a % of the potential habitat) | | |
|--------------------------|-------------------------------------|--|-------------------|-------------|
| | | Level I | Level II | Level III |
| Wildlife Species at Risk | Common Nighthawk | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| | Northern Myotis/Little Brown Myotis | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| | Barn Swallow | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Ungulates | Moose | <10% in RSA | 10% to 25% in RSA | >25% in RA |
| Furbearers | American Marten | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Upland Birds | Upland Birds | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Wetland Birds | Marsh Birds | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Swamp | Small Mammals | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Reptiles and Amphibians | Reptiles and amphibians | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Invertebrates | Invertebrates | <10% in LSA | 10% to 25% in LSA | >25% in LSA |

8.1.1.12 Migratory Birds

As described in Section 6.1.3.12, the effects of the Project on migratory birds were described using two valued components (VCs), namely Upland Birds and Wetland Birds. In order to assign a level of magnitude to the residual adverse migratory bird effects, the total area of the habitat removed or altered/disrupted was compared to the amount of habitat available throughout the wildlife LSA. A comparison to the RSA was not conducted, as the percentages of habitat lost or altered/disrupted would be negligible at that scale. A loss of 10% was classified as a Level I because the boreal forest is constantly undergoing changes due to succession, wildfire and other natural disturbances. Therefore, a change in habitat of 10 % at the LSA scale would be well within the natural range of variation. Greater than 25% loss of habitat was ranked as Level III because habitat loss of that magnitude at the LSA scale would be outside the natural range of variation and could have serious implications for species at that scale. A loss of habitat between these two levels was classified as Level II, as it would be approaching the upper end of the natural range of variation in habitat availability. The levels of magnitude are set out in Table 8.1.1.12-1.



Table 8.1.1.12-1: Levels of Magnitude for Migratory Birds

| Valued Components (VCs) | Indicators | Levels of Magnitude (as a % of the potential habitat) | | |
|-------------------------|--------------|---|-------------------|-------------|
| | | Level I | Level II | Level III |
| Upland Birds | Upland Birds | <10% in LSA | 10% to 25% in LSA | >25% in LSA |
| Wetland Birds | Marsh Birds | <10% in LSA | 10% to 25% in LSA | >25% in LSA |

8.1.1.13 Fish and Fish Habitat

As described in Section 6.1.3.13, the assessment of surface water quality effects from the Project considers four fish and fish habitat VCs which are stream-resident fish, lake-resident fish, migratory fish and fish species-at-risk. There are no at-risk fish species present in the RSA so there will be no effects on them. There are no predicted effects on lake-resident fish. Losses of habitat and alteration of habitat for stream-resident and migratory fish will be mitigated by offsetting that will be required under the *Fisheries Act*. Therefore, as indicated in Table 6.14.9-1 the only residual effect on fish and fish habitat is mortality of stream-resident fish. The principle applied to determine the levels for mortality relate to the ability of populations to recover to in a reasonable period of time (i.e., 10 years) to previous levels and thus vary among species.

The stream-resident fish communities in the watercourses where mortality will occur are primarily short-lived, small-bodied species such as Northern Redbelly Dace, Finescale Dace, Brook Stickleback and Pearl Dace. Significant portions of these populations die each year of natural causes that include age and predation. These species mature at an early age and most can produce multiple broods of offspring in a year - traits that allow their populations to rapidly increase in numbers after significant mortality or when new habitat becomes available (for example when a beaver dam is built). For the stream-resident fish populations in Blackwater Creek Tributary 1 and Tributary 2, where fish mortality will occur, the levels of magnitude for mortality stream-resident fish were as follows.

-) Level I: mortality rate of stream-resident fish is 90% or less;
-) Level II: mortality rate of stream-resident fish is more than 90% and less than 100%; and
-) Level III: the mortality rate of stream-resident fish is 100%.

For migratory fishes such as White Sucker the levels for fish mortality would be lower. Migratory White Sucker mature at 3 to 4 years of age and can have a maximum age of over 30 years (C. Portt, personal observation). Consequently the levels of migratory fish are lower than for the stream-resident species. For migratory fish populations the levels of magnitude for mortality were as follows.

-) Level I: mortality rates of migratory fish is 10% or less;



-) Level II: mortality rate of migratory fish is more than 10% and less than 25%; and
-) Level III: the mortality rate of migratory fish is 25% or greater.

Many lake-resident fishes are similar to migratory White Sucker in terms of age at maturity and life-span. Therefore, for lake-resident fish populations the levels of magnitude for mortality were the same as for migratory fish populations.

For species-at-risk, the levels for mortality may be quite low, depending on the species life-history and whether or not mortality is contributing to the at-risk status. For those species, the levels would often be assessed using a population model. As there are no fish species-at-risk affected by the project no levels are provided.

8.1.1.14 Wetlands and Vegetation

As described in Section 6.1.3.14, wetlands and vegetation communities valued components that could be impacted by the Project were identified as follows: Wetlands, and vegetation species at risk. In order to assign a level of magnitude to assess residual effects, the total area of wetlands, and habitat for vegetation species at risk (Floating Marsh Marigold) removed or degraded was compared to the amount of wetlands and habitat available throughout the LSA. A comparison to the RSA was not conducted for these VCs, due to the fact that the percentage of habitat lost or degraded would be negligible at that scale. A loss of 1.0% was classified as a Level I as wetlands within the boreal forest tend to undergo alterations only over very long time periods (100's to 1000's of years). Therefore, a change in habitat of 1.0 % at the LSA scale would be within the natural range of variation. Greater than 3.0% loss of habitat was ranked as Level III because habitat loss of that magnitude at the LSA scale would be outside the natural range of variation, even over long time periods and could have serious implications for the ecosystem. A loss of habitat between these two levels was classified as Level II, as it would be approaching the upper end of the natural range of variation. The levels of magnitude are set out in Table 8.1.1.11-1.

-) Level 1 – Loss, of <1.0% of wetlands within the LSA;
-) Level II – Loss, of >1.0% to 3.0% of wetlands within the LSA; and
-) Level III – Loss, of >3.0% of potential habitat within the LSA.

8.1.1.15 Land Use

Land and Resource Use valued components that could be impacted by the Project are land use plans and policies, aggregate operations, forestry, mineral exploration, fishing, hunting, trapping, cottagers and outfitters, and recreation. The Project could be in conflict with existing land use plans or policies or the Project could reduce the size of a resource, restrict access to a resource, or change the experience associated with a resource. The levels of magnitude of impacts on Land and Resource Use valued components are defined as:



-) Level 1 – The Project does not conflict with land use plans and does not overlap with or restrict access to other resources;
-) Level II – The Project overlaps with other uses but does not impede the ability to use those other resources. If the overlap is quantifiable, there would be a 5% to 25% overlap; and
-) Level III – The Project conflicts with land use plans or overlaps another resource and limits the ability to use that resource. If quantifiable, there would be an overlap of more than 25%.

8.1.1.16 Social

As described in Section 6.1.3.16, the assessment of potential Project-related social effects considers the following VCs:

-) Population demographics;
-) Education;
-) Infrastructure and services;
-) Housing and property values;
-) Public safety; and
-) Transportation and traffic.

The general approach to assigning levels of magnitude used to assess residual social effects are:

-) Level I – No noticeable change; effects are within the normal range of variability and are manageable within the existing social environment;
-) Level II – Noticeable change that can be managed by existing resources and/or through reasonable investments by communities or governments; and
-) Level III – Noticeable change that cannot be managed by existing resources and will result in a strain on existing services to the extent that interventions, including investments, would be required to meet Project demands.

8.1.1.17 Economic

The Project could affect the economic valued components through the creation of jobs and the purchase of goods and services. Impacts could be observed in changes to the labour participation



and employment, income, cost of living, real estate, economic development, existing business and government revenues. The levels of magnitude for Economic valued components are:

-) Level I – No noticeable change; effects are within the normal range of variability and are manageable;
-) Level II – Noticeable change that does not pose a risk to the valued component or does not create a management challenge using existing resources; and
-) Level III – Effect that poses a serious risk to the valued component or represents a management challenge.

8.1.1.18 Human Health

As described in Section 6.1.3.18, the effects of the Project on human health were evaluated using human health as the single VC. The predicted effects of the Project on human health were presented in Section 6.19.4. As described in Sections 6.17.6, there are no predicted adverse effects of the Project on human health. As there were no residual adverse effects predicted to carry forward for consideration of significance, there is no requirement to establish a framework for assigning magnitude.

8.1.1.19 Heritage Resources

As described in Section 6.1.3.19, the effects of the Project on heritage resources were evaluated using two VCs, namely; archaeological sites, and historic heritage sites. The prediction of the effects of the Project on the heritage resources VCs was described in Section 6.20.4. The mitigation for heritage resources were described in Section 6.20.5, and the residual effects described in Section 6.20.6. There were no residual adverse effects predicted to carry forward for consideration of significance, and therefore no requirement to establish a framework for assigning magnitude.

8.1.1.20 Aboriginal Peoples

Project effects on Aboriginal Peoples are the result of changes in the quantity or quality of a resource gathered for use, change in access to an area traditionally used, changes in the socio-economic environment due to Project spending and in-migration of Project workers and the associated demands on community resources. The valued components that can be impacted are human health, use of resources for traditional practices (plant gathering, hunting, trapping, fishing, and cultural activities), and social and economic conditions. The levels of magnitude for impacts on Aboriginal Peoples are:

-) Level 1 – Project does not impact or overlap with traditionally-used resources and has no or low level socio-economic effects that are within the normal range of variability



-) Level II - The Project impacts or overlaps with traditionally-used resources but does not impede the ability to use those resources or a socio-economic change that can be managed with existing resources; and
-) Level III - The Project impacts or overlaps traditionally-used resources and limits the ability to use that resource or a socio-economic change that cannot be managed with existing resources.

8.1.2 Geographic Extent

The three general levels of geographic extent used in assessing residual effects are:

-) Level I – Residual effect restricted to Project footprint;
-) Level II – Residual effect extends into LSA; and
-) Level III – Residual effect extends into RSA.

The above geographic extents make reference to the LSA and RSA, which may vary by component or VC. Therefore, this approach to assigning geographic extent is consistent with the Round 1 questions related to providing specific special extents by component or VC (e.g., TMI_3-EA(1)-03). Description of the study areas used in provided in Section 6.1.4. The following common levels of magnitude will be used for all components:

-) Level I – Residual effects are restricted to Project Site;
-) Level II – Residual effect are restricted to the LSA for the component or VC; and
-) Level III – Residual effect extends into the RSA for the component or VC.

8.1.3 Timing

The original EIS for the Project did not explicitly consider timing when evaluating the significance of the effects of the Project. According to the Agency (CEAA, 2015b) timing should be considered “...when it is important in the evaluation of the environmental effect (e.g., when the environmental effect could occur during breeding season, or during a period of species migration through the area). It may also be relevant to discuss variation in timing of project activities, such as reservoir level fluctuations, and how that may cause varying environmental effects.” How timing has been established for the various components is described below.



8.1.3.1 Terrain and Soils

A single residual adverse effect was predicted for terrain and soils. This effects was for the natural landscapes VC, and related to the waste rock storage area (WRSA). The WRSA will be constructed as part of the mining activities during the construction phase. Although portions of the WRSA will be re-vegetated during operations, and the entire WRSA will be remediated during closure, the WRSA will remain as a permanent feature on the landscape. Therefore, timing of the effects will conservatively be assigned a timing as Level III.

8.1.3.2 Geology and Geochemistry

A residual adverse effect for geology and geochemistry was predicted to occur as a result of the formation of the pit lake, with the flooding of the open pit following closure. During the post-closure phase, the pit lake will be allowed to passively drain through a spillway into Blackwater Creek. Since Treasury Metals will not be actively managing the pit lake discharge during this phase, the assessment has conservatively assumed to have a timing of Level III.

8.1.3.3 Noise

The assessment of potential noise effects of the Project generally focused on the predicted effects at sensitive receptor locations, as defined by the MOECC. The identified sensitive noise receptors correspond, for the most part, to residential structures. For such locations, timing will be tied to the time of day, and correspond to the time periods used by MOECC, as shown in Table 8.1.3.3-1.

Table 8.1.3.3-1: Levels of Timing for Noise

| Description | Time Period | Timing Level |
|------------------|----------------|--------------|
| Daytime hours | 07:00 to 19:00 | Level I |
| Evening hours | 19:00 to 23:00 | Level II |
| Night-time hours | 23:00 to 07:00 | Level III |

For certain VCs related to noise (e.g., noise disturbance to wildlife), the above levels of timing would not be relevant. However, assigning significance to this VC has been deferred to the evaluation of effects of the Project on wildlife (Section 6.12) and the determination of significance of residual adverse effects to wildlife (Section 8.12). Similarly, concerns about the potential timing of blasting vibration and its potential to affect spawning shoals for fish are addressed in the effects assessment for fish (Section 6.13) and the significance determination for fish (Section 8.13).

8.1.3.4 Light

As there were no predicted residual adverse effects of the Project on light, there is no need to establish a framework for assigning timing.



8.1.3.5 Air Quality

The assessment of potential air quality effect of the Project made use of AERMOD dispersion model identified as the preferred dispersion model in Ontario by MOECC for assessing air quality effects. The model was run using 5 years of hourly dispersion meteorological data provided for use in the region of the Project by the MOECC. The effects assessment made use of the maximum predicted values from the model for the various averaging periods considered (i.e., 1-hour, 8-hour, 24-hour, 30-day, annual). Because the maximum concentrations were used, regardless of the time of day (in the case of the 1-hour and 8-hour predictions), or the time of year, the element of timing does not get considered. Although air quality effects are likely to be most noticeable during the daylight hours on the warmer months of the year when there is the greatest likelihood of people being active and outdoors, the air quality assessment effectively assumes that the maximum predicted values will occur at the worst time of day and at the worst period of the year (i.e., Level III).

8.1.3.6 Climate

While there were predicted residual adverse effect of the Project on climate, specifically for the Project GHG emissions VC, the concept of timing is not relevant for this component. Project GHG emission will be tracked and reported on an annual basis. Therefore, no timing will be assigned.

8.1.3.7 Surface Water Quality

The assessment of potential surface water quality effects as a result of the Project was done using a numerical, based upon mass-balance equations. The model uses flow data and various surface water quality inputs as a result of the Project (e.g., treated effluent discharged to Blackwater Creek, seepage from on-site mine structures to the receiving environment) to determine water quality in the receiving environment at various locations. Surface water quality for each node was evaluated on an annual average, as there was not sufficient baseline data to support modeling monthly variability in surface water quality. While Treasury Metals do have some capacity to manage the discharges during the operations phase, they will not be actively managing discharges from the pit lake during the post-closure phase, as water from the pit lake will be allowed to passively release through the spillway. Therefore, the assessment has conservatively assumed that the predicted effects of the Project could occur during sensitive times of the year throughout the Project life and the timing will be assessed as Level III.

8.1.3.8 Surface Water Quantity

The assessment of potential surface water quantity effects from the Project was done using a numerical hydrologic model, which was based on long-term flow statistics from a representative, regional Water Survey of Canada (WSC) station. The hydrologic model predicted flow rates during the operations and post-closure phases of the Project at various waterbodies. These predicted surface water flows were compared to existing conditions to quantify the changes in flows as a result of the Project during the operations and post-closure phases. Since these changes in flows



during operations and post-closure could occur during sensitive times of the year throughout the life of the Project, timing will be assessed as Level III.

8.1.3.9 Groundwater Quality

As there were no predicted residual adverse effects of the Project on groundwater quality, there is no need to establish a framework for assigning timing.

8.1.3.10 Groundwater Quantity

The modelling to predict residual adverse effects on groundwater quantities provided annual average predictions. Since these changes in groundwater quantity are annual, they could occur during sensitive times of the year. Therefore, timing will be assessed as Level III.

8.1.3.11 Wildlife and Wildlife Habitat

The vulnerability of many wildlife species can increase or decrease during specific times of the year due to factors such as breeding, migration and vocalization. The specific critical times for the wildlife and wildlife habitat VCs are as follows:

-) May to August for breeding and nesting birds;
-) May until August for calling amphibians;
-) June and July for nesting reptiles;
-) Spring and fall dispersions for small mammal; and
-) Spring and early summer for flying invertebrates.

In the characterization of residual effects to wildlife and wildlife habitat, the timing of activities was considered as follows:

-) Level I – Project activities can be scheduled to avoid negative impacts to species or species habitat;
-) Level II – Project activities can be scheduled to reduce negative impacts to species or species habitat, but will still have some negative impact to the species or the species habitat; and
-) Level III – Project activities cannot be scheduled to reduce negative impacts to species or species habitat, and will have a negative impact to the species or species habitat.



8.1.3.12 Migratory Birds

The vulnerability of many migratory bird species can increase or decrease during specific times of the year due to factors such as breeding, migration and vocalization. The specific critical times for the migratory bird VCs are as follows:

-) May to August for breeding and nesting birds;

In the characterization of residual effects to migratory birds, the timing of activities was considered as follows:

-) Level I – Project activities can be scheduled to avoid negative impacts to species or species habitat;
-) Level II – Project activities can be scheduled to reduce negative impacts to species or species habitat, but will still have some negative impact to the species or the species habitat; and
-) Level III – Project activities cannot be scheduled to reduce negative impacts to species or species habitat, and will have a negative impact to the species or species habitat.

8.1.3.13 Fish and Fish Habitat

Timing was a consideration in the mitigation of impacts to fish and fish habitat. For example, in-stream works are restricted to the timing windows that have been put in place to prevent the mortality of spawning fish and developing embryos. Although timing can be used to prevent mortality, if mortality will occur its timing is immaterial. Therefore, it is assigned Level 1.

8.1.3.14 Wetlands and Vegetation

Many ecosystems and vegetative communities can be more susceptible to damage or degradation during specific times of the year. In the characterization of residual effects to wetlands and vegetation communities, the timing of activities was considered as follows:

-) Level 1 – Project activities can be scheduled to avoid any negative impacts to wetlands or vegetation communities;
-) Level II – Project activities can be scheduled to reduce negative impacts to wetlands or vegetation communities, but will still have some negative impact to the wetlands or vegetation communities; and
-) Level III – Project activities cannot be scheduled to reduce negative impacts to wetlands or vegetation communities, and will have a negative impact to the wetlands or vegetation communities.



8.1.3.15 Land Use

The application of timing in the assessment of potential Project-related land and resource use effects is not applicable in the context of the Agency's (CEAA, 2015b) description of when timing should be considered. Assessment of potential Project-related land and resource use effects is based upon Project phases.

8.1.3.16 Social

The application of timing in the assessment of potential Project-related social effects is not applicable in the context of the Agency's (CEAA, 2015b) description of when timing should be considered. Assessment of potential Project-related social effects is based upon Project phases.

8.1.3.17 Economic

The application of timing in the assessment of potential Project-related economic effects is not applicable in the context of the Agency's (CEAA, 2015b) description of when timing should be considered. Assessment of potential Project-related economic effects is based upon Project phases.

8.1.3.18 Human Health

As there were no predicted residual adverse effects of the Project on human health, there is no need to establish a framework for assigning timing.

8.1.3.19 Heritage Resources

As there were no predicted residual adverse effects of the Project on heritage resources, there is no need to establish a framework for assigning timing.

8.1.3.20 Aboriginal Peoples

The application of timing in the assessment of potential Project-related Aboriginal Peoples effects is not applicable in the context of the Agency's (CEAA, 2015b) description of when timing should be considered. Assessment of potential Project-related Aboriginal Peoples effects is based upon Project phases.

8.1.4 Duration

Section 6.1.3 of the original EIS introduced the three levels of used in assessing residual effects, namely:

-) Level I – Residual effect is temporary or not measurable beyond given Project phase (e.g., construction);



-) Level II – Residual effect could persist up to 10 years after Project initiation; and
-) Level III – Residual effect could persist beyond 10 years after Project initiation.

The above descriptions have been modified slightly in this revised EIS to correspond with the relevant phases of the Project described in Section 6.1.5. The following common levels of duration will be used when evaluating the residual effects for all components:

-) Level I – Residual effect is temporary or not measurable beyond given Project phase (e.g., site preparation and construction);
-) Level II – Residual effect would persist through the majority of the Project life (i.e., the effects would persist through the operations phase, up to 10 years after Project initiation; and
-) Level III – Residual effect would persist beyond the life of the Project (i.e., the effects would remain into the post- closure phase).

8.1.5 Frequency

The three levels for frequency are:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

The definitions for frequency vary by component, as described in the following sections.

8.1.5.1 Terrain and Soils

A single residual adverse effect was predicted for terrain and soils. This effects was for the natural landscapes VC, and related to the waste rock storage area (WRSA). The WRSA will be constructed as part of the mining activities during the construction phase. Although the WRSA will only be constructed once, the frequency of the effect is assumed to be Level III as the WRSA will remain as a permanent feature on the landscape.

8.1.5.2 Geology and Geochemistry

A residual adverse effect for geology and geochemistry was predicted to occur as a result of the formation of the pit lake, with the flooding of the open pit following closure. The pit lake will remain a permanent feature on the landscape and will passively drain through a spillway into Blackwater



Creek whenever there is sufficient water flowing into the pit lake as a result of runoff and the inflow of groundwater. The frequency of this effect was assumed to be continuous and assigned as Level III.

8.1.5.3 Noise

In assessing the effects of the Project on noise, the assessment assumes a conservative approach for assigning the levels for frequency. For assessing ambient noise levels, the emphasis is on the maximum hourly equivalent noise level. For this VC, the frequency is assumed to be continuous (Level III). The same approach is used for assigning the frequency for noise related health effects. In the case of blasting, these effects are intermittent, happening no more than once per day, and typically less than 5 days per week. The effects related to blasting have been classified as Level II for frequency.

8.1.5.4 Light

As there were no predicted residual adverse effects of the Project on light, there is no need to establish a framework for assigning frequency.

8.1.5.5 Air Quality

In assessing the effects of the Project on air quality, the assessment assumes a conservative approach was used. This approach used the maximum prediction from the dispersion model. While the maximum model prediction may only occur once during the period modelled, the frequency for air quality refers to how often the model predictions were at a certain level of magnitude. For example, if the maximum 1-hour SO₂ concentration was predicted to exceed the assessment criteria (i.e., Level III as described in Section 8.1.1.5), the frequency of the effects would be based on how often the effects was a Level III magnitude.

When assigning the levels of frequency for the predicted air quality effects of the Project, the following approach was used:

-) For indicators with an averaging period less than 1 year (i.e., 1-hour, 8-hour, 24-hour and 30-days), the frequency of the effect was classified as either infrequent (Level I) or intermittent (Level II), according to the following:
 - If the effects is predicted to be at a magnitude level up to 2% of the time (e.g., up to 2% of the 1-hour predictions) then the effect was considered to be infrequent (Level I);
 - If the effects is predicted to be at a magnitude level more than 2% of the time (e.g., more than 2% of the 1-hour predictions) then the effect was considered to be intermittent (Level II); and



-) For indicators with an annual averaging periods (e.g., annual TSP), the predicted effects of the Project were considered to be continuous, and the frequency was classified as Level III.

The threshold for an infrequent effect was based upon the approach used in the process for establishing the Canada-Wide Standards (CCME, 2000), where compliance is based on the 98th percentile of the ambient air quality data.

8.1.5.6 Climate

There were predicted residual adverse effects of the Project on climate, specifically for the Project GHG emissions VC. The GHG emissions from the Project are assumed to be continuous, and the effects assigned as Level III for frequency.

8.1.5.7 Surface Water Quality

The assessment of potential surface water quality effects of the Project was done by modelling the annual water quality in the receiving waters surrounding the Project. The modelling looked at a range of hydrologic conditions, including an average hydrologic year, a dry year (defined by the 1:20 year dry, or 5th percentile annual flow), and a wet hydrologic year (defined by the 1:20 year wet, or 95th percentile flow). If an effects of a particular magnitude is only predicted in the either the wet year or dry year scenarios, the frequency of the effect will be assigned as Level I. If an effect of a particular magnitude is predicted for the average year, the effect was assigned as Level II. If the effect was predicted for all scenarios, the effects was assigned a frequency of Level III.

8.1.5.8 Surface Water Quantity

There were predicted residual adverse effects of the Project on surface water quantity for the Project during the post-closure phase which are assumed to be continuous, and thus the effects are assigned a Level III for frequency.

8.1.5.9 Groundwater Quality

As there were no predicted residual adverse effects of the Project on groundwater quality, there is no need to establish a framework for assigning timing.

8.1.5.10 Groundwater Quantity

There were predicted residual adverse effects of the Project on groundwater quantity for the Project were assumed to be continuous, and thus the effects are assigned a Level III for frequency.



8.1.5.11 Wildlife and Wildlife Habitat

The frequency of economic effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

8.1.5.12 Migratory Birds

The frequency of economic effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

8.1.5.13 Fish and Fish Habitat

There was one residual adverse effect that remains after the application of mitigation measures, namely the mortality of fish in those watercourses overprinted by the Project. Fish mortality will occur once, when portions of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 are overprinted. Therefore, it is Level I.

8.1.5.14 Wetlands and Vegetation

The frequency of economic effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and



-) Level III – Residual effects occurs frequently or continuously.

8.1.5.15 Land Use

The frequency of land use effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

8.1.5.16 Social

In assessing potential Project-related social effects, frequency levels vary depending on the Project phase. The frequency for which potential Project-related social effects occur is largely dependent upon personal decision-making (e.g., decision to move to a community to seek employment, decision to return to or leave school to support gaining employment) and as such, the assessment of frequency is based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels.

8.1.5.17 Economic

The frequency of economic effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

8.1.5.18 Human Health

As there were no predicted residual adverse effects of the Project on human health, there is no need to establish a framework for assigning frequency.



8.1.5.19 Heritage Resources

As there were no predicted residual adverse effects of the Project on heritage resources, there is no need to establish a framework for assigning frequency.

8.1.5.20 Aboriginal Peoples

The frequency of effects on Aboriginal peoples effects will vary depending on the Project phase. In assessing potential effects of the Project on land use, frequency levels have been assigned based upon professional experience and knowledge. Where appropriate, a conservative approach was taken to assigning frequency levels. The following general frequency descriptions has been used:

-) Level I – Residual effect is expected to occur infrequently;
-) Level II – Residual effect is expected to occur intermittently; and
-) Level III – Residual effects occurs frequently or continuously.

8.1.6 Reversibility

Section 6.1.3 of the original EIS introduced the three levels of used in assessing residual effects, namely:

-) Level I – Residual effect is readily reversible over a relative short time period;
-) Level II – Residual effect is partially reversible (i.e., mitigation cannot guarantee a return to pre-disturbance conditions); and
-) Level III – Residual effect is not reversible.

According to the Agency (CEAA, 2015b), a reversible effect is defined as follows:

A reversible environmental effect is one where the VC is expected to recover from the environmental effects caused by the project. This would correspond to a return to baseline conditions or other target (e.g., a population management objective, remediation target), through mitigation or natural recovery within a reasonable timescale.

For this revised EIS, a common set of reversibility levels will be used. These have been modified as follows:

-) Level I – Residual effect is readily reversible once the activity causing the effect ends;
-) Level II – Residual effect is expected to recover (i.e., to baseline conditions or a remediation target) within a reasonable timescale; and



-) Level III – Residual effect is not reversible.

8.1.7 Likelihood

Section 6.1.4 of the original EIS introduced the following three levels likelihood, which were determined once significance was established:

-) Level I – Residual effect is unlikely to occur;
-) Level II – Residual effect could reasonably be expected to occur; and
-) Level III – Residual effect will occur.

The determination of likelihood will be done in accordance with the guidance from the Agency (CEAA, 2015b), which provides the following guidance for likelihood above:

The determination of likelihood is based on consideration of probability and uncertainty, and is considered only when it is established through stage 2 that one or more predicted residual adverse effects are significant.

The probability of an environmental effect occurring may be based on knowledge and experience with similar past environmental effects. The full life cycle of a project, including its various stages and lifespan, should also be considered in determining the probability of occurrence of an effect.

8.1.8 Determination of Significance

The approach used in the original EIS for determining the significance of an adverse effect was described in Section 6.1.4. A common decision tree (Figure 6.1.1 of the original EIS) was applied for the predicted residual effects for all of the components. Once the levels for the various elements described in Section 8.1 were established for each of the residual effects, the significance could be determined by tracing the effects along the branches of the decision tree. The process presented in Figure 6.1.1 considered only magnitude, geographic extent, duration, frequency and reversibility. The “timing” element was not explicitly considered in the decision tree. A version of that decision tree has been provided as Figure 8.1.8-1.

While the use of a decision tree for determining significance has been used on other assessments completed in Ontario in recent years (IAMGOLD, 2014; OPG 2011), it is not the only approach available for determining significance. Lawrence (2005) described a range of approaches used, including technical, collaborative, and reasoned argument approaches. All of the approaches would include some aspect of professional judgement (Sippe, 1999), and make use of the concepts of valued ecosystem components (VEC). The VEC are referred to by the Agency as valued components (VC) in their publications (CEAA, 2015a), and in the EIS Guidelines. There is, however, currently no legislative direction on what constitutes a significant adverse environmental effect provided in CEAA 2012, nor in there any specific guidance provided by the Agency (CEAA, 2015b).



Figure 8.1.8-1: Decision Tree for Determining Significance



For the revised EIS, the significance of residual adverse effects will be determined two ways. The first approach will be a methodical re-application of the decision tree used in the original EIS (Figure 8.1.8-1), using the elements introduced in Section 8.1, namely: magnitude, geographic extent, duration, frequency and reversibility. The second approach will be the adoption of a “reasoned argument” approach, where a hypothesis of what would constitute significant effects is put forward, and used to test the predicted residual adverse effects of the Project. This approach will vary between components, and will make use of as many of the elements introduced within Section 8.1 as are appropriate for each component.

8.2 Terrain and Soils

8.2.1 Residual Adverse Effects Advanced for Determination of Significance

The residual adverse effects for terrain and soils were described in Section 6.2.6. A single residual adverse effect was identified for the natural landscapes VC. The effect relates to the waste rock storage area (WRSA), which will be constructed during operations and will remain in perpetuity at the site. Table 8.2.1-1 summarizes the predicted residual adverse effects on terrain and soils.

Table 8.2.1-1: Residual Adverse Effects on Terrain and Soils

| Valued Components (VCs) | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-----------------------------------|---|---|---|
| Natural landscapes | — | WRSA 25 to 30 m tall 3:1 slopes (h:v) West face re-vegetated | WRSA 25 to 30 m tall 3:1 slopes (h:v) Fully re-vegetated | WRSA 25 to 30 m tall 3:1 slopes (h:v) Fully re-vegetated |
| Overburden | — | — | — | — |
| Soil chemistry | — | — | — | — |

Note: The “—” symbol indicates where there were no predicted residual adverse effects

8.2.2 Description of Significance

As described in Section 6.1.3.1, three VC were used for evaluating the effects of the Project on terrain and soils, namely: natural landscapes, overburden, and soil chemistry. Residual adverse effects were only predicted for the natural landscapes VC (Table 8.2.1-1). The significance of this residual adverse effect was determined using the measures and methodology described in Section 8.1.

8.2.2.1 Magnitude

The predicted residual adverse for terrain and soils is associated with the WRSA, which will be constructed to a height of between 25 and 30 m during the operations phase. The west side of the WRSA will be vegetated during operations so it appears more natural when viewed from Thunder Lake. During closure, the WRSA will be covered with a low permeability cover and vegetated. Using the approach outlines in Section 8.1.1.1 and Table 8.1.1.1-1. The resulting levels of magnitude are provided in Table 8.2.2.1-1.



Table 8.2.2.1-1: Levels of Magnitude for Terrain and Soils

| Valued Components (VCs) | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-----------------------------------|------------|---------|--------------|
| Natural Landscapes | — | Level I | Level I | Level I |
| Overburden | — | — | — | — |
| Soil chemistry | — | — | — | — |

Note: The “—” symbol indicates where there were no predicted residual adverse effects

8.2.2.2 Geographic Extent

Although the WRSA is constructed within the Project footprint, it is reasonable to assume the effect extends beyond the site because the WRSA would be visible from certain areas on Thunder Lake. Therefore, the geographic extent is classified as Level II.

8.2.2.3 Timing

The WRSA will be a permanent, therefore the timing is classified as Level III.

8.2.2.4 Duration

The WRSA will be constructed during the operations phase, but will remain a permanent feature on the landscape. Therefore, the duration was assigned as Level III.

8.2.2.5 Frequency

The WRSA will be present at the site continuously, and has therefore been classified as having a frequency of Level III.

8.2.2.6 Reversibility

The WRSA is a permanent feature. Therefore the level of reversibility is classified as Level III.

8.2.2.7 Determination of Significance

For an adverse effects on natural landscapes to be considered significant, the feature causing the effects would need to appear to be dramatically than the surrounding landscape and would have to alter the nature of the landscape to a viewer. For this to happen the feature would need to be very tall relative the local topography, and have an appearance of being un-natural when viewed from a distance.

As described in Section 6.2.4, the WRSA will be constructed to a height of between 25 and 30 m, with relatively gently side slopes (3 to 1, horizontal to vertical). The western side of the WRSA will be vegetated during operations to make it look more natural when viewed from Thunder Lake, and the entire WRSA will be covered with a low permeability cover and vegetated as part of the



closure activities. Additionally, the WRSA would not be visible for certain areas of Thunder Lake, as illustrated in Figures 6.2.4.1-1 and 6.2.4.1-2, as well as Figure 6.2.6-1. Therefore, the WRSA would not represent a significant adverse effect on natural landscapes.

Table 8.2.2.7-1 lists the various levels assigned for the measures introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying these assessment measures to the decision tree presented in Figure 8.1.8-1, yields a determination of not significant.

Both the reasoned narrative and the decision tree approach yield the same conclusion, the Project will not result in significant adverse effects for terrain and soils.

8.2.3 Prediction Confidence and Uncertainty

Treasury Metal had made efforts to ensure the Project is designed with a compact footprint, while keeping a minimal profile to avoid effects to its neighbours. The design features to minimize the effects on natural landscapes (e.g., height between 25 to 39 m, side slopes at 3:1, covering and vegetating the surface during closure) are all aspects of the Project that will be implemented as part of the Project.

8.3 Geology and Geochemistry

8.3.1 Residual Adverse Effects Advanced to Significance Assessment

As described in Section 6.3.4, the potential effects of the Project on geology and geochemistry were evaluated with a single VC, pit lake water quality. There were no residual adverse effects predicted on geology and geochemistry during the site preparation and construction, operations, and closure phases of the Project. The residual adverse effects that remain after the application of mitigation, are summarized in Table 8.3.1-1. The residual adverse effects incorporate the mitigation provided by using a wet cover as the closure option for the TSF, as well as any batch treatment required while the open pit is filling with water ensure the quality of the water in the pit lake meets Provincial Water Quality Objectives (PWQO) prior to being passively discharged to a tributary of Blackwater Creek.



Table 8.2.2.7-1: Determination of Significance for Terrain and Soils

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|---|--|-----------|-------------------|-----------|-----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Natural landscapes | No residual adverse effects | | | | | | | | |
| Operations Phase | | | | | | | | | |
| Natural landscapes | Uniqueness of the feature from surrounding terrain | Level I | Level II | Level III | Level III | Level III | Level III | Not significant | NA ⁽¹⁾ |
| Closure Phase | | | | | | | | | |
| Natural landscapes | Uniqueness of the feature from surrounding terrain | Level I | Level II | Level III | Level III | Level III | Level III | Not significant | NA ⁽¹⁾ |
| Post-closure Phase | | | | | | | | | |
| Natural landscapes | Uniqueness of the feature from surrounding terrain | Level I | Level II | Level III | Level III | Level III | Level III | Not significant | NA ⁽¹⁾ |

Notes: (1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



Table 8.3.1-1: Residual Adverse Effects on Pit Lake Water Quality

| Indicator | Pit Lake Water Quality (mg/L) | | | |
|------------|-----------------------------------|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| Sulphate | — | — | — | 58 |
| Aluminum | — | — | — | 0.075 |
| Antimony | — | — | — | 0.0011 |
| Arsenic | — | — | — | 0.0015 |
| Beryllium | — | — | — | 0.0011 |
| Boron | — | — | — | 0.055 |
| Cadmium | — | — | — | 0.00009 |
| Chromium | — | — | — | 0.0010 |
| Cobalt | — | — | — | 0.00090 |
| Copper | — | — | — | 0.004 |
| Iron | — | — | — | 0.30 |
| Lead | — | — | — | 0.0029 |
| Mercury | — | — | — | 0.00002 |
| Molybdenum | — | — | — | 0.0011 |
| Nickel | — | — | — | 0.025 |
| Selenium | — | — | — | 0.0010 |
| Silver | — | — | — | 0.00010 |
| Thallium | — | — | — | 0.00030 |
| Uranium | — | — | — | 0.0050 |
| Vanadium | — | — | — | 0.0011 |
| Zinc | — | — | — | 0.030 |

Note: The “—” symbol indicates where there were no predicted residual adverse effects

8.3.2 Description of Significance

As described in Section 6.1.3.2, the geology and geochemistry assessment relied on a single VC called pit lake water quality. The results of the assessment determined there would be residual adverse effects on pit lake water quality during the post-closure phase of the Project.

8.3.2.1 Magnitude

Using the approach described in Section 8.1.1.2 and the levels of magnitude criteria presented in Table 8.1.1.2-2, magnitude levels were assigned to the predicted residual adverse pit water quality effects summarized in Table 8.3.1-1. As the pit lake water quality will meet, or be better than, PWQO for all parameters, the resulting levels of magnitude will be Level I for all indicators.

8.3.2.2 Geographic Extent

Geographic extent was assigned using the approach described in Section 8.1.2. The pit lake is located within the Project site, therefore the geographic extent was assigned as Level I. The effects of pit lake water that will be discharged into a tributary of Blackwater Creek, which ultimately flows to Wabigoon Lake, on the receiving water quality are addressed as part of the evaluation of



the Project effects on surface water quality. The significance of residual adverse effects on surface water quality are provided in Section 8.8.2.

8.3.2.3 Timing

As described in Section 8.1.3.2, the assessment has conservatively assumed that the predicted effects of the Project could occur during sensitive times of the year throughout the Project life and timing will be assessed at a Level III.

8.3.2.4 Duration

The pit lake will not form fully until the post-closure phase of the Project, but will remain in perpetuity. Based on the approach described in Section 8.1.4, levels of duration were assigned as Level III for all indicators.

8.3.2.5 Frequency

Once the pit lake is fully flooded, it will remain in perpetuity. At closure the operations area will be graded to direct all runoff to the pit lake. The pit lake will also receive groundwater inflow, even when the pit is fully flooded. As a result, the pit lake is expected to discharge to Blackwater Creek Tributary 1 throughout the year. The one exception predicted was during the month of August during a dry hydrologic year (Table 6.7.2.5-1). Therefore, the level of frequency for all indicators has been assigned as Level III, as described in Section 8.1.5.2.

8.3.2.6 Reversibility

The reversibility of the residual effects of the Project on pit lake water quality were classified as Level III. The pit lake will be permanent, and the expected quality in the lake is expected to remain at similar levels over time.

8.3.2.7 Determination of Significance

For an adverse effect on pit lake quality to be considered significant, the pit lake would need to have quality that would not support aquatic, even for sensitive aquatic receptors. If pit lake water quality did not support aquatic life for sensitive receptors then it would be unlikely that it would naturally establish itself as a functioning ecosystem.

Table 8.3.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying these assessment measures to the decision tree (Figure 8.1.8-1) yields a determination of not significant for the residual adverse effect predicted for the pit lake water quality VC.



Table 8.3.2.7-1: Determination of Significance for Geology and Geochemistry

| Valued Components (VCs) | Indicator ⁽¹⁾ | Magnitude ⁽²⁾ | Geographic Extent ⁽³⁾ | Timing | Duration | Frequency | Reversibility ⁽⁴⁾ | Significance | Likelihood |
|---|-----------------------------|--------------------------|----------------------------------|-----------|-----------|-----------|------------------------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Pit Lake water quality | No residual adverse effects | | | | | | | | |
| Operations Phase | | | | | | | | | |
| Pit Lake water quality | No residual adverse effects | | | | | | | | |
| Closure Phase | | | | | | | | | |
| Pit Lake water quality | No residual adverse effects | | | | | | | | |
| Post-closure Phase | | | | | | | | | |
| Pit Lake water quality | Various | Level I | Level I | Level III | Level III | Level III | Level III | Not significant | NA ⁽⁵⁾ |

Notes:

- (1) The indicators for which residual adverse effects (Table 8.3.1-1) were predicted was for the post-closure phase
- (2) The level of magnitude was assigned as described in Section 8.3.2.1
- (3) The geographic extent was assigned as described in Section 8.3.2.2
- (4) The reversibility was based on the highest assigned for that phase of the Project (Section 8.3.2.6)
- (5) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



A review of the predicted residual adverse pit lake water quality effects of the Project on geology and geochemistry (Table 8.2.1-1) show that none of the predicted concentrations in the receiving environment would exceed the Provincial Water Quality Objectives (PWQO) established to be protective of sensitive aquatic receptors. Therefore, the quality of the water in the pit lake should be suitable to support a functioning ecosystem to establish itself in the lake naturally over time. Therefore, the residual adverse effects of the Project on geology and geochemistry, as evaluated using the pit lake water quality VC, as not significant.

Both the reasoned narrative and the decision tree approach yield the same conclusion, the Project will not result in significant adverse effects for geology and geochemistry.

8.3.3 Prediction Confidence and Uncertainty

As part of the process to respond to the Round 1 information requests, a re-evaluation of the available geochemical data was completed using a conservative, or precautionary approach to modelling geochemical reactions and reaction times. Where uncertainty remained with the data, conservative assumptions were made, where there was sufficient supporting data. There is confidence that the actual geochemical effects of the Project will be no worse than the predictions provided. Additionally, recommendations have been made with regards to additional sampling and analysis that will allow the estimates to be refined with more realistic, less conservative data over time.

8.4 Noise

8.4.1 Residual Adverse Effects Advanced to Significance Assessment

Residual adverse effects for noise were predicted for each of the four noise VCs; however, the effects were predicted to occur within the LSA in the immediate vicinity of the Project. As a result, there were no additional cumulative effects that needed to be advanced for consideration of significance. A summary of the predicted residual adverse effects of the Project on the noise VCs is provided in Table 8.4.1-1.

Table 8.4.1-1: Residual Adverse Effects for Noise

| Valued Components (VCs) | Indicators | Measures | Predicted Noise Effects | | | |
|-------------------------------|---------------------|----------|-------------------------------|-------------------------|-------------------------|--------------------|
| | | | Site Preparation Construction | Operations | Closure | Post-closure |
| Ambient noise levels | L_{EQ} | dBA | 40 | 40 | 39 | N/A ⁽²⁾ |
| Noise disturbance to wildlife | Area > 50 dBA | ha | 430 within Project Site | 199 within Project Site | 122 within Project Site | N/A ⁽²⁾ |
| Blasting noise and vibration | Peak sound pressure | dB | 78 | 78 | N/A ⁽¹⁾ | N/A ⁽²⁾ |



Table 8.4.1-1: Residual Adverse Effects for Noise (continued)

| Valued Components (VCs) | Indicators | Measures | Predicted Noise Effects | | | |
|------------------------------|------------------------|----------|-------------------------------|------------|--------------------|--------------------|
| | | | Site Preparation Construction | Operations | Closure | Post-closure |
| | Peak particle velocity | cm/s | 0.123 | 0.123 | N/A ⁽¹⁾ | N/A ⁽²⁾ |
| Noise related health effects | L _{DN} | dBA | 56 | 57 | 55 | N/A ⁽²⁾ |
| | %HA | %HA | 1.6 | 1.4 | 1.2 | N/A ⁽²⁾ |

Notes: (1) There will be no blasting during the closure phase
 (2) There will be no sources of noise during the post-closure phase

8.4.2 Description of Significance

The results of the noise assessment for the Project identified that there would be residual adverse effects related to each of the following noise VCs:

-) Ambient noise levels;
-) Noise disturbance to wildlife;
-) Blasting noise and vibration; and
-) Noise related health effects.

As described in Section 8.1.1.3, the determination of the magnitude of the effects on wildlife and wildlife habitat as a result of avoidance or displacement are evaluated elsewhere in this report, using the results of the noise assessment. Specifically, the effects of noise on wildlife are considered as part of the effects predictions for wildlife (Section 6.12) and the determination of significance of wildlife (Section 8.12).

8.4.2.1 Magnitude

Site Preparation and Construction Phase

The following is noted regarding the magnitude of noise effects during site preparation and construction:

-) Maximum predicted ambient noise levels at sensitive receptor locations (Table 8.4.1-1) were in excess of the background, but meet the relevant night-time MOECC noise criteria;
-) Maximum the peak sound pressure (blasting noise) and peak particle velocity (blasting vibration) predictions at sensitive receptor locations (Table 8.4.1-1) were greater than zero, but less than the relevant MOECC criteria; and
-) Maximum of the absolute sound pressures (L_{DN}) and changes in percent highly annoyed (Table 8.4.1-1) were greater than baseline conditions, but less than the relevant criteria.



As set out in Table 8.1.1.3-1, the levels of magnitude for the above VCs and indicators were all classified as being Level II.

Operations Phase

The following is noted regarding the magnitude of noise effects during the operations phase:

-) Maximum predicted ambient noise levels at sensitive receptor locations (Table 8.4.1-1) were in excess of the background, but meet the relevant night-time MOECC noise criteria;
-) Maximum the peak sound pressure (blasting noise) and peak particle velocity (blasting vibration) predictions at sensitive receptor locations (Table 8.4.1-1) were greater than zero, but less than the relevant MOECC criteria; and
-) Maximum of the absolute sound pressures (L_{DN}) and changes in percent highly annoyed (Table 8.4.1-1) were greater than baseline conditions, but less than the relevant criteria.

As set out in Table 8.1.1.3-1, the levels of magnitude for the above VCs and indicators were all classified as being Level II.

Closure Phase

For the “ambient noise levels” and “noise related health effects” VCs, the following is noted:

-) Maximum predicted ambient noise levels at sensitive receptor locations (Table 8.4.1-1) were in excess of the background, but meet the relevant night-time MOECC noise criteria;
-) Maximum of the absolute sound pressures (L_{DN}) and changes in percent highly annoyed (Table 8.4.1-1) were greater than baseline conditions, but less than the relevant criteria.

As set out in Table 8.1.1.3-1, the levels of magnitude for the above VCs and indicators were all classified as being Level II.

Post-closure Phase

As described in Section 6.4.1, there are no sources of noise anticipated at the Project during the post-closure phase. As a result, there will be no residual noise effects.

8.4.2.2 Geographic Extent

The sensitive noise receptors, as defined by NPC-300 (MOECC, 2015), are all located beyond the Project site, but within the LSA. Therefore, the geographic extent for all VCs and indicators were classified as Level II (Section 8.1.2). The geographic extent would be the same for the site



preparation and construction, operations, and closure phases. There are no predicted residual adverse effects on noise during the post-closure phase.

8.4.2.3 Timing

Although the heavy equipment activities will be conducted between 07:00 and 22:00 (Section 6.4.3), if possible, the assessment conservatively considers that effects could occur 24-hours at certain times during the Project life. Therefore, the timing for the “ambient noise levels” and “noise related health effects” VCs were classified as Level III (Section 8.1.3.3).

Although blasting will be scheduled to reduce disruption to residents (Section 6.4.3), the assessment conservatively considers that effects from blasting could extend into the evening hours during the Project life. The timing is classified as Level II for the site preparation and construction, operations, and closure phases (Section 8.1.3.3). There are no predicted residual adverse effects on noise during the post-closure phase.

If there is a potential effect identified with respect to spawning shoals, the blasting practices will be adjusted to mitigate the effects (Section 6.4.6, and the effects assessment for fish, Section 6.13).

8.4.2.4 Duration

Site Preparation and Construction Phase

The duration for the site preparation and construction phase is classified as Level I (Section 8.1.4) for all VCs and indicators.

Operations Phase

The duration for the operations phase is classified as Level II (Section 8.1.4) for all VCs and indicators.

Closure Phase

The duration for the closure phase is classified as Level I (Section 8.1.4) for all VCs and indicators.

Post-closure Phase

There are no predicted residual adverse effects on noise during the post-closure phase.

8.4.2.5 Frequency

For the “ambient noise levels” and “noise related health effects” VCs, the frequency of the effects are conservatively classified as Level III (Section 8.1.5.3). In contrast, blasting will occur no more



than once per day, and on as many as five days per week. The frequency of effects for blasting noise and vibration indicators was classified as Level II (Section 8.1.5.3).

The frequency effects would apply for the site preparation and construction, operations, and closure phases (Section 8.1.3.3). However, blasting effects are not predicted to occur during closure. There are no predicted residual adverse effects on noise during the post-closure phase.

8.4.2.6 Reversibility

The reversibility of the residual effects of the Project on the noise VCs and indicators were all classified as Level I. Once the Project activities stop, the noise levels and vibration will return to the pre-disturbance levels almost immediately.

The potential that changes in noise levels may have a longer lasting effect on other components of the environment (e.g., displacement of wildlife, human health) are most appropriately addressed in other sections of this report (e.g., effects assessment for wildlife in Section 6.12).

8.4.2.7 Determination of Significance

Based on the experience on similar projects within Ontario, it is reasonable to conclude for there to be a significant adverse effect to ambient noise, blasting noise and vibration, and noise related health effects if the Project results in levels that exceed the relevant criteria (i.e., magnitude Level III), at sensitive receptor locations (geographic extent Level II), on an occasional or continuous basis (frequency Level II or III). The criteria used to establish magnitude for assessing the effects of the Project on noise have been established by MOECC or Health Canada to provide adequate protection against adverse impacts. Therefore, meeting these criteria would preclude the possibility of the effects being significant.

Using the characterization of levels for the assessment criteria measures recommended by the Agency (Table 8.4.2.7-1) and applying the above description of what constitutes a significant effect of the Project on noise, yields the following determinations of significance:

-) Ambient noise VC: not significant
-) Blasting noise and vibration VC: not significant
-) Noise related health effects VC: not significant.

For each of these VC, the maximum predicted effects at the sensitive receptor locations met the established criteria. This result matches the determination of significance identified using the decision tree presented in the original EIS (Figure 6.1.1 of the original EIS), and reproduced in Section 8.1.8.



Table 8.4.2.7-1: Determination of Significance for Noise

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|---|------------------------|---|-------------------|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Ambient noise | LEQ | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| Noise disturbance to wildlife | Area >50 dBA | Refer to the predicted effects and determination of significance for wildlife and wildlife habitat ⁽¹⁾ | | | | | | | |
| Blasting noise and vibration | Peak sound pressure | Level II | Level II | Level I | Level I | Level II | Level I | Not significant | NA ⁽³⁾ |
| | Peak particle velocity | Level II | Level II | Level I ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ |
| Noise related health effects | L _{DN} | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| | in %HA | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| Operations Phase | | | | | | | | | |
| Ambient noise | LEQ | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽³⁾ |
| Noise disturbance to wildlife | Area >50 dBA | Refer to the predicted effects and determination of significance for wildlife and wildlife habitat ⁽¹⁾ | | | | | | | |
| Blasting noise and vibration | Peak sound pressure | Level II | Level II | Level I | Level I | Level II | Level I | Not significant | NA ⁽³⁾ |
| | Peak particle velocity | Level II | Level II | Level I ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ |
| Noise related health effects | L _{DN} | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽³⁾ |
| | in %HA | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽³⁾ |
| Closure Phase | | | | | | | | | |
| Ambient noise | LEQ | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| Noise disturbance to wildlife | Area > 50 dBA | Refer to the predicted effects and determination of significance for wildlife and wildlife habitat ⁽¹⁾ | | | | | | | |
| Blasting noise and vibration | Peak sound pressure | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽³⁾ |
| | Peak particle velocity | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽⁴⁾ | NA ⁽³⁾ |
| Noise related health effects | L _{DN} | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| | in %HA | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽³⁾ |
| Post-closure Phase | | | | | | | | | |
| There will be no sources of noise during the post-closure phase | | | | | | | | | |

Notes: (1) The significance of effects of noise disturbance to wildlife has been considered in the determination of significance for wildlife and wildlife habitat (Section 8.12)
(2) The timing for vibration relates to the time of day when blasting may occur. Timing related to potential effects on fish spawning are addresses in determining significance for fish and fish habitat (Section 8.14)
(3) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant
(4) There will be no blasting during the closure phase of the Project



No determination of significance was completed for the noise disturbance to wildlife VC, as the effects of noise disturbance relate to displacement of wildlife that needs to be evaluated as part of the wildlife and wildlife habitat component. The predicted noise effects were incorporated into the wildlife and wildlife habitat assessment of effects (Section 6.12) and determination of significance (Section 8.12).

8.4.3 Prediction Confidence and Uncertainty

The modelling used in this assessment has an overall prediction accuracy that is dependent on two factors: the accuracy of the acoustical source data, and the accuracy of the noise propagation model.

The sound level data used in this assessment is based on manufacturer's data, engineering calculations, or data from similar equipment, and would be expected to have a high degree of accuracy. Efforts should be made when procuring equipment for the Project to verify that equipment sound levels are similar to those modelled.

The ISO 9613 propagation algorithms have a published accuracy of ± 3 dBA over source-receiver distances between 100 and 1,000 m. A similar degree of accuracy would be expected over the distances considered in this assessment. This is considered to be an excellent agreement for an environmental noise model over such a large distance. A 3 dBA increase or decrease would be considered imperceptible to humans.

In addition, the ISO 9613 model produces results that are representative of meteorological conditions favouring sound propagation (e.g., downwind and/or inversion conditions). These conditions do not occur all the time, and therefore, the model predictions will be conservative, and actual sound levels at the receptors may be less than indicated for much of the time. Based on the above, the overall model prediction confidence is expected to be high.

8.5 Light

As described in Section 6.5.4, there are no predicted residual adverse effects of the Project on light. As there were no predicted residual adverse effects, no determination of significance is required.

8.6 Air Quality

8.6.1 Residual Adverse Effects Advanced to Significance Assessment

Residual adverse effects for air quality were predicted for each of the indicators identified for the "air quality" VC. The effects of the Project on air quality were restricted to the areas in the immediate vicinity of the Project, and at the closest sensitive receptors, or community-oriented locations, as defined by CCME (2000). As a result, there were no additional cumulative air quality



effects that needed to be advanced for consideration of significance. A summary of the predicted residual adverse effects of the Project on the air quality VC is provided in Table 8.6.1-1.

Table 8.6.1-1: Residual Adverse Effects on Air Quality

| Compound | Averaging Period | Maximum Cumulative Prediction at Sensitive Receptors ⁽¹⁾ | | | |
|-------------------------|-----------------------|---|------------|------------------------|-----------------------------|
| | | Site Preparation ⁽²⁾ and Construction | Operations | Closure ⁽³⁾ | Post-closure ⁽⁴⁾ |
| TSP | 24-hour | 291.2 | 291.2 | 291.2 | — |
| | Annual | 56.4 | 56.4 | 56.4 | — |
| PM ₁₀ | 24-hour | 85.8 | 85.8 | 85.8 | — |
| PM _{2.5} | 24-hour | 25.6 | 25.6 | 25.6 | — |
| | Annual | 7.0 | 7.0 | 7.0 | — |
| Dustfall ⁽²⁾ | 30 day | 4.1 | 4.1 | 4.1 | — |
| | Annual | 3.2 | 3.2 | 3.2 | — |
| CO | 1-hour | 1415.4 | 1415.4 | 1415.4 | — |
| | 8-hour ⁽⁴⁾ | 1341.5 | 1341.5 | 1341.5 | — |
| NO ₂ | 1-hour | 220.7 | 220.7 | 220.7 | — |
| | 24-hour | 141.7 | 141.7 | 141.7 | — |
| SO ₂ | 1-hour | 5.5117 | 5.5117 | 5.5117 | — |
| | 24-hour | 4.2400 | 4.2400 | 4.2400 | — |
| | Annual | 1.0278 | 1.0278 | 1.0278 | — |
| Arsenic | 24-hour | 0.0156 | 0.0156 | 0.0156 | — |
| Barium | 24-hour | 0.1705 | 0.1705 | 0.1705 | — |
| Beryllium | 24-hour | 0.0009 | 0.0009 | 0.0009 | — |
| Cadmium | 24-hour | 0.0016 | 0.0016 | 0.0016 | — |
| Chromium | 24-hour | 0.0577 | 0.0577 | 0.0577 | — |
| Cobalt | 24-hour | 0.0041 | 0.0041 | 0.0041 | — |
| Lead | 24-hour | 0.1129 | 0.1129 | 0.1129 | — |
| Manganese | 24-hour | 0.2145 | 0.2145 | 0.2145 | — |
| Nickel | 24-hour | 0.0139 | 0.0139 | 0.0139 | — |
| | Annual | 0.0019 | 0.0019 | 0.0019 | — |
| Phosphorous | 24-hour | 0.1796 | 0.1796 | 0.1796 | — |
| Platinum | 24-hour | 0.0069 | 0.0069 | 0.0069 | — |
| Rhodium | 24-hour | 0.0022 | 0.0022 | 0.0022 | — |
| Thallium | 24-hour | 0.0059 | 0.0059 | 0.0059 | — |
| Titanium | 24-hour | 0.6274 | 0.6274 | 0.6274 | — |
| Uranium | 24-hour | 0.0036 | 0.0036 | 0.0036 | — |
| | Annual | 0.0005 | 0.0005 | 0.0005 | — |
| Vanadium | 24-hour | 0.0165 | 0.0165 | 0.0165 | — |

Notes:

- (1) The air quality effects are presented at the sensitive receptor locations, which correspond to the definition of "community-oriented locations" used by CCME (2000). The cumulative predictions include background air concentrations
- (2) Predicted effects during the site preparation and construction phase are based on the operations phase modelling
- (3) Predicted effects during the closure phase are based on the operations phase modelling
- (4) There are no sources of air emissions during the post-closure phase



8.6.2 Description of Significance

As described in Section 6.1.3.4, the air quality assessment relied on a single VC, namely air quality. The results of the air quality assessment for the Project identified that there would be residual adverse effects to the air quality VC.

8.6.2.1 Magnitude

Using the approach described in Section 8.1.1.5, and the levels of magnitude set out in Table 8.1.1.5-1, levels of magnitude were assigned to the predicted residual adverse air quality effects summarized in Table 8.6.1-1. The results are presented in Table 8.6.2.1-1.

Table 8.6.2.1-1: Levels of Magnitude for Residual Adverse Effects on Air Quality

| Compound | Averaging Period | Level of Magnitude ⁽¹⁾ | | | |
|-------------------------|-----------------------|--|------------|------------------------|-----------------------------|
| | | Site Preparation ⁽²⁾ and Construction | Operations | Closure ⁽³⁾ | Post-closure ⁽⁴⁾ |
| TSP | 24-hour | Level III | Level III | Level III | — |
| | Annual | Level II | Level II | Level II | — |
| PM ₁₀ | 24-hour | Level III | Level III | Level III | — |
| PM _{2.5} | 24-hour | Level II | Level II | Level II | — |
| | Annual | Level II | Level II | Level II | — |
| Dustfall ⁽²⁾ | 30-day | Level II | Level II | Level II | — |
| | Annual | Level II | Level II | Level II | — |
| CO | 1-hour | Level II | Level II | Level II | — |
| | 8-hour ⁽⁴⁾ | Level II | Level II | Level II | — |
| NO ₂ | 1-hour | Level II | Level II | Level II | — |
| | 24-hour | Level II | Level II | Level II | — |
| SO ₂ | 1-hour | Level II | Level II | Level II | — |
| | 24-hour | Level II | Level II | Level II | — |
| | Annual | Level II | Level II | Level II | — |
| Arsenic | 24-hour | Level II | Level II | Level II | — |
| Barium | 24-hour | Level II | Level II | Level II | — |
| Beryllium | 24-hour | Level II | Level II | Level II | — |
| Cadmium | 24-hour | Level II | Level II | Level II | — |
| Chromium | 24-hour | Level II | Level II | Level II | — |
| Cobalt | 24-hour | Level II | Level II | Level II | — |
| Lead | 24-hour | Level II | Level II | Level II | — |
| Manganese | 24-hour | Level II | Level II | Level II | — |
| Nickel | 24-hour | Level II | Level II | Level II | — |
| | Annual | Level II | Level II | Level II | — |
| Phosphorous | 24-hour | Level II | Level II | Level II | — |
| Platinum | 24-hour | Level II | Level II | Level II | — |
| Rhodium | 24-hour | Level II | Level II | Level II | — |



Table 8.6.2.1-1: Levels of Magnitude for Residual Adverse Effects on Air Quality (continued)

| Compound | Averaging Period | Level of Magnitude ⁽¹⁾ | | | |
|----------|------------------|--|------------|------------------------|-----------------------------|
| | | Site Preparation ⁽²⁾ and Construction | Operations | Closure ⁽³⁾ | Post-closure ⁽⁴⁾ |
| Thallium | 24-hour | Level II | Level II | Level II | — |
| Titanium | 24-hour | Level II | Level II | Level II | — |
| Uranium | 24-hour | Level II | Level II | Level II | — |
| | Annual | Level II | Level II | Level II | — |
| Vanadium | 24-hour | Level II | Level II | Level II | — |

Notes:

- ⁽¹⁾ The levels of magnitude for air quality are based on maximum cumulative predictions at the sensitive receptor locations, which correspond to the definition of “community-oriented locations” used by CCME (2000)
- ⁽²⁾ Predicted effects during the site preparation and construction phase are based on the operations phase modelling
- ⁽³⁾ Predicted effects during the closure phase are based on the operations phase modelling
- ⁽⁴⁾ There are no sources of air emissions during the post-closure phase

As described in Section 6.6.4, the predicted effects for the site preparation and construction phase, as well as the closure phase, were based on the dispersion model predictions for the operations phase. Which was described as having the greatest potential impacts, when all factors are considered. Because there are no air emissions sources at the Project during the post-closure phase, there are no residual adverse effects during the post-closure phase.

8.6.2.2 Geographic Extent

The sensitive receptors, which are consistent with the definitions of “community-oriented locations” identified by CCME (2000) as the location where as ambient air criteria and standards should apply. All of the sensitive receptor locations are located beyond the Project site, but within the LSA. Therefore, the geographic extent for all indicators for the air quality VC were classified as Level II (Section 8.1.2) during the site preparation and construction phase, the operations phase, and the closure phase. Because there are no air emissions sources at the Project during the post-closure phase, there are no residual adverse effects during the post-closure phase.

While it is possible, based on the dispersion model used (i.e., AERMOD), to predict effects at the limits of the LSA and the start of the RSA, such effects would be indistinguishable from background levels (response to TMI_174-AE(1)-12). Therefore, if the geographic extent were to be classified by extending the predictions into the RSA (Level III), the corresponding magnitude of effects (Section 8.6.2.1) would need to be classified as Level I.

8.6.2.3 Timing

As described in Section 6.6.5, the predicted effects of the Project on the air quality VC made use of AERMOD dispersion model and 5-years of hourly dispersion meteorological data. The effects assessment used the maximum predicted values for each indicator and averaging periods considered (i.e., 1-hour, 8-hour, 24-hour, 30-day, annual). Because the maximum predictions are used, without regard for the time of day or season, the predicted effects were assumed to occur



at the worst time of day and at the worst period of the year (i.e., Level III). This would apply for the site preparation and construction phase, the operations phase, and the closure phase. Because there are no air emissions sources at the Project during the post-closure phase, there are no residual adverse effects during the post-closure phase.

8.6.2.4 Duration

The duration for the predicted effects of the Project on air quality are as follows:

-) Site preparation and construction phase effects are classified as Level I (Section 8.1.4);
-) Operations phase effects are classified as Level II (Section 8.1.4); and
-) Closure phase effects are classified as Level I (Section 8.1.4);

8.6.2.5 Frequency

As described in Section 8.1.5.5, the frequency of the residual adverse effects depends on the magnitude level and averaging period. As shown in Section 8.6.2.1, the levels of magnitude were determined to be Level II for all indicators and averaging periods. For those indicators with an averaging period less than 1 year (i.e., 1-hour, 8-hour, 24-hour and 30-days), the frequency of the effect was conservatively classified as intermittent (Level II). For those indicators with an annual averaging periods, the frequency of effects were classified as Level III.

8.6.2.6 Reversibility

The reversibility of the residual effects of the Project on air quality were classified as Level I. Once the Project activities stop, the air quality will return to the pre-disturbance levels almost immediately. The potential that changes in air quality may have a longer lasting effect on other components of the environment (e.g., human health) are most appropriately addressed in other sections of this report (e.g., effects assessment for human health [Section 6.19]).

8.6.2.7 Determination of Significance

Based on the experience on similar projects within Ontario, it is reasonable to conclude for there to be a significant adverse effect to air quality, the Project would need to results in cumulative predictions that exceed the relevant criteria, at community-oriented locations more than 10% of the time.

The assessment criteria used to establish magnitude of the effects of the Project on air quality have been established by regulators to provide a level of protection from harm to people and the environment. When establishing ambient air quality criteria in Canada, thresholds are set at levels that inherently provide a level of protection, and set below “no-effects” or “lowest-observed-adverse effects” levels. For example, the “acceptable” national Ambient Air Quality Objectives



(NAAQO) for exposures to CO (i.e., 1-hour value of 35,000 $\mu\text{g}/\text{m}^3$ and an 8-hour value of 15,000 $\mu\text{g}/\text{m}^3$) were set at levels that would result in COHb (Carboxyhemoglobin) levels in adults less than 2%, or below the 2.5% COHb level identified as a conservative “no-effect level” (CEPA/FPAC 1994). For the purposes of this assessment, the more stringent “desirable” NAAQO (i.e., 1-hour value of 15,000 $\mu\text{g}/\text{m}^3$ and an 8-hour value of 6,000 $\mu\text{g}/\text{m}^3$) were selected. These desirable NAAQO levels represent long-term goal for air quality, and provide a basis for an anti- degradation policies for unpolluted parts of the country. In a similar manner, the assessment criteria for 1-hour NO_2 (i.e., 400 $\mu\text{g}/\text{m}^3$) is considerably lower than the “lowest observed adverse effects levels” (LOAEL) of 940 $\mu\text{g}/\text{m}^3$ (FPAC 1987). Finally, some of the indicators (e.g., TSP) have criteria that are based on reasons (MOE 2012) rather than ecological or health thresholds. Therefore, occasionally exceeding the assessment criteria is not likely to result in significant adverse effects.

According to the authors of the Canada-Wide Standards acknowledge that achievement of the ambient air standards were to be based on “community-oriented locations” (CCME 2000), with an emphasis on areas “where people live, work and play” (CCME 2000). This is the appropriate approach used to assess the potential air quality effects of Project. The authors of the Canada-Wide Standards development process has included acceptable frequency for exceeding the criteria value while still achieving the standard.

Ambient air quality will change throughout in response to meteorological conditions and other natural phenomena, as well as a result of human activities. When characterizing existing air quality in an area, it is accepted practice to use the 90% of the available data. The 10% threshold used in determining significance is consistent with accepted practice and has been accepted in previous assessments of air quality in Ontario (OPG, 2014).

Table 8.6.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. In the table, the only highest levels for each element were presented in the table. For example, the frequency for all of the indicators with averaging periods less 1 year (i.e., 1-hour, 8-hour, 24-hour and 30-days), as described in Section 8.1.5, was classified as Level II. However, the frequency for the indicators with an annual averaging period was classified as Level III. Therefore, Level III is used in Table 8.6.2.7-1 for the frequency element. The classification of the effects for the elements presented in the table are described in these preceding sections:

-) Magnitude: Section 8.6.2.1;
-) Geographic extent: Section 8.6.2.2;
-) Timing: Section 8.6.2.3;
-) Duration: Section 8.6.2.4;
-) Frequency: Section 8.6.2.5; and
-) Reversibility: Section 8.6.2.6.



Table 8.6.2.7-1: Determination of Significance for Air Quality

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|--|-----------|-----------|-------------------|-----------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Air quality | All | Level III | Level II | Level III | Level I | Level II | Level I | Not significant | NA ⁽¹⁾ |
| Operations Phase | | | | | | | | | |
| Air quality | All | Level III | Level II | Level III | Level II | Level II | Level I | Not significant | NA ⁽¹⁾ |
| Closure Phase | | | | | | | | | |
| Air quality | All | Level III | Level II | Level III | Level I | Level II | Level I | Not significant | NA ⁽¹⁾ |
| Post-closure Phase | | | | | | | | | |
| There will be no sources of air emissions during the post-closure phase. | | | | | | | | | |

Note:

(1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



By applying the decision tree (Figure 8.1.8-1) to the effects levels in Table 8.6.2.7-1 yields a determination that the residual adverse effects on air quality would not be significant. Similarly, the predicted residual adverse of the Project on air quality were determined to be not significant when tested against the hypothesis of what would constitute a significant adverse effect for air quality. Both approaches for determining significance yield the conclusion that the Project will not have a significant adverse effect on noise.

8.6.3 Prediction Confidence and Uncertainty

The air dispersion model used to predict the effects of the Project on air quality (i.e., AERMOD) is a widely accepted model, and is required to be used for regulatory modelling applications in Ontario. The AERMOD dispersion model is a public-domain model, developed jointly by the United States Environmental Protection Agency (U.S. EPA) and the American Meteorological Society (AMS). The AERMOD model is the default regulatory dispersion model in the United States and Ontario. While the model has undergone extensive testing and verification, there is always potential for uncertainty with any predictions. To address these uncertainties, a full five years of hourly meteorological data developed by the Ministry of Environment and Climate Change (MOECC) for use with AERMOD were used as inputs. The concentrations used in assessing the effects of the Project were the maximum values from the model, adopting a precautionary approach to address possible uncertainties. The reality is that air concentrations will be less than the maximum values predicted the vast majority of the time.

8.7 Climate

8.7.1 Residual Adverse Effects Advanced for Determination of Significance

As described in Section 6.7.1, the potential effects of the Project on climate were evaluated using the following VCs:

-) Project GHG emissions; and
-) Changes in climate due to the Project.

Residual adverse effects were predicted for the Project GHG emissions VC during the site preparation and construction, operations and closure phases. There were no residual adverse effects predicted for Project GHG emissions during post closure. There were no residual adverse effects for the changes in climate due to the Project d predicted during any phase. A summary of the residual adverse effects of the Project on climate is provided in Table 8.7.1-1.



Table 8.7.1-1: Residual Adverse Effects on Climate

| Valued Components (VCs) | Site Preparation and Construction | Operations | Closure | Post-Closure |
|--|-----------------------------------|------------|---------|--------------|
| Project GHG emissions (t/y) ⁽¹⁾ | 10,909 | 14,405 | 12,121 | — |
| Changes in climate due to the Project | — | — | — | — |

Notes:

The “—” symbol indicates where no adverse effects were predicted

(1) The GHG emissions are presented as equivalent CO₂ (eCO₂) in units of tonnes per year (10⁶ g/y)

The eCO₂ combines the emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) using equivalency factors described in Section 6.7

8.7.2 Description of Significance

As described in Section 6.1.3.6, two VC were used for evaluating the effects of the Project on climate, namely: Project GHG emissions, and changes in climate due to the Project. Residual adverse effects were only predicted for the Project GHG emissions VC (Table 8.7.1-1). The significance of this residual adverse effect was determined using the measures and methodology described in Section 8.1.

8.7.2.1 Magnitude

The predicted residual adverse for Project GHG emissions were assigned a magnitude level of Level II for the site preparation and construction, operations, and closure phases using the approach outlines in Section 8.1.1.6 and Table 8.1.1.6-1. The annual GHG emission from the Project were calculated to exceed the reporting threshold under the Ontario Cap and Trade Program (O.Reg. 144/16). However, the Project would not be considered a “large emitter of GHGs” under the regulations as the annual emissions are below 25,000 tonnes annually.

8.7.2.2 Geographic Extent

The scale used for classifying the magnitude of Project GHG emissions is provincial, therefore the geographic extent has been assigned a Level II.

8.7.2.3 Timing

No timing level has been applied for Project GHG emission.

8.7.2.4 Duration

The duration of the emissions was assigned as Level II. Emissions will occur during the site preparation and construction, operations, and closure phases of the Project.



8.7.2.5 Frequency

The emission will occur on a near continuous basis, therefore the frequency has been assigned as Level III.

8.7.2.6 Reversibility

Two VCs were used for characterizing the effects of the Project on climate, namely Project GHG emissions, and changes in climate due to the Project. In the case of Project GHG emissions, the VC relates to the quantity of emissions generated by the Project on an annual basis, in relation to the provincial total and requirements under Ontario Cap and Trade Program (O.Reg. 144/16). As such, the reversibility for this VC is classified as Level I, fully reversible. Once the Project stops emitting GHGs, the effect will stop. However, it is recognized that the effects of GHG emissions with respect to changing climate are long-lived. Therefore, residual adverse effects related to changes in climate due to the Project would have been assigned as Level II, had there been any predicted residual adverse effects.

8.7.2.7 Determination of Significance

For an adverse effects on Project GHG emissions to be considered significant, the Project would have to emit sufficient quantities to be classified as a “large emitter of GHGs” under the Ontario Cap and Trade Program (O.Reg. 144/16), and the intensity of emissions, stated as tonnes of eCO₂ per unit of production, would have to be above the median for the relevant sector of the economy.

The conservatively calculated GHG emissions from the Project show that while the Project emits emissions that are above the reporting levels for the Ontario Cap and Trade Program (O.Reg. 144/16), the Project would not be considered a “large emitter of GHGs” as the annual emissions are below 25,000 tonnes annually. Therefore, the residual adverse effects of the Project on climate would be classified as not significant.

Table 8.7.2.7-1 lists the various levels assigned for the measures introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying these assessment measures to the decision tree presented in Figure 8.1.8-1, yields a determination of not significant for the predicted adverse effects of the Project GHG emissions.

Both the reasoned narrative and the decision tree approach yield the same conclusion, the Project will not result in significant adverse effects for climate.



Table 8.7.2.7-1: Determination of Significance for Climate

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|---|-----------------------------------|-----------|-------------------|-------------------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Project GHG emissions | Annual eCO ₂ emissions | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level I | Not significant | NA ⁽²⁾ |
| Operations Phase | | | | | | | | | |
| Project GHG emissions | Annual eCO ₂ emissions | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level I | Not significant | NA ⁽²⁾ |
| Closure Phase | | | | | | | | | |
| Project GHG emissions | Annual eCO ₂ emissions | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level I | Not significant | NA ⁽²⁾ |
| Post-closure Phase | | | | | | | | | |
| Project GHG emissions | No residual adverse effects | | | | | | | | |

Notes:

- (1) As described in Section 8.1.3.7, timing is not applicable for the Project GHG emissions VC
- (2) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



8.7.3 Prediction Confidence and Uncertainty

The calculation of Project GHG emissions conservatively assumed that equipment would be operating on a continuous basis throughout the year. This assumption is considered conservative for the following reasons:

-) Activities during the site preparation and construction phase are not expected to occur 24-hours a day throughout the year;
-) Gas heating for the underground mine may not be required during the summer months; and
-) Closure phase activities are not expected to occur 24-hours a day throughout the year;

8.8 Surface Water Quality

8.8.1 Residual and Adverse Effects Advanced to Significance Assessment

There were no residual adverse effects during the site preparation and construction phase as there will be no discharges.

Numerical modelling has identified residual adverse effects for surface water quality during operations. A residual adverse effects for surface water quality is identified when the predicted effects of the Project, including mitigation, existing the existing conditions. Operations phase residual adverse effects for surface water quality (Table 8.8.1-1) were predicted at the modelling nodes on Blackwater Creek (nodes BW1 and BW2), as well as the downstream node in Wabigoon Lake (WL).

There were no residual adverse effects predicted during the closure phase as there will be no discharges.

The numerical modelling of surface water quality during post-closure considered the mitigation provided by a wet cover over the tailings storage facility (TSF). Post-closure phase residual adverse effects for surface water quality (Table 8.8.1-2) were predicted at the modelling nodes in Blackwater Creek (BW1 and BW2), the node on Thunder Lake Tributary 3 (TL2) and the downstream node on Thunder Lake Tributary 3 near Thunder Lake (TL3), Hoffstrom's Bay Tributary (HB1), Thunder Lake (TL) and Wabigoon Lake (WL).

8.8.2 Description of Significance

As described in Section 6.1.3.7, the surface water quality assessment relied on a single VC, namely surface water quality. The results of the assessment determined there would be residual adverse effects on surface water quality as a result of the Project during the operations and post-closure phases.



Table 8.8.1-1: Residual Adverse Effects on Surface Water Quality during Operations

| Parameter | BW1: Blackwater Creek (downstream of Project) | | | BW2: Blackwater Creek (discharge to Wabigoon Lake) | | | Wabigoon Lake: Wabigoon Lake | | |
|-------------|---|----------|----------|--|----------|----------|------------------------------|----------|----------|
| | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year |
| Aluminum | — | — | — | — | — | — | — | — | — |
| Antimony | 0.0047 | 0.0039 | 0.0049 | 0.0032 | 0.0027 | 0.0033 | — | — | 0.00064 |
| Arsenic | 0.022 | 0.018 | 0.023 | 0.014 | 0.012 | 0.015 | 0.0011 | — | 0.0012 |
| Beryllium | 0.0031 | 0.0027 | 0.0032 | 0.0023 | 0.0021 | 0.0024 | — | — | — |
| Boron | 0.081 | 0.076 | 0.083 | 0.070 | 0.066 | 0.071 | — | — | — |
| Cadmium | 0.00006 | 0.00005 | 0.00006 | 0.00004 | 0.00004 | 0.00004 | — | — | — |
| Chloride(a) | 25.9 | 21.2 | 27.3 | 16.7 | 13.6 | 17.6 | — | — | 3.4 |
| Chromium | 0.0027 | 0.0024 | 0.0028 | 0.0020 | 0.0018 | 0.0021 | — | — | — |
| Cobalt | 0.0006 | 0.0006 | 0.0007 | 0.0006 | 0.0006 | 0.0006 | — | — | — |
| Copper | 0.0020 | 0.0018 | 0.0020 | 0.0017 | 0.0016 | 0.0017 | — | — | — |
| Cyanide | 0.0026 | 0.0025 | 0.0027 | 0.0024 | 0.0023 | 0.0024 | — | — | — |
| Iron | — | — | — | — | — | — | — | — | — |
| Lead | 0.0018 | 0.0017 | 0.0019 | 0.0015 | 0.0014 | 0.0016 | — | — | — |
| Mercury | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | — | — | — |
| Molybdenum | 0.0092 | 0.0077 | 0.0096 | 0.0062 | 0.0052 | 0.0065 | — | — | 0.0011 |
| Nickel | 0.0068 | 0.0059 | 0.0071 | 0.0051 | 0.0045 | 0.0052 | — | — | — |
| Nitrate(a) | 2.8 | 2.2 | 2.9 | 1.8 | 1.4 | 1.9 | 0.044 | 0.033 | 0.056 |
| Phosphorus | — | — | — | — | — | — | — | — | — |
| Selenium | 0.022 | 0.018 | 0.023 | 0.014 | 0.012 | 0.015 | 0.0011 | — | 0.0012 |
| Silver | — | — | — | — | — | — | — | — | — |
| Thallium | — | — | — | — | — | — | — | — | — |
| Uranium | — | — | — | — | — | — | — | — | — |
| Vanadium | 0.0022 | 0.0020 | 0.0023 | 0.0018 | 0.0017 | 0.0019 | — | — | — |
| Zinc | 0.0097 | 0.0087 | 0.010 | 0.0078 | 0.0071 | 0.0080 | — | — | — |

Note:

The “—” symbol indicates there were no adverse effects predicted (i.e., predicted effects were less than or equal to existing conditions)



Table 8.8.1-2: Residual Adverse Effects on Surface Water Quality during Post-Closure

| Parameter | BW1: Blackwater Creek (downstream of Project) | | | BW2: Blackwater Creek (discharge to Wabigoon Lake) | | | HB1: Hoffstrom's Bay Tributary (at Thunder Lake) | | | TL2: Thunder Lake Tributary 3 (downstream of Tree Nursery Ponds) | | | TL3: Thunder Lake Tributary 2 (at Thunder Lake) | | | Thunder Lake: Thunder Lake | | | Wabigoon Lake: Wabigoon Lake | | |
|-------------|---|----------|----------|--|----------|----------|--|----------|----------|--|----------|----------|---|----------|----------|----------------------------|----------|----------|------------------------------|----------|----------|
| | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year | Avg. Year | Dry Year | Wet Year |
| Aluminum | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.029 | 0.028 | 0.029 | — | — | — |
| Antimony | 0.00075 | 0.00080 | 0.00075 | 0.00070 | 0.00073 | 0.00070 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Arsenic | 0.0012 | 0.0012 | 0.0011 | 0.0011 | 0.0011 | 0.0011 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Beryllium | — | 0.0011 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Boron | — | 0.054 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Cadmium | 0.00004 | 0.00005 | 0.00004 | 0.00003 | 0.00004 | 0.00003 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Chloride(a) | 36.01 | 47.43 | 36.43 | 23.65 | 32.07 | 24.24 | 0.51 | 0.84 | 0.46 | 0.35 | 0.58 | 0.31 | 0.30 | 0.39 | 0.28 | — | — | — | — | — | — |
| Chromium | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Cobalt | 0.0007 | 0.0007 | 0.0007 | 0.0006 | 0.0007 | 0.0006 | — | — | — | — | — | — | — | — | — | 0.00053 | 0.00053 | 0.00053 | — | — | — |
| Copper | 0.0020 | 0.0023 | 0.0020 | 0.0017 | 0.0019 | 0.0017 | — | 0.0011 | — | — | 0.0011 | — | — | — | — | — | — | — | — | — | — |
| Cyanide | 0.0029 | 0.0031 | 0.0029 | 0.0026 | 0.0028 | 0.0026 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Iron | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 0.16 | 0.16 | 0.16 | — | — | — |
| Lead | 0.0016 | 0.0017 | 0.0016 | 0.0014 | 0.0015 | 0.0014 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Mercury | 0.00001 | 0.00002 | 0.00001 | 0.00001 | 0.00001 | 0.00001 | — | 0.00001 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Molybdenum | — | 0.00106 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Nickel | 0.009 | 0.011 | 0.0089 | 0.006 | 0.008 | 0.007 | — | — | — | — | — | — | — | — | — | 0.0022 | 0.0022 | 0.0022 | — | — | — |
| Nitrate(a) | 3.8 | 5.1 | 3.9 | 2.5 | 3.4 | 2.6 | — | — | — | — | — | — | — | — | — | — | — | — | 0.051 | 0.039 | 0.068 |
| Phosphorus | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † | † |
| Selenium | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Silver | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Thallium | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Uranium | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Vanadium | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Zinc | 0.012 | 0.014 | 0.012 | 0.009 | 0.011 | 0.009 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |

Notes:

The numbers table incorporate the mitigation provided by using a wet cover for the closure of the TSF
 The "—" symbol indicates that there was no adverse effect predicted (i.e., predicted effects were less than or equal to the existing conditions)
 The "†" symbol indicates that surface water quality was not modelled due to insufficient source data



8.8.2.1 Magnitude

Using the approach described in Section 8.1.1.7, and the levels of magnitude set out in Table 8.1.1.7-2, levels of magnitude were assigned to the predicted residual adverse surface water quality effects summarized in Tables 8.8.1-1 and 8.8.1-2. For the purposes of assigning magnitude, the highest magnitude of the prediction for each of the indicators has been selected. The results are presented in Table 8.8.2.1-1.

Table 8.8.2.1-1: Levels of Magnitude for Residual Adverse Effects on Surface Water Quality

| Parameter | Level of Magnitude ⁽¹⁾ | | | |
|-------------|-----------------------------------|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| Aluminum | — | — | — | — |
| Antimony | — | Level I | — | Level I |
| Arsenic | — | Level I | — | Level I |
| Beryllium | — | Level I | — | Level I |
| Boron | — | Level I | — | Level I |
| Cadmium | — | Level I | — | Level I |
| Chloride(a) | — | Level I | — | Level I |
| Chromium | — | Level I | — | — |
| Cobalt | — | Level I | — | Level I |
| Copper | — | Level I | — | Level I |
| Cyanide | — | Level I | — | Level I |
| Iron | — | — | — | Level I |
| Lead | — | Level I | — | Level I |
| Mercury | — | Level I | — | Level I |
| Molybdenum | — | Level I | — | Level I |
| Nickel | — | Level I | — | Level I |
| Nitrate(a) | — | Level I | — | Level I |
| Phosphorus | — | — | — | † |
| Selenium | — | Level I | — | — |
| Silver | — | — | — | — |
| Thallium | — | — | — | — |
| Uranium | — | — | — | — |
| Vanadium | — | Level I | — | — |
| Zinc | — | Level I | — | Level I |

Notes:

The “—” symbol indicates that there was no adverse effect predicted (i.e., predicted effects were less than or equal to the existing conditions)

The “†” symbol indicates that surface water quality was not modelled due to insufficient source data

8.8.2.2 Geographic Extent

Geographic extent was assigned using the approach described in Section 8.1.2. The residual adverse surface water quality effects of the Project (Tables 8.8.1-1 and 8.8.1-2) were determined at a series of nodes, described in Section 6.1.4.8, that were located in both the LSA and RSA for surface water quality. In assessing the geographic extent for the residual adverse effects on



surface water quality, the largest geographic extent was selected for indicator. That is to say, if residual adverse effects were predicted for an indicator in only nodes within the LSA, then the geographic extent was assigned as Level II. If the residual effects were predicted for nodes in the LSA and RSA, geographic extent was assessed as Level III. The geographic extents are summarized in Table 8.8.2.2-1.

Table 8.8.2.2-1: Geographic Extent for Residual Adverse Effects on Surface Water Quality

| Parameter | Level of Geographic Extent ⁽¹⁾ | | | |
|-------------|---|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| Aluminum | — | — | — | Level III |
| Antimony | — | Level III | — | Level II |
| Arsenic | — | Level II | — | Level II |
| Beryllium | — | Level II | — | Level II |
| Boron | — | Level II | — | Level II |
| Cadmium | — | Level II | — | Level II |
| Chloride(a) | — | Level II | — | Level II |
| Chromium | — | Level II | — | — |
| Cobalt | — | Level II | — | Level III |
| Copper | — | Level II | — | Level II |
| Cyanide | — | Level II | — | Level II |
| Iron | — | — | — | Level III |
| Lead | — | Level II | — | Level II |
| Mercury | — | Level II | — | Level II |
| Molybdenum | — | Level III | — | Level II |
| Nickel | — | Level II | — | Level III |
| Nitrate(a) | — | Level III | — | Level III |
| Phosphorus | — | — | — | † |
| Selenium | — | Level III | — | — |
| Silver | — | — | — | — |
| Thallium | — | — | — | — |
| Uranium | — | — | — | — |
| Vanadium | — | Level II | — | — |
| Zinc | — | Level II | — | Level II |

Notes:

The “—” symbol indicates that there was no adverse effect predicted (i.e., predicted effects were less than or equal to the existing conditions)

The “†” symbol indicates that surface water quality was not modelled due to insufficient source data

8.8.2.3 Timing

The predicted effects of the Project on the surface water quality made use of a numerical model to predict annual average surface water quality at various location in the waterbodies surrounding the Project. As described in Section 8.1.3.7, the assessment has conservatively assumed that the predicted effects of the Project could occur during sensitive times of the year throughout the Project life and the timing will be assessed as Level III.



8.8.2.4 Duration

Using the approach described in Section 8.1.4, levels of duration were assigned to the predicted residual adverse surface water quality effects summarized in Tables 8.8.1-1 and 8.8.1-2. The results are presented in Table 8.8.2.4-1.

Table 8.8.2.4-1: Levels of Duration for Residual Adverse Effects on Surface Water Quality

| Parameter | Level of Duration ⁽¹⁾ | | | |
|-------------|-----------------------------------|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| Aluminum | — | — | — | — |
| Antimony | — | Level II | — | Level III |
| Arsenic | — | Level II | — | Level III |
| Beryllium | — | Level II | — | Level III |
| Boron | — | Level II | — | Level III |
| Cadmium | — | Level II | — | Level III |
| Chloride(a) | — | Level II | — | Level III |
| Chromium | — | Level II | — | — |
| Cobalt | — | Level II | — | Level III |
| Copper | — | Level II | — | Level III |
| Cyanide | — | Level II | — | Level III |
| Iron | — | — | — | Level III |
| Lead | — | Level II | — | Level III |
| Mercury | — | Level II | — | Level III |
| Molybdenum | — | Level II | — | Level III |
| Nickel | — | Level II | — | Level III |
| Nitrate(a) | — | Level II | — | Level III |
| Phosphorus | — | — | — | † |
| Selenium | — | Level II | — | — |
| Silver | — | — | — | — |
| Thallium | — | — | — | — |
| Uranium | — | — | — | — |
| Vanadium | — | Level II | — | — |
| Zinc | — | Level II | — | Level III |

Notes:

The "—" symbol indicates that there was no adverse effect predicted (i.e., predicted effects were less than or equal to the existing conditions)
The "†" symbol indicates that surface water quality was not modelled due to insufficient source data

8.8.2.5 Frequency

The predicted effects of the Project on the surface water quality made use of a numerical model to predict annual average surface water quality at various location in the waterbodies surrounding the Project. As described in Section 8.1.5.7, the assessment has conservatively assumed that the predicted effects of the Project could occur continuously, and the frequency will be assessed as Level III.



8.8.2.6 Reversibility

The reversibility of the residual effects of the Project on surface water quality were classified as Level I during operations. During operations, the residual adverse effects of the Project on surface water quality are result of the treated effluent being discharged to Blackwater Creek. Should the discharges during operations be stopped for any reason, the surface water quality would quickly return to the existing conditions. This meets the definition of a Level I reversibility.

The reversibility of the residual effects of the Project on surface water quality were classified as Level II during the post-closure phase. During post-closure, the residual adverse effects on surface water quality are the result of discharges from the pit lake, and seepage from the TSF and WRSA. Should discharges from the pit lake cease, the surface water quality as a result of those discharges would quickly return to existing conditions. However, should it be possible in the future to eliminate the ongoing seepage from the TSF and WRSA, the effects on surface quality would not immediately return to existing conditions. The reason is that seepage from the TSF and WRSA will take years to reach the surrounding water courses and the effects will continue long after the seepage stops, should that be possible.

8.8.2.7 Determination of Significance

Based on the experience on similar projects within Ontario, it is reasonable to conclude for there to be a significant adverse effect to surface water quality, the Project would need to results in predicted annual average concentrations that exceed both existing conditions and the relevant criteria during operations, or extending into the post-closure phase.

A review of the predicted residual adverse surface water quality effects of the Project on surface water quality (Tables 8.8.1-1 and 8.8.1-2) show that none of the predicted concentrations in the receiving environment would exceed the relevant criteria used in the assessment. The PWQO assessment criteria used to evaluate the effects of the Project on surface water quality have been established to provide a level of protection from harm to sensitive aquatic receptors. Therefore, the effects of the Project on surface water quality would be classified as not significant.

Table 8.8.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying the decision tree (Figure 8.1.8-1) to the effects levels in Table 8.8.2.7-1 yields a determination that the residual adverse effects on surface water quality would not be significant.

The residual adverse of the Project on surface water quality were determined to be not significant using a reasoned narrative approach as well when using the decision tree (Figure 8.1.8-1). Therefore, it is concluded that the Project will not have a significant adverse effect on surface water quality.



Table 8.8.2.7-1: Determination of Significance for Surface Water Quality

| Valued Components (VCs) | Indicator ⁽¹⁾ | Magnitude ⁽²⁾ | Geographic Extent ⁽³⁾ | Timing | Duration | Frequency | Reversibility ⁽⁴⁾ | Significance | Likelihood |
|---|-----------------------------|--------------------------|----------------------------------|-----------|-----------|-----------|------------------------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Surface water quality | No residual adverse effects | | | | | | | | |
| Operations Phase | | | | | | | | | |
| Surface water quality | Various | Level I | Level III | Level III | Level II | Level III | Level I | Not significant | NA ⁽⁵⁾ |
| Closure Phase | | | | | | | | | |
| Surface water quality | No residual adverse effects | | | | | | | | |
| Post-closure Phase | | | | | | | | | |
| Surface water quality | Various | Level I | Level III | Level III | Level III | Level III | Level II | Not significant | NA ⁽⁵⁾ |

Notes:

- (1) The indicators for which residual adverse effects (Tables 8.8.1-1 and 8.8.1-2) were predicted varied by phase and modelling nodes
- (2) The level of magnitude was based on the highest assigned for that phase of the Project (Table 8.8.2.1-1)
- (3) The geographic extent was based on the highest assigned for that phase of the Project (Table 8.8.2.2-1)
- (4) The reversibility was based on the highest assigned for that phase of the Project (Section 8.8.2.5)
- (5) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



8.8.3 Prediction Confidence and Uncertainty

The predictions of the surface water quality effects of the Project made use of a mass balance model described in Section 6.8.2. The theory behind the modelling is straightforward, and certain. The confidence in the results of the modelling is supported by the commitments made by Treasury Metals with regards to the releases to the environment. During operations, the effluent releases from the Project to Blackwater Creek will be treated to meet the Provincial Water Quality Objectives (PWQO) prior to discharge into the receiving environment. There will be no reliance on in-stream dilution to achieve these objectives. In the case of the post-closure releases from the pit lake, Treasury Metals will test the pit lake as it is filling and, if required, implement batch treatment to ensure that the PWQO can be achieved in the water to be passively discharges from the pit lake to a tributary of Blackwater Creek. The post-closure modelling also incorporates the effects of seepage from the waste rock storage area (WRSA) and tailings storage facility (TSF) to surface water. It was conservatively assumed than there would be no attenuation to the quality of the seepage as it travelled to the receiving waters.

8.9 Surface Water Quantity

8.9.1 Residual Adverse Effects Advanced to Significance Assessment

As described in Section 6.9.1, the potential effects of the Project on surface water quantity were evaluated with a single VC, surface water quantity. There were no residual adverse effects predicted on surface water quantity during the site preparation and construction or closure phases of the Project. Residual adverse effects associated with surface water flows, after the implementation of mitigation, are predicted to occur during the operations and post-closure phases of the Project and results are summarized in Tables 8.9.1-1 and 8.9.1-2 for the abovementioned Project phases, respectively.

8.9.2 Description of Significance

As described in Section 6.1.3.8, the surface water quantity assessment relied on the VC called surface water quantity. The results of the assessment determined there would be residual adverse effects on surface water quantity during the operations and post-closure phases of the Project.

8.9.2.1 Magnitude

The levels of magnitude for predicted residual adverse effects to surface water quantity were assigned based on the approach described in Section 8.1.1.8 and the levels of magnitude presented in Table 8.1.1.8-1. Surface water flow increases were evaluated on an annual basis and surface water flow decreases were evaluated on a monthly basis. The levels of magnitude are set out in Tables 8.9.2.1-1 and 8.9.2.1-2 for the operations and post-closure phases, respectively. There are no residual adverse effects predicted for either the site preparation and construction or closure phases.



Table 8.9.1-1: Residual Adverse Effects on Surface Water Quantity during Operations

| Scenario | Calculated Change in Flows, Q (%) | | | | | | | | | | | | Annual |
|---------------------|-----------------------------------|--------|--------|--------|------------------|---------|---------|---------|---------|---------|--------|---------|------------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Average Year | | | | | | | | | | | | | |
| TL1 | -4.92% | -4.99% | -4.90% | -0.05% | — ⁽¹⁾ | — | — | — | — | — | — | -4.91% | † ⁽²⁾ |
| TL2 | -4.92% | -4.99% | -4.90% | -0.05% | — | — | — | — | — | — | — | -4.91% | † |
| TL3 | -4.28% | -4.35% | -4.27% | -0.04% | — | — | — | — | — | — | — | -4.28% | † |
| HB1 | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | † |
| LC1 | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | † |
| BW1 | ‡ ⁽³⁾ | ‡ | ‡ | ‡ | -15.76% | -5.23% | -6.40% | ‡ | ‡ | ‡ | ‡ | -1.39% | +0.78% |
| BW2 | ‡ | ‡ | ‡ | ‡ | -9.94% | -3.30% | -4.04% | ‡ | ‡ | ‡ | ‡ | -0.88% | +0.49% |
| Dry year | | | | | | | | | | | | | |
| TL1 | -4.99% | -4.93% | -5.06% | -5.00% | -5.00% | -5.01% | -5.01% | -4.98% | -5.00% | -4.99% | -5.02% | -4.98% | † |
| TL2 | -4.99% | -4.93% | -5.06% | -5.00% | -5.00% | -5.01% | -5.01% | -4.98% | -5.00% | -4.99% | -5.02% | -4.98% | † |
| TL3 | -4.35% | -4.30% | -4.41% | -4.36% | -4.36% | -4.37% | -4.36% | -4.34% | -4.36% | -4.35% | -4.37% | -4.34% | † |
| HB1 | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | † |
| LC1 | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | -20.62% | -20.62% | -20.62% | -20.62% | -20.62% | -20.62% | ‡ | -14.12% | † |
| BW2 | ‡ | ‡ | ‡ | ‡ | -13.00% | -13.00% | -13.00% | -13.00% | -13.00% | -13.00% | ‡ | -8.91% | † |
| Wet Year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL3 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| HB1 | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | -7.77% | † |
| LC1 | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | -8.74% | † |
| BW1 | -1.42% | ‡ | ‡ | -4.84% | -11.60% | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | -8.90% | +1.76% |
| BW2 | -0.90% | ‡ | ‡ | -3.05% | -7.32% | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | -5.61% | +1.11% |

Notes:

- (1) The "—" symbol indicates where no adverse effects were predicted.
- (2) The "†" symbol indicates predicted decreases in annual flows. Decreases in flows are evaluated with monthly flows
- (3) The "‡" symbol indicates predicted increases in monthly flows. Increases in flows are evaluated with annual flows



Table 8.9.1-2: Residual Adverse Effects on Surface Water Quantity during Post-closure

| Scenario | Calculated Change in Flows, Q (%) | | | | | | | | | | | | |
|---------------------|-----------------------------------|--------|--------|--------|--------|---------|---------|---------|---------|--------|--------|--------|------------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| Average Year | | | | | | | | | | | | | |
| TL1 | — ⁽¹⁾ | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ ⁽²⁾ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.20% |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.08% |
| HB1 | -5.47% | -4.86% | -5.22% | -6.99% | -7.01% | -6.83% | -6.80% | -6.16% | -6.57% | -6.68% | -6.55% | -6.21% | † ⁽³⁾ |
| LC1 | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | -1.70% | -3.48% | -13.77% | ‡ | ‡ | ‡ | ‡ | +7.98% |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | -1.07% | -2.19% | -8.68% | ‡ | ‡ | ‡ | ‡ | +5.04% |
| Dry year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.71% |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.29% |
| HB1 | -0.97% | ‡ | -0.09% | -6.38% | -6.48% | -5.84% | -5.73% | -3.42% | -4.91% | -5.31% | -4.82% | -3.62% | † |
| LC1 | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | -11.02% | -19.35% | -20.76% | -20.76% | ‡ | ‡ | ‡ | +19.03% |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | -6.95% | -12.20% | -13.09% | -13.09% | ‡ | ‡ | ‡ | +12.00% |
| Wet Year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.12% |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | +0.05% |
| HB1 | -6.20% | -5.85% | -6.06% | -7.08% | -7.10% | -6.99% | -6.98% | -6.60% | -6.84% | -6.91% | -6.83% | -6.63% | † |
| LC1 | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | -7.49% | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | -1.34% | ‡ | ‡ | ‡ | ‡ | +12.43% |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | -0.84% | ‡ | ‡ | ‡ | ‡ | +7.84% |

Notes:

- (1) The "—" symbol indicates where no adverse effects were predicted
- (2) The "‡" symbol indicates predicted increases in monthly flows. Increases in flows are evaluated with annual flows
- (3) The "†" symbol indicates predicted decreases in annual flows. Decreases in flows are evaluated with monthly flows



Table 8.9.2.1-1: Levels of Magnitude for Surface Water Quantity during Operations

| Scenario | Calculated Change in Flows, Q (%) | | | | | | | | | | | | |
|---------------------|-----------------------------------|---------|---------|---------|------------------|----------|----------|----------|----------|----------|---------|---------|------------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| Average Year | | | | | | | | | | | | | |
| TL1 | Level I | Level I | Level I | Level I | — ⁽¹⁾ | — | — | — | — | — | — | Level I | † ⁽²⁾ |
| TL2 | Level I | Level I | Level I | Level I | — | — | — | — | — | — | — | Level I | † |
| TL3 | Level I | Level I | Level I | Level I | — | — | — | — | — | — | — | Level I | † |
| HB1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | ‡ ⁽³⁾ | ‡ | ‡ | ‡ | Level II | Level I | Level I | ‡ | ‡ | ‡ | ‡ | Level I | Level I |
| BW2 | ‡ | ‡ | ‡ | ‡ | Level I | Level I | Level I | ‡ | ‡ | ‡ | ‡ | Level I | Level I |
| Dry year | | | | | | | | | | | | | |
| TL1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| TL2 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| TL3 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| HB1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | Level II | Level II | Level II | Level II | Level II | Level II | ‡ | Level I | † |
| BW2 | ‡ | ‡ | ‡ | ‡ | Level I | Level I | Level I | Level I | Level I | Level I | ‡ | Level I | † |
| Wet Year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL3 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| HB1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | Level I | ‡ | ‡ | Level I | Level I | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level I |
| BW2 | Level I | ‡ | ‡ | Level I | Level I | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level I |

Notes:

- (1) The "—" symbol indicates where no adverse effects were predicted
- (2) The "†" symbol indicates predicted decreases in annual flows. Decreases in flows are evaluated with monthly flows
- (3) The "‡" symbol indicates predicted increases in monthly flows. Increases in flows are evaluated with annual flows



Table 8.9.2.1-2: Levels of Magnitude for Surface Water Quantity during Post-closure

| Scenario | Calculated Change in Flows, Q (%) | | | | | | | | | | | | Annual |
|---------------------|-----------------------------------|---------|---------|---------|---------|---------|----------|----------|----------|---------|---------|---------|------------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
| Average Year | | | | | | | | | | | | | |
| TL1 | — ⁽¹⁾ | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ ⁽²⁾ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| HB1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † ⁽³⁾ |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level I | Level I | ‡ | ‡ | ‡ | ‡ | Level I |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level I | Level I | ‡ | ‡ | ‡ | ‡ | Level I |
| Dry year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| HB1 | Level I | ‡ | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level II | Level II | Level II | ‡ | ‡ | ‡ | Level II |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | Level I | Level I | Level I | ‡ | ‡ | ‡ | Level I |
| Wet Year | | | | | | | | | | | | | |
| TL1 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I |
| HB1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| LC1 | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level I | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | ‡ | ‡ | ‡ | ‡ | Level I |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level I | ‡ | ‡ | ‡ | ‡ | Level I |

Notes:

- (1) The "—" symbol indicates where no adverse effects were predicted
- (2) The "‡" symbol indicates predicted increases in monthly flows. Increases in flows are evaluated with annual flows
- (3) The "†" symbol indicates predicted decreases in annual flows. Decreases in flows are evaluated with monthly flows



8.9.2.2 Geographic Extent

Geographic extent was assigned using the approach described in Section 8.1.2. All of the sub-watershed for which there were predicted residual adverse effects are within the LSA. Therefore, the geographic extent was assigned a Level II.

8.9.2.3 Timing

The predicted effects of the Project on surface water quantity made use of a numerical model to determine surface water flows at various locations in waterbodies surrounding the Project. As described in Section 8.1.3.8, the assessment has conservatively assumed that the predicted effects of the Project could occur during sensitive times of the year throughout the life of the Project and timing will be assessed as Level III.

8.9.2.4 Duration

Using the approach described in Section 8.1.4, levels of duration were assigned to the predicted residual adverse surface water quantity effects summarized in Tables 8.9.1-1 and 8.9.1-2. The results are presented in Table 8.9.2.4-1.

Table 8.9.2.4-1: Levels of Duration for Residual Adverse Effects on Surface Water Quantity

| Sub-watershed | Level of Geographic Extent | | | |
|---------------|-----------------------------------|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| TL1 | — | Level II | — | — |
| TL2 | — | Level II | — | Level III |
| TL3 | — | Level II | — | Level III |
| HB1 | — | Level II | — | Level III |
| LC1 | — | Level II | — | Level III |
| BW1 | — | Level II | — | Level III |
| BW2 | — | Level II | — | Level III |

Note: The “—” symbol indicates that there was no adverse effect predicted

8.9.2.5 Frequency

The predicted effects of the Project on surface water quantity made use of a numerical model to determine surface water flows at various locations in waterbodies surrounding the Project. The levels of frequency for the residual adverse effects on surface water quantity are summarized in Table 8.9.2.5-1, using the method described in Section 8.1.5.8. The level of frequency was assigned based on the highest magnitude predicted in a particular sub-watershed and time period (i.e., month or annual).



Table 8.9.2.5-1: Levels of Frequency for Surface Water Quantity

| Scenario | Levels of Frequency | | | | | | | | | | | | | |
|-----------------------------------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------------|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual | |
| Site Preparation and Construction | | | | | | | | | | | | | | |
| No residual adverse effects | | | | | | | | | | | | | | |
| Operations Phase | | | | | | | | | | | | | | |
| TL1 | Level II | Level II | Level II | Level II | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level II | Level II | † ⁽¹⁾ |
| TL2 | Level II | Level II | Level II | Level II | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level II | Level II | † |
| TL3 | Level II | Level II | Level II | Level II | Level I | Level I | Level I | Level I | Level I | Level I | Level I | Level II | Level II | † |
| HB1 | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | † |
| LC1 | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | † |
| BW1 | Level I | ‡ | ‡ | Level I | Level II | Level I | Level I | Level I | Level I | Level I | ‡ | Level III | Level II | Level II |
| BW2 | Level I | ‡ | ‡ | Level I | Level III | Level II | Level II | Level I | Level I | Level I | ‡ | Level III | Level II | Level II |
| Post-closure Phase | | | | | | | | | | | | | | |
| TL1 | — ⁽²⁾ | — | — | — | — | — | — | — | — | — | — | — | — | — |
| TL2 | ‡ ⁽³⁾ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level III |
| TL3 | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | ‡ | Level III |
| HB1 | Level III | Level II | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | † ⁽³⁾ |
| LC1 | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | Level III | † |
| BW1 | ‡ | ‡ | ‡ | ‡ | ‡ | Level II | Level I | Level I | Level I | ‡ | ‡ | ‡ | ‡ | Level III |
| BW2 | ‡ | ‡ | ‡ | ‡ | ‡ | Level II | Level II | Level III | Level I | ‡ | ‡ | ‡ | ‡ | Level III |
| Post-closure Phase | | | | | | | | | | | | | | |
| No residual adverse effects | | | | | | | | | | | | | | |

Notes:

- The frequencies were assigned for the largest magnitude in a particular sub-watershed and time period
- (1) The "†" symbol indicates predicted decreases in annual flows. Decreases in flows are evaluated with monthly flows
- (2) The "—" symbol indicates where no adverse effects were predicted
- (3) The "‡" symbol indicates predicted increases in monthly flows. Increases in flows are evaluated with annual flows



8.9.2.6 Reversibility

The reversibility of the residual effects of the Project on surface water quantity have been classified as a Level II for Thunder Lake Tributary 2 and Thunder Lake Tributary 3 for the operations and post-closure phases. Once water takings cease from the two dug ponds along Thunder Lake Tributary 3 and the pond located on Thunder Lake Tributary 2, surface water flows would return to existing conditions over a period of time. The reversibility of the residual effects of the Project on surface water quantity have been classified as a Level III for Blackwater Creek, Little Creek and Hoffstrom’s Bay Tributary for the operations and post-closure phases of the Project. These effects are considered to be not reversible as these catchment sizes will be affected as a result of the Project. Refer to Table 8.9.2.6-1 for levels of reversibility for residual adverse effects on surface water quantity.

Table 8.9.2.6-1: Levels of Reversibility for Residual Adverse Effects on Surface Water Quantity

| Sub-watershed | Level of Reversibility | | | |
|---------------|-----------------------------------|------------|---------|--------------|
| | Site Preparation and Construction | Operations | Closure | Post-closure |
| TL1 | — | Level I | — | — |
| TL2 | — | Level I | — | Level II |
| TL3 | — | Level I | — | Level II |
| HB1 | — | Level III | — | Level III |
| LC1 | — | Level III | — | Level III |
| BW1 | — | Level I | — | Level III |
| BW2 | — | Level I | — | Level III |

Note: The “—” symbol indicates that there was no adverse effect predicted

8.9.2.7 Determination of Significance

For the effects of the Project on surface water quantity to be considered significant, the predicted residual adverse effects would need to be sufficient large to permanently change the hydrologic and geomorphologic function of the watercourse. This definition of focusses on the hydrologic significance, and does not consider the significance of changes in surface water flows to aquatic life. The evaluation of changes in flows on aquatic life has been incorporated into the assessment of effects on fish and fish habitat (Section 6.14).

Based on this hypothesis, the changes in average flows predicted for surface water quantity would not result in permanent changes that are of sufficient magnitude to alter the hydrologic function of capacity of the watercourses.

Table 8.9.2.7-1 lists the various levels assigned for the elements introduced in Section 8.9. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying the decision tree presented in Figure 8.1.8-1 the assigned assessment levels yields a determination that the residual adverse effects on surface water quantity would be not significant.



Table 8.9.2.7-1: Determination of Significance for Surface Water Quantity

| Valued Components (VCs) | Indicator | Magnitude ⁽¹⁾ | Geographic Extent ⁽²⁾ | Timing | Duration | Frequency ⁽³⁾ | Reversibility ⁽⁴⁾ | Significance | Likelihood |
|---|-----------------------------|-----------------------------|----------------------------------|-----------|-----------|--------------------------|------------------------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Surface water quantity | No residual adverse effects | | | | | | | | |
| Operations Phase | | | | | | | | | |
| Surface water quantity | Increase in surface flows | Level I | Level II | Level III | Level II | Level II | Level I | Not significant | NA ⁽⁵⁾ |
| | Decrease in surface flows | Level II | Level II | Level III | Level II | Level II | Level I | Not significant | NA ⁽⁵⁾ |
| | Change in lake levels | No residual adverse effects | | | | | | | |
| Closure Phase | | | | | | | | | |
| Surface water quantity | No residual adverse effects | | | | | | | | |
| Post-closure Phase | | | | | | | | | |
| Surface water quantity | Increase in surface flows | Level I | Level II | Level III | Level III | Level III | Level III | Not significant | NA ⁽⁵⁾ |
| | Decrease in surface flows | Level II | Level II | Level III | Level III | Level I | Level III | Not significant | NA ⁽⁵⁾ |
| | Change in lake levels | No residual adverse effects | | | | | | | |

NOTES:

- (1) The level of magnitude was based on the highest assigned for each indicator for that phase of the Project
- (2) The geographic extent was based on the extent for the highest magnitude assigned for each indicator for that phase of the Project
- (3) The frequency was based on the frequency assigned for the highest magnitude assigned for each indicator that phase of the Project
- (4) The reversibility was based on the reversibility for the highest magnitude assigned for each indicator that phase of the Project
- (5) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



The residual adverse of the Project on surface water quantity were determined to be not significant using a reasoned narrative approach as well when using the decision tree (Figure 8.1.8-1). Therefore, it is concluded that the Project will not have a significant adverse effect on surface water quantity.

8.9.3 Prediction Confidence and Uncertainty

The modelling of the effects of the Project on surface water quantities made use of a model developed based on long-term flow statistics from a representative, regional Water Survey of Canada (WSC) station. The confidence in the results were enhanced by conducting the hydrologic modelling for the following range of hydrologic conditions:

-) Average hydrologic year;
-) A dry hydrologic year, based on the 1:20 year (5th percentile) low annual flows; and
-) A wet hydrologic year, based on the 1:20 year (95th percentile) high annual flows.

8.10 Groundwater Quality

As described in Section 6.10.4, there were no predicted adverse effects of the Project on groundwater quality. Although some of the seepage from the waste rock storage area (WRSA) and tailings storage facility (TSF) is predicted to leave the site during the post-closure phase, after the after the pit lake is filled and the groundwater levels return to near pre-development conditions, the groundwater modelling determined that this seepage would report to surface water courses and would not affect water wells in the area. The effects of seepage during post-closure on surface watercourse was incorporated into the assessment effects on surface water quality.

Because there were no predicted residual adverse effects on groundwater quality, no determination of significance is required.

8.11 Groundwater Quantity

8.11.1 Residual Adverse Effects Advanced for Determination of Significance

As described in Section 6.11.1, the potential effects of the Project on the groundwater quantity VC considered two indicators, namely; decreasing elevations in private water well, and decreasing contribution to surface flows patterns. Although potential effects to elevations in private water wells were for wells within the zone of influence created by the dewatering of the open pit and underground mine, these effects can be fully mitigated by deepening those wells where the productivity is affected by the dewatering activities. In fact, Treasury Metals will be required to sureties to the government as part of the permitting process to provide for mitigating water wells that may be affected. Therefore, there are no residual adverse effects to the decreasing elevations in private water indicator. A residual adverse effect also predicted for



decreasing contributions to surface water flows, specifically with respect to decreases in the groundwater contributions to flows in the watershed for Thunder Lake Tributary 2 and Thunder Lake Tributary 3. Table 8.11.1-1 provides a summary of the predicted residual adverse effects on groundwater quantity.

Table 8.11.1-1: Residual Adverse Effects on Groundwater Quantity

| Indicator | Site Preparation and Construction | Operations | Closure | Post-closure |
|--|-----------------------------------|--|--|--|
| Decreasing elevations in private wells | — | — | — | — |
| Decreasing contribution to surface flow patterns | — | Decrease in average flows in watershed for Thunder Lake Tributary 2 and 3 -1.2%: average year -4.4%: dry year -0.7%: wet year | Decrease in average flows in watershed for Thunder Lake Tributary 2 and 3 -1.2%: average year -4.4%: dry year -0.7%: wet year | Decrease in average flows in watershed for Thunder Lake Tributary 2 and 3 -1.2%: average year -4.4%: dry year -0.7%: wet year |

Note: The “—” symbol indicates where no residual adverse effects were predicted.

8.11.2 Description of Significance

As described in Section 6.1.3.10, the evaluation of effects of the Project on groundwater quantity VC considered two indicators, namely; decreasing elevations in private water well, and decreasing contribution to surface flows patterns.

8.11.2.1 Magnitude

The levels of magnitude for the predicted residual effects of the Project on groundwater quantity were assigned as Level I, using the approach described in Section 8.1.1.10, and Table 8.1.1.10-1. The predicted changes in the average flows for the watershed (calculated at node TL3) represented a change in average flows of less than 10%.

8.11.2.2 Geographic Extent

Geographic extent to the residual adverse effects for decreases in contributions to surface flow patterns is assigned as Level II, using the approach described in Section 8.1.2. The effects extend into the LSA.

8.11.2.3 Timing

The levels of timing for the residual adverse effects on groundwater quantity were assigned as Level III, as described in Section 8.1.3.10.



8.11.2.4 Duration

The levels of duration for the predicted residual effects on groundwater quantities were classified as Level II for effects during the operations and closure phases and Level III during the post-closure phase (Section 8.1.4).

8.11.2.5 Frequency

As described in Section 8.1.5.10, the levels of frequency for groundwater quantity residual adverse effects were assigned as Level III.

8.11.2.6 Reversibility

The levels of reversibility for the predicted residual effects of the Project on groundwater quantity were assigned as Level II. The effects the Project on groundwater contribution to surface flow patterns can be reversed with time as the groundwater levels return to near pre-disturbance conditions. The approach for assigning significance is provided in Section 8.1.6.

8.11.2.7 Determination of Significance

For the effects of the Project groundwater quantities, specifically for the decreasing contributions to surface flows patterns indicator, the predicted effects would need to be sufficiently large to permanently change the hydrologic and geomorphologic function of the watercourse. This definition focusses on the hydrologic significance, and does not consider the significance of changes in surface water flows on aquatic life. The evaluation of changes in flows on aquatic life has been incorporated into the assessment of effects on fish and fish habitat (Sections 6.14).

The predicted changes in average flows within the watershed of Thunder Lake Tributary 2 and Thunder Lake Tributary 3 were -1.2% for an average hydrologic year (-4.4% in a dry year and -0.7% in a wet year). The magnitude of these changes would not be sufficient to affect the hydrologic function of the watercourses. Additionally, the changes in flows would be reversible with time. Therefore the residual adverse effects on groundwater quantity is determined to be not significant.

Table 8.11.2.7-1 lists the various levels assigned for the elements introduced in Section 6.11. The classification of the effects for the elements presented in the table are described in the preceding sections. By applying the decision tree presented in Figure 8.1.8-1 to the assigned assessment levels yields a determination that the residual adverse effects on groundwater quantities would be not significant.



Table 8.11.2.7-1: Determination of Significance for Groundwater Quantity

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility |
|---|---|-----------------------------|-------------------|-----------|-----------|-----------|---------------|
| Site Preparation and Construction Phase | | | | | | | |
| Surface water quantity | No residual adverse effects | | | | | | |
| Operations Phase | | | | | | | |
| Groundwater quantity | Decreasing elevations in private wells | No residual adverse effects | | | | | |
| | Decreasing contributions to surface flow patterns | Level I | Level II | Level III | Level II | Level III | Level II |
| Closure Phase | | | | | | | |
| Groundwater quantity | Decreasing elevations in private wells | No residual adverse effects | | | | | |
| | Decreasing contributions to surface flow patterns | Level I | Level II | Level III | Level II | Level III | Level II |
| Post-closure Phase | | | | | | | |
| Groundwater quantity | Decreasing elevations in private wells | No residual adverse effects | | | | | |
| | Decreasing contributions to surface flow patterns | Level I | Level II | Level III | Level III | Level III | Level II |

Notes: (1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



8.11.3 Prediction Confidence and Uncertainty

The modelling of the effects of the Project on groundwater quantities made use of a the widely accepted, and verified Modular Finite-Difference Groundwater Flow Model (MODFLOW) platform, originally developed for the United States Geological Survey (USGS). The best information available were used as inputs to the modelling, and the confidence in the results were tested through a series of sensitivity runs provided as part of Appendix M to the EIS.

8.12 Wildlife and Wildlife Habitat

8.12.1 Residual and Adverse Effects Advanced to Significance Assessment

Residual adverse effects of the Project on wildlife and wildlife habitat were predicted to occur during the site preparation and construction, operations, and closure phases of the Project. There were no residual adverse effects during the post-closure phase. The predicted residual adverse effects were determined using a combination of numerical GIS models, and qualitative evaluation of the effects as described in Section 6.12. The residual adverse effects of the Project on wildlife and wildlife habitat advanced for the determination of significance are summarized in Table 8.12.1-1.

8.12.2 Description of Significance

As described in Section 6.1.3.11, the evaluation of effects of the Project on wildlife and wildlife habitat considered eight VCs; namely wildlife species at risk, ungulates, furbearers, upland birds, wetland birds, small mammals, reptiles and amphibians, invertebrates.

8.12.2.1 Magnitude

The levels of magnitude for the predicted residual effects of the Project on wildlife and wildlife habitat (Table 8.12.1-1) were assigned using the approach described in Section 8.1.1.11. The results are summarized in Table 8.12.2.1-1.

8.12.2.2 Geographic Extent

Geographic extent to the residual adverse effects for wildlife and wildlife habitat (Table 8.12.1-1) was assigned using the approach described in Section 8.1.2. The geographic extents are summarized in Table 8.12.2.2-1.

8.12.2.3 Timing

The levels of timing for the predicted residual effects of the Project on wildlife and wildlife habitat (Table 8.12.1-1) were assigned using the approach described in Section 8.1.3.11. The results are summarized in Table 8.12.2.3-1.



Table 8.12.1-1: Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|---------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | 300 | 300 | 300 | — |
| | | Habitat alteration or disruption (ha) | 198 | 122 | 192 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | 15.85 | 15.85 | 15.85 | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Low | Low | Low | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | 198 | 122 | 192 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Ungulates | Moose | Habitat loss (ha) | 84 | 84 | 84 | — |
| | | Habitat alteration or disruption (ha) | 57 | 34 | 53 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Furbearers | American Marten | Habitat loss (ha) | 62 | 62 | 62 | — |
| | | Habitat alteration or disruption (ha) | 14 | 8 | 14 | — |
| | | Potential for mortality (%) | Low | Low | Low | — |
| Upland birds | Upland birds | Habitat loss (ha) | 95 | 95 | 95 | — |
| | | Habitat alteration or disruption (ha) | 3.21 | 4.3 | 2.6 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | 33 | 33 | 33 | — |
| | | Habitat alteration or disruption (ha) | 2.9 | 7.5 | 0.7 | — |
| | | Potential for mortality (%) | Low | Low | Low | — |
| Small mammals | Small mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | 400 | 109 | 172 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Reptiles and Amphibians | Reptiles and amphibians | Habitat loss (ha) | 162 | 162 | 162 | — |
| | | Habitat alteration or disruption (ha) | 89 | 60 | 88 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | 162 | 162 | 162 | — |
| | | Habitat alteration or disruption (ha) | 89 | 60 | 88 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | 400 | 400 | 400 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects.



Table 8.12.2.1-1: Levels of Magnitude for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Ungulates | Moose | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Furbearers | American Marten | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Small mammals | Small mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.12.2.2-1: Levels of Geographic Extent for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Ungulates | Moose | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Furbearers | American Marten | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Upland Birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Small mammals | Small mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.12.2.3-1: Levels of Timing for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|-----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Ungulates | Moose | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Furbearers | American Marten | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Upland birds | Upland birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Small mammals | Small Mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



8.12.2.4 Duration

The levels of duration for the predicted residual effects of the Project on wildlife and wildlife habitat (Table 8.12.1-1) were assigned using the approach described in Section 8.1.4. When assigning the duration (Table 8.12.2.4-1) for “habitat loss”, Level II was assigned as the habitat will remain lost through to post-closure.

8.12.2.5 Frequency

The levels of frequency for the predicted residual effects of the Project on wildlife and wildlife habitat (Table 8.12.1-1) were assigned using the approach described in Section 8.1.5.11. The results are summarized in Table 8.12.2.5-1

8.12.2.6 Reversibility

The levels of reversibility for the predicted residual effects of the Project on wildlife and wildlife habitat (Table 8.12.1-1) were assigned using the approach described in Section 8.1.6. When assigning the reversibility (Table 8.12.2.6-1) for “habitat loss”, Level II was assigned as the habitat will recover over time. Level I was assigned for the habitat alteration and potential for mortality as those effects will stop once the activities causing the effect (e.g., noise from equipment) will recover as soon as the activity causing the effect stops.

8.12.2.7 Determination of Significance

Based on experience with Projects in the boreal forest region of Ontario, a significant effect to wildlife or wildlife habitat is one that would alter the available habitat to an extent where it would have serious, long-term effects on a species at the local or regional scale. When the predicted residual adverse effects of the Project on wildlife and wildlife habitat are tested against this definition of significance, not significant adverse effects are predicted. The reason is that none of the residual adverse effects were classified with a Level III magnitude, which is the level required for there to be serious long term effects. In this regard, the magnitude can act as a surrogate for significance.

Table 8.12.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in these preceding sections:

-) Magnitude: Section 8.12.2.1;
-) Geographic extent: Section 8.12.2.2;
-) Timing: Section 8.12.2.3;



Table 8.12.2.4-1: Levels of Duration for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Ungulates | Moose | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Furbearers | American Marten | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Small mammals | Small Mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.12.2.5-1: Levels of Frequency for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|-----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Ungulates | Moose | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Furbearers | American Marten | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Upland birds | Upland birds | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Small mammals | Small mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Invertebrates | Terrestrial invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.12.2.6-1: Levels of Reversibility for Residual Adverse Effects on Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|-------------------------------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Wildlife SAR | Common Nighthawk | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| | Northern Myotis/Little Brown Myotis | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | — | — | — | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| | Barn Swallow | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Ungulates | Moose | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Furbearers | American Marten | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Small mammals | Small mammals | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Reptiles and amphibians | Reptiles and amphibians | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Invertebrates | Terrestrial Invertebrates | Habitat loss (ha) | — | — | — | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.12.2.7-1: Determination of Significance for Wildlife and Wildlife Habitat

| Valued Components (VCs) | Indicators | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|--|-------------------------------------|-----------|-------------------|-----------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Wildlife species at risk (SAR) | Common Nighthawk | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Northern Myotis/Little Brown Myotis | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Barn Swallow | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Ungulates | Moose | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Furbearers | American Marten | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Small mammals | Small mammals | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Reptiles and amphibian | Reptiles and amphibians | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Invertebrates | Terrestrial invertebrates | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Operations Phase | | | | | | | | | |
| Wildlife species at risk (SAR) | Common Nighthawk | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Northern Myotis/Little Brown Myotis | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Barn Swallow | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽¹⁾ |



Table 8.12.2.7-1: Determination of Significance for Wildlife and Wildlife Habitat (continued)

| Valued Components (VCs) | Indicators | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|--------------------------------|-------------------------------------|-----------|-------------------|-----------|----------|-----------|---------------|-----------------|-------------------|
| Ungulates | Moose | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Furbearers | American Marten | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Small mammals | Small mammals | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Reptiles and amphibian | Reptiles and amphibians | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Invertebrates | Terrestrial invertebrates | Level II | Level II | Level III | Level II | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Closure Phase | | | | | | | | | |
| Wildlife species at risk (SAR) | Common Nighthawk | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Northern Myotis/Little Brown Myotis | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| | Barn Swallow | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Ungulates | Moose | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Furbearers | American Marten | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |



Table 8.12.2.7-1: Determination of Significance for Wildlife and Wildlife Habitat (continued)

| Valued Components (VCs) | Indicators | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|-----------------------------|---------------------------|-----------|-------------------|-----------|----------|-----------|---------------|-----------------|-------------------|
| Small mammals | Small mammals | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Reptiles and amphibian | Reptiles and amphibians | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Invertebrates | Terrestrial invertebrates | Level II | Level II | Level III | Level I | Level III | Level I | Not significant | NA ⁽¹⁾ |
| Post-closure Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |

Notes:

The Levels in the Table represent the highest assigned for that VC, indicator and phase of the Project (Tables 8.12.2.1-1 to 8.12.2.6-1)

(1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



-) Duration: Section 8.12.2.4;
-) Frequency: Section 8.12.2.5; and
-) Reversibility: Section 8.12.2.6.

By applying the decision tree (Figure 8.1.8-1) to the effects levels in Table 8.12.2.7-1 yields a determination that the residual adverse effects on wildlife and wildlife habitat would not be significant.

The conclusions regarding the significance of the residual adverse effects of the Project on wildlife and wildlife habitat are the same whether the reasoned narrative approach or the decision tree approach is used. Therefore, it is concluded that the Project would not have a significant effect on wildlife or wildlife habitat.

8.13 Migratory Birds

8.13.1 Residual and Adverse Effects Advanced to Significance Assessment

Residual adverse effects of the Project on migratory birds were predicted to occur during the site preparation and construction, operations, and closure phases of the Project. There were no residual adverse effects during the post-closure phase. The predicted residual adverse effects were determined using a combination of numerical GIS models, and qualitative evaluation of the effects as described in Section 6.13. The residual adverse effects of the Project on migratory birds advanced for the determination of significance are summarized in Table 8.13.1-1.

8.13.2 Description of Significance

As described in Section 6.1.3.12, the evaluation of effects of the Project on migratory birds considered two VCs; upland birds and wetland birds.

8.13.2.1 Magnitude

The levels of magnitude for the predicted residual effects of the Project on migratory birds (Table 8.13.1-1) were assigned using the approach described in Section 8.1.1.12. The results are summarized in Table 8.13.2.1-1.

8.13.2.2 Geographic Extent

Geographic extent to the residual adverse effects for migratory birds (Table 8.13.1-1) was assigned using the approach described in Section 8.1.2. The geographic extents are summarized in Table 8.13.2.2-1.



Table 8.13.1-1: Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|---------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | 95 | 95 | 95 | — |
| | | Habitat alteration or disruption (ha) | 3.21 | 4.3 | 2.6 | — |
| | | Potential for mortality (%) | Medium | Medium | Medium | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | 33 | 33 | 33 | — |
| | | Habitat alteration or disruption (ha) | 2.9 | 7.5 | 0.7 | — |
| | | Potential for mortality (%) | Low | Low | Low | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.13.2.1-1: Levels of Magnitude for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.13.2.2-1: Levels of Geographic Extent for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Upland Birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level II | Level II | Level II | — |
| | | Potential for mortality (%) | Level II | Level II | Level II | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



8.13.2.3 Timing

The levels of timing for the predicted residual effects of the Project on migratory birds (Table 8.13.1-1) were assigned using the approach described in Section 8.1.3.12. The results are summarized in Table 8.13.2.3-1.

8.13.2.4 Duration

The levels of duration for the predicted residual effects of the Project on migratory birds (Table 8.13.1-1) were assigned using the approach described in Section 8.1.4. When assigning the duration (Table 8.13.2.4-1) for “habitat loss”, Level II was assigned as the habitat will remain lost through to post-closure.

8.13.2.5 Frequency

The levels of frequency for the predicted residual effects of the Project on migratory birds (Table 8.13.1-1) were assigned using the approach described in Section 8.1.5.12. The results are summarized in Table 8.13.2.5-1

8.13.2.6 Reversibility

The levels of reversibility for the predicted residual effects of the Project on migratory birds (Table 8.13.1-1) were assigned using the approach described in Section 8.1.6. When assigning the reversibility (Table 8.13.2.6-1) for “habitat loss”, Level II was assigned as the habitat will recover over time. Level I was assigned for the habitat alteration and potential for mortality as those effects will stop once the activities causing the effect (e.g., noise from equipment) will recover as soon as the activity causing the effect stops.

8.13.2.7 Determination of Significance

Based on experience with Projects in the boreal forest region of Ontario, a significant effect to migratory birds is one that would alter the available habitat to an extent where it would have serious, long-term effects on a species at the local scale. When the predicted residual adverse effects of the Project on migratory birds are tested against this definition of significance, not significant adverse effects are predicted. The reason is that none of the residual adverse effects were classified with a Level III magnitude, which is the level required for there to be serious long term effects. In this regard, the magnitude can act as a surrogate for significance.

Table 8.13.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in these preceding sections:



Table 8.13.2.3-1: Levels of Timing for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|-----------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level I | Level I | Level I | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level II | Level III | Level III | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.12.2.4-1: Levels of Duration for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level II | Level I | — |
| | | Potential for mortality (%) | Level I | Level II | Level I | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.13.2.5-1: Levels of Frequency for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|-----------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level III | Level III | Level III | — |
| | | Habitat alteration or disruption (ha) | Level III | Level III | Level III | — |
| | | Potential for mortality (%) | Level III | Level III | Level III | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.13.2.6-1: Levels of Reversibility for Residual Adverse Effects on Migratory Birds

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|-------------------------|--------------|---------------------------------------|-----------------------------------|------------|----------|--------------|
| Upland birds | Upland birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |
| Wetland birds | Marsh birds | Habitat loss (ha) | Level II | Level II | Level II | — |
| | | Habitat alteration or disruption (ha) | Level I | Level I | Level I | — |
| | | Potential for mortality (%) | Level I | Level I | Level I | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.13.2.7-1: Determination of Significance for Migratory Birds

| Valued Components (VCs) | Indicators | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|--|--------------|-----------|-------------------|-----------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Operations Phase | | | | | | | | | |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Closure Phase | | | | | | | | | |
| Upland birds | Upland birds | Level II | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Wetland bird | Marsh birds | Level I | Level II | Level III | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Post-closure Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |

Notes:

The levels in the table represent the highest assigned for that VC, indicator and phase of the Project (Tables 8.13.2.1-1 to 8.13.2.6-1)

(1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



-) Magnitude: Section 8.13.2.1;
-) Geographic extent: Section 8.13.2.2;
-) Timing: Section 8.13.2.3;
-) Duration: Section 8.13.2.4;
-) Frequency: Section 8.13.2.5; and
-) Reversibility: Section 8.13.2.6.

By applying the decision tree (Figure 8.1.8-1) to the effects levels in Table 8.13.2.7-1 yields a determination that the residual adverse effects on migratory birds would not be significant. The conclusions regarding the significance of the residual adverse effects of the Project on migratory birds are the same whether the reasoned narrative approach or the decision tree approach is used. Therefore, it is concluded that the Project would not have a significant effect on migratory birds.

8.14 Fish and Fish Habitat

8.14.1 Residual Adverse Effects Advanced to Significance

There was one residual adverse effect for fish and fish habitat that remains after the application of mitigation measures. That residual adverse effect fish mortality for the stream-resident fish populations VC. This residual adverse effect will occur during the site preparation and construction phase, when portions of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 are overprinted.

8.14.2 Description of Significance

8.14.2.1 Magnitude

It is estimated that approximately 50% of the fish present in these tributaries will leave as flows diminish, or will be successfully relocated downstream as part of the mitigation measures to be implemented by Treasury Metals. The magnitude level was assigned as Level I in accordance with the procedures described in Section 8.1.1.13.

8.14.2.2 Geographic Extent

Fish mortality, the residual adverse effects extends beyond the footprint of the Project into the LSA. The effects were assigned a magnitude level of Level II, in accordance with the procedures described in Section 8.1.2.



8.14.2.3 Timing

Timing is not a significant consideration when mortality is involved. The level of timing for mortality was assigned as Level III.

8.14.2.4 Duration

Fish mortality will occur during the site preparation and construction phase, when portions of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 are overprinted and flows are diminished in the downstream portions. The duration for the effect was assigned a duration of Level I, in accordance with Section 8.1.4.

8.14.2.5 Frequency

Fish mortality will occur once, when portions of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 are overprinted and flows are diminished in the downstream portions during the Construction Phase of the Project. Therefore, the frequency is Level I.

8.14.2.6 Reversibility

Fish mortality is not reversible, and was assigned as Level III.

8.14.2.7 Determination of Significance

Based on experience in evaluating similar mining Project, a significant adverse effect for fish mortality would be one that permanently reduces the size or viability of a fish population such that the sustainability of a commercial, recreational or Aboriginal fishery is at risk. When the predicted residual adverse effects of the Project are tested against this hypothesis of what constitutes a significant adverse effect, the effects of the Project would not be significant. This is supported by the nature of fish affected. The stream-resident fish species that will suffer mortality are common species that are widely distributed throughout in Ontario and Canada. This fish community could arguably be considered the most common stream fish community on the Canadian Shield, where it occurs in many, if not most, small stream habitats that are low-gradient with fine substrates and extensive beaver activity as well as small, shallow lakes and ponds.

The effects levels assigned to the residual adverse effects of the Project on fish and fish habitat have been summarized in Table 8.14.2.7-1. By applying the decision tree (Figure 8.1.8-1) to the effects levels in the table yields a determination that the residual adverse effects on fish and fish habitat would not be significant.

Both the application of the decision tree approach and the use of a reasoned argument approach yield the same conclusion, the Project will not result in significant adverse effects to fish or fish habitat.



Table 8.14.2.7-1: Determination of Significance for Fish and Fish Habitat

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|---|-----------|-----------|-------------------|---------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Stream-resident fish population | Mortality | Level I | Level II | Level I | Level I | Level I | Level III | Not significant | NA ⁽¹⁾ |
| Operation Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |
| Closure Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |
| Post-closure Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |

Note:

(1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant.



8.14.3 Prediction Confidence and Uncertainty

Based on professional experience, we are confident that fish mortality will occur when the watercourses portions of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 are overprinted and flows are diminished in the downstream portions during the Construction Phase of the Project. Measures to relocate fish or allow them to leave will not be 100% effective and mortality of 50% has been assumed. This is considered a realistic estimate, but may vary depending on the effectiveness of measures to reduce the number of fish present when the watercourses are isolated. One measure to encourage fish to leave would be removing beaver dams and allowing ponds to draw down the water levels prior to dewatering the watercourse.

8.15 Wetlands and Vegetation

8.15.1 Residual Adverse Effects Advanced to Significance Assessment

As described in Section 6.15.7, the Projected is predicted to result in residual adverse effects to the wetlands extent VC during the site preparation and construction, operations phases (Table 8.15.1-1). No residual adverse effects are predicted during the post-closure phase.

8.15.2 Description of Significance

8.15.2.1 Magnitude

The levels of magnitude for the predicted residual effects of the Project on wetlands and vegetation (Table 8.14.1-1) were assigned using the approach described in Section 8.1.1.14. The results are summarized in Table 8.15.2.1-1.

8.15.2.2 Geographic Extent

Geographic extent to the residual adverse effects predicted residual effects of the Project on wetlands and vegetation (Table 8.14.1-1) was assigned using the approach described in Section 8.1.2. The geographic extents are summarized in Table 8.15.2.2-1.

8.15.2.3 Timing

The levels of timing for the predicted residual effects of the Project on wetlands and vegetation (Table 8.15.1-1) were assigned as Level II, in accordance with the approach described in Section 8.1.3.14. The results are summarized in Table 8.15.2.3-1.

8.15.2.4 Duration

The levels of duration (Table 8.15.1-1) for the predicted residual effects on wetlands and vegetation were assigned using the approach described in Section 8.1.4. Level II was assigned as the wetlands lost during site preparation and construction will not recover until post-closure.



Table 8.15.1-1: Predicted Residual Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|-------------------|-------------------|--------------|
| Wetland extent | Wetland area | Wetland area lost (ha) | 33 ⁽¹⁾ | 33 ⁽¹⁾ | 33 ⁽¹⁾ | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note:

The “—” symbol indicates there were no residual adverse effects

(1) The areas lost during the site preparation and construction phase will not recover until post-closure

Table 8.15.2.1-1: Levels of Magnitude for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|----------|--------------|
| Wetland extent | Wetland area | Wetland area lost (ha) | Level II | Level II | Level II | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.15.2.2-1: Levels of Geographic Extent for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|----------|--------------|
| Wetland extent | Wetland area | Wetland area lost (ha) | Level II | Level II | Level II | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.15.2.3-1: Levels of Timing for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|----------|--------------|
| Wetland extent | Wetland area | Wetland area lost (ha) | Level II | Level II | Level II | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.14.2.4-1: Levels of Duration for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|----------|--------------|
| Wetland extent | Wetland area | Wetland area lost (ha) | Level II | Level II | Level II | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



8.15.2.5 Frequency

The levels of frequency for the predicted residual effects of the Project on wetlands and vegetation habitat (Table 8.15.1-1) were assigned using the approach described in Section 8.1.5.14. The results are summarized in Table 8.15.2.5-1.

8.15.2.6 Reversibility

The levels of reversibility for the predicted residual effects of the Project on wetlands and vegetation (Table 8.15.1-1) were assigned using the approach described in Section 8.1.6. The results are summarized in Table 8.14.2.6-1.

8.15.2.7 Determination of Significance

Based on experience with Projects in the boreal forest region of Ontario, a significant effect to wetlands and vegetation is one that would alter a wetland or vegetative community to an extent where it would have serious, long-term effects at the local or regional scale. When the predicted residual adverse effects of the Project on wetlands and vegetation are tested against this definition of significance, no significant adverse effects are predicted. The reason is that none of the residual adverse effects were classified with a Level III magnitude, which is the level required for there to be serious long term effects. In this regard, the magnitude can act as a surrogate for significance.

Table 8.14.2.7-1 lists the various levels assigned for the elements introduced in Section 8.1. The classification of the effects for the elements presented in the table are described in these preceding sections:

-) Magnitude: Section 8.15.2.1;
-) Geographic extent: Section 8.15.2.2;
-) Timing: Section 8.15.2.3;
-) Duration: Section 8.15.2.4;
-) Frequency: Section 8.15.2.5; and
-) Reversibility: Section 8.15.2.6.

By applying the decision tree (Figure 8.1.8-1) to the effects levels in Table 8.15.2.7-1 yields a determination that the residual adverse effects on wetlands and vegetation would not be significant.



Table 8.15.2.5-1: Levels of Frequency for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|-----------|--------------|
| Wetland Extent | Wetland area | Wetland area lost (ha) | Level III | Level III | Level III | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects

Table 8.15.2.6-1: Levels of Reversibility for Adverse Effects on Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Measures | Site Preparation and Construction | Operations | Closure | Post-closure |
|------------------------------------|-------------------------|-------------------------------------|-----------------------------------|------------|----------|--------------|
| Wetland Extent | Wetland area | Wetland area lost (ha) | Level II | Level II | Level II | — |
| Vegetation communities and species | Floating Marsh Marigold | Area of potential habitat lost (ha) | — | — | — | — |

Note: (1) The “—” symbol indicates there were no residual adverse effects



Table 8.15.2.7-1: Determination of Significance for Wetlands and Vegetation

| Valued Components (VCs) | Indicators | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood |
|--|-------------------------|-----------|-------------------|----------|----------|-----------|---------------|-----------------|-------------------|
| Site Preparation and Construction Phase | | | | | | | | | |
| Wetlands extent | Wetlands area | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Vegetation communities and species | Floating March Marigold | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Operations Phase | | | | | | | | | |
| Wetlands Extent | Wetlands area | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Vegetation communities and species | Floating March Marigold | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Closure Phase | | | | | | | | | |
| Wetlands Extent | Wetlands area | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Vegetation communities and species | Floating March Marigold | Level II | Level II | Level II | Level II | Level III | Level II | Not significant | NA ⁽¹⁾ |
| Post-closure Phase | | | | | | | | | |
| No residual adverse effects | | | | | | | | | |

Notes:

The levels in the table represent the highest assigned for that VC, indicator and phase of the Project (Tables 8.15.2.1-1 to 8.15.2.6-1)

(1) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



The conclusions regarding the significance of the residual adverse effects of the Project on wetlands and vegetation are the same whether the reasoned narrative approach or the decision tree approach is used. Therefore, it is concluded that the Project would not have a significant effect on wetlands and vegetation.

8.16 Land Use

8.16.1 Residual Effects Advanced to Significance Assessment

The predicted residual effects carried forward to the assessment of significance summarized in Table 8.16.1-1. For land use, the residual effects have been classified as either adverse, or neutral.

8.16.2 Description of Significance

8.16.2.1 Site Preparation and Construction Phase

The potential conflict of the Project with existing land use planning and policies may occur during this phase. The proposed avoidance and mitigation measure of developing a land and resource use baseline as an early step in this phase will identify any potential conflict. Should a conflict be identified, appropriate avoidance and mitigation measures will be proposed. Currently, there are no known conflicts.

For the three industrial-based land and resource uses (aggregate operations, forestry and mineral operations), the potential effect during this phase is related to a change in access to the use areas. The proposed avoidance and mitigation measure of developing a land and resource use baseline and communication plan as an early step in this phase will identify any potential access changes. Should a conflict be identified, appropriate avoidance and mitigation measures will be proposed. Currently, there are no known conflicts.

For the three land and resource uses associated with the harvesting of fish and wildlife (fishing, hunting and trapping), the potential effect during this phase is related to a change in access to the use areas and a change in abundance of species. The proposed avoidance and mitigation measure of developing a land and resource use baseline and communication plan as an early step in this phase will identify any potential access changes. The proposed avoidance and mitigation measures associated with abundance of species will support the management of the potential effect. Should an access conflict be identified, appropriate avoidance and mitigation measures will be proposed. Currently, there are no known access conflicts.

Potential effects to the cottagers and outfitters during this phase will be associated with increases in human activity, such as noise and traffic, which may affect their enjoyment of the land. Outfitters may experience an increase in local clientele due to increased workforce or decrease due to a change in the areas used or perceptions that the area is not pristine. However, due to the Project being situated primarily on private lands the effects are expected to be minimal.



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|--|--|--|--|--|
| Land Use Planning and Policies | | | | |
| Potential for conflict with approved and existing land use plans and policies. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Land and resources baseline | Existing land use planning and policies could conflict with the Project's use of the land. Specific requirements or information related to these existing planning and policies may require consideration through the Project approval and permitting process. | Adverse or neutral depending on the conflict |
| Aggregate Operations | | | | |
| Potential for change in demand for aggregate resources. | Site preparation and construction | Communications Management Plan Land and resources baseline Socio-economic Management Plan | The construction of the Project could place increased demand on area aggregate resources. The Project will acquire any required aggregate from existing third-party suppliers. | Neutral |
| Forestry | | | | |
| Potential for a change in access to forestry resources for management. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Communications Management Plan Land and resources baseline | Site preparation, construction and operation of the Project could potentially limited access to forestry resources currently managed under a Sustainable Forest Licence. Communications with forestry operators will facilitate addressing access issues. | Adverse |
| Mineral Exploration | | | | |
| Potential change in access to mineral claims for exploration and production. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Communications Management Plan Land and resources baseline | Site preparation and construction and operation of the Project could limit access for mineral exploration and/or production in the immediate area of the Project. Communication with mineral claim owners will facilitate addressing access issues. | Adverse |



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|--|--|---|--|-----------|
| Fishing - Recreational and Commercial | | | | |
| Loss of habitat and displacement of fish species. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Regulatory and cautionary signage Communications Management Plan Traditional land use information collection Wildlife habitat and plant habitat measures | Project site preparation and construction, operation, and closure could potentially reduce fish habitat and displace fish species at the Project site resulting in reduced fishing success and reduced food or income source. There is little or no fish harvesting on the Project site. | Adverse |
| Potential change in access to fishing areas. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Regulatory and cautionary signage Communications Management Plan Land and resources baseline Traditional land use information collection Wildlife habitat and plant habitat measures | Project site preparation and construction, operation, and closure could potentially reduce access to fishing area and reduce fishing success and reduced food or income source, however, there is little or no fishing in the Project site. | Adverse |
| Contamination of fish making them unsuitable for harvesting. | Site preparation and construction Operations Closure | Water Quality measures Communications Management Plan | Contamination of fish could reduce the amount of fish consumed. Potential release of contaminants could occur during site preparations and construction, operations, and closure but is expected to be low in probability and infrequent through environmental management. | Adverse |



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|---|--|--|---|-----------|
| Hunting | | | | |
| Loss of habitat and displacement of wildlife species. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Regulatory and cautionary signage Noise and vibration measures Communications Management Plan Traditional land use information collection Wildlife habitat and plant habitat measures | There could be a potential reduction in hunting success and reduced food or income source due to the loss of wildlife habitat. Effects would be limited to the Project site and the wildlife impact assessment determined there would be no impacts on wildlife abundance or habitat. | Adverse |
| Potential change in access to hunting areas. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Wildlife habitat and plant habitat measures Regulatory and cautionary signage Communications Management Plan Land and resources baseline | Potential reduction in hunting success and reduced food or income source. Access will be restricted during all Project phases but just to the Project site; access to adjacent areas will remain available. | Adverse |
| Increased noise, vibration, and light could diminish the experience of being on the land and conducting hunting activities. | Site preparation and construction Operations Closure Post-closure | Noise and vibration measures Communications Management Plan Traditional land use information collection Wildlife habitat measures | Diminished experience of spending time on the land and reduced participation in hunting activities. Noise and vibration effects will be restricted to the Project site and light effects will be controlled to minimize impacts of areas around the Project site. | Adverse |
| Trapping | | | | |
| Loss of habitat and displacement of wildlife species. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint | Potential reduction in trapping success and reduced income source due to the loss of wildlife habitat. Effects would be limited to the Project site and the wildlife impact | Adverse |



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|--|--|--|--|-----------|
| | Post-closure | Minimize activities on eastern portion of property Noise and vibration measures Communications Management Plan Traditional land use information collection Wildlife habitat and plant habitat measures | assessment determined there would be no impacts on wildlife abundance or habitat.. | |
| Potential change in access to trapline areas. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Regulatory and cautionary signage Communications Management Plan Land and resources baseline | Potential reduction in trapping success and reduced income source. Access will be restricted during all Project phases but just to the Project site; access to adjacent areas will remain available. | Adverse |
| Increased noise, vibration, and light could diminish the experience of being on the land and conducting trapping activities. | Site preparation and construction Operations Closure Post-closure | Noise and vibration measures Communications Management Plan Traditional land use information collection Wildlife habitat and plant habitat measures | Diminished experience of spending time on the land and reduced participation in trapping activities. Noise and vibration effects will be restricted to the Project site and light effects will be controlled to minimize impacts of areas around the Project site. | Adverse |
| Cottagers and Outfitters | | | | |
| Increased noise, vibration, and light could diminish the experience of being on the land and conducting related activities. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Regulatory and cautionary signage Noise and vibration measures | Diminished experience of spending time at cottages and/or on the land and reduced participation in related activities. Noise and vibration effects will be restricted to the Project site and light effects will be controlled to minimize impacts of areas around the Project site. | Adverse |



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|--|--|---|---|---|
| | | Communications Management Plan Visual effects – contouring of waste storage areas | | |
| Potential change in the access to areas outfitters had previously used. | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Regulatory and cautionary signage Communications Management Plan Land and resources baseline | Potential reduction in fishing and hunting success and reduced income source. Access will be restricted during all Project phases but just to the Project site; access to adjacent areas will remain available. | Adverse |
| Potential changes for outfitters with lodges located in near the Project site that may experience an increase in clientele related to accommodations for temporary visitors / workers / contractors at the Project site. | Site preparation and construction Operations Closure | Communications Management Plan Land and resources baseline Socio-economic Management Plan | Outfitters may experience an increase in clientele related to the need for accommodations. The Project will communicate information about the potential demand for accommodations by Project workers and will monitor for impacts on accommodations. | Adverse or positive depending on the how it is experience by the outfitter. |
| Other Recreational Uses | | | | |
| Potential change in access to Project site where other recreational uses may occur. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Regulatory and cautionary signage Communications Management Plan Environmental management plan Traditional land use information collection Wildlife habitat and plant habitat measures | Potential reduction in the success and reduced food and income source as related to picking of consumptive foods. Access will be restricted during all Project phases but just to the Project site; access to adjacent areas will remain available. Other recreational activities are expected to be low due to the large proportion of private land within the Project site, | Adverse |



Table 8.16.1-1: Summary of Residual Land and Resource Use Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measure | Residual Effect | Direction |
|---|--|---|---|-----------|
| Increased noise, vibration, and light could diminish the experience of being on the land and conducting related activities. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Regulatory and cautionary signage Noise and vibration measures Communications Management Plan Land and resources baseline Socio-economic Management Plan Visual effects – contouring of waste storage areas water treatment | Diminished experience of spending time on the land and reduced participation in related activities. Noise and vibration effects will be restricted to the Project site and light effects will be controlled to minimize impacts of areas around the Project site. | Adverse |
| Potential change in the abundance of consumptive foods. | Site preparation and construction Operations Closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Air quality measures Communications Management Plan Land and resources baseline | Potential reduction in the success and reduced food and income source as related to picking of consumptive foods. Effects will be limited to the Project site which is comprised of mainly private land. | Adverse |



Potential effects to the other recreational uses of land and resources during this phase will be associated with changes in access where these activities may have occurred. However, due to the Project being situated primarily on private lands the effects are expected to be minimal.

8.16.2.2 Operations Phase

The potential effects described for the site preparation construction phase will continue through the operations phase. Likewise, avoidance and mitigation measures established during site preparation and construction phase will be continued and expanded through operations phase.

8.16.2.3 Closure Phase

The decrease in Project site activities during the closure phase will decrease the probability of effects associated with the intrinsic values, particularly due to noise and vibration.

The access-related effects will continue through the closure phase as access will continue to be restricted. The effects on the on-the-land experience will decline due to the reduced Project activity.

8.16.2.4 Post-closure Phase

When closure is completed and the Project site has been restored and waste materials sealed, potential effects on species abundance will gradually subside.

Access to the site will be available in the post-closure phase and the site restoration to forest will provide opportunities for land and resource use activities on the Project site.

8.16.2.5 Determination of Significance

The determination of significance for each valued component and potential effect is presented in Table 8.16.2.5-1. The table lists the various levels assigned for the elements introduced in Section 8.1. By applying the decision tree (Figure 8.1.8-1) to the effects levels in the table yields a determination that the effects of the Project on land use would not be significant. In addition to those elements, the table indicates the direction of the effect (adverse, neutral, or positive).

8.16.2.6 Prediction Confidence and Uncertainty

The prediction confidence regarding land and resource uses is moderate. Existing gaps in information will be addressed by completion of a land and resource use baseline. Treasury Metals is committed to continue to engage with area users to gather Project-specific land and resource use information.



Table 8.16.2.5-1: Determination of Significance for Land and Resource Use

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---|---|------------------------|-------------------|--------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Site Preparation and Construction Phase | | | | | | | | | | |
| Land use planning and policies | Conflict with accepted land uses as stipulated in approved land use plans | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Aggregate operations | Change in access to aggregate resources | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | neutral |
| | Change in demand of aggregate resources extraction | Level I | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | neutral |
| Forestry | Change in access to forestry resources for management | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Mineral exploration | Change in access to mineral claims for exploration and production | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Fishing - recreational and commercial | Change in access fishing areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of fisheries resources | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Hunting | Change in access hunting areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Trapping | Change in access trapping areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Cottagers and outfitters | Change in access to cottage and/or outfitter areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |



Table 8.16.2.5-1: Determination of Significance for Land and Resource Use (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---------------------------------------|--|------------------------|-------------------|--------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| | Alteration in the enjoyment of properties, their surroundings and their property, or intrinsic values | Level I | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Other recreational uses | Change in access for residents and visitors to public lands for non-consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in access for residents and visitors to pick berries and/or mushrooms or other for consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Operations Phase | | | | | | | | | | |
| Land use planning and policies | Conflict with accepted land uses as stipulated in approved land use plans | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Aggregate operations | Change in demand of aggregate resources extraction | Level I | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | neutral |
| Mineral exploration | Change in access to mineral claims for exploration and production | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Forestry | Change in access to forestry resources for management | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Fishing - recreational and commercial | Change in access fishing areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of fisheries resources | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Hunting | Change in access hunting areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |



Table 8.16.2.5-1: Determination of Significance for Land and Resource Use (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---------------------------------------|--|------------------------|-------------------|--------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Trapping | Change in access trapping areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Cottagers and outfitters | Change in access to cottage and/or outfitter areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Alteration in the enjoyment of properties, their surroundings and their property, or intrinsic values | Level I | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Other recreational uses | Change in access for residents and visitors to public lands for non-consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in access for residents and visitors to pick berries and/or mushrooms or other for consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Closure Phase | | | | | | | | | | |
| Land use planning and policies | Conflict with accepted land uses as stipulated in approved land use plans | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Mineral exploration | Change in access to mineral claims for exploration and production | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Forestry | Change in access to forestry resources for management | Level I | Level II | NA | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Fishing - recreational and commercial | Change in access fishing areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of fisheries resources | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |



Table 8.16.2.5-1: Determination of Significance for Land and Resource Use (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---------------------------------------|--|------------------------|-------------------|--------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Hunting | Change in access hunting areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Trapping | Change in access trapping areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Cottagers and outfitters | Change in access to cottage and/or outfitter areas | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Alteration in the enjoyment of properties, their surroundings and their property, or intrinsic values | Level I | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Other recreational uses | Change in access for residents and visitors to public lands for non-consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in access for residents and visitors to pick berries and/or mushrooms or other for consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Post-closure Phase | | | | | | | | | | |
| Land use planning and policies | Conflict with accepted land uses as stipulated in approved land use plans | Level I | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| Fishing - recreational and commercial | Change in abundance of fisheries resources | Level I ⁽²⁾ | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |



Table 8.16.2.5-1: Determination of Significance for Land and Resource Use (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|--------------------------|--|------------------------|-------------------|--------|----------|-----------|---------------|-----------------|-------------------|-----------|
| Hunting | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| Trapping | Change in abundance of wildlife | Level I ⁽²⁾ | Level II | NA | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| Cottagers and outfitters | Change in access for residents and visitors to pick berries and/or mushrooms or other for consumptive purposes | Level I ⁽¹⁾ | Level II | NA | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |

Notes:

- (1) Locations of specific land and resource uses, including planning and policies, fishing, hunting, trapping, cottagers and outfitters and other recreational uses, have not been identified on the Project site and were unlikely due to the high proportion of private property
- (2) Assessment of impacts on fish and wildlife determined there would be no significant impacts to population abundance and distribution
- (3) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant



8.17 Social

8.17.1 Residual Effects Advanced to Significance Assessment

Residual Project-related social effects were predicted for each of the social VCs. The effects are expected to occur primarily within the communities in closest proximity to the Project, namely Village of Wabigoon and City of Dryden. A summary of the predicted residual effects of the Project on the social VCs is provided in Table 8.17.1-1. The residual effects for social have been classified as either adverse or positive, depending on the VC, indicator and phase of the Project.

8.17.2 Description of Significance

The description of the criteria for the determination of significance is located in Section 8.1.

8.17.2.1 Site Preparation and Construction Phase

Potential social effects during site preparation and construction will be largely influenced by personal decision-making (e.g., people choosing to move to the area to take up employment, people choosing to participate in employment or business opportunities) and the potential effects resulting from in-migration to the area on existing infrastructure and community services. Prior to site preparation and construction, an updated socio-economic baseline study will be undertaken and a socio-economic management plan will be developed for the Project. These documents will serve to guide the monitoring and management of social effects through all phases of the Project.

8.17.2.2 Operations Phase

The potential effects described during the site preparation and construction phase are anticipated to continue through Project operations. The Project's socio-economic management plan will guide monitoring and adaptive management activities to mitigate or optimize social effects as required.

8.17.2.3 Closure Phase

As employment and business opportunities decline closure, it is expected that social effects within the socio-economic study area will change in response to loss of employment, potential out-migration and subsequent declines in demands upon existing infrastructure and services.

8.17.2.4 Post-closure Phase

There are no anticipated employment or business opportunities during post-closure and therefore, it is expected that Project-related social effects will be minimal.



Table 6.17.9-1 Summary of Social Residual Effects

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|---|--|
| Population Demographics | | | | |
| Increased demand on existing community housing, infrastructure and services due to in-migration of Project workers | Site preparation and construction Operations Closure Post-closure | Socio-economic monitoring and management Traffic safety Socio-economic baseline | Potential increased demand on existing community housing, infrastructure and services. A noticeable change may result but it is expected that the current infrastructure within the communities most likely to be affected (City of Dryden and Village of Wabigoon) would be able to accommodate increased population. Population levels may decline to pre-Project conditions during Closure and Post-closure. | <p>) Adverse during Site preparation and construction and operations.</p> <p>) Positive during closure and post-closure.</p> |
| Education | | | | |
| Increased training opportunities | Site preparation and construction Operations Closure | Education and training policies and plans | Increased training and education opportunities for unemployed and under-employed residents and non-resident workers. It is anticipated that any increase in training would be able to be accommodated within existing education and training facilities. | <p>) Positive during Site preparation and construction, operations and closure.</p> <p>) Adverse during post-closure.</p> |
| Increased education enrollment | Site preparation and construction Operations | Communication with school districts Socio-economic baseline | Potential increased demand on education services. It is anticipated that any increase in enrollments could be accommodated within existing education system. | <p>) Adverse during Site preparation and construction and operations.</p> <p>) Positive during closure and post-closure.</p> |
| Infrastructure and Services | | | | |
| Increased demand on various infrastructure and services | Site preparation and construction Operations Closure | Communicate with government agencies as appropriate, including but not limited to: Project plans, proposed transportation volumes and workforce requirements. Socio-economic monitoring and management plan Socio-economic baseline | Potential increased demand on infrastructure and services may be noticeable but are anticipated to be within the current capacity. | <p>) Adverse during Site preparation and construction and operations.</p> <p>) Positive during closure and post-closure.</p> |



Table 6.17.9-1 Summary of Social Residual Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|--|---|
| Housing and Property Values | | | | |
| Increased demand for temporary accommodations | Site preparation and construction | Socio-economic monitoring and management plan Socio-economic baseline | Potential for demand to limit supply or lead to price increases for temporary accommodations. It is anticipated that this effect will be noticeable during Site preparation and construction but is unlikely to exceed current capacity. | Adverse during Site preparation and construction. |
| Increased demand for permanent accommodation | Site preparation and construction Operations | Socio-economic monitoring and management plan Socio-economic baseline | Potential for increase in property values may be noticeable. | Adverse or positive during Site preparation and construction and operations depending on whether effect is experienced by potential buyers or sellers of real estate. |
| Change in property values | Site preparation and construction Operations Closure Post-closure | Socio-economic monitoring and management plan Socio-economic baseline Noise and vibration measures Treasury Metals will work with specific affected homeowners to ensure that their concerns about potential Project-related effects are addressed | Real and perceived effects of Project-related activities (e.g., traffic, blasting) could negatively affect the value of houses that are closest to the Project's property boundary. Increased demand for housing because of in-migration to the area may lead to an increase in real estate values. | Adverse during Site preparation and construction and operations. Positive and adverse during closure and post-closure. |
| Public Safety | | | | |
| Potential for increase in demand for public safety services due to increased traffic volumes related to the Project and population increases | Site preparation and construction Operations Closure | Contracted security services onsite Safety and work policy guidelines Mine closure planning Socio-economic monitoring and management plan Socio-economic baseline Onsite fire suppression | Project-related effects may be noticeable during Site preparation and construction and Operations phases, less noticeable during Closure and are expected to cease following Closure. | Adverse. |



Table 6.17.9-1 Summary of Social Residual Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|--|---|
| | | Traffic safety | | |
| Potential increase in crime rate related to the behaviour of a non-local labour force and increased income and spending levels due to Project-related employment | Site preparation and construction Operations Closure Post-closure | Socio-economic monitoring and management plan | Personal decision-making related to spending Project-related income may positively or negatively affect public safety within the affected communities. Although potential out-migration of population following mine closure may occur, decreases in income levels due to mine closure and personal decision-making and behaviours could negatively affect the crime rate within the affected socio-economic study area communities. | Adverse. |
| Transportation and Traffic | | | | |
| Increased level of traffic | Site preparation and construction Operations Closure Post-closure | Socio-economic monitoring and management plan Acquisition of Tree Nursery Road Traffic safety protocols, regulatory and cautionary signage, road maintenance and emergency response plans | The existing levels of service will be maintained on both Highway 17 and Anderson Road with additional anticipated Project-related traffic. There is no anticipated residual effect. |) Adverse during Site preparation and construction and operations.) Positive during closure and post-closure. |

Note:

For additional avoidance and mitigation measures related to potential effects on housing (e.g., noise, water, light), please refer to the noise, water and light sections of this report



8.17.2.5 Determination of Significance

Table 8.17.2.5-1 lists the various assessment levels for the criteria listed in Section 8.1. By applying the decision tree (Figure 8.1.8-1) to the effects levels in the table yields a determination that the effects of the Project on social factors would not be significant. In addition to those elements, the table indicates the direction of the effect (adverse, neutral, or positive).

8.18 Economic

8.18.1 Residual Effects Advanced to Significance Assessment

The predicted residual economic effects carried forward to the assessment of significance are summarized in Table 8.18.1-1. The residual effects for economics are classified as either adverse or positive, depending on the VC, indicator and phase of the Project. For the “changes in house prices” indicator, the direction is classified as adverse and positive, depending on whether viewed from the position of the seller or the buyer.

8.18.2 Description of Significance

The criteria for the determination of significance are described in Section 8.1.

8.18.2.1 Site Preparation and Construction Phase

During the site preparation and construction, the Project's economic activities will have effects on employment, labour income, cost of living, existing business and government revenues. These effects are positive of a regional and provincial nature and short duration.

Treasury Metals' proposed mitigation measure inducing policies for hiring and purchasing locally and within the Province of Ontario as well as offering training including on the job training will enhance the positive economic effects during the site preparation and construction phase.

8.18.2.2 Operations Phase

During operations, the Project's economic effects will continue over a longer period of time, the full life of the mine, and will further improve and enhance the economy of the region. Treasury Metals' proposed mitigation measures will continue during the operations phase and will further enhance the positive economic effects of the Project.

8.18.2.3 Closure Phase

During closure, employment and operations expenditures from the project are expected to decrease until they stop completely creating therefore negative economic effects for a short period of time, one year closure phase.



Table 8.17.2.5-1: Determination of Significance for Social Valued Components

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---|--|-----------|-------------------|-------------------|----------|-----------|---------------|-----------------|-------------------|----------------------|
| Site Preparation and Construction Phase | | | | | | | | | | |
| Population demographics | Changes to population –increase | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level II | Not significant | NA ⁽²⁾ | adverse |
| Education | Increased demand for education services at all levels | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Motivation to stay in or leave school | Level II | Level II | NA ⁽¹⁾ | Level II | Level I | Level I | Not significant | NA ⁽²⁾ | positive |
| Infrastructure and services | Potential for increase in demand on existing infrastructure and services such as utilities, municipal infrastructure, communication services and recreation facilities | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Housing | Increased demand for temporary accommodations | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Increased demand for permanent accommodation due to in-migration | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Positive and negative changes in real estate values due to in-migration and proximity to Project location | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level II | Not significant | NA ⁽²⁾ | positive and adverse |
| Public safety | Potential for increase in demand for public safety services due to increased traffic volumes related to the Project and population increases | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| | Potential increase in crime rate related to the behaviour of a non-local labour force and increased income and spending levels due to Project-related employment | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Transportation and traffic | Potential impact on transportation infrastructure due to potential population increases and transportation of goods and services | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| | Increased traffic on the roads leading to the Project site | Level II | Level II | NA ⁽¹⁾ | Level II | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |



Table 8.17.2.5-1: Determination of Significance for Social Valued Components (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|-----------------------------|--|-----------|-------------------|-------------------|----------|-----------|---------------|-----------------|-------------------|----------------------|
| Operations Phase | | | | | | | | | | |
| Population demographics | Changes to population –increase | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Education | Increased demand for education services at all levels | Level II | Level II | NA ⁽¹⁾ | Level II | Level I | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Motivation to stay in or leave school | Level II | Level II | NA ⁽¹⁾ | Level I | Level I | Level I | Not significant | NA ⁽²⁾ | positive |
| Infrastructure and services | Potential for increase in demand on existing infrastructure and services such as utilities, municipal infrastructure, communication services and recreation facilities | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Housing | Increased demand for permanent accommodation due to in-migration | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| | Positive and negative changes in real estate values due to in-migration and proximity to Project location | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | positive and adverse |
| Public safety | Potential for increase in demand for public safety services due to increased traffic volumes related to the Project and population increases | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Potential increase in crime rate related to the behaviour of a non-local labour force and increased income and spending levels due to Project-related employment | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Transportation and traffic | Potential impact on transportation infrastructure due to potential population increases and transportation of goods and services | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level I | Not significant | NA ⁽²⁾ | adverse |
| | Increased traffic on the roads leading to the Project site | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |
| Closure Phase | | | | | | | | | | |
| Population demographics | Changes to population –decline | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | positive |



Table 8.17.2.5-1: Determination of Significance for Social Valued Components (continued)

| Valued Components (VCs) | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|----------------------------|--|-----------|-------------------|-------------------|----------|-----------|---------------|-----------------|-------------------|----------------------|
| Education | Decreased demand for education services at all levels | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level I | Not significant | NA ⁽²⁾ | positive |
| Housing | Positive and negative changes in real estate values due to out-migration | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | positive and adverse |
| Public safety | Potential for increase in demand for public safety services due to increased traffic volumes related to the Project | Level II | Level II | NA ⁽¹⁾ | Level I | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Transportation and traffic | Potential impact on transportation infrastructure due to mine closure activities | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | positive |
| | Increased traffic on the roads leading to the Project site | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | positive |
| Post-closure Phase | | | | | | | | | | |
| Population demographics | Changes to population –decline | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | positive |
| Education | Decreased demand for education services at all levels | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | adverse |
| Housing | Positive and negative changes in real estate values due to out-migration and proximity to Project location | Level II | Level II | NA ⁽¹⁾ | Level II | Level II | Level II | Not significant | NA ⁽²⁾ | positive and adverse |
| Public safety | Potential for increase in demand for public safety services due to increased traffic volumes related to the Project and population increases | Level II | Level II | NA ⁽¹⁾ | Level I | Level II | Level II | Not significant | NA ⁽²⁾ | adverse |
| Transportation and traffic | Increased traffic on the roads leading to the Project site | Level II | Level II | NA ⁽¹⁾ | Level I | Level III | Level I | Not significant | NA ⁽²⁾ | positive |

Notes:

- (1) Timing is not applicable to social components
- (2) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant
- (3) No measurable residual effect



Table 8.18.1-1: Summary of Residual Economic Effects

| Predicted Effect | Project Phase | Enhancement and Mitigation Measures | Residual Effect | Direction |
|---|---|--|--|---|
| The Project will affect labour income, change labour participation and change employment opportunities in the region. | Site preparation and construction Operations Closure and post-closure | Site Preparations and Construction and Operations: <ul style="list-style-type: none">) Treasury will have policies for hiring and purchasing locally.) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario) Treasury will offer training including on the job training. Closure and Post Closure: <ul style="list-style-type: none">) Upon mine closure and loss of jobs, Treasury's employees will be able to utilize their experience and training skills gained from the Project in other economic sectors in the region including forestry and manufacturing. | Site Preparation and construction and Operations will create a demand for workers and increase in employment and labour income in the Project area. Closure and Post Closure will cause a reduction in Project area employment and labour income as Project employees are laid off. | Construction and Operations: Positive Closure and Post Closure: Negative |
| The Project will affect income levels in the region. | Site preparation and construction Operations Closure and post-closure | Construction and Operations: <ul style="list-style-type: none">) Treasury will have policies for hiring and purchasing locally.) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario) Treasury will offer training including on the job training. Closure and Post Closure: <ul style="list-style-type: none">) Upon mine closure and loss of jobs, Treasury's employees will be able to utilize their experience and training skills gained from the Project in other economic sectors in the region including forestry and manufacturing | Site Preparation and Construction and Operations employment will Increase in labour income in the Project area. Closure and Post Closure and the reduction in Project employees will cause a reduction in labour income in the Project area | Construction and Operations: Positive Closure and Post Closure: Negative |
| The Project through employment and contracting opportunities will affect cost of living | Site preparation and construction Operations Closure and post-closure | Construction and Operations: <ul style="list-style-type: none">) Treasury will have policies for hiring and purchasing locally.) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario | During Site Preparation and Construction and Operations demand for labour, goods and services by the Project and by | Construction and Operations: Positive Closure and Post Closure: Neutral |



Table 8.18.1-1: Summary of Residual Economic Effects (continued)

| Predicted Effect | Project Phase | Enhancement and Mitigation Measures | Residual Effect | Direction |
|---|---|--|---|--|
| | | <p>) Treasury will offer training including on the job training.</p> <p>Closure and Post Closure:) Upon mine closure and loss of jobs, Treasury's employees will be able to utilize their experience and training skills gained from the Project in other economic sectors in the region including forestry and manufacturing</p> | <p>workers moving into the Project area will could increase prices and the cost of living.</p> <p>During Closure and Post Closure, the Project demand for labour, goods and services will decline and reduce the cost of living</p> | |
| The Project through employment and contacting opportunities will affect real estate prices | Site preparation and construction Operations Closure and post-closure | <p>Construction and Operations:) Treasury will have policies for hiring locally to the extent possible. Workers recruited from elsewhere and workers with additional income who like to improve their housing are expected to create additional demands for housing and therefore affect real estate prices. See additional discussion on housing and temporary housing capacity in the Social Factors.</p> <p>Closure and Post Closure:) Workers from outside the region may choose to leave and move elsewhere and sell their properties. This is a life style decision and its mitigation is beyond the control of the Project.</p> | <p>Site Preparation and Construction and Operations will cause workers to move into the Project area and cause an increase in the demand for housing</p> <p>At Closure and Post Closure former Project employees may move away from the area causing a reduction in demands for housing</p> | <p>Construction and Operations: Positive</p> <p>Closure and Post Closure: Neutral-Negative</p> |
| The Project will change government taxes which will affect economic development in the region | Site preparation and construction Operations Closure and post-closure | <p>Construction and Operations:) Treasury will have policies for hiring and purchasing locally.) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario) Treasury will offer training, including on the job training.</p> <p>Closure and Post Closure:</p> | <p>During Site Preparation and Construction and Operations the Project employment, purchases and operation will increase in government taxes which could be used for local development</p> | <p>Construction and Operations: Positive</p> <p>Closure and Post Closure: Negative</p> |



Table 8.18.1-1: Summary of Residual Economic Effects (continued)

| Predicted Effect | Project Phase | Enhancement and Mitigation Measures | Residual Effect | Direction |
|--|--|---|---|--|
| | | <p>) During Project closure and post closure, there will be a decrease in government revenues from the Project; but since this drop is expected after 12 of years of Project operations in the region and given market uncertainty it is hard to determine whether other projects will be proposed and or operational in the region to substitute that loss in government tax. This is driven by the market and is outside Project control.</p> | <p>At Closure and Post Closure, there will be reduction in government taxes and funds for local development as Project expenditures decrease.</p> | |
| <p>The Project, through employment and contacting opportunities, will affect existing businesses</p> | <p>Site preparation and construction Operations Closure and post-closure</p> | <p>Construction and Operations:) Treasury will have policies for hiring and purchasing locally.) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario) Treasury will offer training, including on the job training.</p> <p>Closure and Post Closure:) During the Project's Closure and Post Closure, there will be a decrease in labour income, employment opportunities and Project purchase to goods and services; this may affect local businesses. However, Treasury's employees training work experience and additional skills gained through involvement in the Project are transferrable to other economic sectors and will benefit local businesses either directly or indirectly. Other factors that determine Project's Closure and Post Closure effects and required mitigation are driven by the market and are outside Treasury's control.</p> | <p>During Site Preparation and Construction and Operations, the Project will increase the Project area demand for goods and services from local businesses</p> <p>At Closure and Post Closure, there will be a reduction in Project demand for local goods and services</p> | <p>Construction and Operations: Positive Closure and Post Closure: Negative</p> |
| <p>The project through expenditures and employment will affect government revenues</p> | <p>Site preparation and construction Operations</p> | <p>Construction and Operations:) Treasury will have policies for hiring and purchasing locally.</p> | <p>During Site Preparation and Construction and Operations there will be an increase in government</p> | <p>Construction and Operations: Positive</p> |



Table 8.18.1-1: Summary of Residual Economic Effects (continued)

| Predicted Effect | Project Phase | Enhancement and Mitigation Measures | Residual Effect | Direction |
|------------------|--------------------------|---|--|------------------------------------|
| | Closure and post-closure | <p>) Treasury will purchase a majority of its goods and services locally and within the Province of Ontario</p> <p>) Treasury will offer training including on the job training.</p> <p>) The above policies will maximize and enhance the Project's contribution to additional government revenues at the Federal, Provincial and Municipal level through both income and corporate tax.</p> <p>Closure and Post Closure:) During Project Closure and Post Closure, there will be a decrease in government revenues from the Project; but since this drop is expected after 12 of years of Project operations in the region and given market uncertainty it is hard to determine whether other projects will be proposed and or operational in the region to substitute that loss in government revenues. This is driven by the market and is outside Project control.</p> | <p>revenues through the payment of Project-related business and employment taxes</p> <p>At Closure and Post Closure, there will be a reduction in Project's contribution to government revenues due to reduced spending and employment</p> | Closure and Post Closure: Negative |



The negative economic effects created during the closure phase could be improved if other developments are proposed in the region and if mine employees choose to stay in the region and utilize their skills and experience in other economic sectors. These factors are outside Treasury Metals' control and are driven by the market and personal life style decisions.

8.18.2.4 Post-closure Phase

Post closure, direct economic effects from the Project will stop completely and permanently. While this will create negative economic effects relative to closure, the conditions in the region will return to the levels they would have been without the Project. In addition, the training and skills acquired by individuals over the life of the Project will be able to be utilized in other economic sectors in the region, including forestry and manufacturing. This will contribute to the economic prosperity of the region.

8.18.2.5 Determination of Significance

Table 8.18.2.5-1 lists the various assessment levels for economic factors using the criteria listed in Section 8.1. By applying the decision tree (Figure 8.1.8-1) to the effects levels in the table yields a determination of significance. There were no significant residual economic effects identified during the site preparation and construction, closure, or post-closure phases. Significant economic effects were identified during operations. However, these significant effects were positive in direction, with the exception of changes in house prices. The direction for this effects was classified as neutral as the effects would be considered as negative for the buyers, but positive for the sellers.

8.19 Human Health

As described in Section 6.19.6, there were no predicted adverse effects of the Project on human health. Because there were no predicted residual adverse effects on human health, no determination of significance is required.

8.20 Heritage Resources

As described in Section 6.20.6, there were no predicted adverse effects of the Project on heritage resources. Because there were no predicted residual adverse effects on heritage resources, no determination of significance is required.

8.21 Aboriginal Peoples

8.21.1 Residual Effects Advanced to Significance Assessment

The residual effects carried forward to the assessment of significance are summarized in Table 8.21.1-1.



Table 8.18.2.5-1: Determination of Significance for Economic

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---|--|------------------------|-------------------|--------------------|----------|-----------|---------------|-----------------|-------------------|------------------------|
| Site Preparation and Construction Phase | | | | | | | | | | |
| Labour force, labour participation and employment | Changes in employment and labour participation | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Income levels | Changes in employment income | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Cost of living | Changes in cost of living | Level I ⁽³⁾ | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | adverse |
| Real estate | Changes in housing prices | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | neutral ⁽³⁾ |
| Economic development | Changes in economic development | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Existing businesses | Changes in demands for existing businesses | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Government revenues | Changes in government revenues | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Operations Phase | | | | | | | | | | |
| Labour force, labour participation and employment | Changes in employment and labour participation | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | positive |
| Income levels | Changes in employment income | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | positive |
| Cost of living | Changes in cost of living | Level I ⁽³⁾ | Level III | N/A | Level II | Level II | Level II | Not Significant | NA ⁽²⁾ | adverse |
| Real estate | Changes in housing prices | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | neutral ⁽³⁾ |
| Economic development | Changes in economic development | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | positive |
| Existing businesses | Changes in demands for existing businesses | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | positive |



Table 8.18.2.5-1: Determination of Significance for Economic (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---|--|------------------------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|------------------------|
| Government revenues | Changes in government revenues | Level II | Level III | N/A | Level II | Level II | Level II | Significant | Level III | positive |
| Closure Phase | | | | | | | | | | |
| Labour force, labour Participation and employment | Changes in employment and labour participation | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Income levels | Changes in employment income | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Cost of living | Changes in cost of living | Level I ⁽³⁾ | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | adverse |
| Real estate | Changes in housing prices | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | neutral ⁽³⁾ |
| Economic development | Changes in economic development | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Existing businesses | Changes in demands for existing businesses | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Government revenues | Changes in government revenues | Level II | Level III | N/A ⁽¹⁾ | Level I | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Post-closure Phase | | | | | | | | | | |
| Labour force, labour participation and employment | Changes in employment and labour participation | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Income levels | Changes in employment income | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Cost of living | Changes in cost of living | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | adverse |
| Real estate | Changes in housing prices | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | neutral ⁽³⁾ |



Table 8.18.2.5-1: Determination of Significance for Economic (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|----------------------|--|-----------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Economic development | Changes in economic development | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Existing businesses | Changes in demands for existing businesses | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |
| Government revenues | Changes in government revenues | Level I | Level III | N/A ⁽¹⁾ | Level III | Level II | Level II | Not Significant | NA ⁽²⁾ | positive |

Notes:

- (1) Timing in not In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant
- (2) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant
- (3) The magnitude for cost of living cost of living was classified as Level I, as the change from the Project would not be distinguishable from the current conditions.



Table 8.21.1-1: Summary of Residual Aboriginal Peoples Effects

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|--|--|-----------|
| Health Effects | | | | |
| Release of tailings storage facility effluent could result in exceedances of MMER, CCME and/or PWQO criteria. | Operations Closure | Environmental management plan Water quality measures | Potential release of tailings storage facility effluent causing water quality to exceed regulatory criteria with adverse effects on resources used by Aboriginal people. This could occur during operations and closure but is expected to be low in probability and infrequent through facility design. | Adverse |
| Release of chemicals and petroleum products due to spills during handling and/or equipment malfunctions. | Site preparation and construction Operations Closure | Environmental management plan Water quality measures | Potential release of chemicals and petroleum products with adverse effects on resources used by Aboriginal people. This could occur during site preparations and construction, operations, and closure but is expected to be low in probability and infrequent through environmental management. | Adverse |
| Physical alteration of the Project area landscape could result in increased erosion and an increase in the total suspended sediments in surface water. | Site preparation and construction Operations Closure Post-closure | Environmental management plan Water quality measures | Potential erosion of disturbed soils and an increased in water total suspended sediments with adverse effects on resources used by Aboriginal people. This could occur during site preparations and construction, operations, and closure and managed through water collection and treatment. | Adverse |
| Adverse health effects due to increased noise and vibration | Site preparation and construction Operations Closure | Noise and vibration measures | Potential adverse health effects due to increased noise and vibration to Aboriginal people living near the Project. Noise and vibration effects will be limited to the Project site during site preparations and construction, operations, and closure. | Adverse |
| Gathering of Plant Materials | | | | |
| Removal of plant materials traditionally gathered | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Wildlife habitat and plant habitat measures Traditional land use information collection | Removal of traditionally harvested plant materials could reduce the amount of plants harvested by Aboriginal people. Effects during all Project phases are limited to the Project site on which there is little or no known traditional plant gathering as most of the site is private land; the site represents a small proportion of the available habitat for traditionally harvested plants. | Adverse |



Table 8.21.1-1: Summary of Residual Aboriginal Peoples Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|--|-----------|
| Loss of access to areas of traditional plant gathering | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Traditional land use information collection | Potential loss of access to areas of traditional plant gathering could reduce the amount of plants harvested by Aboriginal people. Effects during all Project phases are limited to the Project site on which there is little or no known traditional plant gathering as most of the site is private land; the site represents a small proportion of the available habitat for traditionally harvested plants. | Adverse |
| Contamination of traditionally gathered plant materials | Site preparation and construction Operations Closure | Environmental management plan Water quality measures Air quality measures | Potential contamination of traditionally harvested plant material could reduce the amount of plants harvested by Aboriginal people. Effects during all Project phases are limited to the Project site on which there is little or no known traditional plant gathering as most of the site is private land. | Adverse |
| Increased noise, vibration, and light and a change in the viewscape could diminish the experience of being on the land and conducting traditional activities | Site preparation and construction Operations Closure Post-Closure | Communications Noise and vibration measures Light measures Visual effects – contouring of waste storage areas Traditional land use information collection | Potential diminished traditional land use experience and a decline in traditional land use activities. Noise and vibration effects will be restricted to the Project site. Noise, vibration, and light will effects will begin at site preparation and construction and cease at post-closure. Waste piles will be contoured and vegetated to blend into the surroundings. | Adverse |
| Hunting; Trapping Fishing | | | | |
| Reduction in abundance of animals hunted or trapped | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Traditional land use information collection | Potential reduction in the abundance of traditionally hunted or trapped animals and a reduction in food or income sources. Effects during all Project phases are limited to the local Project area on which there is little or no known traditional hunting, fishing, or trapping; most of the Project site is private land. Assessment of effects on wildlife predicts no impact on wildlife abundance. | Adverse |
| Loss of suitable habitat for animals hunted or trapped | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Traditional land use information collection | Potential reduction in suitable habitat for species traditionally hunted or trapped and a reduction in food or income sources. Effects during all Project phases are limited to the Project site on which there is little or no known traditional hunting, fishing, or trapping; most of the Project site is private land | Adverse |



Table 8.21.1-1: Summary of Residual Aboriginal Peoples Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|--|-----------|
| Loss of access to areas of traditional hunting, trapping, and fishing | Site preparation and construction Operations Closure Post-closure | Minimize Project footprint Minimize Crown land used in Project footprint Minimize activities on eastern portion of property Wildlife habitat measures Traditional land use information collection | Potential loss of access to areas of traditional hunting, trapping, and fishing and a reduction in food or income sources. Effects during all Project phases are limited to the local Project area on which there is little or no known traditional hunting, fishing, or trapping; most of the Project site is private land. | Adverse |
| Contamination of fish making them unsuitable for harvesting | Site preparation and construction Operations Closure | Environmental management plan Water quality measures | Potential contamination of fish making them unsuitable for harvesting and a loss of a food source. There is little or no fish harvesting on the Project site. If water from the Project site were to be contaminated and affect downstream fish, it could occur during operations and closure but is expected to be low in probability and infrequent through facility design. | Adverse |
| Increased noise, vibration, and light and a change in the viewscape could diminish the experience of being on the land and conducting traditional activities | Site preparation and construction Operations Closure Post-closure | Communications Noise and vibration measures Light measures Visual effects – contouring of waste storage areas Traditional land use information collection | Potential diminished traditional land use experience and a decline in traditional land use activities. Noise and vibration effects will be restricted to the Project site. Noise, vibration, and light will effects will begin at site preparation and construction and cease at post-closure. Waste piles will be contoured and vegetated to blend into the surroundings. | Adverse |
| Cultural Activities | | | | |
| Loss of culturally significant sites | Site preparation and construction Operations Closure Post-closure | Communication Traditional land use information collection | Potential loss of culturally significant sites and loss of ability to practice cultural activities. Effects during all Project phases are limited to the Project site on which there is no known culturally significant sites. | Adverse |
| Loss of access to culturally significant sites | Site preparation and construction Operations Closure Post-closure | Communication Traditional land use information collection | Potential loss of access to culturally significant sites and loss of ability to practice cultural activities. Effects during all Project phases are limited to the Project site on which there is no known culturally significant sites. | Adverse |



Table 8.21.1-1: Summary of Residual Aboriginal Peoples Effects (continued)

| Predicted Effect | Project Phase | Avoidance and Mitigation Measures | Residual Effect | Direction |
|--|--|---|--|---|
| Loss of access to traditional use sites where cultural practices occur and can be taught | Site preparation and construction Operations Closure Post-closure | Communication Traditional land use information collection | Potential loss of access to traditional use sites where cultural practices occur and can be taught. Effects during all Project phases are limited to the Project site on which there are no known culturally significant sites. | Adverse |
| Increased noise, vibration, and light and a change in the viewscape could diminish the experience of being on the land and conducting traditional activities | Site preparation and construction Operations Closure Post-closure | Communications Traditional land use information collection Noise and vibration measures Light measures Visual effects – contouring of waste storage areas | Potential diminished traditional land use experience and a decline in traditional land use activities. Noise and vibration effects will be restricted to the Project site. Noise, vibration, and light will effects will begin at site preparation and construction and cease at post-closure. Waste piles will be contoured and vegetated to blend into the surroundings. | Adverse |
| Socio-economic Effects | | | | |
| Increased employment and business opportunities | Site preparation and construction Operations Closure Post-Closure | Local hiring Local purchasing Employment at closure | There will be increased employment and business opportunities during site preparation and construction and operations directly by Project spending and indirectly from local businesses working for the Project. The employment and business opportunities will decline during closure and post-closure. | Positive during construction, operations, and closure Adverse post-closure |
| Increased training opportunities | Site preparation and construction Operations | Workforce development | Increased training and educational opportunities during site preparation and construction and operations. The training and educational opportunities will decline during closure and post-closure. | Positive during construction, operations. Adverse during closure and post-closure |
| Increased demand on existing community housing, infrastructure and services due to in-migration of Project workers | Site preparation and construction Operations Closure | Socio-economic Management Plan Socio-economic baseline Education enrollment Regional infrastructure and services Protective services Housing measures | The in-migration of construction and operations workers could place increased demand on existing community housing, infrastructure and services during site preparation and construction and operations. Demand on community housing, infrastructure, and services will decline during closure and post-closure if Project workers leave the area. | Adverse during construction and operations. Positive during closure and post-closure |



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

8.21.2 Description of Significance

The description of the criteria for the determination of significance is in Section 8.1.

8.21.2.1 Site Preparation and Construction Phase

Potential effects to the health of Aboriginal peoples through the release of contaminants and the subsequent contamination of traditional foods could begin in the construction phase. Avoidance and mitigation measures will be established to monitor and minimize releases of contaminants and sediment in water and dust to the surrounding environment which reduces the probability of adverse effects.

The health impacts of increased noise and vibration during construction will be mitigated through avoidance and mitigation measures and monitoring.

The loss of and the loss of access to traditionally gathered and harvested resources and cultural sites may begin in the construction phase. Aboriginal communities have not identified any specific traditional land use activities that were practiced on the Project site and all but 1.11% of the Project site is on private land where it is unlikely traditional practices were conducted. The loss of the ability to conduct traditional land use is, therefore, expected to be minimal.

Employment and business opportunities for Aboriginal people will begin during construction. The level of participation of Aboriginal people and businesses will depend on their personal choice and suitable qualifications and on the ability of Aboriginal businesses to compete on price, quality, and delivery. Treasury Metals has committed to giving preference to local and Aboriginal hiring, contracting, and purchasing.

Treasury Metals has committed to providing employment-related training that will be available to Aboriginal people beginning during construction.

Aboriginal people living off-reserve may experience the effects of increased demand for community housing, services, and infrastructure should there be an influx of workers seeking or obtaining employment at the Project during construction.

8.21.2.2 Operations Phase

The potential effects described for the construction phase will continue through the operations phase. Likewise, avoidance and mitigation measures established during construction will be continued and expanded through operations.



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

8.21.2.3 Closure Phase

The decrease in Project site activities during the closure phase will decrease the probability of health effects on Aboriginal people, particularly due to noise and vibration.

The effects on traditional land use will continue through the closure phase as access will continue to be restricted. The effects on the on-the-land experience will decline due to the reduced Project activity.

Employment and business opportunities will be reduced during the closure phase which could adversely affect Aboriginal workers and businesses. Employment-related training will no longer be available.

Demand on community housing, services, and infrastructure could be reduced if former mine employees move away from the local communities during closure providing more capacity for Aboriginal residents.

8.21.2.4 Post-closure Phase

When closure is completed and the Project site has been restored and waste materials sealed, potential health effects on Aboriginal people will be eliminated.

Access to the site will be available in the post-closure phase and the site restoration to forest will provide opportunities for traditional land use activities on the Project site.

The Project will not provide any employment or business opportunities during the post-closure phase.

A further reduction in the demand for community housing, services, and infrastructure may occur if the closure workforce moves away from the local communities providing more capacity for Aboriginal residents.

8.21.2.5 Determination of Significance

The determination of significance for each valued component and potential effect is presented in Table 8.21.2.5-1, with the various assessment levels assigned using the criteria listed in Section 8.1. By applying the decision tree (Figure 8.1.8-1) to the effects levels in the table yields a determination of significance. None of the residual effects for Aboriginal peoples were classified as being significant.



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|---|--|------------------------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Site Preparation and Construction Phase | | | | | | | | | | |
| Health effects | Changes in water quality downstream of the Project site | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in quality of harvested plants, animals, or fish | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in health due to noise and vibration | Level I | Level I | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Gathering of plant materials | Loss of locations of traditionally harvested vegetation | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas of traditional plant harvesting | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in plant quality | Level I | Level I | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Hunting, trapping, fishing | Changes in populations of harvested animals or fish | Level I ⁽⁵⁾ | Level III | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas used for traditional hunting, trapping, or fishing activities | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in habitat | Level II | Level I | N/A ⁽²⁾ | Level I | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in fish quality | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Cultural activities | Loss of or restricted access to cultural sites | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level III | Not significant | NA ⁽³⁾ | adverse |
| | Reduction in traditional activities | Level I ⁽¹⁾ | Level II | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|------------------------------|--|-------------------------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| Socio-economic Effects | Economic effects | Level II ⁽⁴⁾ | Level III | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | positive |
| | Social effects | Level II | Level II | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| Operations Phase | | | | | | | | | | |
| Health effects | Changes in water quality downstream of the Project site | Level II | Level II | N/A ⁽²⁾ | Level II | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in quality of harvested plants, animals, or fish | Level II | Level II | N/A ⁽²⁾ | Level II | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in health due to noise and vibration | Level I | Level I | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Gathering of plant materials | Loss of locations of traditionally harvested vegetation | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas of traditional plant harvesting | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level II | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in plant quality | Level I | Level I | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Hunting, trapping, fishing | Changes in populations of harvested animals or fish | Level I ⁽⁵⁾ | Level III | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas used for traditional hunting, trapping, or fishing activities | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in habitat | Level II | Level I | N/A ⁽²⁾ | Level I | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in fish quality | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Cultural activities | Loss of or restricted access to cultural sites | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level III | Not significant | NA ⁽³⁾ | adverse |



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|------------------------------|--|--------------------------|-------------------|--------------------|----------|-----------|---------------|----------------------|-------------------|-----------|
| | Reduction in traditional activities | Level I ⁽¹⁾ | Level II | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Socio-economic effects | Economic effects | Level III ⁽⁴⁾ | Level III | N/A ⁽²⁾ | Level I | Level III | Level I | Significant Positive | NA ⁽³⁾ | positive |
| | Social effects | Level II | Level II | N/A ⁽²⁾ | Level II | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| Closure Phase | | | | | | | | | | |
| Health effects | Changes in water quality downstream of the Project site | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in quality of harvested plants, animals, or fish | Level II | Level II | N/A ⁽²⁾ | Level II | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in health due to noise and vibration | Level I | Level I | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| Gathering of plant materials | Loss of locations of traditionally harvested vegetation | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level I | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas of traditional plant harvesting | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in plant quality | Level I | Level I | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Hunting, trapping, fishing | Changes in populations of harvested animals or fish | Level I ⁽⁵⁾ | Level III | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas used for traditional hunting, trapping, or fishing activities | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in habitat | Level II | Level I | N/A ⁽²⁾ | Level I | Level I | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in fish quality | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|------------------------------|--|-------------------------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Cultural activities | Loss of or restricted access to cultural sites | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level III | Not significant | NA ⁽³⁾ | adverse |
| | Reduction in traditional activities | Level I ⁽¹⁾ | Level II | N/A ⁽²⁾ | Level II | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Socio-economic effects | Economic effects | Level II ⁽⁴⁾ | Level III | N/A ⁽²⁾ | Level I | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Social effects | Level II | Level I | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |
| Post-closure Phase | | | | | | | | | | |
| Health effects | Changes in water quality downstream of the Project site | Level II | Level II | N/A ⁽²⁾ | Level II | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in quality of harvested plants, animals, or fish | Level II | Level II | N/A ⁽²⁾ | Level II | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Changes in health due to noise and vibration | Level I | Level I | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| Gathering of plant materials | Loss of locations of traditionally harvested vegetation | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas of traditional plant harvesting | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Change in plant quality | Level I | Level I | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level II | Level I | Not significant | NA ⁽³⁾ | adverse |
| Hunting, trapping, fishing | Changes in populations of harvested animals or fish | Level I ⁽⁵⁾ | Level III | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Restricted access to areas used for traditional hunting, trapping, or fishing activities | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |



Table 8.21.2.5-1: Determination of Significance for Aboriginal Peoples (continued)

| Valued Components | Indicator | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Significance | Likelihood | Direction |
|------------------------|--|------------------------|-------------------|--------------------|-----------|-----------|---------------|-----------------|-------------------|-----------|
| | Change in habitat | Level II | Level I | N/A ⁽²⁾ | Level I | Level I | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Change in fish quality | Level II | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Diminished on-the-land experience | Level I | Level II | N/A ⁽²⁾ | Level I | Level I | Level I | Not significant | NA ⁽³⁾ | adverse |
| Cultural activities | Loss of or restricted access to cultural sites | Level I ⁽¹⁾ | Level I | N/A ⁽²⁾ | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| | Reduction in traditional activities | Level I ⁽¹⁾ | Level II | N/A ⁽²⁾ | Level III | Level III | Level II | Not significant | NA ⁽³⁾ | adverse |
| Socio-economic effects | Economic effects | Level I ⁽⁴⁾ | Level III | N/A ⁽²⁾ | Level III | Level III | Level I | Not significant | NA ⁽³⁾ | adverse |
| | Social effects | Level II | Level I | N/A ⁽²⁾ | Level I | Level II | Level II | Not significant | NA ⁽³⁾ | adverse |

Notes:

- (1) Locations of traditional land use, including plant gathering, hunting, trapping, fishing, and cultural activities, have not been identified on the Project site and were unlikely due to the high proportion of private property.
- (2) Timing is not applicable, see Section 8.1.3.17.
- (3) In accordance with Agency guidance (CEAA, 2015b) likelihood was not determined as none of the effects were classified as significant
- (4) For the Socio-economic Effects economic indicator, the effect is positive for the construction and operations phases and adverse for the closure and post-closure phases
- (5) Assessment of impacts on wildlife determined there would be no measurable residual effect to population abundance and distribution



8.21.3 Prediction Confidence and Uncertainty

The prediction confidence regarding traditional activities is moderate. No Aboriginal group has identified that traditional land use activities take place in the Project area, however, Project-specific traditional knowledge studies have not been completed. Treasury Metals is committed to continue to engage with Aboriginal communities to gather Project-specific traditional knowledge and land use information.

The prediction confidence for socio-economic effects on Aboriginal peoples is moderate. The capacity and capability of the local workforce and businesses will be considered in a socio-economic baseline update which will advance the estimates of the level of Project participation. However, any estimates are subject to the personal choice of people and businesses to participate in the Project. The level local and Aboriginal participation in the Project will be monitored through the socio-economic management plan.

The prediction confidence regarding Health Effects on Aboriginal peoples is high with the avoidance and mitigation measures being planned by Treasury Metals.

8.22 Federal Considerations

8.22.1 Changes in Environmental Components within Federal Jurisdiction

Residual adverse effects associated with the Project were predicted for migratory birds and wildlife species at risk. These effects were determined to be not significant (Sections 8.12 and 8.13). There were no adverse effects predicted for vegetation species at risk identified in the regional study area (Section 8.15). The Project will overprinting of sections of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2. These activities will require a *Fisheries Act* authorization, which would include requirements for offsetting measures to be completed that would mitigate the loss or alteration of fish habitat. However, residual adverse effects were predicted due to mortality to some of the stream-based fish that remain in those isolated sections of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 that cannot be re-located. There were no residual adverse effects identified for any fish species at risk.

8.22.2 Changes to Environment on Federal or Transboundary Lands

The Project is not anticipated to cause any changes to the environment on federal lands, nor are there and transboundary effects. There are no residual adverse effects on federal or transboundary lands.

8.22.3 Changes to the Environment Linked or Incidental to Federal Decisions

As described in Section 6.14, the implementation of an offsetting plan that will be required as part of the required authorizations under the *Fisheries Act* would mitigate the effect of the overprinting



of fish habitat by the Project. Therefore, there would be no residual adverse effects as a result of the loss or alteration of fisheries habitat causes by the Project.

A program will be implemented to relocate the fish isolated in the sections of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 overprinted by the construction of the perimeter ditch downstream from the operations area, or to the main branch of Blackwater Creek. However, there will remain a residual effect of mortality to some of the stream-based that reside in those isolated sections of Blackwater Creek Tributary 1 and Blackwater Creek Tributary 2 that cannot be re-located.

As described in Section 6.23.3, Treasury Metals has received a letter from the Navigation Protection Program of Transport Canada (2017) indicating that the Project would not require an exemption under the *Navigation Protection Act*. Therefore, there are no residual adverse effects on navigable water.

8.22.4 Effects of Changes to the Environment on Aboriginal People

The integrated assessment presented in this Impact Review Report identified residual adverse effects of the Project on Aboriginal peoples. Some of those were specifically related to the changes in the environment associated with the Project. None of the residual adverse effects that remained after incorporating technically and economically feasible mitigation were determined to be significant (Section 8.21).

8.22.5 Effects of Changes to the Environment Linked or Incidental to Federal Decisions

The significance of the residual adverse effects on social conditions are described in Section 8.17, while the significance of the residual adverse effects for economic conditions are described in Section 8.18. There were no residual adverse effects predicted for human health (Section 8.19) or for heritage resources (Section 8.20).