Appendix C.1

Air Quality Assessment

Crawford Nickel Project Technical Data Report – Air Quality Assessment

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Prepared for:

Canada Nickel Company

Prepared by:

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Limitations and Sign-off

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Executive Summary

Canada Nickel Company Incorporated (Canada Nickel) proposes to develop, construct, operate, and progressively reclaim a new open pit nickel mine, collectively known as the Crawford Nickel Project ('the Project'), approximately 42 km north of Timmins, Ontario. The Project includes the development of an Open Pit, Stockpiles, Processing Plant(s), and other mine related infrastructure, as well as a new rail spur line. Highway 655 and an existing 500 kilovolt (kV) transmission line will be relocated to facilitate the Project. The Project has an expected project life of 41 years.

This Technical Data Report (TDR) consolidates the results of the assessment of the effects of each of the Project components and physical activities, in all phases of the Project, based upon a comparison of baseline environmental, Health, Social and Economic conditions and the predicted future conditions with and without the Project for Air Quality (AQ). The TDR will inform the completion of the associated Valued Component (VC) chapter and will be appended to the Impact Statement.

This TDR has been prepared pursuant to the Canadian federal *Impact Assessment Act*, 2019 (IAA 2019) and in consideration of the Tailored Impact Statement Guidelines (Appendix A.1 of the Impact Statement [TIS Guidelines]) for the Project.

The assessment of the potential changes in air quality due to the Project was performed by conducting dispersion modelling to predict the downwind concentrations of air contaminants of potential concern (CoPCs) and comparing these predictions to regulatory standards, objectives and guidelines. The assessment consisted of the following elements:

- Compilation of an emissions inventory of Project point and mobile sources.
- Assessment of baseline ambient air quality conditions for CoPCs from site-specific measurements the existing published sources of air quality data.
- Dispersion and deposition modelling of the Project to provide input to the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement), and to support the assessment of potential environmental effects, including cumulative effects, for the Impact Statement.
- Comparison of dispersion model predictions to ambient air quality criteria (AAQC) as well as evaluation of the incremental change in air quality associated with the Project.

Using computer based modelling, ground level CoPC concentrations due to the Project were predicted over gridded receptors located along and outside of the Modelled Mine Boundary. Additionally, a series of special receptors were situated in areas where human activities more regularly take place (including hunting/fishing cabins, residences, recreational areas, and Indigenous use areas). Both outside Modelled Mine Boundary and inside Modelled Mine Boundary special receptors were assessed. The Modelled Mine Boundary provided a buffer around the Project Area (PA) similar to those at other mines and industrial areas. People (on snowmobile trails, rivers, other trails), could still pass through the area within the Modelled Mine Boundary (but outside the PA), but their time within this area would be limited and no overnight stays would be possible.

The dispersion modelling was done using three methodologies:

Base Method: includes all particulate emissions sources and conservatively does not account for plume particulate deposition and depletion.

Refined Method: includes plume deposition and depletion, which is expected to provide a more representative characterization of ambient particulate matter and metals concentrations.

MECP Method: Excludes particulate (but not metals) emissions from haul road and wind erosion sources in the dispersion modelling; it also excludes plume deposition and depletion. This is the methodology that can be used in the Ontario environmental compliance approval process. Background air quality is not included/assessed in this method.

A total of 80 contaminants of potential concern (CoPCs) were assessed for the Project construction phase and 85 CoPCs were assessed for the Project operations phase. Project operations includes 5 additional CoPCs due to ore processing relative to the construction phase.

Background Air Quality

Ambient air quality monitoring data were used to characterize air quality in the Local Study Area (LSA) and to develop background concentration levels to be used in the assessment. Onsite ambient monitoring was used to characterise suspended particulate matter (SPM), metals in SPM, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), dustfall, nitrogen dioxide (NO_2), sulphur dioxide (SO_2), volatile organic compounds (VOCs), benzo(a)pyrene (B(a)P), respirable crystalline silica (RCS), asbestos and elemental carbon.

Baseline air quality for carbon monoxide (CO) and ozone (O_3) was assessed through a review of historical air quality measurements from representative National Air Pollutant Surveillance (NAPS) stations operated by Environment and Climate Change Canada. The background levels of all CoPCs were below applicable air quality criteria except for 24-hour and annual average concentrations of B(a)P.

The results of the air quality assessment are provided for the following combinations: Project Alone – Construction; Project Alone - Operations; Cumulative – Construction and Cumulative - Operations.

Project Alone Construction

Base Method:

- The maximum predicted 24-hour average Suspended Particulate Matter (SPM) ground level concentration (GLC) is predicted to exceed the 24-hour ambient air quality criteria (AAQC) by 74% at the Modelled Mine Boundary. The AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides and would be infrequent (no more than 1% of the time).
- The maximum predicted 24-hour average Particulate Matter with particles less than 10 µm (PM_{10}) concentration exceeds its AAQC by 24%. The AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides and exceedances in this area would be infrequent (no more than 0.3% of the time).

- Maximum predicted 24-hour average aluminum and muscovite concentrations are above their MECP screening levels by 25% and 195% respectively. Exceedance of a screening level indicates that further assessment is required to determine if there is a potential for an adverse effect on health.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.

Refined Method:

- Maximum predicted 24-hour average muscovite concentrations is above its MECP screening level by 33%.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.

MECP Method:

- Maximum predicted 24-hour average aluminum and muscovite concentrations are above their MECP screening levels by 25% and 195% respectively.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.

Project Alone Operations

Base Method:

- The maximum predicted 24-hour average SPM GLC is predicted to exceed the 24-hour criterion by 322% at the Modelled Mine Boundary. The AAQC is predicted to be exceeded in a large area around the Modelled Mine Boundary using this conservative methodology, however frequencies of exceedance greater than 5% only occur within 2 km of the north Modelled Mine Boundary and less than 1 km from the east boundary. With additional enhanced mitigation measures implemented, the maximum predicted 24-hour average SPM exceedance could reduce to 111%, with the predicted area of exceedance being substantially reduced and concentrations exceeding the AAQC by more than 0.5% of the time only occurring within 2-km of the north Modelled Mine Boundary. The limiting effect for the MECP SPM AAQC is visibility and the area around the Project is primarily forested where human presence is expected to be infrequent.
- The maximum predicted 24-hour average PM_{10} concentration is above its criterion by 196%. Frequencies of exceedance greater than 2% occur within 1.5-km of the north Modelled Mine Boundary. With additional mitigation, the maximum predicted 24-hour average PM_{10} exceedance would reduce to 48% and the predicted area exceedance would substantially reduce, with concentrations exceeding the AAQC by more than 0.2% of the time only occurring within 2-km from the north Modelled Mine Boundary.
- Maximum predicted 24-hour average aluminum and muscovite concentrations are above their MECP screening levels by 208% and 706% respectively. With additional mitigation, the maximum predicted 24-hour average aluminum and muscovite exceedances would reduce to 54% and 304% respectively.

- The maximum predicted 24-hour average manganese concentration is above its criterion by 21%. The area above the AAQC is small and exceedances in this area would be infrequent (no more than 0.3% of the time). With additional mitigation, the maximum predicted 24-hour average concentration would be below its AAQC.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.

Refined Method:

- The maximum predicted 24-hour average SPM GLC is 63% above the MECP AAQC.
- The maximum predicted 24-hour average aluminum concentration is 16% above its screening level.
- The maximum predicted 24-hour average muscovite concentration is above its MECP screening level by 262%.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.
- With additional mitigation implemented, only maximum predicted 24-hour average muscovite would be above its screening level.

MECP Method:

- Maximum predicted 24-hour average aluminum and muscovite concentrations are above their MECP screening levels by 208% and 706% respectively. With additional mitigation, the maximum predicted 24-hour average aluminum and muscovite exceedances would reduce to 54% and 304% respectively.
- The maximum predicted 24-hour average manganese concentration is above its criterion by 21%. With additional mitigation, the maximum predicted 24-hour average concentration would be below its AAQC.
- The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria.

Cumulative Effects (Project + Background Concentrations) – Construction

Base Method:

- Maximum predicted cumulative SPM, PM_{10}, muscovite, and aluminum concentrations exceed their 24-hour average criteria by 96%, 50%, 195% and 29% respectively. As no background measurement data is available for muscovite, the maximum predicted cumulative concentration is the same as for the Project Alone.
- Cumulative 24-hour and annual average B(a)P are predicted to exceed their criteria by 8% and 2% respectively. The background concentration of B(a)P is above its applicable air quality criteria, with the Project only providing a small (1%) contribution to the cumulative concentrations therefore mitigation is not expected to be required.

Refined Method:

- The only CoPC predicted to exceed its criterion is muscovite, with the maximum predicted cumulative GLC being 33% above its screening level.

MECP Method:

- Not applicable – background concentrations are not considered for Ontario environmental permitting (air).

Cumulative Effects (Project + Background Concentrations) – Operations

Base Method:

- Maximum predicted cumulative SPM, PM_{10}, muscovite, aluminum and manganese concentrations exceed their 24-hour average criteria by 345%, 222%, 706%, 212% and 23% respectively.
- The highest predicted annual average cumulative SPM concentration is 3% above its criterion.
- The highest predicted 24-hour average cumulative $PM_{2.5}$ GLC (Base Method) is 5% above the criterion. The model prediction is the maximum daily average concentration rather than a 98^{th} percentile value and therefore provides a conservative comparison to the MECP AAQC.
- The maximum predicted 24-hour average cumulative RCS concentration is above its criteria by 17%.
- Cumulative 24-hour and annual average B(a)P are predicted to exceed their criteria by 10% and 3% respectively.
- With additional mitigation, the maximum predicted 24-hour average cumulative $PM_{2.5,}$ RCS and manganese concentrations would be below their respective criteria, as would the annual average for SPM. The aluminum exceedance using the Base Method would reduce to 56% and the maximum muscovite exceedance would decrease to 304% of their applicable screening levels. The highest predicted 24-hour average cumulative SPM GLC would reduce to 223% above the criterion and the highest predicted 24-hour average cumulative PM_{10} GLC would reduce to 74% above the criterion.

Refined Method:

- The only CoPCs predicted to exceed their criteria are SPM, muscovite, and magnetite with their maximum predicted GLCs decreasing by greater than 50% relative to the conservative no plume depletion (Base Case) assessment.

MECP Method:

- Not applicable – background concentrations are not considered for Ontario environmental permitting (air).

Special Receptors – Construction

Base Method:

- The maximum predicted Project Alone concentrations of all CoPCs were below applicable criteria for all special receptors outside the Modelled Mine Boundary other than muscovite, which was above its screening level by at most 46%.
- Project Alone dispersion modelling predicted exceedances of the 24-hour average SPM, PM_{10}, aluminum, and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary. As public access will be limited within the Modelled Mine Boundary, 24-hour (or longer) exposure is not anticipated in this area.
- The maximum predicted cumulative concentrations of muscovite and B(a)P are above their criteria at outside Modelled Mine Boundary special receptors. Cumulative concentrations of SPM, PM_{10}, aluminum, muscovite and B(a)P are predicted at inside Modelled Mine Boundary special receptors. B(a)P was above its 24-hour and annual criteria by 6% and 2% respectively; however, the 24-hour and annual average background B(a)P concentrations exceed their applicable criteria alone, with the Project only contributing a small increment above the background concentrations. Therefore B(a)P mitigation is not expected to be required.

Refined Method:

- The maximum predicted Project Alone concentrations of all CoPCs are below applicable criteria for all special receptors outside the Modelled Mine Boundary.
- The refined dispersion modelling predicted only muscovite to exceed its screening level at the inside Modelled Mine Boundary special receptors, where public access will be limited.
- The maximum predicted cumulative concentrations of all CoPCs other than B(a)P are below applicable criteria for all special receptors outside the Modelled Mine Boundary. Maximum predicted cumulative muscovite and B(a)P concentrations are predicted to exceed their criteria at inside Modelled Mine Boundary special receptors. As noted above, background B(a)P concentrations alone exceed the ambient criteria, with the Project only contributing a small increment above the background concentrations, thus B(a)P mitigation is not expected to be required.

MECP Method:

- The maximum predicted Project Alone concentrations of all CoPCs are below applicable criteria for all special receptors outside the Modelled Mine Boundary other than muscovite, which is above its screening level by at most 46%.
- Project Alone dispersion modelling predicted exceedances of the 24-hour average aluminum and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.

- The MECP method is not applicable to cumulative concentrations as background concentrations are not considered for Ontario environmental permitting (air).

Special Receptors – Operations

Base Method:

- Project Alone dispersion modelling had the following results for the outside Modelled Mine Boundary special receptors:
  - The maximum predicted 24-hour average SPM concentration at the outside Modelled Mine Boundary special receptors is 67% above its criterion at a Sensitive Receptor - Indigenous where occupancy would be in infrequent. SPM concentrations are predicted to be above the 24-hour average criterion infrequently at this location (no more than 0.7% of the time).
  - The maximum predicted 24-hour average PM_{10} and aluminum concentrations at the outside Modelled Mine Boundary special receptors are 16% and 21% above their criteria. PM_{10} and aluminum concentrations are predicted to be above their respective 24-hour average criteria infrequently (no more than 0.1% of the time).
  - The maximum predicted 24-hour average muscovite concentration at the outside Modelled Mine Boundary special receptors is 267% above its criterion at a house south of the mine. Muscovite exceedances are predicted to occur infrequently (no more than 3.1% of the time).
  - The maximum GLCs of all other CoPCs are predicted to be below their applicable criteria at outside Modelled Mine Boundary receptors.
- Project Alone dispersion modelling predicted exceedances of the 24-hour average SPM, PM_{10}, aluminum, RCS, manganese and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.
- The maximum predicted cumulative concentrations of SPM, $PM_{10,}$ aluminum, muscovite and B(a)P are above applicable criteria for special receptors outside the Modelled Mine Boundary. Cumulative exceedances of the 24-hour average SPM, PM_{10}, $PM_{2.5}$, aluminum, RCS, manganese and benzo(a)pyrene (24-hour and annual) ambient criteria are predicted at receptors inside the Modelled Mine Boundary where public access will be limited and 24-hour (or longer) exposure is not anticipated. The B(a)P cumulative concentration exceedances are attributable to the background levels alone being above their applicable criteria, therefore mitigation is not expected to be required.

Refined Method:

- Project Alone dispersion modelling predicted only muscovite to exceed its 24-hour average criterion at outside Modelled Mine Boundary special receptors, with the maximum predicted GLC being 67% above the screening level.

- Project Alone dispersion modelling predicted 24-hour average SPM, PM_{10} and muscovite to exceed their criteria at the inside Modelled Mine Boundary special receptors, where public access will be limited and 24-hour (or longer) exposure is not anticipated.
- Cumulative exceedances of muscovite and B(a)P are predicted at outside Modelled Mine Boundary receptors, while SPM, PM_{10}, muscovite and B(a)P exceedances are predicted at inside Modelled Mine Boundary receptors where public access will be limited and 24-hour (or longer) exposure is not anticipated.

MECP Method:

- The maximum predicted Project Alone 24-hour average aluminum and muscovite concentrations at outside Modelled Mine Boundary special receptors are above their criteria by the same amount as the Base Method, with all other CoPCs below applicable criteria.
- Project Alone dispersion modelling predicted exceedances of the 24-hour average aluminum, RCS, manganese and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.
- The MECP method is not applicable to cumulative concentrations as background concentrations are not considered for Ontario environmental permitting (air).

Nitrogen Dioxide Predictions

- Maximum predicted hourly and 24-hour average NO_2 predictions for both Construction and Operations and Project Alone and Cumulatively are below applicable MECP criteria throughout the LSA.
- Maximum predicted NO_2 concentrations are below the Canadian Ambient Air Quality Standards (CAAQS) for the Project Alone and Cumulative Construction cases at outside Modelled Mine Boundary special receptors.
- The maximum predicted Project Alone 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration for Project Operations is predicted to be above the 1-hour NO_2 (2025) CAAQS at 3 of the 10 special receptors assessed outside the Modelled Mine Boundary, with the maximum prediction being 41% above the CAQQS.
- The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 3 of the special receptors assessed inside the Modelled Mine Boundary for Project Construction and at all receptors for Project Operations.
- The CAAQS are non-regulatory health and environmentally based ambient air objectives that are used to assess general air quality in air zones and reflect desirable concentrations of contaminants in air from all sources (MECP, 2024). The CAAQS are not used to assess compliance at a facility's property line but rather are used to assess regional air quality. Predicted concentrations at locations above the CAAQS in proximity to the Project are an indicator that air

management actions should be considered to reduce ambient levels, which are discussed in this report.

Indigenous Receptors

- Of the 80 CoPCs assessed for Project Construction, 79 are predicted to be below their applicable criteria for the Base Method, Project Alone case at all Indigenous receptors outside the Modelled Mine Boundary, with only muscovite predicted to be above its MECP screening level by 46% (which indicates that further assessment is required to determine if there is a potential for an adverse effect).
- For Project Operations, 85 CoPCs were assessed and 80 are predicted (Base Method) to be below their applicable criteria at all Indigenous receptors outside the Modelled Mine Boundary for the Project Alone. The maximum predicted 24-hour average concentrations of SPM and PM_{10}, are above their respective MECP criteria by 67% and 16%, while aluminum and muscovite are above their MECP screening levels by 21% and 227% respectively. SPM, PM_{10}, aluminum and muscovite are above their criteria at an Indigenous receptor infrequently, with the maximum frequencies being 0.7%, 0.1%, 0.1% and 3.1% respectively.
- The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted for Project Operations to be above the 1-hour NO_2 (2025) CAAQS at 2 outside Modelled Mine Boundary Indigenous special receptors, with the maximum prediction being 41% above the CAAQS.
- For both construction and operations, maximum predicted cumulative B(a)P concentrations are predicted to exceed the applicable 24-hour and annual criteria at Indigenous receptor locations. The background level of B(a)P is above the applicable air quality criteria, with the Project only providing a small contribution to the cumulative concentrations.

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Glossary

Air Contaminant Emissions	For stationary sources, the release or discharge of a pollutant from a facility or operation into the ambient air either by means of a stack, vent or as a fugitive dust, mist or vapour.
Canadian Council of Ministers of the Environment (CCME)	A council made up of environmental ministers from provincial and federal levels of government that proposes nationally consistent environmental standards and objectives to achieve high levels of environmental quality for waste management, air pollution, and toxic chemicals across Canada.
Carbon Monoxide (CO)	A colourless, odourless gas produced by incomplete fossil fuel combustion.
Combustion Product	Substance produced during the burning or oxidation of a material.
Combustion	1. Burning, or rapid oxidation, accompanied by the release of energy in the form of heat and light. 2. Refers to controlled burning of waste, in which heat chemically alters organic compounds, converting into stable compounds such as carbon dioxide and water.
Concentration	In air quality, concentration is defined as the abundance (mass or volume) of a substance suspended in a unit volume of ambient air.
Director	Director of the Environmental Assessment and Approvals Branch, Ministry of the Environment and Climate Change.
Dust	A term used to describe particles of a solid or liquid that are suspended in air. Also referred to as particulate or suspended particulate.
Dustfall	A term used to describe the quantity of particles in the air that settle onto the ground over a given area and time under the influence of gravity and/or precipitation scavenging.
Ecological/Environmental Risk Assessment (ERA)	A scientific method used to examine the nature and magnitude of risks from the exposure of plants and animals to contaminants in the environment.
Emission Factor	A representative value that relates the quantity of pollutant released to the atmosphere with an activity or input associated with the release of that pollutant.
Emissions Trading	The creation of surplus emission reductions at certain stacks, vents or similar emissions sources and the use of this surplus to meet or redefine pollution requirements applicable to other emissions sources. This allows one source to increase emissions when another source reduces them, maintaining an overall constant emission level. Facilities that reduce emissions substantially may "bank" their "credits" or sell them to other facilities or industries.

Emissions	Technically, all solid, liquid, or gaseous discharges from a processing facility, but normally referring to those released to the atmosphere (with solids referred to as residue and liquids as effluent).
Environment	The environment is broadly defined under the *Environmental Assessment Act* as follows: a) Air, land or water; b) Plant and animal life, including human life; c) The social, economic and cultural conditions that influence the life of humans or a community; d) Any building, structure, machine or other device or thing made by humans; e) Any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from human activities; or, f) Any part or combination of the foregoing and the interrelationships between any two or more of them.
Environmental Protection Act (EPA)	An Ontario Act to provide for the protection and conservation of the natural environment.
Fugitive Emissions	Emissions from facilities or activities that could not reasonably pass through a stack, vent, or other functionally equivalent opening nor caught by a capture system.
Greenhouse Effect	The warming of the Earth's atmosphere attributed to a build-up of carbon dioxide or other gases; some scientists think that this build-up allows the sun's rays to heat the Earth, while making the infra-red radiation atmosphere opaque to infra-red radiation, thereby preventing a counterbalancing loss of heat.
Mitigation	Measures taken to reduce adverse effects on the environment.
Moisture Content	The percentage of a material that is water.
Monitoring	Periodic or continuous surveillance or testing to determine the characteristics of a substance or the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.
National Pollutant Release Inventory (NPRI)	The only legislated, nation-wide, publicly accessible inventory of information on annual releases to air, water, land, and disposal or recycling from all sectors in Canada.
Particulate	A particle of a solid or liquid that is suspended in air.
Particulate Deposition	The quantity of particles of a solid or liquid in air that settles onto the ground over a given area and time under the influence of gravity and/or precipitation scavenging. Commonly referred to as dustfall.
Particulate Matter	A particle in solid or liquid phase that is suspended in air.

Point of Impingement	A defined point or points set at a defined distance from a facility (usually between the facility and sensitive community receptors) at which a specific limit for air pollutants must be met.
Pollutant	Generally, any substance introduced into the environment that can adversely affect the usefulness of a resource or the health of humans, animals, or ecosystems.
Pollution	Generally, the presence of a substance in the environment that because of its chemical composition or quantity can prevent the functioning of natural processes and produce undesirable environmental and health effects
Receptor	A person, plant or wildlife species that may be affected due to exposure to a contaminant.
Stack	A chimney, smokestack, or vertical pipe that discharges flue gas or used air.
United States Environmental Protection Agency AP-42 (US EPA AP-42)	US EPA document Compilation of Air Emission Factors, Volume 1: Stationary Point and Area Sources.

Acronyms/Abbreviations

AAQC	ambient air quality criteria
AHS	Autonomous Haulage System
AP-42	US Environmental Protection Agency Compilation of Air Pollution Emission Estimation Factors Document
B(a)P	benzo(a)pyrene
CAAQS	Canadian Ambient Air Quality Standards
CAC	criteria air contaminants
CARB	California Air Resources Board
CAS	Chemical Abstracts Service
CCME	Canadian Council of Ministers of the Environment
CO	carbon monoxide
CoPC	Contaminants of Potential Concern
ECCC	Environment and Climate Change Canada
GLC	Ground Level Concentrations
IAAC	Impact Assessment Agency of Canada
kt/d	kilotonnes per day
kWp	kilowatts peak
LSA	Local Study Area
LOM	Life of Mine
m^3	cubic metre
m/s	metres per second
MECP	Ministry of the Environment, Conservation and Parks

Mt/a	million tonnes per annum
MTO	Ministry of Transportation Ontario
N/A	not applicable
NAPS	National Air Pollution Surveillance
ND	not detected
Ni	nickel
NO_2	nitrogen dioxide
NPRI	National Pollutant Release Inventory
NPI	National Pollutant Inventory
O_3	ozone
O. Reg.	Ontario Regulation
PA	Project Area
PAH	Polycyclic Aromatic Hydrocarbon
PM	particulate matter (also referred to as SPM)
PM_{10}	particulate matter smaller than 10 microns
$PM_{2.5}$	particulate matter smaller than 2.5 microns
RH	relative humidity
RSA	Regional Study Area
SO_2	sulphur dioxide
SPM	Suspended Particulate Matter
t	tonnes
TDR	Technical Data Report
TMF	Tailings Management Facility

tpd	tonnes per day
µg	Microgram
URT	upper risk threshold
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
VC	Valued Component
VOC	volatile organic compounds

1 Introduction

Canada Nickel Company (Canada Nickel) proposes to develop, operate, and progressively reclaim the Crawford Nickel Project ('the Project'), a new Open Pit nickel mine and processing facility approximately 42 kilometres (km) north of Timmins. The Project is being assessed in accordance with the *Impact Assessment Act*, 2019.

Stantec Consulting Ltd. (Stantec) has been retained by Canada Nickel to conduct an assessment of predicted changes in air quality resulting from the Project. This report provides an air quality assessment based on the proposed Project design and corresponding activities proposed during construction, operations, and decommissioning of the Project.

As per the Tailored Impact Statement Guidelines (Appendix A.1 of the Impact Statement [TIS Guidelines]), this Technical Data Report (TDR) entitled Air Quality Assessment describes the existing air quality conditions related to the Project followed by an analysis of potential effects, mitigation measures and cumulative effects of the Project. The key components of the Air Quality Assessment include:

- Study methodology
- Review of applicable regulatory requirements
- Review of baseline ambient air quality
- Emission inventory for the Project
- Dispersion modelling
- Comparison of model predictions to applicable air quality criteria.

The information presented in this TDR and used to quantify AQ impacts resulting from the Project have been obtained from Canada Nickel, existing literature, published technical data sources, engineering calculations, or from previous similar project experience.

1.1 Study Objectives

This Report will inform the Impact Statement for the Project. The objectives of this study are to describe and present available information on the expected changes in air quality due to the Project within the study area.

The scope of this report includes the following information, presented in alignment with the requirements of the TIS Guidelines (Appendix A.1 of the Impact Statement), Section 8 – Biophysical Environment:

Requirement	Section where Addressed
• Characterize the ambient air quality in the project area, LSA, and RSA, and identify existing emissions and contaminant sources; • Provide baseline ambient air concentrations for contaminants in the LSA, in particular near key receptors (e.g., communities, traditional land users, wildlife) for the following: - Total particulate matter - Particulate matter less than 2.5 microns ($PM_{2.5}$) - Particulate matter less than 10 microns (PM_{10}) - Carbon monoxide (CO) - Sulphur dioxide (SO_2) - Nitrogen dioxide (NO_2) and nitrogen oxides (NO_x) - Ozone (O_3) - Volatile organic compounds (VOCs), individual or an appropriate subset - Polycyclic aromatic compounds, including polycyclic aromatic hydrocarbons (PAHs), alkylated PAHs, PAH transformation products, including nitro and oxy-PAHs, and dibenzothiophenes - Metals - Diesel particulate matter - Asbestos (chrysotile and amphibole) - Any other relevant air pollutants from mobile, stationary or fugitive sources, including contaminants produced by the combustion of diesel fuel	Sections 1.5 and 3.4 and Baseline Air Quality Report
• Compare ambient air quality results with applicable regional, provincial, and federal criteria and standards. For air pollutants with standards, the comparison must use the same averaging period and the statistical format associated with each numerical value	Section 3.4 and Baseline Air Quality Report
• Standards include Canadian Ambient Air Quality Standards (CAAQS), National Ambient Air Quality Objectives (NAAQO), or relevant provincial criteria and standards. The proponent must refer to the new CAAQS established by the Canadian Council of Ministers of the Environment (CCME) for $PM_{2.5}$, O_3, SO_2 and NO_2 for 2020 and 2025	Section 2.1
• Describe deposition through either existing long term, or new monitoring data for a duration of a minimum of one year	Section 3.4 and Baseline Air Quality Report
• Describe the data collection methods and data source(s), including data validation and quality control methods	Section 3.4 and Baseline Air Quality Report
• Identify and address issues related to the quality of the monitoring data and seasonal variability in the baseline survey and determine ambient contaminant concentrations using complete, exhaustive, and representative monitoring data, collected over an appropriate duration and geographic scope	Section 3.4 and Baseline Air Quality Report
• If modelling is undertaken to understand baseline ambient air quality, then describe direct and indirect sources of baseline air emissions, including mobile, stationary, and fugitive, and provide an inventory of all equipment sources of baseline air emissions	N/A
• Provide a detailed description of emission sources of air pollutants listed under section 8.5.1 Baseline conditions, for all phases of the Project • Provide detailed methodology and assumptions used to estimate emissions of air pollutants released • all relevant emission factors should be provided and referenced	Section 4.2

Requirement	Section where Addressed
• For all applicable emission sources, include the assumed tier of emission standard for each emission factor applied • Provide details of the achievement of emission standards for all mobile and stationary engines used in the Project	
• Use atmospheric dispersion modelling to predict the fate of air pollutants resulting from project-related emission sources, with a big enough domain to identify potential air quality impacts on all sensitive receptors, and provide appropriately scaled contour map(s) plotting the predicted pollutant levels for all phases of the project	Section 5 and Appendix I of this report
• Determine whether the formation of secondary pollutants (pollutants which are not directly emitted but form when other primary pollutants react in the atmosphere) resulting from the Project under assessment has the potential to raise concentrations above baseline levels – if so, identify and characterize these pollutants	Section 1.1
• Provide the rationale for the choice of air quality model, including the type and magnitude of emissions, the complexity of sources, terrain and meteorology, or for why modelling is not being used to predict fate of air emissions	Section 4.3
• Provide justification for all control efficiencies used to reduce emission rates of sources within the model, including details of all assumptions associated with the related mitigation measures, and their achievability	Section 4.2.4.6
• Assess the uncertainty in the modeled air pollutant concentrations using relevant range of model inputs. All sources of uncertainty should be taken into account, including - Model uncertainty, including a consideration for how uncertainty in modelled predictions may vary spatially and temporally - Uncertainty in baseline concentration estimates, in the estimates of meteorological inputs, and in estimates of source emissions and control efficiencies (from sources attributable to the Project, and externally)	Crawford Nickel Project Impact Statement, Chapter 12.6
• Conduct a source contribution analysis to assess the relative contributions of project and non-project emission sources on pollutant concentrations at key receptors. The source contribution analysis should be conducted for all pollutants that exceed 10% of the relevant guidance or standard value. Emission sources should be grouped into appropriate categories	Sections 5.1.1, 5.2.1
• Model particulate matter emissions from unpaved road dust both with and without implementation of mitigation measures during the construction and operations phases. Mitigation measures with varying control efficiency scenarios should be modeled such as 50% and 70% control efficiency	Sections 142 and 5.8
• Describe additional analyses that were undertaken, if any, to predict the likelihood and quantity of asbestos (chrysotile and amphibole) contamination in dust	Section 5
• Assess effects to receiving environment through • Comparison of predicted air pollutant levels to the most stringent applicable federal or provincial air quality criteria and standards, including CAAQS. The assessment against CAAQS should be based on the principles of “keeping clean areas clean” and continuous improvement, and in the context of air sheds and air zones with the Air Quality Management System • Comparison with critical thresholds (consider current, historical loadings, buffering capacity, including Acid Deposition Critical Loads) • Comparison with sensitive ecological receptors (consider effects thresholds of species in question) • Comparison to other appropriate existing guidelines, objectives, or standards, where relevant. This includes regional and community-based air quality guidelines	Section 5, and HHRA TDR

1.2 Project Overview

The Project includes the development of an Open Pit, Stockpiles, two ore processing plants, and other mine related infrastructures, as well as new rail spur line and the relocation of Highway 655 and 500 kilovolt (kV) transmission line. Project components are shown on Figure A.1 in Appendix A of this report. Ore will be extracted from a single Open Pit that will be divided into an East Zone and Main Zone. The Project has a mineral reserve estimate of 1,715 million tonnes (Mt) and an expected project life of 41 years.

The Project is located approximately 42 km north of the City of Timmins, Ontario, in the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark, and Prosser. A small portion of the Project extent within the geographic townships of Kidd and Wark also lies within the municipal boundary of the City of Timmins.

Based on the current Project design, the maximum rate of ore extraction will be up to 240,000 tonnes per day (tpd) during year 5 of operations and an average rate of 160,000 tpd over the life of mine. The two ore Processing Plants and associated service facilities will process run of mine ore delivered to primary crushers to produce nickel concentrate, iron concentrate, and tailings at a rate of approximately 60,000 tpd at the start of mine life, ramping up to a maximum of 120,000 tpd. In addition to nickel and iron, other metals such as cobalt, chromium, palladium and platinum are expected to be recovered from concentrate streams.

Based on the proposed processing rate and current information regarding the ore body, the current life of the proposed Project is expected to be approximately 41 years. Mining would be completed at a faster pace than milling, thus mining of ore would occur for about 30 years, then milling alone for the last 11 years.

Concentrate from the processing plants will be loaded onto rail cars and shipped via the rail spur line for refinement offsite.

1.3 Key Project Activities

The temporal boundary of the assessment includes all Project phases from the start of construction through to the end of closure. Based on the current Project schedule, the Project phases include:

- Construction (Year -3 to Year -1)
- Operations
  - Operations phase 1 (Year 1 to Year 5); 60 kilotonnes per day (kt/d milling capacity with ore extraction
  - Operations phase 2 (Year 5 to Year 30); 120 kt/d milling capacity with ore extraction
  - Operations phase 3 (Year 30 to Year 41); 120 kt/d milling capacity with no ore extraction

- Decommissioning and closure
  - Active closure (Year 41 to Year 46)
  - Passive closure (Year 46+)

Effects on air quality are assessed on an annual basis for construction (Year -1) and operations phase 2 (Year 7) of the Project (see Section 4.2.4.4).

1.3.1 Construction Phase

The construction phase will include the preparation of the site up to the point at which the first Process Plant has been commissioned and is ready to commence operations. This phase will include site preparation, physical construction, pre-production, and commissioning activities. Construction is anticipated to begin in the Main Zone and East Zone, and rock extracted at this time may be crushed into aggregate using a mobile aggregate crusher for use during the construction of roads and other infrastructure, as necessary.

It is noted that additional construction will occur through the operations phases of the Project, and that this phase is defined by the start of ore processing.

1.3.2 Operations Phase

The operations phase is focused on the active processing of ore and generation of concentrate for delivery to market, specifically operation of the process plant(s). Due to the sequential nature of the mine operations, the operations phase of the Project has been divided into 3 sub-phases based on the Open Pit extraction schedule and sequential operation of the two process plants.

The three sub-phases of the operations phase include:

- Operations phase 1 – This phase includes the operation of the first of two process plants that will be operating at an ore processing capacity of approximately 60 kt/d (or 21.9 million tonnes per annum [Mt/a]). In Process Tailings (IPT) carbonation within the process plant may also commence if a CO_2 source is available. Mining operations during this phase will produce more ore than the process plant can process, with surplus material to be stockpiled in the East Stockpile location for future processing. Construction will continue during the phase to expand and construct the second process plant and other supporting mine infrastructure, including the Highway 655 realignment. Material will begin to be stored within the West Stockpile at the end of this phase
- Operations phase 2 – This phase includes the operation of both process plants that will be operating at an ore processing capacity of approximately 120 kt/d (or 43.8 Mt/a), including IPT carbonation. Mining operations during this phase will produce approximately 240 kt/d, which is more ore than the process plants can process. Low grade ore will continue to be stockpiled in the East and/or the West Ore Stockpiles

- Operations phase 3 – This phase includes continuation of the operation of both process plants at an ore processing capacity of approximately 120 kt/d (or 43.8 Mt/a) following completion of mining operations (e.g., no further extraction of ore from the pits). The process plants will continue to operate by processing the ore stockpiled during Operations Phase 1 and 2. As mine operations cease, there will be an opportunity for progressive reclamation of the pits, haul routes, and other no longer used areas of the Project site.

1.3.3 Decommissioning and Closure Phase

Following the completion of ore processing, all Project operations will cease, and active closure will commence. Active closure includes the removal of buildings, structures, and other infrastructure, as well as reclamation and site stabilization activities. Once complete, the Project will then enter a passive closure phase as the pit lake fills. During this time, closure monitoring and adaptive mitigation will occur. Following pit lake filling, the Project site will be permanently closed.

Activities completed during the Decommissioning and Closure Phase of the Project are focused on reclaiming the environments, establishing physical, chemical, and biological stability at the site, and to meet desired end land functions and uses. The Closure Plan will be updated throughout the life of the Project as necessary to reflect the environmental requirements in place at the time of closure. The Closure Plan will be prepared, refined, and implemented in accordance with the Ontario *Mining Act* and Ontario Regulation (O. Reg.) 35/24.

Progressive reclamation throughout the course of the mine life will occur, but the majority of the closure activities will commence at the cessation of mining activities and will be completed five years after ore processing ceases. Ongoing closure monitoring and maintenance activities will be carried out throughout active and passive closure phases until the closure objectives have been satisfied and the Project has been moved to a closed out and abandoned status.

1.3.4 Ancillary Facilities and Infrastructure Outside Care and Control of Canada Nickel

There are several components and activities that are ancillary to the Project and are outside of the operational care and control of Canada Nickel. These ancillary components will be built and/or operated by others but are included in the activities considered in the assessment of effects since were listed Project components or activities of the TIS Guidelines. These ancillary components include:

- the proposed rail spur line to be owned, operated, and maintained by Ontario Northland Railway (ONR) connecting the Process Plant to the existing ONR spur line close to the existing Kidd Mine near Highway 655
- the relocated section of 500 kV transmission line that will be owned, constructed, operated, and maintained by Hydro One Networks Incorporated (Hydro One)
- the re-aligned segment of Highway 655 that will be owned, operated and maintained by MTO

Additional details and information on each of these ancillary facilities and infrastructure is provided in Chapter 3 of Impact Statement.

1.4 Study Area

The **Project Area (PA)** encompasses the Project footprint and is the anticipated area of physical disturbance associated with the construction, operations and decommissioning/closure of the Project. The PA is 11,785 hectares (ha) (118 square kilometres [km^2]) and includes but is not limited to the Open Pit, stockpiles, ore processing components, Tailings Management Facility (TMF), water management facilities and drainage works, mining infrastructure, site access and internal roads, power supply and distribution, and waste management. The extent of the PA for the Project is shown in Appendix A, Figure A.1.

1.4.1 Local Study Area (LSA)

The **Local Study Area (LSA)** is the maximum area within which environmental effects from Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the PA and adjacent areas where Project-related environmental effects are reasonably expected to occur based on available information and professional judgment. The LSA for air quality is also depicted in Appendix A, Figure A.1 of this report.

The LSA for air quality is considered to be an area extending about 10 km from the PA. The LSA was sized based on guidelines provided by the MECP to capture the maximum predicted ground level concentrations due to the Project in the dispersion modelling (MECP 2017b). This report utilizes the surface claim area boundary, which defines the maximum surface extent of the mine site, as the basis for defining the 10 km zone around the site.

1.4.2 Regional Study Area (RSA)

The **Regional Study Area (RSA)** is the area within which residual environmental effects from Project activities and components may interact cumulatively with the residual environmental effects of other past, present and future (i.e., certain or reasonably foreseeable) physical activities. The RSA is based on the potential for interactions between the Project and other existing or future potential projects.

For air quality, the RSA is an area extending 40 km from the Site claim boundary and is depicted in Appendix A, Figure A.1 of this report. This distance defines the extent that other projects within this area may have a measurable effect on air quality in this study's LSA based on the types of emission sources anticipated for this Project.

1.4.3 Mine Boundary used in the Assessment

The Modelled Mine Boundary used in the air quality assessment defines the extent of the area that Canada Nickel will own, lease, or have agreements in place with the owners that would enable Canada Nickel to restrict access to the general public if required. These include the following:

- Areas owned or leased by Canada Nickel or for which Canada Nickel has rights to (the PA)

- Areas where Canada Nickel will develop agreements with property owners to remove buildings (through acquisition of the property or other)
- Canada Nickel will enter into agreements with other individual landowners to prevent any construction of seasonal or permanent housing (through acquisition or specific agreements to defer any construction until after mine operations)
- Crown Leases to be obtained on Crown lands, to restrict access

The intention of the Modelled Mine Boundary is to provide a buffer around the PA similar to those at other mines and industrial areas. The extent of the buffer around the PA considers prevailing wind directions and the locations of Project air and noise emissions sources. Within the Modelled Mine Boundary any seasonal or permanent housing will be avoided. People (on snowmobile trails, rivers, etc.), could still pass through the area within the Modelled Mine Boundary (but outside the PA), but time within this area would be limited and no overnight stays would be possible. A map of the proposed Modelled Mine Boundary is presented in Appendix A ,Figure A.2 of this report. Public roads are not included within the Modelled Mine Boundary.

1.5 Contaminants of Potential Concern

The expected emissions, based on the Project-specific design and operations, formed the basis of selecting the substances for evaluation. Stantec developed a comprehensive list of air contaminants of potential concern (CoPCs) for this study by using experience from similar projects and knowledge of the regulatory requirements. Several information sources were considered, including:

- Review of the Project design
- Review of mineralogical and trace constituent analysis of the ore, waste rock and overburden
- Review of Safety Data Sheets for additives and other chemicals used in the ore milling and concentrating processes
- Air contaminants with O. Reg. 419 criteria that may be emitted during construction, operations and closure
- Air contaminants emitted from vehicle tailpipe exhaust.

The CoPCs on this list may be released to the atmosphere during the mining and associated processing activities. The CoPCs were reviewed and grouped to allow for comparison with regulatory air quality criteria and to assess potential effects on human health. The major contaminant groupings are as follows:

- Suspended particulate matter (SPM or PM), particulate matter with particles less than 10 microns in diameter (PM_{10}) and particulate matter with particles less than 2.5 microns in diameter ($PM_{2.5}$). SPM is a measure of the particles in the atmosphere that are too small to settle out quickly, but remain suspended for substantial periods of time. Generally, this means particles with an aerodynamic diameter of less than 44 µm. SPM is produced by a variety of activities including wind erosion of agricultural or cleared fields and other open areas, abrasion of vehicle tires on

paved and unpaved roads, and combustion processes (e.g., industrial boilers and heaters, power generation, vehicle emissions). Although total suspended particulate matter is an excellent measure of the loading of particulate matter in the air, it does not necessarily reflect the health risks of the particulate matter. The larger aerodynamic particles (PM_{10}) are trapped by the upper airways, and do not enter the lungs. Smaller diameter particles ($PM_{2.5}$) can make their way deep into the lungs

- Other CAC – substances with regulatory limits including sulphur dioxide (SO_2), nitrogen oxides (NO_X), and carbon monoxide (CO)
- Hazardous Air Pollutants - Substances that are capable of causing environmental or health effects including Volatile Organic Compounds (VOCs), Polycyclic Aromatic Hydrocarbons (PAHs) and metals. PAHs and VOCs (including benzo(a)pyrene and benzene) from vehicle tailpipe emissions were included in the assessment. PAH derivatives such as nitrated PAHs (nitro-PAHs) and oxygenated PAHs (oxy-PAHs) occur at far lower concentrations than those of parent PAHs in off-road diesel engine exhaust (CARB, 2020) and were therefore not included in the assessment
- Asbestiform minerals. The ore and waste rock types identified by Canada Nickel (dunite, peridotite, pyroxenite, metavolcanic and gabbro) are all mafic or ultramafic rock. These rock types can contain serpentine mineral groups including chrysotile (an asbestiform mineral) as well as lizardite and antigorite (which are non-asbestiform minerals). Canada Nickel has identified chrysotile in dunite and peridotite and has not identified any amphibole family asbestiform minerals (which are typically found in felsic rocks). Therefore, chrysotile was included as a CoPC in the air quality assessment

The CoPCs that were considered in the assessment are presented in Table 2.1 to Table 2.5 of this Atmospheric Environment TDR. This CoPC list was used as a guide in developing the emissions inventory for the Project.

Detectable odours could result from emissions of odorous hydrocarbons, which would only be released to the atmosphere at negligible emission rates from mining equipment powered with fossil fuel. Odour emissions from chemicals used in the process plant were reviewed and considered negligible due to their low volatility. Other materials stored and used in the sewage and effluent treatment systems are all enclosed with negligible emissions. Odour emissions are not expected to be a concern provided adequate consideration of odour management is incorporated in the Project operations, and therefore were not considered further in this assessment.

2 Regulatory Setting

This Technical Data Report (TDR) – Air Quality has been prepared pursuant to the federal IAA and in consideration of the TIS Guidelines (Appendix A.1 of the Impact Statement).

The Project may be regulated and/or influenced by a number of air quality policy mechanisms, including:

- Ambient Air Quality Criteria (AAQC), Objectives, and Standards
- Provincial emissions limits
- Emissions limits for specific types of equipment (i.e., generators)
- Emissions reporting through NPRI and O. Reg. 452/09
- Local municipal by-laws

2.1 Ambient Air Quality Criteria

Regulatory agencies have identified AAQC, objectives, and standards. These criteria are described below.

2.1.1 Provincial Air Quality Criteria

The following point of impingement criteria published by the Ministry of the Environment, Conservation and Parks (MECP) have been applied as part of this review to characterize existing conditions:

- Ontario Regulation 419/05 standards and guidelines
- AAQC
- Screening Levels (SLs)
- Upper Risk Thresholds (URTs)

The Project will be considered a new facility under O. Reg. 419/05 and, as such, the Schedule 3 standards apply. Where no O. Reg. 419/05 Schedule 3 standards are available for a particular CoPC, guidelines, Ontario AAQCs, and SLs were considered. Ontario's AAQC criteria are desirable effects-based concentrations in air with variable averaging periods. The type of effect that a chemical may have varies, but may be based on health, odour, vegetation, soiling, visibility, or corrosion, amongst others. These criteria are outlined in the MECP's "Air Contaminants Benchmarks (ACB) List – Standards, Guidelines and Screening Levels for Assessing Point of Impingement Concentrations of Air Contaminants" (MECP, 2023), which includes Benchmark 1 values (Standards and Guidelines) and Benchmark 2 values (Screening Levels). Modelled concentrations of chemicals that are below published screening levels are considered to be insignificant. URTs are maximum concentrations which are not to be exceeded anywhere off property. Similar to SL values, URTs are compared to modelled concentrations at the Modelled Mine Boundary.

Criteria published in O. Reg. 419/05 are applied at a point of impingement, most commonly at or beyond a mine boundary. The exception is when a sensitive land use, such as a child-care facility, health care facility or educational facility, exists on site.

Summaries of the relevant provincial air quality objectives, guidelines, and standards are presented in Table 2.1 for suspended particulate matter (SPM), metals and metallic compounds; Table 2.2 for Criteria Air Contaminants (CACs); Table 2.3 for volatile organic compounds (VOCs); Table 2.4 for polycyclic aromatic hydrocarbons (PAHs) and Table 2.5 for other CoPCs.

Table 2.1 Summary of Provincial Air Quality Criteria for SPM, Metals and Metallic Compounds

Parameter	CAS #	O. Reg. 419/05 - Schedule 3 Standards, Guidelines, SLs and URTs		Ontario AAQC	
		24 Hour (µg/m^3)	Other time period (µg/m^3)	24 Hour (µg/m^3)	Other time period (µg/m^3)
Suspended Particulate Matter (SPM)	N/A	120	-	120	60 (annual)
Aluminum	7429-90-5	12	-	-	-
Antimony	7440-36-0	25	-	25	-
Arsenic and compounds	7440-38-2	0.3	-	0.3	-
Barium – total water soluble	7440-39-3	10	-	10	-
Beryllium and beryllium compounds	7440-41-7	0.01	-	0.01	-
Biotite	1302-27-8	-	-	-	-
Bismuth	7440-69-9	2.5	-	-	-
Boron	7440-42-8	120	-	120	-
Cadmium and cadmium compounds	7440-43-9	0.025, 0.25(1)	-	0.025	0.005 (annual)
Calcium	7440-70-2	-	-	-	-
Chlorite	1318-59-8	120	-	-	-
Chromium (total)	7440-47-3	0.5, 5(1)	-	0.5	-
Chromium (hexavalent)	18540-29-9	-	0.00014 (annual)	0.00035 (in PM_{10}) 0.0007 (in SPM)	0.00007 (in PM_{10}; annual) 0.00014 (in SPM; annual)
Asbestos	1332-21-4	0.04 fibres/cm^3	-	0.04 fibres/cm^3	-
Cobalt	7440-48-4	0.1	-	0.1	-
Copper	7440-50-8	50	-	50	-
Hematite	1317-60-8	25	-	-	-
Iron	7439-89-6	4 (2)	-	4	-

Parameter	CAS #	O. Reg. 419/05 - Schedule 3 Standards, Guidelines, SLs and URTs		Ontario AAQC	
		24 Hour (µg/m³)	Other time period (µg/m³)	24 Hour (µg/m³)	Other time period (µg/m³)
Lead	7439-92-1	0.5, 2(1)	0.2 (30 day)	0.5	0.2 (30 day)
Lithium	7439-93-2	20	-	20	-
Magnesium	7439-95-4	72	-	-	-
Magnetite	1309-38-2	25	-	-	-
Manganese	7439-96-5	0.4	-	0.1 (Mn in $PM_{2.5}$), 0.2 (Mn in PM_{10}), 0.4 (Mn in SPM)	-
Mercury	7439-97-6	2 (Hg), 0.5 (Hg as alkyl compounds)	-	2 (Hg), 0.5 (Hg as alkyl compounds)	-
Molybdenum	7439-98-7	120	-	120	-
Muscovite	1318-94-1	1.5	-	-	-
Nickel	7440-02-0	2(1)	0.04 (annual)	0.1 (Ni in PM_{10}), 0.2 (Ni in SPM)	0.02 (Ni in PM_{10}, annual), 0.04 (Ni in SPM, annual)
Palladium	7647-10-1	10	-	10	-
Phosphorous	7723-14-0	0.5	-	-	-
Platinum	7440-06-4	0.2	-	0.2	-
Potassium	7440-09-7	-	-	-	-
Potassium amyl xanthate	2720-73-2	-	-	-	-
Pyrite	1309-36-0	120	-	-	-
Quartz (in PM_{10})	14808-60-7	5	-	5	-
Selenium	7782-49-2	10	-	10	-
Silicon	7440-21-3	27	-	-	-
Silver	7440-22-4	1	-	1	-
Sodium	7440-23-5	-	-	-	-
Sodium hexametaphosphate	10124-56-8	15	-	-	-
Strontium	7440-24-6	120	-	120	-
Talc (fibrous)	14807-96-6	2	-	2	-
Thallium	7440-28-0	0.5	-	-	-
Thorium	7440-29-1	-	-	-	-
Tin	7440-31-5	10	-	10	-
Titanium	7440-32-6	120	-	120	-
Tungsten	7440-33-7	5	-	-	-
Uranium	7440-61-1	1.5 (U in PM_{10}) (1)	0.03 (U in PM10, annual)	0.15 (U in PM_{10}), 0.3 (U in SPM)	0.03 (U in PM_{10}, annual),

Parameter	CAS #	O. Reg. 419/05 - Schedule 3 Standards, Guidelines, SLs and URTs		Ontario AAQC	
		24 Hour (µg/m³)	Other time period (µg/m³)	24 Hour (µg/m³)	Other time period (µg/m³)
					0.06 (U in SPM, annual)
Vanadium	7440-62-2	2	-	2	-
Yttrium	7440-65-5	5	-	-	-
Zinc	7440-66-6	120	-	120	-
Notes: 1 – URT 2 – as metallic iron					

Table 2.2 Summary of Provincial Air Quality Criteria for Criteria Air Contaminants (CACs)

Parameter	CAS	O. Reg. 419/05 – Schedule 3 Standards and AAQC		
		1-Hour (µg/m³)	24-Hour (µg/m³)	Other time Period (µg/m³)
Sulphur dioxide	7446-09-5	100 [D]	N/A [D]	10 [D] annual
Nitrogen oxides [B]	10102-44-0	400	200	-
Ozone	10028-15-6	165	-	-
$PM_{2.5}$	N/A	-	27 [A, C]	8.8 [A, C]
PM_{10}	N/A	-	50 [A, C]	-
Carbon monoxide	630-08-0	36,200 [A]	-	6,000; ½-hour [E] 15,700; 8-hour [A]

Notes:

A. Ontario Ambient Air Quality Criteria

B. The Schedule 3 standards for NO_X are based on health effects of NO_2, as NO_2 has adverse health effects at much lower concentrations than NO. Therefore, the standard was compared to NO_2 in this report.

C. AAQC for $PM_{2.5}$ references CAAQS. AAQC for PM_{10} is an interim AAQC provided as a guide for decision making.

D. New Schedule 3 standards for SO_2 effective July 1, 2023.

E. Half-hour standard for carbon monoxide accounts for high background levels from automobiles (i.e., individual facilities are only allowed a small fraction of the total airshed).

Table 2.3 Summary of Air Quality Criteria for VOCs

Parameter	CAS #	O. Reg. 419/05 - Schedule 3 Standards, Guidelines, and SLs		Ontario AAQC	
		24 Hour (µg/m³)	Other (µg/m³)	24 Hour (µg/m³)	Other time period (µg/m³)
Acetaldehyde	75-07-0	500	500 (30 min)	500	500 (30-min)
Acrolein	107-02-8	0.4	4.5 (1 hour)	0.4	4.5 (1 hour)
1,3-Butadiene	106-99-0	10	2 (annual)	10	2 (annual)
Benzene	71-43-2	-	0.45 (annual)	2.3	0.45 (annual)
Bromine	7726-95-6	20	-	20	-
Formaldehyde	50-00-0	65	-	65	-
Hydrocarbons	-	-	-	-	-
2-Pentanol, 4-methyl-	108-11-2	500	-	-	-

Table 2.4 Summary of Applicable Provincial Air Quality Standards and Criteria for Selected PAHs

CoPC	Chemicals Abstracts Services Number (CAS No.)	O. Reg. 419/05 – Schedule 3 Standards and SLs		Ontario AAQC	
		24-Hour (µg/m³)	Other time Period (µg/m³)	24-Hour (µg/m³)	Other time Period (µg/m³)
Acenaphthene	83-32-9	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-
Anthracene	120-12-7	-	-	-	-
Benzo(a)anthracene	56-55-3	-	-	-	-
Benzo(a)pyrene (B(a)P)	50-32-8	0.00005, 0.005 (1)	0.00001 (annual)	0.00005	0.00001 (annual)
Benzo(b+k) fluoranthene	205-99-2/ 208-08-0	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-
Chrysene	218-01-9	-	-	-	-
Fluoranthene	206-44-0	-	-	-	-
Fluorene	86-73-7	-	-	-	-
Phenanthrene	85-01-8	-	-	-	-
Pyrene	129-00-0	-	-	-	-
Dibenz(a,h)perylene	53-70-3	-	-	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	-	-	-	-
Naphthalene	91-20-3	22.5	50 (10 min)	22.5	50 (10-min)

Note:
1. URT

Table 2.5 Summary of Applicable Provincial Air Quality Standards for Other CoPCs

CoPC	Chemicals Abstracts Services Number (CAS No.)	O. Reg. 419/05 – Schedule 3 Standards and SLs		Ontario AAQC	
		24-Hour (µg/m³)	Other time Period (µg/m³)	24-Hour (µg/m³)	Other time Period (µg/m³)
Diesel particulate matter	1333-86-4	-	-	-	-
Elemental carbon	7440-44-0	15	-	-	-
Sulphuric Acid	7554-93-9	5, 15(1)	-	5	-
Note: 1. URT					

2.1.2 Federal Air Quality Criteria

The Federal air quality criteria are published in the Canadian Ambient Air Quality Standards referred to as the CAAQS. The CAAQS were developed through a collaborative process involving the federal, provincial, and territorial governments and stakeholders, as directed by the Canadian Council of Ministers of the Environment (CCME) (CCME 2012).

New or updated CAAQS for sulphur dioxide (SO_2) and particulate matter with diameter less than 2.5 µm ($PM_{2.5}$) came into effect in 2020 and 2025 (for SO_2) (CCME 2012, 2020a). The CAAQS for nitrogen dioxide (NO_2) were released on November 3, 2017 and come into effect in 2020 and 2025 (CCME 2020b).

The applicable federal criteria are summarized in Table 2.6 below.

Table 2.6 Summary of Canadian Ambient Air Quality Standards

Parameter	Averaging Time	2020 CAAQS (µg/m³)	2025 CAAQS (µg/m³)
NO_2	1 hour	119 [a]	83 [b]
	24 hours	-	-
	Annual	34 [a]	24 [b]
$PM_{2.5}$	24 hours	27 [c]	-
	Annual	8.8 [c]	-
SO_2	1 hour	193 [d]	179 [e]
	24 hours	-	-
	Annual	13.7 [d]	11 [e]

Parameter	Averaging Time	2020 CAAQS ($\mu g/m^3$)	2025 CAAQS ($\mu g/m^3$)
O_3	8 hours	124	-

Notes:

A. 1 Hour and Annual CAAQS for NO_2, effective by 2020 (CCME, 2020b). The 1-hour CAAQS is referenced to the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations. The annual CAAQS is the average over a single calendar year of all 1-hour average concentrations. The criteria were converted from ppb to $\mu g/m^3$ based on standard temperature of 10^{o}C and pressure of 1 atm.

B. 1 Hour and Annual CAAQS for NO_2, effective by 2025 (CCME, 2020b). The 1-hour CAAQS is referenced to the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations. The annual CAAQS is the average over a single calendar year of all 1-hour average concentrations. The criteria were converted from ppb to $\mu g/m^3$ based on standard temperature of 10 ^{o}C and pressure of 1 atm.

C. 24 Hour and Annual CAAQS for Respirable Particulate Matter, effective by 2020 (CCME, 2012). The 24-hour CAAQS is referenced to the 98th percentile daily average concentration averaged over 3 consecutive years. The annual CAAQS is referenced to the 3-year average of the annual average concentrations.

D. 1 Hour and Annual CAAQS for SO_2, effective by 2020 (CCME, 2020a). The 1-hour CAAQS is the 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations. The annual CAAQS is referenced to the average over a single calendar year of all 1-hour average concentrations. The criteria were converted from ppb to $\mu g/m^3$ based on a standard temperature of 10 ^{o}C and pressure of 1 atm.

E. 1 Hour and Annual CAAQS for SO_2, effective by 2025 (CCME, 2020a). The 1 Hour CAAQS is the 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations. The annual CAAQS is the average over a single calendar year of all 1-hour average concentrations. The criteria were converted from ppb to $\mu g/m^3$ based on standard temperature of 10 ^{o}C and pressure of 1 atm.

2.2 Codes, Guidelines and Standards

Air CoPC emissions, emission controls, and equipment for specific sources from the Project may be influenced by the following guidelines:

- The MECP Guidance Document – Emission limits and operating conditions for emergency generator sets in non-emergency situations (MECP 2021). This guidance document sets out the following emission requirements for internal combustion engine generator sets used for non-emergency situations. At present, Canada Nickel will be off-grid during construction when generators would be run on a continual basis to supply electricity for the site, so these criteria are applicable to the Project

Table 2.7 Summary of Emission Limits for Internal Combustion Engine Generator Sets for Non-Emergency Use

CoPC	Limits	Timeframe
Nitrogen oxides (NOx) (expressed as nitrogen dioxide equivalent)	1.0 kg/MWh 0.4 kg/MWh	2007 – 2010 2011 onward
Particulate Matter (PM)	0.2 kg/MWh 0.02 kg/MWh	2007 – 2010 2011 onward
Non-Methane Hydrocarbons (NMHC)	1.3 kg/MWh 0.19 kg/MWh	2007 – 2010 2011 onward
CO	3.5 kg/MWh	2007 onward
SO_2	Ultra-low sulphur diesel: 15 ppm	2007 onwards
SOURCE: MECP 2021		

2.3 Emissions Reporting

Project emissions would be required to be reported under Environment and Climate Change Canada's (ECCC's) NPRI program and O. Reg. 452/09 Greenhouse Gas Reporting.

2.4 Municipal Planning Policies and Bylaws

No municipal policies or bylaws applicable to the Project for atmospheric environment were identified.

3 Existing Conditions

The Project is located approximately 42 km north of the City of Timmins, Ontario. Timmins is a community of approximately 28,874 people (Statistics Canada, 2021), approximately 300 km northeast of Sault Ste. Marie. The centre of the Project footprint sits at approximately 48° 50’ N latitude, 81° 22’ W longitude (UTM NAD83 N16 Easting 473380 and Northing 5408504).

The Project is located in an area well-connected by local infrastructure. The Project is bisected by Highway 655, a two-laned paved provincial highway connecting Highway 101 to Highway 11 (Trans-Canada Highway). An existing rail spur line connects Glencore’s existing Kidd Mine west of Highway 655 to the Kidd Metallurgical Site to the southeast of the Project site.

Regulation under the *Ontario Mining Act* requires that all mining claims must be taken to lease prior to mineral development. The footprint of the Project is comprised mostly of privately held surface rights. Canada Nickel is currently working with landowners to obtain surface rights. Parts of the Project are also provincial Crown lands, and reservations to the Crown exists on privately held lands.

Regional land use activities in the area include hunting, fishing, trapping and snowmobiling, as well as mineral exploration (and mining) and forestry.

The following sections describe the existing physical environment of the study area.

3.1 Topography

The topography across the Project Area (PA) and Local Study Area (LSA) and Regional Study Area (RSA) is flat to gently undulating, typical of the glaciated Canadian Shield. Site elevations range from about 265 and 290 metres above sea level (masl), with topographic local relief averaging about 15 m. The few rare areas of relief are associated to an esker complex, locally entrenched river systems, and a few rare bedrock-controlled hills.

The PA and LSA are covered by a mix of wetland, mixed deciduous and boreal forest complexes with many streams and rivers and few small lakes. Vegetation communities that occur directly within and adjacent to the proposed project site are generally early successional mixed deciduous communities that have been shaped by timber harvest and infrastructure development; however, a few fragmented mature coniferous forest areas remain intact. As with most of northern Ontario, the site is crossed by several minor waterbodies and tributaries to larger rivers.

3.2 Climate

The Project area lies in the sub-arctic region. The climate of the Project area is typical of northern areas within the Canadian Shield, with long winters and short warm summers.

The following sections describe the general climatology of the Project area. The climatology is based on 30-year (1991 – 2020) Canadian Climate Normal data obtained from Environment and Climate Change Canada (ECCC) for the Timmins Victor M. Power Airport (Timmins Airport). The Timmins Airport is the nearest climate normal station with a comprehensive set of measurements and with a similar setting to the Project area.

3.2.1 Temperature

A summary of the daily average, maximum and minimum temperatures on a monthly basis (1991 – 2020) is shown below in Table 3.1. Temperatures for the Timmins area is characterized by warm summers and cold winters with the coldest temperatures occurring during the winter months of December to February and the warmest temperatures occurring in the summer months of July and August. The daily average temperature varies between -16.4 °C and 17.7 °C, with an annual average temperature of 1.9 °C.

Table 3.1 Summary of Average Temperature Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-16.4	-14.4	-7.5	0.9	9.7	15.3	17.7	16.2	11.7	4.5	-3.2	-11.2	1.9
Daily Maximum (°C)	-10.4	-7.6	-0.7	7.2	16.8	22.4	24.4	22.8	17.8	9.1	0.8	-6.5	8
Daily Minimum (°C)	-22.3	-21	-14.4	-5.3	2.5	8.1	10.9	9.6	5.5	-0.1	-7.1	-15.9	-4.1

3.2.2 Precipitation

A summary of the monthly average rainfall, snowfall, total precipitation (as equivalent rainfall based on a conversion factor for snowfall to equivalent rainfall of 0.1) and average snow depth is presented in Table 3.2. The average annual precipitation for the Timmins Airport is 796.2 mm.

Table 3.2 Mean Monthly Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	4	1.1	14.3	35.3	63.5	77.9	84.8	77	81.7	66.8	28.1	8.7	543.1
Snowfall (cm)	59.2	47.9	43.2	25.3	3.1	0.2	0	0	0.5	13.7	50.8	63.8	307.6
Precipitation (mm)	49	39.9	48.3	61.7	69.9	80.4	78.7	75.6	81.2	86.2	68.9	56.6	796.2
Average Snow Depth (cm)	44	54	48	18	1	0	0	0	0	0	7	22	16

3.2.3 Relative Humidity

Relative humidity (RH) is the gravimetric ratio of water vapour in a unit volume to the water vapour that would prevail under saturated conditions at a given temperature. Average monthly RH levels at 6:00 AM and 3:00 PM local standard time (LST) the Timmins Airport is presented in Table 3.3. Monthly average RH for the Timmins Airport ranged from 76.5% - 92% at 6:00 AM and 45.7% - 76.9% at 3:00 PM.

Table 3.3 Summary of Average Relative Humidity Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Relative Humidity – 0600 LST (%)	77.1	76.5	77.2	78.1	78.3	83	87.6	90.9	92	89.5	87.1	83.4	83.4
Average Relative Humidity – 1500 LST (%)	70.4	61.7	52.9	48.9	45.7	48.8	53.1	55.5	60.4	67.1	75.1	76.9	59.7

3.2.4 Wind Speed and Direction

Wind speed and direction climate normal data for Timmins are presented in Table 3.4. The annual average windspeed is 11.7 km/hr with the most frequent wind direction being southerly.

Table 3.4 Monthly Average Wind Speed and Direction Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Speed (km/h)	11.5	12.5	12.9	13	12.4	11.1	10.2	10	10.8	11.9	12.4	11.7	11.7
Most Frequent Direction	NW	S	NW	N	N	S	W	S	S	S	S	S	S

3.3 Special Receptors

Special receptors are locations where human activity more regularly takes place. The following special receptors were identified and included in the air quality assessment:

- Sensitive Receptor – Non-Indigenous: Locations where non-Indigenous overnight use has been confirmed or assumed.
- Sensitive Receptor – Indigenous: A generalized location identified by Indigenous nations that is used for overnight use.
- Representative Receptor – Indigenous: A generalized location identified for Indigenous use and by IAAC as a point of interest for assessment as part of the Impact Statement.

- Surface Water Receptor: Locations used for the analysis of acid deposition for surface water assessment.

The sensitive and representative receptors identified for input into the human health risk assessment (HHRA) analysis include both non-Indigenous and Indigenous receptors.

The special receptors located nearest to the PA in all directions were identified for consideration in the air quality study. A total of 13 special receptors, including 4 surface water receptors, were identified and included in the assessment. A tabular summary of the special receptors is presented in Appendix B and locations are presented in Appendix A, Figure A.3 of this report.

It is noted that Canada Nickel will impose the following restrictions within the Modeled Mine Boundary (Figure A.3, Appendix A of this report) and at receptors R1 and R5:

- Agreements with property owners within the restricted area to remove buildings (through acquisition of the property or other arrangements).
- Agreements with other individual landowners to prevent construction of any seasonal or permanent housing through acquisition or specific agreements to defer any construction until after mine operations are completed.
- Crown Leases to be obtained on Crown lands, to restrict access.
- In addition to the receptor specific mitigations listed above, the following general mitigation are proposed:
  - Install signage and/or gates on trails to restrict access and prevent overnight stays in the Modelled Mine Boundary (agreement with landowners if needed to place the signs).
  - Work with the snowmobile clubs to prohibit overnight stays in warming huts except in cases of emergency along the snowmobile trail (signage for warming huts to be installed).

In total, the air quality modelling included 6,438 gridded, Modelled Mine Boundary and special receptors (locations where ambient air quality is assessed) covering the LSA. The gridded receptors were used to evaluate variations in air quality levels over the LSA and covered areas not assessed by special receptors for selected CoPCs.

3.4 Local Air Quality

Ambient air quality monitoring data from two different sources were assessed to characterize air quality in the LSA and to develop background concentration levels, as summarized in the following sub-sections. These included data available from the federal (Canadian) National Air Pollution Surveillance (NAPS) Network and onsite ambient monitoring conducted by WSP. Detailed analyses of the ambient monitoring data are presented in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement).

One solar/battery powered air quality monitoring station was installed at the Project site to measure local baseline air concentrations. Local stakeholders were consulted to find a powered location; however, no suitable location could be agreed upon and thus a solar/battery-based system was selected and installed (Appendix B.2 of the Impact Statement [Baseline Air Quality Monitoring Report]). The location of the station was at the north end of Martin Lake, approximately 2 km west of Route 655 in a clearing. The MECP's siting requirements for setbacks from vegetation and roads were met.

Baseline air quality for selected contaminants (CO and O_3) was assessed through a review of historical air quality measurements from NAPS stations operated by Environment Canada. The closest representative NAPS monitoring stations to the Project site are in Sudbury, approximately 260 km south-southeast of the subject property, and in Sault-Ste. Marie, approximately 340 km southwest of the Project site. The Project site is located on the east side of Highway 655 in a remote area of northwestern Ontario, approximately 40 km north of Timmins and 35 km southwest of Cochrane. As a result, baseline ambient air quality is expected to be representative of rural areas. Data from more developed municipalities, such as Sudbury and Sault-Ste. Marie, are expected to provide conservative (i.e., over-estimate) estimates of air quality levels in the LSA.

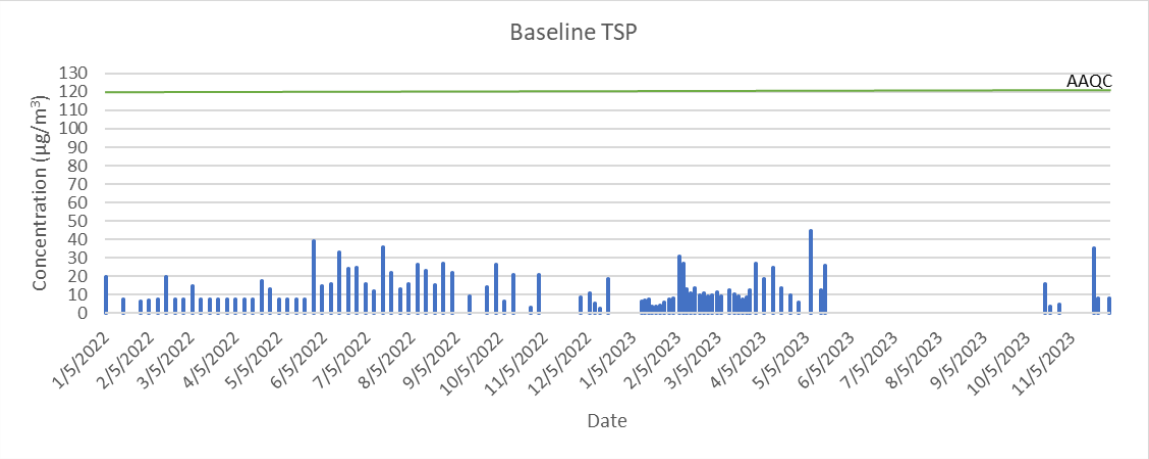
3.4.1 Particulate Matter and Metals

Suspended particulate matter (SPM) sampling was conducted by WSP using a low-volume BGI PQ-200 air sampler between January 2022 and December 2023 (Appendix B.2 of the Impact Statement [Baseline Air Quality Monitoring Report]). The SPM samples were subsequently analyzed for metals content. SPM samples were collected from midnight to midnight on a 1-in-6-day sampling schedule that coincided with the standard NAPS sampling schedule The sampling schedule frequency was increased to a 1-in-3-day schedule in the spring of 2023 to address some sampling gaps in the winter of 2022. A total of 93 SPM samples were collected over the sampling period. The PQ-200 runtime was doubled to 48 hours to improve the metals' detection limits. SPM and metal concentrations were adjusted to 24-hour equivalent concentrations in accordance with the methodology outlined in the Procedure for Preparing an Emission Summary and Dispersion Modelling Report (MECP 2018).

The PQ-200 sampler is not a US EPA equivalent reference method for SPM sampling, with studies suggesting that the low volume sampler configuration may underestimate SPM ambient concentrations by up to a factor of two (Vanderpool et al. 2018). To account for this potential bias, all measured SPM/metals concentrations presented in the WSP Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement were conservatively increased by a factor of 2.

The maximum measured 24-hour average SPM concentration was 45 µg/m^3 which is well below the MECP AAQC of 120 µg/m^3. The measured annual average (geometric mean) SPM concentration is 13.8 µg/m^3 which is 23% of the MECP annual criterion of 60 µg/m^3. A plot of the measured SPM concentrations over the monitoring period is shown on Figure 3.1.

Figure 3.1 Measured 24-hour Average SPM Concentrations

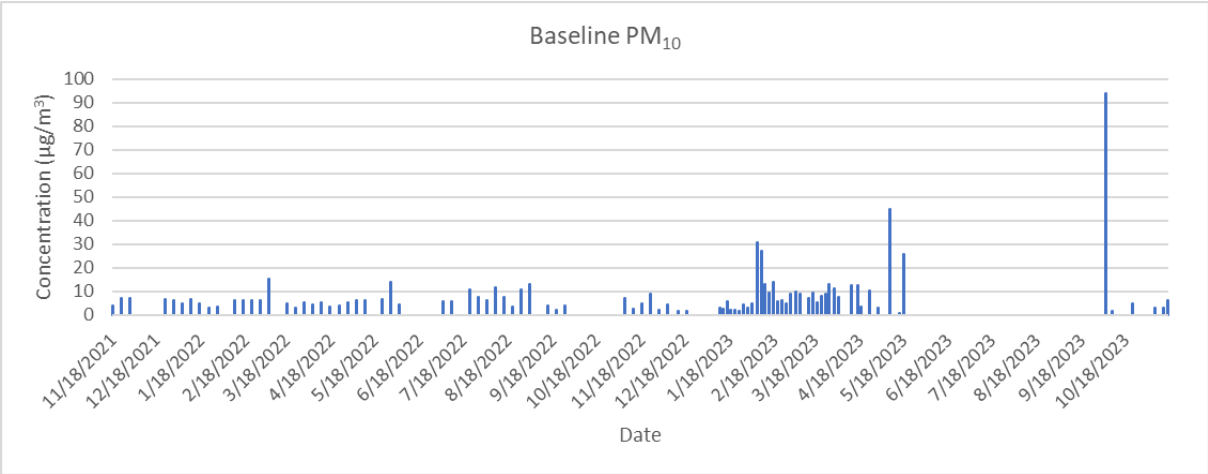


There were no exceedances of the applicable 24-hour criteria for the measured metals in the available data. Further, the measured annual concentrations for nickel and the measured 30-day average concentrations for lead were all below their applicable criteria.

3.4.2 Particulate Matter less than 10 Microns (PM_{10})

Particulate matter PM_{10} sampling was conducted by WSP using a low-volume BGI PQ-200 air sampler between November 2021 and November 2023 (Appendix B.2 of the Impact Statement [Baseline Air Quality Monitoring Report]). A total of 91 PM_{10} samples were collected over the sampling period. The maximum measured PM_{10} concentration was 94 µg/m^3 which is above the MECP guideline value of 50 µg/m^3 and occurred during a period when there were active wildfires in the region that were likely affecting ambient air quality. All other measurements were below the MECP guideline. The maximum measured PM_{10} concentration occurred on a day that a SPM sample was not collected. A time history of the measured PM_{10} concentrations is presented on Figure 3.2.

Figure 3.2 Time History of Measured Ambient PM_{10} Concentrations



3.4.3 Particulate Matter less than 2.5 Microns ($PM_{2.5}$)

Particulate matter $PM_{2.5}$ sampling was conducted by WSP using an AQS1 continuous particle profiler from November 2021 to December 2023, with some data gaps noted (Appendix B.2 of the Impact Statement [Baseline Air Quality Monitoring Report]). While this instrument is not a US EPA equivalent reference method, comparison of the measured $PM_{2.5}$ concentrations to the PM_{10} measurements using an equivalent reference method generally show consistent measurements and therefore are expected to provide a reasonable representation of ambient $PM_{2.5}$ concentrations. The maximum measured 24-hour average $PM_{2.5}$ concentration was 69 µg/m^3 and the annual average was 6.2 µg/m^3. There were 8 days during the measurement period when measured $PM_{2.5}$ levels were above the CAAQS criteria of 27 µg/m^3. During the summer and fall of 2023 wildfires affected air quality throughout northern Ontario and the measurements may reflect the influence of wildfires on air quality.

3.4.4 Nitrogen Dioxide (NO_2)

Nitrogen oxides (NO_X) are almost entirely made up of nitric oxide (NO) and nitrogen dioxide (NO_2). Together, they are often referred to as NO_X. Most NO_2 in the atmosphere is formed by the oxidation of NO, which is emitted directly by combustion processes, particularly those at high temperature and pressure. NO_2 is the regulated form of NO_X. Similar to other jurisdictions (e.g., Alberta Environment, World Health Organization), the O. Reg. 419/05 Schedule 3 standards for NO_X are based on health effects of NO_2, as health effects are seen at much lower concentrations of NO_2 than NO. In this report, because NO_2 is the regulated form of NO_X, the AAQC were compared to measured NO_2 concentrations (as per MECP, 2018).

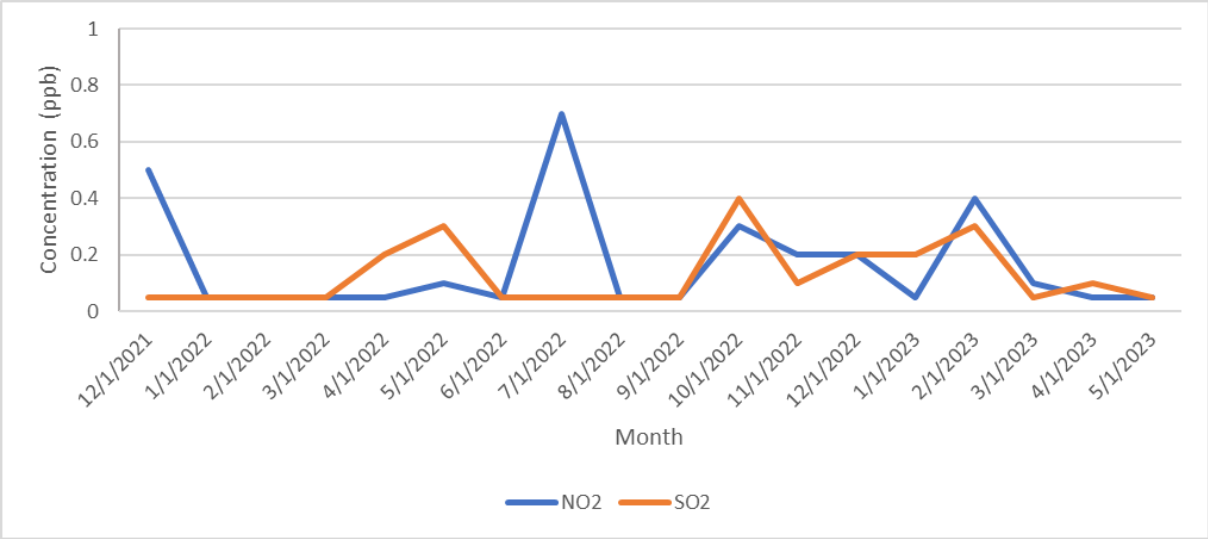
Ambient NO_2 concentrations were measured onsite using passive samplers as part of the air monitoring program which was operated from December 2021 to May 2023 by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement). A time history of the measured NO_2 concentrations is presented on Figure 3.3. The passive sampler results (30-day averages) were conservatively converted to equivalent hourly and 24-hour averages following MECP guidance (MECP,

2017b). The maximum measured hourly and 24-hour average NO_2 concentrations at the station were 4.4 ppb (8.8 µg/m³) and 1.8 ppb (3.6 µg/m³) which are 2% and 2% of their respective 1-hour and 24-hour MECP criteria (Appendix B.2 of the Impact Statement [Baseline Air Quality Monitoring Report]). The measured annual average NO_2 concentration was 0.2 ppb (0.3 µg/m³).

3.4.5 Sulphur Dioxide (SO_2)

Ambient SO_2 concentrations were measured onsite using passive samplers as part of the air monitoring program which was operated from December 2021 to May 2023 by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement). A time history of the measured SO_2 concentrations are presented on Figure 3.3. The passive sampler results (30-day averages) were conservatively converted to equivalent hourly averages following MECP guidance (MECP, 2017b). The measured maximum hourly average SO_2 concentration was 2.5 ppb (7 µg/m³) which is below the applicable 1-hour criterion of 100 ppb (40 µg/m³). The measured annual average SO_2 concentration was 0.1 ppb (0.4 µg/m³), which is 4% of the annual criterion (4 ppb or 10 µg/m³).

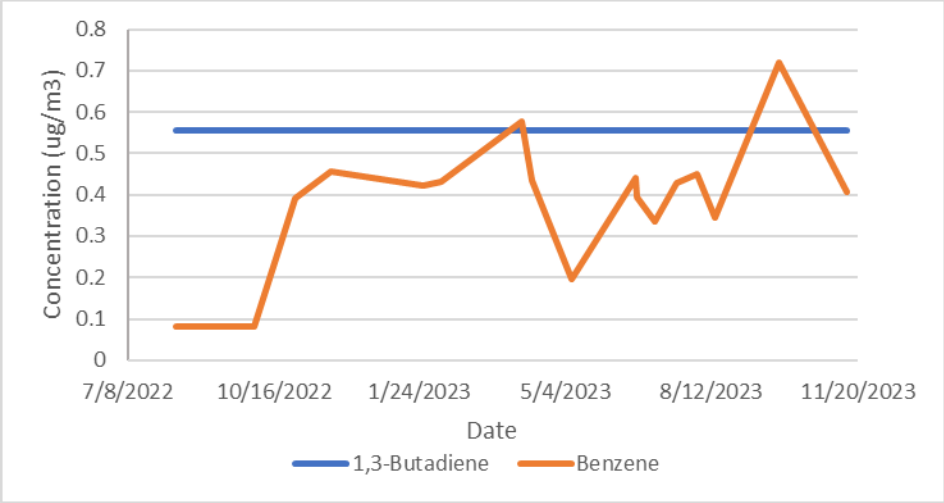
Figure 3.3 Measured Monthly Average NO_2 and SO_2 Concentrations



3.4.6 Volatile Organic Compounds (VOCs)

Ambient VOC concentrations were measured onsite using SUMMA canisters from August 2022 to November 2023 by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement). A total of 18 samples were taken over this period. The measured VOC levels were low, with 82% of all samples being non-detects. A time history of measured benzene and 1-3 butadiene concentrations is presented on Figure 3.4. All 1-3 butadiene concentrations were below the method detection limit and were thus estimated to be ½ the detection limit. All measured ambient VOC concentrations were below their relevant air quality criteria.

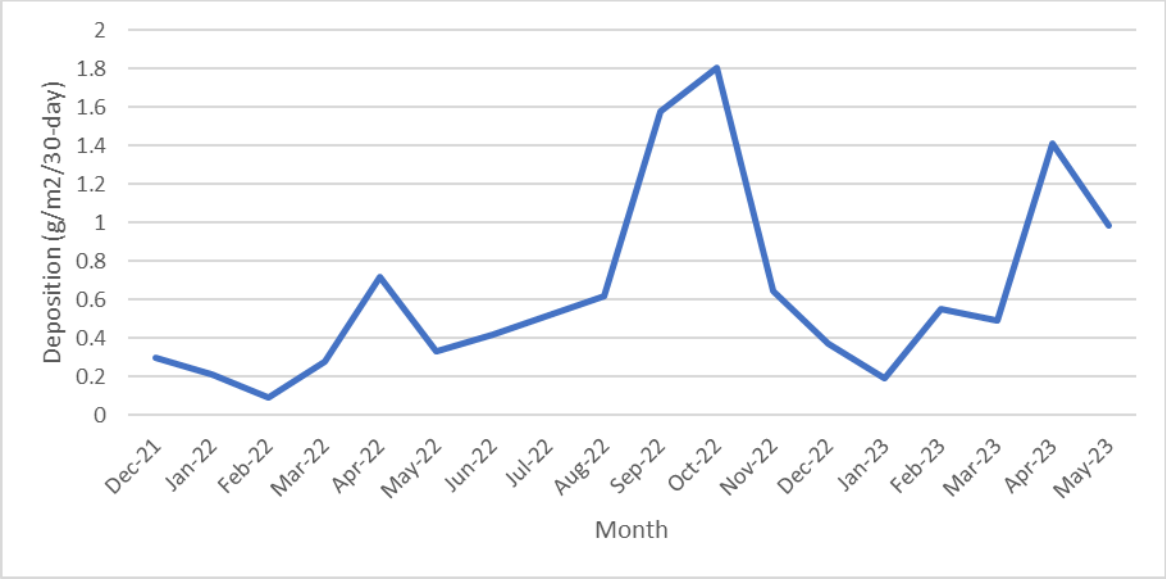
Figure 3.4 Time History of Measured 24-Hour Average Benzene and 1-3 Butadiene Concentrations



3.4.7 Dustfall

Total dustfall was measured onsite using dust fall jars from December 2021 to May 2023 by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement). A total of 17 monthly samples were taken over this period. All measured monthly dustfall levels were below the MECP dustfall criterion of 7 g/m^2/30-days, with the largest measurement being 26% of the criterion. The annual average dustfall for 2022 was 0.65 g/m^2 which is 14% of the MECP dustfall criterion of 4.6 g/m^2. A time history of measured monthly dustfall levels is presented on Figure 3.5.

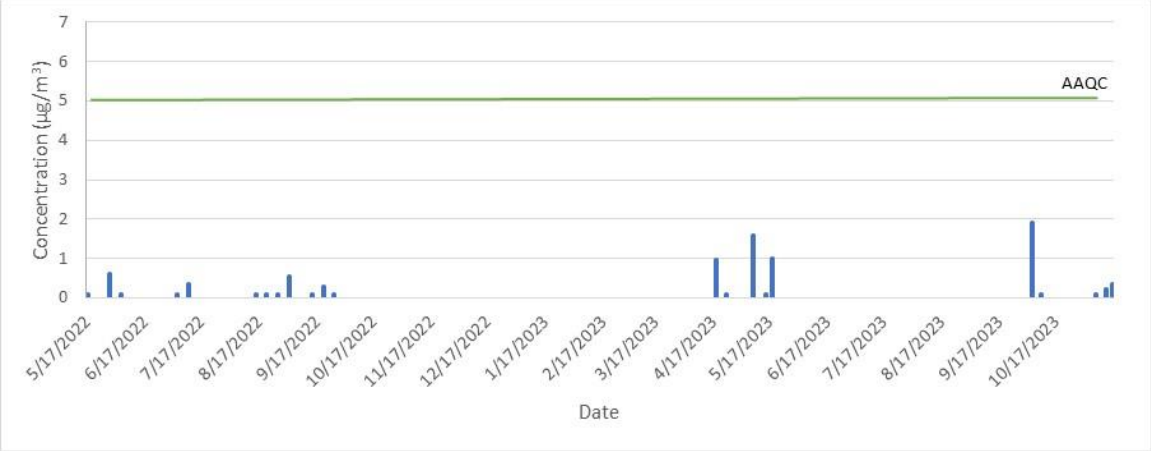
Figure 3.5 Measured Total Dustfall Levels



3.4.8 Respirable Crystalline Silica

Respirable crystalline silica (RCS) was measured onsite from May 2022 to November 2023 by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement). A total of 22 24-hour average samples were taken over this period. All measured RCS concentrations were below the MECP criterion of 5 µg/m^3, with the largest measurement (1.9 µg/m^3) being 38% of the criterion. A time history of measured RCS concentrations is presented on Figure 3.6.

Figure 3.6 Time History of Measured Respirable Crystalline Silica Concentrations



3.4.9 Elemental Carbon

Elemental carbon (EC) is considered a surrogate for diesel particulate matter. EC was measured onsite by WSP in the Baseline Air Quality Monitoring Report (Appendix B.2 of the Impact Statement) between April 2023 to November 2023. A total of 8 samples were collected, with all samples being below the laboratory method detection. Using half the detection limit for each sample, the maximum EC concentration was 0.046 µg/m^3.

3.4.10 Polycyclic Aromatic Hydrocarbons (PAHs)

Passive sampling for PAHs was conducted onsite by WSP between May 2023 and continued until December 2023. Two long-term PAH samples were collected, which were conservatively converted to 24-hour average concentrations following MECP guidance (MECP, 2017b). The mean 24-hour average benzo(a)pyrene (B(a)P) concentration is 0.000053 µg/m^3 which is 6% above the MECP criterion of 0.00005 µg/m^3.

3.4.11 Asbestos

Asbestos sampling was conducted onsite by WSP between July 2022 and November 2023, with a total of 12 samples being collected. Of those samples, 75% were below the laboratory method detection limit and half the detection limit was used for these samples. The maximum measured asbestos concentration was 0.003 fibres/cm^3 which is below the MECP criterion of 0.04 fibres/cm^3.

3.4.12 Ozone

Ozone data for 2017 to 2021 were examined for the Sudbury and Sault Ste. Marie monitoring stations which are the nearest Ontario sites to the Project. The O. Reg. 419 1-hour average criterion for O_3 is 80 ppb (165 µg/m^3). The maximum measured hourly average O_3 concentrations over the 5-years of data varied between 56 ppb (116 µg/m^3) and 77 ppb (159 µg/m^3), the latter of which occurred in 2020 at the Sault Ste. Marie station. There were no exceedances of the Ontario hourly criterion at either station.

Compliance with the ozone CAAQS of 60 ppb (124 µg/m^3) is based on the assessment of three consecutive years of ozone data, with the 4th highest daily 8-hour average concentration from three consecutive years averaged together. The highest daily 8-hour average O_3 concentration was 43 ppb (89 µg/m^3) at Sault Ste. Marie in 2020. All measurements are below the ozone CAAQS.

3.4.13 Background Concentration Levels

Background concentrations are used in dispersion modelling to represent the effect of other emissions sources in addition to the sources being included in the dispersion modelling. Sources of ambient air emissions in the LSA may include:

- Transportation (traffic on local roads, railways, aircraft, off road)
- Naturally occurring (wind erosion of open surfaces, forests, fires)
- Long-range transport from other sources outside the LSA

Background air quality levels due to these sources can be included in a dispersion modelling assessment in order to quantify the incremental change in local air quality with respect to the emissions source(s) being studied. Cumulative air quality levels due to the emissions sources being studied combined with background levels can then be compared to applicable air quality criteria to assess significance. Ambient monitoring is typically used to quantify air quality levels due to background emissions sources, as the emission rates of many of these sources are difficult to estimate accurately and their emission rates can vary considerably both temporally and spatially.

In previous Projects conducted by Stantec, the MECP has requested that 90th percentile ambient monitoring data be added to the dispersion model predictions to conservatively account for existing ambient concentrations. The MECP specifies the use of 90th percentile values for short-term averaging periods as it provides a conservative estimate of ambient levels, while at the same time providing some consideration for the fact that the location and time for the occurrence of maximum ground level

concentrations from background sources varies from that for the source(s) being considered in the modelling assessment. For annual averages, an annual average value was used as the background level.

Background concentrations for the Project were conservatively determined by taking the 90th percentile concentration of each CoPC from the data sources previously presented. Table 3.5 summarizes the 90th percentile 24-hour and annual average concentrations for the CoPCs used in the air quality assessment. Table 3.6 summarizes background concentrations for CoPCs with other averaging periods.

Table 3.5 24-hour and Annual Average Background Concentrations Used in the Dispersion Modelling Assessment

CoPC	CAS	90th Percentile 24-Hour Average Concentration (µg/m^3)	Annual Average Concentration (µg/m^3)
PM	N/A	26.5	11.6
PM_{10}	N/A	13.1	8.3
$PM_{2.5}$	N/A	12.4	6.2
CO	630-08-0	965	591
SO_2	7446-09-5	2.1	0.4
Non-methane hydrocarbons	N/A	-	-
NOx	10102-44-0	2.2	0.3
1,3-butadiene	106-99-0	0.6	0.6
Acenaphthene	83-32-9	4.41E-03	8.46E-04
Acenaphthylene	208-96-8	8.15E-03	1.56E-03
Acetaldehyde	75-07-0	-	-
Acrolein	107-02-8	-	-
Anthracene	120-12-7	1.61E-04	3.08E-05
Benzene	71-43-2	0.5	0.4
Benzo(a)anthracene	56-55-3	-	-
Benzo(a)pyrene (B(a)P)	50-32-8	5.29E-05	1.01E-05
Benzo(b+k)fluoranthene	205-99-2	2.79E-04	5.35E-05
Benzo(g,h,i)perylene	191-24-2	-	-
Chrysene	218-01-9	3.38E-04	6.49E-05
Dustfall	N/A	1.48 (g/m^2, 30-day)	0.64 (g/m^2)
Fluoranthene	206-44-0	8.15E-04	1.56E-04
Fluorene	86-73-7	1.47E-03	2.82E-04
Formaldehyde	50-00-0	-	-
Phenanthrene	85-01-8	2.21E-03	4.24E-04
Pyrene	129-00-0	7.14E-04	1.37E-04
Fluoride	16984-48-8	-	-

CoPC	CAS	90th Percentile 24-Hour Average Concentration (µg/m³)	Annual Average Concentration (µg/m³)
Chromium VI	18540-29-9	-	-
Mercury	7439-97-6	6.40E-05	6.80E-05
Aluminum	7429-90-5	4.20E-01	1.46E-01
Silver	7440-22-4	2.60E-04	2.60E-04
Arsenic	7440-38-2	1.26E-03	1.28E-03
Barium	7440-39-3	8.60E-03	1.08E-02
Beryllium	7440-41-7	7.60E-04	7.80E-04
Boron	7440-42-8	2.60E-02	2.60E-02
Bismuth	7440-69-9	1.26E-03	1.28E-03
Calcium	7440-70-2	6.80E-01	3.00E-01
Cadmium	7440-43-9	2.60E-04	2.60E-04
Cobalt	7440-48-4	7.60E-04	7.80E-04
Chromium	7440-47-3	6.00E-03	3.20E-03
Copper	7440-50-8	5.80E-03	3.20E-03
Iron	7439-89-6	2.20E-01	1.52E-01
Potassium	7440-09-7	1.26E-01	1.30E-01
Lithium	7439-93-2	-	-
Magnesium	1309-48-4	1.92E-01	9.60E-02
Manganese	7439-96-5	8.60E-03	4.20E-03
Molybdenum	7439-98-7	7.60E-04	7.80E-04
Silicon	7440-21-3	-	-
Sodium	7440-23-5	5.20E-01	3.20E-01
Nickel	7440-02-0	2.60E-03	1.66E-03
Lead	7439-92-1	3.40E-03	1.64E-03
Antimony	7440-36-0	1.26E-03	1.28E-03
Selenium	7782-49-2	2.60E-03	2.60E-03
Tin	7440-31-5	2.40E-03	1.04E-03
Strontium	7440-24-6	1.50E-03	1.48E-03
Titanium	7440-32-6	8.80E-03	4.20E-03
Thallium	7440-28-0	2.60E-04	2.60E-04
Uranium	7440-61-1	2.60E-04	2.60E-04
Vanadium	7440-62-2	7.60E-04	7.80E-04
Tungston	7440-65-5	-	-
Yttrium	7440-65-5	-	-
Zinc	7440-66-6	1.50E-02	1.38E-02
Quartz (in PM_{10})	14808-60-7	0.99	0.41

CoPC	CAS	90th Percentile 24-Hour Average Concentration (µg/m³)	Annual Average Concentration (µg/m³)
Chrysotile Asbestos	132207-32-0	0.0029	0.001
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	9.40E-02	1.80E-02
Platinum	7440-06-4	-	-
Palladium	7440-05-3	-	-
Magnetite	12227-89-3	-	-
Hematite	1317-60-8	-	-
Chlorite	1318-59-8	-	-
Muscovite	1318-94-1	-	-
Talc (fibrous)	14807-96-6	-	-
Elemental Carbon (from diesel exhaust)	7440-44-0	9.40E-02	1.80E-02
Phosphorus	7723-14-0	-	-

Notes:
"-" indicates no background data available

Table 3.6 Background Concentrations Used in the Dispersion Modelling Assessment – Other Averaging Periods

CoPC	CAS #	Averaging Period (Hours)	Background Concentration (µg/m³)
CO	630-08-0	0.5	1170
CO	630-08-0	1	965
CO	630-08-0	8	965
NO_2	10102-44-0	1	5.4
SO_2	7446-09-5	0.17	8.6
SO_2	7446-09-5	1	5.2
1,3-butadiene	106-99-0	1	1.35
Benzene	71-43-2	1	1.2
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	2	0.19

4 Effects Assessment Methodology

4.1 Overview

The potential effects of the Project activities on air quality were assessed by conducting dispersion modelling to predict the downwind concentrations of CoPCs and comparing these predictions to regulatory standards, objectives and guidelines.

The assessment of air quality effects related to the construction and operations of the Project consisted of the following elements:

- Compiling emissions inventories of point and mobile sources for the Project
- Establishing baseline ambient air quality conditions for CoPCs from the existing published sources of air quality data and site-specific measurements.
- Conducting dispersion and deposition modelling of the Project to provide input to:
  - Crawford Nickel Project Impact Statement, Chapter 15 – Assessment of Potential Effects on Surface Water
  - Crawford Nickel Project Impact Statement, Chapter 17 – Assessment of Potential Effects on Fish and Fish Habitat
  - Crawford Nickel Project Impact Statement, Chapter 21 – Assessment of Potential Effects on Health
  - Support the assessment of potential environmental effects, including cumulative environmental effects, for the Project.
- Comparing dispersion model predictions to air quality standards and guidelines

The assessment also includes consideration of the following:

- Ambient air quality objectives, and standards
- Incremental change in ground level O_3 precursor emissions
- Odour detectability

Three timeframes (or phases) were considered for potential environmental effects - construction, operations and closure as described in Section 1.3.

4.2 Emissions Inventory

The emissions inventory for Project activities is based on published emission factors (i.e., US EPA AP-42) or emissions levels provided by manufacturers. Emissions estimates are expected to be conservative and represent worst-case short-term emissions from the Project activities during times when the Project is at maximum production.

Sources of air CoPCs were identified and assessed following the procedures specified in MECP Guideline A-10, Procedure for Preparing an Emission Summary and Dispersion Modelling Report (MECP 2018).

4.2.1 Project Overview

The Project consists of the development of an Open Pit mining and processing operation located approximately 42 km north of the City of Timmins, Ontario. The design details of the Project described below are conceptual in nature and based on feasibility study work that will be finalized through subsequent detailed engineering and operational permitting.

The Project will be developed as an Open Pit operation designed around two discrete, although overlapping, ore bodies – the Main Zone and the East Zone. Ore will be extracted from the pits and processed (crushed, ground, concentrated) at two on-site processing facilities (Processing Plants). Ore will be transported from the pits to the Processing Plants via haul trucks. A series of internal roads will be established to facilitate the movement of mine rock and other materials around the site. Final concentrates will be transported from the mine site via rail for further processing.

4.2.2 Site Preparation

For the purposes of the Air Quality assessment, site preparation activities were considered to include clearing, grubbing, and soil stripping of the Project Area as needed in preparation for the planned infrastructure. The duration of these preliminary activities will be relatively brief and based on past Stantec experience of mining operations with similar equipment and timelines, air contaminant emissions from these activities are expected to be less than those included in the construction assessment as the numbers of equipment units will be lower. Emissions from site preparation activities were therefore not assessed as the assessment of the construction scenario will implicitly address site preparation emissions.

4.2.3 Construction Emissions

4.2.3.1 Description of Project Construction

4.2.3.1.1 Open Pit Development

During construction the focus will be on the Open Pit, Stockpiles, TMF and the corridor between the process plants and the primary crusher in preparation for the commencement of mining operations. Bulk earthworks such as stripping, grading and stockpiling will be completed using heavy equipment such as graders, dozers and scrapers. During construction, mine rock will be excavated from the Open Pit and surrounding area. Excavated rock will be loaded onto haul trucks and hauled for immediate use in infrastructure development. Rock will be sorted based on size to identify its construction stream. A portable crusher will be used during construction to reduce mine rock to aggregate of various sizes. Erosion sediment control mitigation will be implemented as required during the construction phase. The ore that is removed from around the Open Pit as the bulk earthwork advances will be stored in the East Ore Stockpile for future processing.

4.2.3.1.2 Stockpiles and Impoundment Facility

The Project involves the construction of various stockpiles and an Impoundment Facility. These stockpiles are proposed to manage ore, waste rock, clay, and overburden generated on site. The main stockpiles include:

- Two ore stockpiles located east and west of the pit (referred to as the East and West Stockpiles)
- An Impoundment Facility to the north of the Open Pit, consisting of waste rock impoundment, sand & till impoundment, and clay impoundment facilities.

During the early stages of construction, the impoundment Facility and ore stockpile areas will be prepared so that the areas are ready to begin accepting material at the onset of operations. Most rock generated during construction will be used for building roads, laydowns and pads for buildings. Excess rock, overburden, clay and sand will be stockpiled in the Impoundment Facility. The water runoff from the material will be contained and managed. Ore identified during this phase will be stockpiled in the East Stockpile.

4.2.3.1.3 Drilling and Blasting

Drilling and blasting will occur to develop the Open Pit and to prepare the process plants area and surfaces for construction where bedrock may be at or near the surface (e.g., TMF dams, plant site). Blast holes will be drilled using conventional drills. Explosives will be site mixed emulsion (SME) explosive-based products.

4.2.3.1.4 Aggregate and Rock Fill Supply

It is anticipated that aggregate and rock fill needed for site preparation and construction purposes will primarily come from on-site sources. This includes overburden removed during stripping, as well as mine rock that is excavated from the pit areas during pre-production mining. A roadstone crusher will be used to generate the desired aggregate and rock fill types (sizes) from on-site sources. It may be necessary to supplement the on-site sources with off-site aggregate that is available from licensed local quarries, owned and operated by third parties.

4.2.3.1.5 Mine Infrastructure

Components of the mine site will be installed and/or constructed during construction to support the operating mine, including, but not limited to, a water management system, the TMF, the process plants, primary and secondary crushers, office, workshop, other buildings, and the site road network. Construction of infrastructure will focus on supporting earth works, foundation construction, and erection of structures so that interior construction can be completed during winter months. Mine equipment will also be mobilized to the site.

As part of the construction phase, a new 25.2 km rail spur will be constructed to facilitate the transport of materials to and from the mine and a temporary multi-plate (corrugated steel) grade separation (underpass) will be constructed under the existing Highway 655 corridor to allow the mine haul road and conveyor to pass beneath the highway. The underpass and the haul road will be in place to provide access between the Open Pit and the process plant until the highway can be permanently realigned during the operations phase of the project.

4.2.3.1.6 Power Supply

Power to the site will be provided by a future 230 kV transmission line that is being designed, constructed and operated by a fully independent business venture. The 230 kV transmission line will connect the Porcupine Substation in Timmins to a new switching station near the process plant. It is anticipated that the transmission line will follow Highway 655, including the proposed realignment.

4.2.3.2 Construction Schedule

Site preparation and construction is estimated to be completed over a three (3) year period. The work schedule will likely vary over this period according to the nature of the work that is being completed at any one time. For this purpose of this assessment it was assumed that construction would occurr 24-hours per day, seven (7) days per week, with two shifts per day.

4.2.3.3 Potential Construction Emissions Sources

The following potential sources of emissions to the air were identified based on the process descriptions and data supplied by Canada Nickel for the construction phase. These sources were assessed for their significance following the requirements presented in MECP Guideline A-10 (MECP 2018). All substantial sources are included in this assessment (see Appendix C of this assessment for details).

The following construction emissions sources were identified:

- Open Pit development: material handling, equipment travel in the Open Pit, grading, drilling, blasting, tailpipe emissions from mobile equipment
- Stockpiles, Impoundment Facility and TMF: wind erosion, material handling, material movement, grading, tailpipe emissions from mobile equipment
- Roadstone crusher: material handling, primary crushing, secondary crushing and screening and wind erosion from temporary storage piles
- Process Plant construction: general construction activities, and tailpipe emissions from mobile equipment
- Water Management and TMF Excavations – material handling, tailpipe emissions from mobile equipment
- Unpaved roads: unpaved road dust, tailpipe emissions from mobile equipment
- Locomotive – emissions from diesel locomotives idling and travelling on on-site rail spurs
- Power Supply – emissions from diesel generators

4.2.3.4 Modelled Construction Emissions Sources

Construction activities that generate emissions are expected to occur intermittently during daylight hours over the duration of the construction period, and the quantities of air contaminants emitted will depend on the level of activity. Construction activities will be temporary and standard construction mitigation procedures will be implemented to reduce dust emissions.

Construction emissions sources are discussed in this section. Detailed emission calculations and methodologies are presented in Appendix C of this assessment.

4.2.3.4.1 Open Pit Development

The following emission sources are identified for pre-production mining during construction:

- Holes are drilled and used for placing explosives for blasting. Drilling of holes can occur throughout the workday. Emissions from drilling include particulate emissions (including SPM, PM_{10}, $PM_{2.5}$ and associated metals in particulates) and tailpipe emissions (products of combustion including NO_X, SO_2, CO, VOCs, PAHs) from the drilling equipment. Drilling emissions were estimated using emission factors for particulates from US EPA AP-42, Chapter 11.9, Table 11.9-4 (Western Surface Coal Mining) and the Australia Government NPI “Emission Estimation Technique Manual for Mining” (Australian NPRI 2012).
- Blasting would occur daily during the work week (averaging 5 times per week). Blasting is an intermittent and instantaneous emission and modelled as a separate source (but occurring concurrently) with the rest of the Open Pit emission sources. Emission factors for blasting from US EPA AP-42, Chapter 11.9, Table 11.9-2 (Western Surface Coal Mining) were used to estimate particulate emissions from blasting. Emission factors for blasting from the Australia

Government NPI Guide “Explosives Detonation and Firing Ranges” (Australian NPRI 2016) were used to estimate combustion products (CO, NO_X, SO_2) emissions.

- Excavators and wheeled loaders transfer mine rock, overburden, or ore from the Open Pit into haul trucks. CoPCs from material unloading/dropping include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions from mobile equipment. Particulate emissions for material unloading/dropping were calculated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Graders maintain the haul roads in the pit for efficient operation of haul trucks moving around the pit. Emissions from grading include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions from mobile equipment. Particulate emissions from grading were estimated using emission factors for grading of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.
- Emissions from mobile equipment travelling within the pit including dust and tailpipe emissions. CoPCs include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions (NOx, CO, PM_{10}, $PM_{2.5}$, PAHs, VOCs). Particulate emissions were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.2 (Unpaved Roads).
- Metals emissions for all sources were estimated using speciation profiles of metals in particulates for mine rock and overburden obtained from Canada Nickel (refer to Appendix B12 of the Impact Statement for Geotechnical Reports).
- Tailpipe emissions from non-road mobile equipment were estimated using equipment counts and make/model data provided by Canada Nickel, following the methodology discussed in Section 4.2.3.4.8.

4.2.3.4.2 Stockpiles, Impoundment Facility and TMF

The CoPCs that may be released to the atmosphere from Stockpiles, Impoundment Facility and TMF construction would include particulate (dust) and metals emissions as well as tailpipe emissions. Emissions sources include the following:

- Unloading of ore, mine rock, or overburden at the Stockpiles, Impoundment Facility and TMF. Particulates (PM, PM_{10}, $PM_{2.5}$), and metals emissions are the CoPCs expected from this operation. Particulate emissions for material unloading/dropping were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Material movement of Stockpiles, Impoundment Facility and TMF (emissions of PM, PM_{10}, $PM_{2.5}$, and metals in particulates) using bulldozers, and front-end loaders. Particulate emissions were estimated using emission factors for bulldozing of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.
- Graders maintain the truck routes on and around the Stockpiles, Impoundment Facility and TMF for efficient operation of the haul trucks. The expected CoPCs from this operation include PM, PM_{10}, $PM_{2.5}$, and associated metals in particulates. Particulate emissions were estimated using

emission factors for grading of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.

- Wind erosion of the Stockpiles, Impoundment Facility and TMF (emissions of SPM, PM_{10}, $PM_{2.5}$, and metals in particulates). For the construction scenario, wind erosion from the west ore stockpile and the TMF were not evaluated, as these areas will not become active until the beginning of operations. Particulate emissions for the east ore stockpile, waste rock and sand and till impoundment Facilities were estimated following the methodology in Chapter 13.2.5 of US EPA AP-42 (Industrial Wind Erosion) using the threshold friction velocity (TFV) for Overburden in Table 13.2.5-2. Particulate emissions from the clay impoundment were estimated using the same methodology and the TFV velocity for Ground Coal in Table 13.2.5-2.
- Metals emissions for all sources were estimated using speciation profiles of metals in particulates for mine rock and overburden obtained from Canada Nickel (refer to Appendix B12 of the Impact Statement for Geotechnical Reports).
- Tailpipe emissions from non-road mobile equipment were estimated using equipment counts and make/model data provided by Canada Nickel following the methodology discussed in Section 4.2.3.4.8.

4.2.3.4.3 Roadstone Crusher

Crushing operations generate particulate matter emissions from material handling and crushing of mine rock. The following sources are considered:

- Loading/unloading and material transfers of aggregate at the Roadstone crusher. PM, PM_{10}, $PM_{2.5}$, and metals emissions are the CoPCs expected from these operations. Particulate emissions for material unloading/dropping were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Primary crushing and secondary crushing and screening using jaw and cone crushers. PM, PM_{10}, $PM_{2.5}$, and metals emissions are the CoPCs expected from this operation. Particulate emissions for crushing were estimated using emission factors in US EPA AP-42, Chapter 11.24 (Metallic Minerals Processing), Table 11.24-1. Particulate emissions for screening were estimated using emission factors in US EPA AP-42, Chapter 11.19.2 (Crushed Stone Processing and Pulverized Mineral Processing) Table 11.19.2-1.
- Wind erosion of the crushed mine rock stockpile for the Roadstone crusher. Particulate and metals emissions were estimated following the methodology in Chapter 13.2.5 of US EPA AP-42 (Industrial Wind Erosion) using the threshold friction velocity for Overburden in Table 13.2.5-2.
- Metals emissions from those sources were estimated using speciation profiles of metals in particulates for mine rock obtained from Canada Nickel (refer to Appendix B12 of the Impact Statement for Geotechnical Reports).

4.2.3.4.4 Process Plant Construction

Construction activities for the process plant and other ancillary facilities would generate dust emissions. The quantity of dust emissions depends on the area of land being worked, type of equipment on site, and the level of construction activities and the use of dust control measures. It is not anticipated that the construction work area will exceed 14.9 hectares (148,899 m^2) at any one time. A generic emission factor from US EPA AP-42 Section 13.2.3 (Heavy Construction Operations) is therefore used to estimate the overall area-wide dust emissions.

Tailpipe emissions from process plant construction equipment were estimated using equipment counts and make/model data provided by Canada Nickel following the methodology discussed in Section 4.2.3.4.8.

4.2.3.4.5 Water Management and TMF Excavations

Excavation of the Water Management Facility and TMF will generate particulate emissions from material handling and tailpipe emissions from mobile equipment. The following sources are considered:

- Loading of excavated material into haul trucks will generate dust emissions. CoPCs include particulate matter (PM, PM_{10} and $PM_{2.5}$) and metals in particulates. Particulate emissions for material loading were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles). Metals emissions were estimated using speciation profiles of metals in particulates for mine rock and overburden obtained from Canada Nickel.
- Tailpipe emissions from non-road mobile equipment were estimated using equipment counts and make/model data provided Canada Nickel following the methodology discussed in Section 4.2.3.4.8.

4.2.3.4.6 Unpaved Roads

Mining trucks and other support vehicles travel within the PA via unpaved haul and access roads. Particulate matter (PM, PM_{10}, $PM_{2.5}$ and associated metals in particulates) from road dust, and products of combustion from the heavy equipment are the CoPCs. Particulate emissions were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.2 (Unpaved Roads). Metals emissions were estimated using speciation profiles of metals in particulates for mine rock obtained from Canada Nickel. Unpaved roads included in the inventory are:

- ACCESSAB: main access road from Project Area to Highway 655
- HAUL1AB: haul road from the main access road to the pit ring road
- HAUL 2A: haul road around TMF perimeter
- HAUL3A: haul road from pit ring road to Main Zone 1A (MZ1A) pit entrance
- HAUL4AB: haul road from Main Zone (MZ) entrance to pit ring road
- HAUL5A: haul road from East Stockpile to East Zone 1 (EZ1) pit entrance
- HAUL6A: haul road from EZ1 entrance to pit ring road intersection

- HAUL7A: haul road from pit ring road to Sand and Till Impoundment (South End)
- HAUL8A: haul road from pit ring road to Clay Impoundment
- HAUL9A: haul road from EZ1 entrance to HAUL6A
- HAUL16A: haul road from pit ring road to Low Grade Ore East Stockpile
- HAUL21A: haul road from pit ring road to Waste Rock Dump (WRD1)

4.2.3.4.7 Generators

During construction, power will be supplied using diesel generators. Diesel generator counts and make/model data provided by Canada Nickel were used to estimate emissions following the methodology presented in Section 4.2.3.4.8.

4.2.3.4.8 Vehicle and Non-Road Equipment Emissions

The construction fleet will consist of heavy equipment units including excavators, wheeled loaders, haul trucks, drills, wheeled and tracked dozers, graders, and other support vehicles. Not all of the equipment will be operating simultaneously. Different construction equipment will be used during different phases of the construction as needed. Emissions from the diesel fuel-fired mobile equipment would be expected to be combustion emissions including nitrogen oxide (NOx), SO_2, CO, PM, PAHs, and hydrocarbons. The following methodologies were used for on-road and non-road equipment:

- Vehicle tailpipe emissions for on-road vehicle emissions were estimated using the US EPA's Motor Vehicle Emission Simulator (MOVES), MOVES3 project level (US EPA 2021).
- Vehicle tailpipe emissions for non-road CACs, VOCs and PAHs were estimated based on the US EPA Emissions Standards for Nonroad Engines and Vehicles document "Nonroad Compression-Ignition Engines: Exhaust Emission Standards" (US EPA 2016). Where applicable, Tier 4 standards were used. For other CoPCs such as VOCs / PAHs, speciation profiles from US EPA (US EPA 2022a) were applied to the total VOC estimates. The VOC emissions were calculated based on the ratio of VOC/NMHC as provided in the MOVES documentation. Particulate PAH speciation profiles were based on $PM_{2.5}$ emissions.

4.2.3.5 Ancillary Infrastructure

To facilitate extraction from the Main Zone of the Open Pit mine, approximately 26 km of Highway 655 will be realigned to the west of the mine to divert traffic around the mine site. Canada Nickel will be responsible for the design and construction of the realignment, including any temporary by passes, and will transfer ownership of the highway to MTO once construction is complete. Construction of the highway re-alignment is expected to commence in Year 1 of operations and be completed by the end of Year 2 operations. The emissions were therefore not included in the Year -1 construction scenario.

Construction of the rail spur and 230 kV power line will occur during the construction period. These activities would involve land clearing with the power line installation involving minimal earth disturbance. Construction of the rail spur would occur sequentially, with only localised construction activities occurring at any given time. The majority of the construction activities for the rail spur and power line would occur outside the LSA. Emissions from these activities are therefore not expected to substantially affect air quality in the LSA and are not included in the inventory.

4.2.3.6 Emissions Summary

A summary of the maximum daily emissions of each CoPC from Project construction is presented in Table 4.1 Emissions Summary - Construction

. The table excludes emissions from wind erosion from the Stockpiles, Impoundment Facilities, and the TMF as the wind velocity needed to cause erosion from these sources occurs infrequently. Emissions from the haul roads (both inside and outside of the pit), blasting and construction of the processing plant are the substantial contributors to the maximum daily emission rates. There are currently no applicable construction emissions limit criteria for the Project.

Table 4.1 Emissions Summary - Construction

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
PM	N/A	29,135
PM_{10}	N/A	8,900
$PM_{2.5}$	N/A	1,589
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	31
Elemental Carbon (from diesel exhaust)	7440-44-0	31
Carbon Monoxide (CO)	630-08-0	3,747
Sulphur Dioxide (SO_2)	7446-09-5	11.9
Nitrogen Oxides (NOx)	10102-44-0	2,155
Fluoride	7664-39-3	69
Chromium VI	18540-29-9	47
Mercury	7439-97-6	1.59E-07
Aluminum	7429-90-5	2,088
Silver	7440-22-4	7.28E-03
Arsenic	7440-38-2	47
Barium	7440-39-3	3.2
Beryllium	7440-41-7	4.86E-03
Boron	7440-42-8	3.21E-01
Bismuth	7440-69-9	1.69E-03
Calcium	7440-70-2	2,506
Cadmium	7440-43-9	1.67E-03

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
Cobalt	7440-48-4	58
Chromium	7440-47-3	15
Copper	7440-50-8	2.9
Iron	7439-89-6	1,282
Potassium	7440-09-7	95
Lithium	7439-93-2	28
Magnesium	7439-95-4	2,022
Manganese	7439-96-5	27
Molybdenum	7439-98-7	44
Silicon	7440-21-3	155
Sodium	7440-23-5	250
Nickel	7440-02-0	10
Lead	7439-92-1	5.0
Antimony	7440-36-0	1.47E-01
Selenium	7782-49-2	8.83E-03
Tin	7440-31-5	9.33E-02
Strontium	7440-24-6	3.7
Titanium	7440-32-6	37
Thallium	7440-28-0	8.13E-02
Uranium	7440-61-1	7.34E-01
Vanadium	7440-62-2	3.2
Tungsten	7440-33-7	4.40E-03
Yttrium	7440-65-5	2.19E-01
Zinc	7440-66-6	1.1
Thorium	7440-29-1	2.47E-02
Quartz (in PM_{10})	14808-60-7	188
Pyrite	12068-85-8	3.50E-03
Biotite	1302-27-8	145
Magnetite	1309-38-2	161
Hematite	1317-60-8	6.4
Chlorite	1318-59-8	3,171
Muscovite	1318-94-1	609
Talc (fibrous)	14807-96-6	86
Phosphorus	7723-14-0	10
Nickel (in PM_{10})	7440-02-0	2.1
Uranium (in PM_{10})	7440-61-1	8.92E-04

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
Chrysotile Asbestos	132207-32-0	9.3
Manganese (in PM_{10})	7439-96-5	8.3
Manganese (in $PM_{2.5}$)	7439-96-5	8.52E-01
Chromium VI (in PM_{10})	18540-29-9	6.49E-02
1,3-butadiene	106-99-0	1.91E-01
Acenaphthene	83-32-9	1.36E-02
Acenaphthylene	208-96-8	2.26E-02
Acetaldehyde	75-07-0	16.60
Acrolein	107-02-8	2.4
Anthracene	120-12-7	8.15E-03
Benzene	71-43-2	3.1
Benzo(a)anthracene	56-55-3	1.45E-04
Benzo(a)pyrene (B(a)P)	50-32-8	1.13E-04
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	9.84E-05
Benzo(g,h,i)perylene	191-24-2	7.40E-05
Chrysene	218-01-9	2.32E-04
Fluoranthene	206-44-0	1.26E-02
Fluorene	86-73-7	4.91E-02
Formaldehyde	50-00-0	52
Phenanthrene	85-01-8	2.14E-01
Pyrene	129-00-0	1.07E-02
Naphthalene	91-20-3	3.8
Dibenzo(a,h) anthracene	53-70-3	3.12E-05
Indeno(1,2,3,c,d)pyrene	193-39-5	3.55E-05
Hydrocarbons	N/A	183

4.2.4 Operations Phase Emissions

The assessment of the operations phase will focus on operations phase 2 since this phase will have both process plants operating at their maximum production rates, and continued ore extraction from the Open Pit at its maximum rate.

4.2.4.1 Description of Project Operations

4.2.4.1.1 Ore Extraction

The Project will be developed as an Open Pit operation designed around two discrete, although overlapping, ore bodies – the Main Zone and the East Zone. The Open Pit is located generally central to the mine site between the TMF to the south and Impoundment Facility to the north.

The Main Zone and the East Zone of the Pit contain an approximately equal tonnage of ore. An estimated 5,932 Mt of material will be removed from the pit, including overburden, waste rock and ore, which includes an estimated 1,715 Mt of ore suitable for processing. The ultimate Open Pit will cover an area of approximately 992 ha, measuring 4,400 m by 3,100 m, extending to a depth of approximately 690 m.

Development of the Open Pit will occur sequentially commencing in Year -2 (2 years prior to the start of milling operations). The Main Zone will be the primary supply of ore for the first 17 years of operations, providing approximately 843 Mt of ore for processing. The ultimate dimensions of the Main Zone will be approximately 3,400 m by 1,700 m with a depth of 690 m below grade. Full development of the Main Zone will require the realignment of Highway 655, which is scheduled to be completed following the start of operations.

The East Zone will initially provide materials that will be used for Project construction. Slightly larger than the Main Zone, the East Zone will provide approximately 863 Mt of additional ore for processing. The ultimate dimensions of the East Zone Pit will be approximately 3,800 m by 1,500 m, with a depth of 615 m below grade.

4.2.4.1.2 Ore Handling

The run-of-mine or stockpiled ore will be hauled from the Open Pit or storage piles and dumped into a 580-tonne live capacity hopper above the primary crusher. The primary crusher will be an enclosed and partially buried structure with a dust collection system. The crushed ore is transferred to the secondary crusher structure via a conveyor equipped with a tramp magnet.

The conveyor will feed the crushed ore into a 667-tonne surge bin. The ore will be drawn from the surge bin via a belt feeder onto a secondary screen. Oversized ore from the screen will be fed into the secondary crusher equipped with a dust collection system. The product from the secondary crusher will be deposited onto the stockpile feed conveyor where it will be combined with the undersized ore from the secondary screen and transported to the crushed ore stockpile.

The crushed ore stockpile will be a covered facility equipped with two 25,000 m^3/hr pulse jet dust collectors. The ore will be reclaimed from the stockpile using three variable-speed apron feeders.

4.2.4.1.3 Ore Processing

Minerals will be recovered from the ore and processed into concentrate in the process plants, which are centrally located between the Open Pit and the TMF. The average daily feed rate will be approximately 120,000 tonnes. The conceptual mill process flow diagram is shown in Appendix A, Figure A.4 of this report. The process plants are designed to process an ultramafic komatiite-hosted Ni-Cu-Co-(PGE) deposit type ore, recovering a nickel flotation concentrate and a magnetite concentrate. The detailed ore processing method is provided in the Technical Report and Feasibility Study (Ausenco 2023).

The ore will be reclaimed from the crushed ore stockpile into the grinding circuit consisting of a semi-autogenous grinding (SAG) mill and ball mill circuit operating in a closed circuit with a cyclone cluster. The overflow from the cyclone cluster will be deslimed in the deslime cyclone cluster. The deslimed slurry will then feed the rougher in the course nickel floatation circuit. Ball mill grinding and subsequent ore processing steps will be wet processes with no potential to generate particulate emissions.

The floatation circuit consists of three stages of cleaning with a cleaner regrind between the first and second stages. The product from the coarse cleaners will then be transferred to the nickel concentrate thickener.

The tails from the coarse rougher and cleaner circuit will be re-ground at the ball mill for size reduction and upgraded in the fines cleaner cells. The products from the fines cleaner will be sent to the nickel concentrate thickener. The tails from the finer rougher and cleaners will be sent to a magnetic separation circuit consisting of three stages of magnetic separations and a dedicated regrind mill for further size reduction. The magnetic concentrate will go through a sulphide flotation stage and will then be dewatered and filtered before stockpiling.

The coarse and fines nickel concentrate will be combined and passed over a trash screen into the nickel concentrate thickener where it is thickened to approximately 50% w/w solids. The product will then be pumped to a filter press for further dewatering to 90% w/w solids before stockpiling.

The primary reagents that are planned for use in the flotation process to produce concentrate may include:

- Potassium amyl xanthate (PAX), to be used in the flotation circuit
- Methyl isobutyl carbinol (MIBC) and Cytec 65 are frothers, that will be applied to the flotation circuit
- Calgon (sodium hexametaphosphate) and Carboxy-methylcellulose (CMC), are depressants which may be applied intermittently to the cleaner floatation process
- Sulphuric acid (H_2SO_4) will be used as needed as a pH modifier
- Flocculant will be added to the nickel concentrate thickeners

The tailings from the magnetic separation process will be combined with the deslime cyclone overflows and thickened in the tailings thickener. The product from the thickener will be pumped through tanks where carbon dioxide is introduced to convert brucite into nesquehonite for carbon absorption. The slurry will then be pumped into the TMF.

4.2.4.1.4 Concentrate Handling, Storage and Transportation

The nickel and magnetite concentrates will be transferred by a front-end loader to the concentrate load-out buildings where it will be stockpiled indoors prior to it being sold and shipped off site by rail. The front-end loader will then be used to transfer the nickel and magnetite concentrates from the indoor stockpiles to the rail cars. The loading of the rail cars will occur in a partially enclosed building to reduce dust emissions.

It is estimated that at peak concentrate production, 4 trains with 24 cars per train will be used to transported nickel and magnetite concentrate off-site daily.

4.2.4.1.5 Mine Rock Management

The pit excavation includes 1,715 Mt of ore and waste materials (peat, clay, sand and till and waste rock). High value ore will be fed directly to the process plants. Low value ore will be temporarily stockpiled into two stockpiles located east and west of the Open Pit (referred to as the East and West Stockpile). Once mining has ceased in the Open Pit, the low value ore will be transferred from the East and West stockpiles to the process plants for processing until the end of the project life.

For the waste materials, it is intended that all of the peat will to be consumed in reclaiming disturbed areas. The remaining waste materials not used in construction and reclamation will be impounded in one large facility located north of the pits. The Impoundment Facility will be divided into three zones:

- Waste Rock Impoundment
- Sand and Till Impoundment
- Clay Impoundment

4.2.4.1.6 Process Solids Management

The TMF will be located to the south of the Open Pit and has been designed to hold 495 million m^3 of tailings covering an area of 2,300 ha. The TMF will be operated as a “thickened tailings cone” with tailings being deposited near the center of the facility. Tailings will be thickened to approximately 39% solids in the process plants and then pumped to the TMF for long-term storage. The TMF capacity is sufficient for the first 17 years of production.

After the capacity limit of the TMF has been reached, deposition activity will transition to the depleted Main Zone of the Open Pit. This will provide capacity for a further 484 Mm^3, representing 15 years mill production. Once mining has ceased in the Main Zone of the Open Pit, deposition of tailings will be transitioned to the East Zone void until the end of the project life.

4.2.4.1.7 Haul Roads

A series of internal haul and access roads will be constructed to facilitate access to various Project components. Over the life of the Project, approximately 44.6 km of surface internal roads will be constructed. Haul roads will be 35 m wide, with the exception of the pit ramps that will be 50 m. All other roads will be 15 m wide. Roads will be constructed of mine rock or aggregate.

4.2.4.1.8 Trolley Assist Haulage

Haul trucks, transporting the ore or waste from the rock face to the dump point, use the most energy out of a conventional Open Pit mining fleet. A trolley assist system will be implemented that allows for the use of grid electricity to propel the motors of haul trucks, through the connection of haulage trucks to overhead trolley-lines. Benefits of trolley-assisted haulage can include increased productivity and fuel savings, decreased engine wear, and reduction in tailpipe and GHG emissions through increased efficiency and use of lower carbon grid electricity compared with conventional diesel combustion (SMS Equipment 2024).

4.2.4.1.9 Autonomous Vehicles

The project will use autonomous mining trucks that are designed to haul mined material without the need for human intervention. The autonomous trucks are typically part of an Autonomous Haulage System (AHS) which includes a central control system, communication infrastructure and other supporting technologies. Autonomous vehicles typically utilize artificial intelligence, machine learning and a range of sensors, to perceive their environment, detect obstacles and make informed decisions. AHS systems can achieve a higher level of safety and productivity during haulage operations and greatly improve efficiency of overall operations (Mix Telematics, 2024). Improvements in efficiency may lower fuel consumption during mining operations and result in lower tailpipe emissions.

4.2.4.1.10 Power Supply

Electric power for the Project is planned to be supplied through the development of a new 230 kV electricity transmission line from the Porcupine substation near Timmins to the Project site.

Generators will also be used to provide standby power in emergency situations. Each diesel generator will be contained within a weatherproof enclosure and will include a neutral ground resistor. A total of 20 diesel generators (10 for each process plant) ranging in size from 150 to 1,250 kW are anticipated. Additional smaller scale generators may be employed in other areas of the site for emergency power backup. These generators will only operate during a power outage or for short duration routine testing.

4.2.4.1.11 Aggregate and Rock Fill Supply

A Roadstone Crusher consisting of a primary crusher, secondary crusher and screen will be used to generate aggregate and rock fill types (sizes) from on site sources. It may be necessary to supplement the on-site sources with off-site aggregate that is available from licensed local quarries, owned and operated by third parties.

4.2.4.1.12 Highway 655 Realignment

Full development of the Main Zone of the Open Pit will require the realignment of Highway 655, which is scheduled for completion following the start of operations. At present, Highway 655 bisects the location of the proposed Open Pit and a realignment is required to access the ore body.

To facilitate extraction, approximately 26 km of Highway 655 will be realigned to the west of the mine to divert Highway 655 traffic around the mine site. Once realigned, the existing section of Highway 655 will be decommissioned. The realignment will be completed by the end of Year 2 of operations.

4.2.4.1.13 Miscellaneous Sources

Miscellaneous sources of air contaminants on site that are expected to be negligible contributors to emissions include the following:

- Fuel Farm – located between the Open Pit and the TMF comprised of fuel tanks, fueling stations and containment infrastructure. Fuel will be stored in above ground vertical or horizontal bulk tanks. Fueling stations are considered negligible sources following MECP guidance (MECP 2018)
- Explosive Storage Facility – the Project will utilize site mixed emulsion explosives that will only be sensitized when injected with a gassing agent in a bulk delivery truck used to charge the blast holes. As a result, materials stored on site will not be considered explosive. The inert materials used for explosives will be stored in tanks in an explosive storage facility
- An Assay Lab that will be located adjacent to the process plants that will analyze samples taken from the process plants

4.2.4.2 Operating Schedule

The Project will operate 24 hours per day, 365 days per year for the life of mine (LOM).

4.2.4.3 Potential Project Emissions Sources

The following potential sources of emissions to the air were identified based on the process descriptions and data supplied by Canada Nickel and are included in the assessment (see Appendix C of this assessment for details):

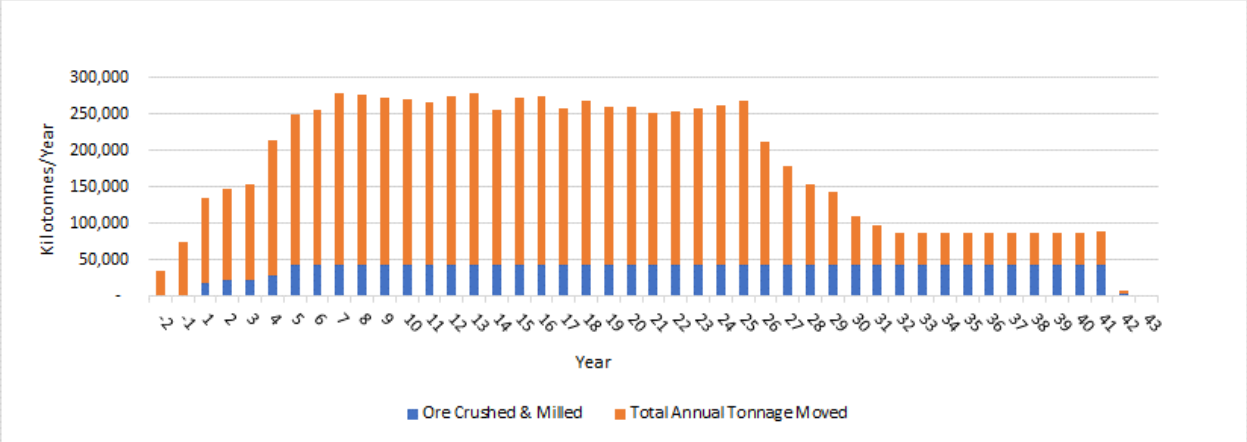
- Open Pit operation: material handling, equipment travel in the Open Pit, grading, drilling, blasting, tailpipe emissions from mobile equipment
- Stockpiles, Impoundment Facility and TMF: wind erosion, material handling, material movement, grading, tailpipe emissions from mobile equipment
- Roadstone crusher: material handling, primary crushing, secondary crushing, screening and wind erosion from temporary storage pile
- Primary and Secondary Crushing: truck unloading of ore, primary crushing, secondary crushing and screening, dust collection and mobile emissions
- Crushed Ore stockpile: crushed ore stockpiling, dust collection
- Ore processing: material transfer and semi-autogenous grinding (SAG) mill grinding, unloading of solid reagents to storage tanks or mix tanks, reagent addition to the flotation circuit
- Concentrate handling: material handling and mobile emissions
- Unpaved roads: unpaved road dust, mobile equipment emissions

- Tailpipe emissions in exhaust from mobile equipment
- Locomotive –emissions from locomotives idling and travelling on on-site rail spurs
- Tailpipe emissions in exhaust and re-suspended particulate matter from vehicle traffic on the realigned Highway 655

4.2.4.4 Modelled Project Emissions Sources

The variation in material milled and moved through the Project operating years is presented on Figure 4.1. For modelling, the year with the highest mass of material moved (mining rate + material transported from the ore stockpile to the primary crusher) was selected for assessment, as this year is expected to have the highest emission rates. As can be seen on Figure 4.1, Project material movements remain reasonably consistent through Years 7 to 25 and decrease following that. Using Year 7 operating data to represent the entire operations phase will provide a conservative estimate of air quality levels as the depth of the Open Pit will be less in Year 7 versus later years, which will result in “worst-case” impacts due to emissions of particulate matter in the pits being increasingly retained in the pits as their depths increase.

Figure 4.1 Annual Tonnages Moved and Milled (kt/yr) over LOM



Project emission sources and operations are discussed in this section along with an overview of the emission estimation techniques. Metals emissions for all sources were calculated by speciating the particulate emissions using measured metals contents in ore, mine rock and overburden obtained from Canada Nickel. Detailed emission calculations and methodologies are presented in Appendix C of this assessment.

4.2.4.4.1 Open Pit Operation

The following emission sources are identified in the Open Pit:

- Holes are drilled and used for placing explosives for blasting. Drilling of holes can occur throughout the workday. Emissions from drilling include particulate emissions (including PM, PM_{10}, $PM_{2.5}$ and associated metals in particulates) and tailpipe emissions (products of combustion including NO_X, SO_2, CO, VOCs, PAHs) from the drilling equipment. Drilling emissions were estimated using emission factors for particulates from US EPA AP-42, Chapter 11.9, Table 11.9-4 (Western Surface Coal Mining) and the Australia Government NPI "Emission Estimation Technique Manual for Mining" (Australian NPI 2012).
- Blasting would occur daily during the work week (averaging 5 times per week). Blasting is an intermittent and instantaneous emission and modelled as a separate source (but occurring concurrently) with the rest of the Open Pit emission sources. Emission factors for blasting from US EPA AP-42, Chapter 11.9, Table 11.9-2 (Western Surface Coal Mining) were used to estimate particulate emissions from blasting. Emission factors for blasting from the Australia Government NPI Guide "Explosives Detonation and Firing Ranges" (Australian NPI 2016) were used to estimate the quantities of combustion products (CO, NO_X, SO_2) released.
- Excavators and wheeled loaders transfer mine rock, overburden, or ore from the Open Pit into haul trucks. The CoPCs from material unloading/dropping include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions from mobile equipment. Particulate emissions for material unloading/dropping were calculated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Graders maintain the haul roads in the pit for efficient operation of haul trucks moving around the pit. Emissions from grading include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions from mobile equipment. Particulate emissions from grading were estimated using emission factors for grading of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.
- Emissions from mobile equipment travelling within the pit and tailpipe emissions. The CoPCs include particulate matter (PM, PM_{10}, $PM_{2.5}$), associated metals in particulates and tailpipe emissions (NOx, CO, PM_{10}, $PM_{2.5}$, PAHs, VOCs). Particulate emissions were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.2 (Unpaved Roads). Tailpipe emissions were estimated using equipment counts and make/model data supplied by Canada Nickel following methodology presented in Section 4.2.4.4.8.

4.2.4.4.2 Stockpiles, Impoundment Facility and TMF

The CoPCs from Stockpiles, Impoundment Facility and continuing TMF construction would include particulate (dust) emissions as well as tailpipe emissions. Emissions sources include the following:

- Unloading of ore, mine rock, or overburden at the Stockpiles, Impoundment Facility and TMF. Particulates (PM, PM_{10}, $PM_{2.5}$), and metals emissions are the CoPCs expected from this operation. Particulate emissions for material unloading/dropping were calculated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Material movement of Stockpiles, Impoundment Facility and TMF (emissions of PM, PM_{10}, $PM_{2.5}$, and metals in particulates) using bulldozers, and front-end loaders. Particulate emissions were estimated using emission factors for bulldozing of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.
- Graders maintain the truck routes on and around the Stockpiles, Impoundment Facility and TMF for efficient operation of the haul trucks. The expected CoPCs from this operation include PM, PM_{10}, $PM_{2.5}$, and associated metals in particulates. Particulate emissions were estimated using emission factors for grading of material other than coal in US EPA AP-42, Chapter 11.9 (Western Surface Coal Mining), Table 11.9-2.
- Wind erosion of the Stockpiles, Impoundment Facility and TMF (emissions of PM, PM_{10}, $PM_{2.5}$, and metals in particulates). Particulate emissions for the East and West Stockpiles, Waste Rock and Sand and Till Impoundment Facilities were estimated by following the methodology in Chapter 13.2.5 of US EPA AP-42 (Industrial Wind Erosion) using the threshold friction velocity (TFV) for overburden in Table 13.2.5-2. Particulate emissions from the Clay Impoundment were estimated using the same methodology and the TFV for ground coal in Table 13.2.5-2. The TFV used in estimating the particulate emissions from the TMF was calculated using the results from the Mine Tailing Study (RWDI 2013). This study tested tailings samples from a nickel mine in a portable wind tunnel to determine the wind erosion rate from the tailings surface.
- Emissions from mobile equipment tailpipe emissions. CoPCs include NOx, CO, PM_{10}, $PM_{2.5}$, PAHs, VOCs. Tailpipe emissions were estimated using equipment counts and make/model data supplied by Canada Nickel following methodology presented in Section 4.2.4.4.8.

4.2.4.4.3 Road Stone Crusher

Crushing operations generate particulate emissions from material handling and crushing of mine rock. The following sources are considered:

- Loading/unloading and material transfers of aggregate at the Roadstone crusher. PM, PM_{10}, $PM_{2.5}$, and metals emissions are the CoPCs expected from these operations. Particulate emissions for material unloading/dropping were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Primary crushing, secondary crushing and screening using jaw and cone crushers. PM, PM_{10}, $PM_{2.5}$, and metals emissions are the CoPCs expected from this operation. Particulate emissions for crushing were estimated using emission factors in US EPA AP-42, Chapter 11.24 (Metallic

Minerals Processing), Table 11.24-1. Particulate emissions for screening were estimated using emission factors in US EPA AP-42, Chapter 11.19.2 (Crushed Stone Processing and Pulverized Mineral Processing) Table 11.19.2-1.

- Wind erosion of the crushed mine rock stockpile for the Roadstone crusher. Particulate and metals emissions were estimated following the methodology and related emission factors in Chapter 13.2.5 of US EPA AP-42 (Industrial Wind Erosion).

4.2.4.4.4 Processing Plants Crushing

Crushing operations generate particulate emissions from material handling and crushing operations. Products of combustion are also generated from trucks unloading aggregate. The following sources are considered:

- Unloading of aggregate at the primary crusher. PM, PM_{10}, $PM_{2.5}$, and metals emissions are the CoPCs expected from these operations. Particulate emissions for material unloading were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Primary crushing using a gyratory crusher and conveying material to secondary screening and crushing. PM, PM_{10}, $PM_{2.5}$, and speciated metals emissions are the CoPCs expected from these operations. Particulate emissions for crushing were estimated using emission factors in US EPA AP-42, Chapter 11.24 (Metallic Minerals Processing), Table 11.24-1.
- Secondary screening and crushing using a cone crusher and conveying material to the crushed ore stockpiles. Particulates (PM, PM_{10}, $PM_{2.5}$) and speciated metals emissions are the CoPCs expected from these operations. Particulate emissions for crushing were estimated using emission factors in US EPA AP-42, Chapter 11.24 (Metallic Minerals Processing), Table 11.24-1.
- Crushed ore from the secondary screen and crusher are conveyed and dropped to covered stockpiles. The expected CoPCs are particulates (PM, PM_{10}, $PM_{2.5}$) and speciated metals. Particulate emissions for material drops were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Dust collectors controlling emissions from the primary crusher, secondary screening and crushing and conveying, and crushed ore stockpile. Particulate emissions were estimated based on the MECP recommended emission factor of 20 mg/m^3 for the most substantial baghouse and 10 mg/m^3 for other units as per Table C-2, Appendix C, Guideline A-10 of this assessment. Emission factors for PM_{10}, $PM_{2.5}$ are estimated using data from US EPA AP-42, Appendix B-1, Section 11.xx (Fluorspar Ore Rotary Drum Dryer) of this assessment.
- Tailpipe emissions from non-road mobile equipment. CoPCs include NOx, CO, PM_{10}, $PM_{2.5}$, PAHs, VOCs. Tailpipe emissions were estimated using equipment counts and make/model data supplied by Canada Nickel following methodology presented in Section 4.2.4.4.8.

4.2.4.4.5 Ore Processing

Emission sources considered during ore processing operations are the following:

- Material transfer from the crushed ore stockpiles to the SAG mill for primary grinding. The expected CoPCs are particulate matter (PM, PM_{10} and $PM_{2.5}$) and speciated metals. Particulate emissions for material unloading were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Unloading of solid reagents received in bags and transferred to holding/storage/mix tanks where they are diluted to form solutions. The CoPCs include particulate matter (PM, PM_{10}, $PM_{2.5}$) and the various components of the reagents used, of which the notable CoPCs include potassium amyl xanthate (PAX) and sodium hexametaphosphate. The emissions were estimated using the emission factor for product loading and transferring from US EPA AP-42 Chap 11.17 (Lime Manufacturing) along with the annual usage (in tonnes/year) for each contaminant.

4.2.4.4.6 Concentrate Handling

Particulate matter (PM, PM_{10}, $PM_{2.5}$ and associated metals in particulates) from loading/unloading operations and products of combustion from the mobile equipment are the CoPCs. Emissions sources include the following:

- Particulate emissions from the concentrate due to material loading into indoor stockpiles and transferring the concentrate from the stockpiles into the rail cars via a front-end loader. PM, PM_{10}, $PM_{2.5}$, and speciated metals emissions are the CoPCs expected from these operations. Particulate emissions for material unloading/dropping were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.4 (Aggregate Handling and Storage Piles).
- Tailpipe emissions from mobile equipment. CoPCs include NOx, CO, PM_{10}, $PM_{2.5}$, PAHs, VOCs. Tailpipe emissions were estimated using equipment counts and make/model data supplied by Canada Nickel following methodology presented in Section 4.2.4.4.8.

4.2.4.4.7 Unpaved Roads

Mining trucks and other support vehicles travel within the Project Area via unpaved haul and access roads. Particulate matter (PM, PM_{10}, $PM_{2.5}$ and associated metals in particulates) from road dust, and products of combustion from the heavy equipment are the CoPCs. Particulate emissions from road dust were estimated using Equation (1) in US EPA AP-42, Chapter 13.2.2 (Unpaved Roads). Metals emissions were estimated using speciation profiles of metals in particulates for mine rock obtained from Canada Nickel. Haul roads segments included in the assessment were:

- ACCESSAB: main access road from Project Area to Highway 655
- HAUL1AB: haul road from the main access road to the pit ring road
- HAUL 2B: haul road from pit ring road around TMF perimeter
- HAUL4AB: haul road from Main Zone (MZ) entrance to pit ring road

- HAUL5B: haul road from East Stockpile to East Zone 2 (EZ2) pit entrance
- HAUL6B: haul road from EZ2 entrance to pit ring road intersection
- HAUL7B: haul road from pit ring road to Sand and Till Impoundment (South End)
- HAUL11B: haul road from pit ring road Sand and Till Impoundment to Waste Rock Dump
- HAUL12B: haul road from pit ring road Waste Rock Dump to future MZ3 entrance
- HAUL13B: haul road from pit ring road future MZ3 entrance to Low Grade Ore West entrance
- HAUL14B: haul road from Low Grade Ore East to Primary Crusher 2 Entrance
- HAUL15B: haul road from pit ring road Primary Crusher 2 to MZ3 entrance
- HAUL16B: haul road from pit ring road to Low Grade Ore East Stockpile
- HAUL17B: haul road from pit ring road to Primary Crusher 2
- HAUL18B: haul road from pit ring road to Low Grade Ore West Stockpile
- HAUL19B: haul road from pit ring road to Waste Rock Impoundment
- HAUL20B: haul road from pit ring road to EZ2 entrance
- HAUL21B: haul road from pit ring road MZ3 entrance to HAUL4AB

4.2.4.4.8 Vehicle and Non-Road Equipment Emissions

The operations fleet will consist of heavy equipment units including excavators, wheeled loaders, haul trucks, drills, wheeled and tracked dozers, graders, and other support vehicles. Not all of the equipment will be operating simultaneously. Different equipment will be used during different phases of operations as needed. Emissions from the diesel fuel-fired mobile equipment would be expected to be combustion emissions including nitrogen oxide (NOx), SO_2, CO, PM, PAHs, and hydrocarbons. The following methodologies were used for on-road and non-road equipment:

- Vehicle tailpipe emissions for on-road vehicle emissions were estimated using the US EPA's Motor Vehicle Emission Simulator (MOVES), MOVES3 project level (US EPA 2021).
- Vehicle tailpipe emissions for non-road CACs and PAHs were estimated based on the US EPA Emissions Standards for Nonroad Engines and Vehicles document "Nonroad Compression-Ignition Engines: Exhaust Emission Standards" (US EPA 2016). Where applicable, Tier 4 standards were used. For other CoPCs such as VOCs/ PAHs, speciation profiles from "Speciation Profiles for Toxic Emission Factors for Non-road Engines" (US EPA 2022a) were applied to the total VOC estimates. VOCs were calculated based on the ratio of VOC/NMHC as provided in the MOVES documentation. Particulate PAH speciation profiles were based on $PM_{2.5}$ emissions.

4.2.4.4.9 Negligible Sources

The following emission sources are considered to be negligible following the MECP procedure document (MECP, 2018):

- Ball mill grinding is a wet process
- Evaporation of liquid reagents stored in storage/mix tanks as the contents are non-volatile
- Emissions from tailings pumped to the TMF as the tailings are in a slurry form and the contents are non-volatile
- Assay Lab
- Raw materials used for explosives mixing will be in prill or liquid (solutions) form and a non-volatile state
- Fuel storage tanks

4.2.4.5 Accidents and Malfunctions

Accidents and malfunctions that could have an adverse effect on the atmospheric environment are presented in Chapter 31 of the Impact Statement.

4.2.4.6 Emissions Controls and Mitigation Efficiency Estimates

The emission inventory included several sources/source types that will have mitigation measures applied to them. The expected control efficiencies, rationale and reference for these measures are summarized in

Table 4.2.

Table 4.2 Summary of Assumed Mitigation Control Efficiencies

Source/Source Type	Expected Collection Efficiency (%)	Control	Reference/Rationale
Drilling in Open Pit	90%	Wet Drilling	Typical drill configuration. US Office of Mine Safety and Health Research (OMSHR 2014) estimates wet drilling eliminates up to 97% of respirable dust. Control of 90% equivalent to a moderate water flow rate of 0.8 gpm assumed for control efficiency.
Truck Loading / Unloading (Open Pit, Stockpiles, Impoundment Facility & TMF)	0%	Uncontrolled	-
Grading	0%	Uncontrolled	-
Material movement	0%	Uncontrolled	-
Wind Erosion (Stockpiles, Impoundment Facility & TMF)	0%	Uncontrolled	-
Roadstone Crusher – Material Handling	50%	Typical crusher configuration - partially enclosed/drop heights minimized	Western Regional Air Partnership Report (WRAP 2006)

Source/Source Type	Expected Collection Efficiency (%)	Control	Reference/Rationale
Roadstone Crusher – Primary Crusher	90%	Typical crusher configuration with enclosure	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Roadstone Crusher – Secondary Crusher	90%	Typical crusher configuration with enclosure	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Primary Crushers	99%	Enclosure with dust collector (baghouse)	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002). The Texas Commission for Environmental Quality (TCEQ) notes a 100% control efficiency for a building under negative pressure. A 99% control efficiency was conservatively used as the enclosure will not be completely under negative aii. Emissions from the dust collectors are estimated following MECP guidance (MECP 2018).
Secondary Crushers	99%	Enclosure with dust collector (baghouse)	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Crushed Ore Stockpiles	99%	Enclosure with dust collector (baghouse)	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Conveyor Transfer (Crushed Ore Stockpiles to SAG mills)	90%	Enclosed	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Reagents unloading	90%	Enclosed in building	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Concentrate Area Loadout – stockpiling concentrate	90%	Enclosed in building	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Concentrate Area Loadout – loading rail cars	90%	Enclosed in building	Rock Crushing Plants: Technical Guidance for Rock Crushing Plants (TCEQ 2002)
Unpaved Roads – Summer	85%	Road watering and/or surfactant	Western Regional Air Partnership Report (WRAP 2006) notes a mitigation efficiency of 84% for application of a dust suppressant on unpaved roads.
Unpaved Roads – Winter	95%	Natural mitigation	Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada", (Golder 2012)

4.2.4.7 Project Emissions Summary

A summary of the maximum daily emissions of each CoPC from the Project (after the implementation of mitigation) is presented in Table 4.3. The table excludes emissions from wind erosion from the Stockpiles, Impoundment Facility and the TMF as the wind velocity needed to cause erosion from these sources occurs infrequently. The substantial contributors to the maximum daily emissions include the haul roads and pit ramp, blasting, material handling in the Open Pit and crushing activities at the road stone crusher and process plants. There are currently no applicable federal or provincial emissions limit criteria for the Project.

Table 4.3 Emissions Summary – Operations

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
PM	N/A	86,826
PM_{10}	N/A	25,374
$PM_{2.5}$	N/A	2,783
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	85
Elemental Carbon (from diesel exhaust)	7440-44-0	85
Carbon Monoxide (CO)	630-08-0	9,084
Sulphur Dioxide (SO_2)	7446-09-5	41
Nitrogen Oxides (NO_x)	10102-44-0	7,192
Fluoride	7664-39-3	6.54E-03
Chromium VI	18540-29-9	4.60E-05
Mercury	7439-97-6	7.09E-07
Aluminum	7429-90-5	6,173
Silver	7440-22-4	2.17E-02
Arsenic	7440-38-2	2.39E-01
Barium	7440-39-3	9.57
Beryllium	7440-41-7	1.17E-02
Boron	7440-42-8	8.99E-01
Bismuth	7440-69-9	5.32E-03
Calcium	7440-70-2	7,122
Cadmium	7440-43-9	5.07E-03
Cobalt	7440-48-4	3.98
Chromium	7440-47-3	46
Copper	7440-50-8	8.43
Iron	7439-89-6	3,932
Potassium	7440-09-7	291

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
Lithium	7439-93-2	1.05
Magnesium	7439-95-4	6,058
Manganese	7439-96-5	82
Molybdenum	7439-98-7	4.86E-02
Silicon	7440-21-3	500
Sodium	7440-23-5	836
Nickel	7440-02-0	22
Lead	7439-92-1	7.65E-02
Antimony	7440-36-0	3.66E-02
Selenium	7782-49-2	2.53E-02
Tin	7440-31-5	2.76E-01
Strontium	7440-24-6	10.96
Titanium	7440-32-6	119.05
Thallium	7440-28-0	2.81E-03
Uranium	7440-61-1	7.73E-03
Vanadium	7440-62-2	9.65
Tungsten	7440-33-7	1.59E-02
Yttrium	7440-65-5	4.74E-01
Zinc	7440-66-6	3.41
Thorium	7440-29-1	7.41E-02
Quartz (in PM_{10})	14808-60-7	822
Pyrite	12068-85-8	1.60E-02
Biotite	1302-27-8	443
Magnetite	1309-38-2	593
Hematite	1317-60-8	18
Chlorite	1318-59-8	9251
Muscovite	1318-94-1	2127
Talc (fibrous)	14807-96-6	80
Phosphorus	7723-14-0	7.01E-06
Platinum	7440-06-4	2.08E-09
Palladium	7440-05-3	7.16E-09
Nickel (in PM_{10})	7440-02-0	6.16
Uranium (in PM_{10})	7440-61-1	2.43E-03
Chrysotile Asbestos	132207-32-0	43
Manganese (in PM_{10})	7439-96-5	24
Manganese (in $PM_{2.5}$)	7439-96-5	2.52

CoPC	CAS No.	Maximum Daily Emission Rate (kg/day)
Chromium VI (in PM_{10})	18540-29-9	1.37E-05
1,3-butadiene	106-99-0	4.41E-01
Acenaphthene	83-32-9	3.01E-02
Acenaphthylene	208-96-8	4.93E-02
Acetaldehyde	75-07-0	39
Acrolein	107-02-8	5.50
Anthracene	120-12-7	1.91E-02
Benzene	71-43-2	7.19
Benzo(a)anthracene	56-55-3	2.69E-04
Benzo(a)pyrene (B(a)P)	50-32-8	2.89E-04
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	2.50E-04
Benzo(g,h,i)perylene	191-24-2	1.49E-04
Chrysene	218-01-9	5.18E-04
Fluoranthene	206-44-0	2.95E-02
Fluorene	86-73-7	1.13E-01
Formaldehyde	50-00-0	120
Phenanthrene	85-01-8	7.09E-01
Pyrene	129-00-0	3.45E-02
Potassium amyl xanthate	2720-73-2	2.43
Sodium hexametaphosphate	10124-56-8	3.96
Napthalene	91-20-3	12.33
Dibenz(a,h)anthracene	53-70-3	1.18E-04
Indeno(1,2,3-cd)pyrene	193-39-5	7.05E-05
Hydrocarbons	N/A	427

4.2.5 Closure Emissions

Following the completion of ore processing, all Project operations will cease, and active closure will commence. Active closure includes the removal of buildings, structures, and other infrastructure, as well as reclamation and site stabilization activities. Active closure emissions are expected to be less than construction emissions (as no ore extraction or TMF construction would be occurring) and, therefore, the assessment of the construction scenario will implicitly address active closure phase emissions as well.

4.2.6 Existing and Future Development

4.2.6.1 Existing Industrial Sources

Table 4.4 provides a summary of other industrial activities/sources identified within the LSA and RSA that would have the potential for emissions of CoPCs in common with the Project. These facilities reported their emissions for the 2022 operating year to the ECCC National Pollutant Release Inventory (NPRI) (ECCC, 2024) and these sources are implicitly accounted for in this assessment through the background concentration levels used in the cumulative effects assessment.

Table 4.4 Summary of Existing Industrial Sources in the Air Quality RSA

Company Name	Approximate Distance from PA (km)	Facility Name
Glencore Canada Corporation	<1	Kidd Mine Site
Glencore Canada Corporation	16	Kidd Metallurgical Site
Lake Shore Gold	11	Bell Creek Complex
Northern Sun Mining Corp.	37	Redstone Mine and Mill
Lake Shore Gold	33	Lake Shore Gold Timmins West Mine
Goldcorp Canada Ltd.	20	Porcupine Gold Mines
Margis Talc Canada Inc.	18	Timmins Micronizing Plant
Eacom Timber Corporation	17	Timmins Sawmill
Atlantic Power LP	30	Tunis Power Plant
Greenfirst Forest Products (QC) Inc.	27	Cochrane Sawmill
TransCanada Pipelines Ltd.	38	Smooth Rock Falls Comp Stn

4.2.6.2 Existing Non-Industry Emissions

Other sources of air contaminants within the RSA with air CoPCs in common with the Project would include those not from industry per se and include:

- Residential and commercial areas within the Towns of Timmins and Cochrane
- City of Timmins water pollution control plants and sewage lagoon
- Forestry activities
- Timmins Victor M. Power Airport and associated air traffic
- Transportation (including Highway 655 and railway).

Air quality concentrations due to these sources were accounted for in this assessment through the use of measured background concentration levels in the cumulative effects assessment that will include the influence of these sources.

4.2.6.3 Future Development

Future development is addressed in Section 29.7 of the Crawford Nickel Project Impact Statement.

4.2.7 Design and Mitigation Measures

4.2.7.1 Construction Emission Control

Proposed mitigation measures for potential air emission concerns during the construction phase will include:

- Use of dust suppressants (e.g., water) during situations that have an increased potential to generate airborne dust
- Maintenance of vehicles to increase fuel efficiency
- Implement an idling policy on site for mobile equipment and vehicles

4.2.7.2 Operations Emission Control

Canada Nickel will implement the following design mitigation measures for operations:

- Primary crushers will be enclosed and equipped with dust collectors that filter the internal air and exhaust it to the environment.
- Secondary crushers will also be enclosed and equipped with dust collectors.
- Crushed ore Stockpiles will be enclosed and equipped with dust collectors or vent filters as necessary to demonstrate compliance during the provincial permitting process for air emissions (i.e., Environmental Compliance Approval).
- Conveyors transferring ore from the crushed ore Stockpiles to the SAG mills will be enclosed.
- Rail car concentrate loading will be enclosed in buildings.
- The mobile roadstone primary and secondary crushers will be partially enclosed.
- Canada Nickel will install a trolley-assist system in the Open Pit for haul trucks to reduce diesel fuel combustion during phase 1 of operations.
- Canada Nickel will optimize the road network design and the mining schedule to reduce haulage distances
- Canada Nickel will implement the following unpaved road mitigation methodologies:
  - Once the mining operations are able to sustain the aggregate needs, haul roads will be surfaced with crushed gabbro from the Open Pit, which contains low percentages of silica, and will produce a hardened surface that will result in reduced silica emissions relative to other rock types.

  - Usage of dust suppressants during non-precipitation days in the summertime. Watering application rates and intervals will be adjusted to achieve the required mitigation efficiency, and additional operational measures that can control water evaporation rates will be implemented if needed.
- Canada Nickel will acquire mobile equipment that meet applicable Transport Canada off-road vehicle emission requirements (Tier 4 emissions standards), where feasible.
- Canada Nickel will implement effective and timely vehicle maintenance to maintain equipment in good working condition.
- Canada Nickel will implement a Traffic Management Plan for the Project.
- Implement an idling policy on site for mobile equipment and vehicles.

4.2.7.3 Closure Emission Control

Mitigation measures for potential air emission concerns during the closure phase will be similar to those for the construction phase.

4.3 Dispersion Modelling – Approach and Methods

This section presents an overview of the dispersion modelling methodologies used in this study.

4.3.1 Modelling Assessment Approach

In this study, several dispersion modelling scenarios were assessed to represent different construction and operational aspects of the Project. A summary of the dispersion modelling scenarios assessed in this study is presented in Table 4.5. For modelling purposes, the worst case emissions for construction were selected to be Year -1 and for operations in Year 7 as these represent the years with maximum mine activity or throughputs that correspond to maximum emission rates.

Table 4.5 Summary of Dispersion Modelling Scenarios Assessed

Scenario	Air CoPCs	Sources Modelled	Receptors
Construction	All [1]	Construction Sources	Special Receptors
Construction	Selected CoPCs [2]	Construction Sources	Gridded Receptors[4]
Construction	All [1]	Construction Sources	Modelled Mine Boundary
Operation	All [1]	Project Sources	Special Receptors
Operation	Selected CoPCs [2]	Project Sources	Gridded Receptors[4]
Operation	All [1]	Project Sources	Modelled Mine Boundary
Current Traffic	Traffic Emissions[3]	Current Highway 655 Alignment	Special Receptors

Scenario	Air CoPCs	Sources Modelled	Receptors
Future Traffic	Traffic Emissions[3]	Project Sources (Operation) with Realigned Highway 655 and new rail spur	Special Receptors

Notes:
1. CoPCs from the Project include SPM, PM_{10}, $PM_{2.5}$; other CACs including NO_X, SO_2, CO; and hazardous air pollutants including PAHs, VOCs and metals.
2. CoPCs requiring additional modelling analysis to determine magnitude, extent, frequency, severity and sensitivity.
3. CoPCs listed in the Ministry of Transportation (MTO) Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects (MTO 2020)
4. Details on gridded receptors provided in Section 4.3.4.

4.3.2 Modelling Domain

The assessment area for air quality dispersion modelling was composed of a 32 km by 42 km domain, which is consistent with the LSA shown in Appendix A, Figure A.1 of this report.

4.3.3 Air Dispersion Modelling Methodology

Ontario Regulation O. Reg. 419/05 requires concentrations to be calculated with an approved dispersion model used in accordance with the MECP publication Air Dispersion Modelling Guideline for Ontario (MECP Guideline A-11) (MECP 2017b).

4.3.3.1 Dispersion Model Used

The methodology applied to predict the air quality effect of the releases of air CoPCs to the atmosphere is based on the MECP Guideline A-11 (MECP 2017b) and is presented herein. The results of the emission inventory were used to prepare a dispersion modelling assessment of the Project for comparison against the applicable ambient air quality standards. The US EPA dispersion model, AERMOD (Version 22112) (US EPA 2022b), was used to predict the maximum 1-hour, 8-hour, 24-hour, 30 day and annual average ground level concentrations (GLCs). AERMOD is an approved model by the MECP for assessing contaminants against Schedule 3 limits of O. Reg. 419/05. Maximum ground level concentration estimates from Project emissions were determined over an approximate 32 km by 42 km domain with varying receptor grid points to capture the maximum concentrations.

AERMOD is a steady-state plume model that is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including, point, area and volume sources). In the Stable Boundary Layer, the concentration distribution is assumed to be Gaussian in both the vertical and horizontal. Vertical profiles of wind speed wind direction, turbulence temperature, and temperature gradient are estimated using available meteorological observations. AERMOD accounts for the vertical inhomogeneity of the Planetary Boundary Layer (PBL). This is accomplished by "averaging" the parameters of the actual Stable Boundary Layer into "effective" parameters of an equivalent homogeneous PBL. With these effective parameters, AERMOD accounts for the inhomogeneity of the PBL, in an averaged sense.

Parameters that directly influence the dispersion of pollutants include; wind speeds and direction, atmospheric stability and mixing layer depths. Meteorological conditions that may lead to high GLCs from elevated point sources are typically either convective atmospheric stability with light winds or neutral conditions with high wind speeds. Both of these conditions lead to the plume rapidly being carried to ground level close to the source. High concentrations from low elevated sources, elevated sources with building or topography effects, or virtual sources are typically due to stable conditions with light winds.

4.3.3.2 Meteorological Data Sources

The local meteorology of the region must be characterized to evaluate the short-term atmospheric dispersion and transport of emissions released by the Project. The data required for predicting dispersion and transport includes: wind speeds and direction, temperature, atmospheric stability, and mixing layer depth. Wind and temperature data are readily available from meteorological stations, but atmospheric stability and mixing layer depth are calculated from additional raw meteorological data including; cloud cover and opaque sky cover.

A five-year (2018 – 2022) meteorological dataset provided by the MECP was used in the modelling assessment. Upper air data from ECCC's Maniwaki station and surface data from NAV Canada's Timmins airport station were processed using AERMET version 22112. The meteorological data were processed by the MECP to reflect the land uses surrounding the proposed site.

4.3.3.3 Wind Speed and Direction

The frequency distribution of wind speeds (from AERMET) at the Project is shown on Figure 4.2. A wind rose plot is presented on Figure 4.3. The predominant winds blow from southerly, northwesterly, and southwesterly directions.

Figure 4.2 Wind Class Frequency Distribution for the MECP Meteorological Data Set

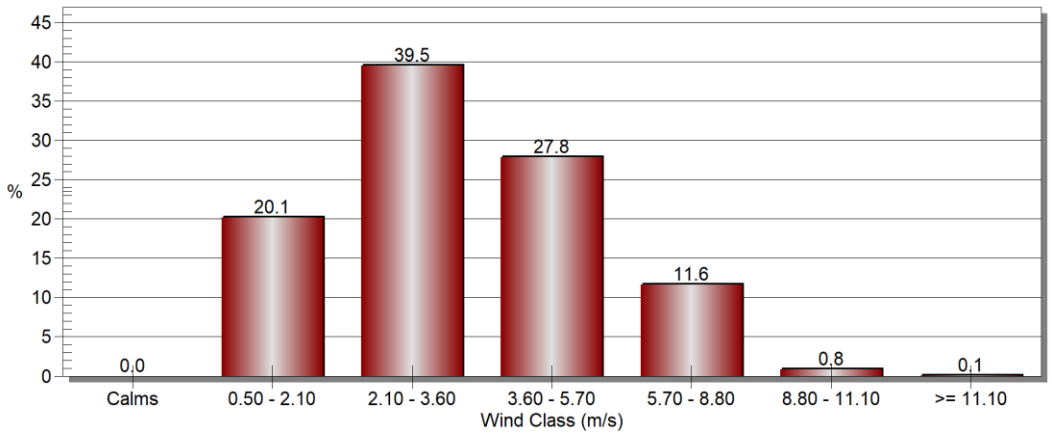
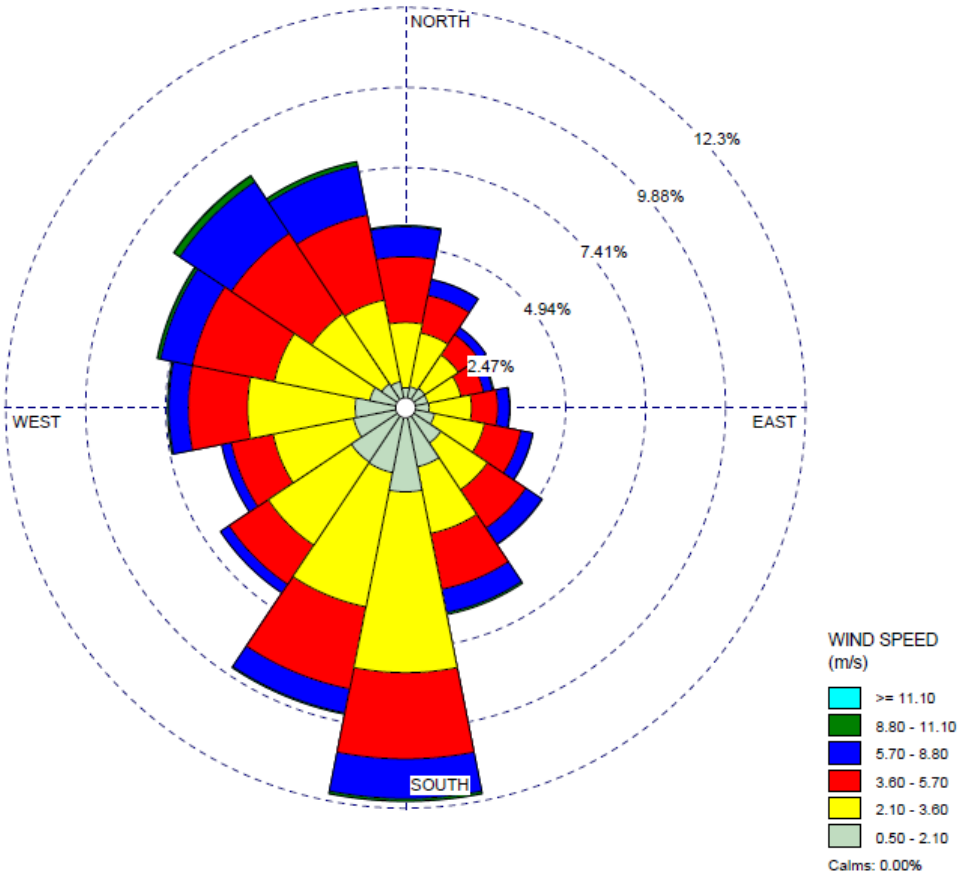


Figure 4.3 Wind Rose Plot for the MECP Meteorological Data Set



4.3.3.4 Building Downwash

Wind dependent building/obstacle dimensions are an input to AERMOD for use in the building wake and building downwash calculations for point source emissions. Emissions sources that would be affected by building downwash were included in the AERMOD modelling, such as dust collector stacks.

A plan view of the Project process area showing the building layout used in the dispersion modelling during construction and operations are presented in Appendix A, Figure A.5.1 and Figure A.5.2, of this report respectively.

4.3.3.5 Topographic Data

Canadian Digital Elevation Data (CDED) data for the LSA was acquired from the MECP and evaluated using AERMOD's terrain processor (AERMAP) for use in the dispersion modelling.

4.3.3.6 Averaging Periods

The AERMOD model is capable of predicting concentrations for a variety of averaging times of 1-hour and greater than 1-hour. For this Project, the model was run for 1-hour, 8-hour, 24-hour, 30-day, and annual averaging times to give results that can be directly compared to O. Reg. 419/05 and federal criteria.

Model predictions for averaging periods not mentioned above were converted to the required period following MECP guidance provided in Guideline A-11 (MECP 2017b).

4.3.4 Receptor Grid

An approximately 32 km by 42 km computational domain of gridded receptors was used in the modelling assessment, as well as receptors along the Modelled Mine Boundary. Receptors were placed around four bounding boxes that encompassed the emission sources, with spacings following guidance in the MECP Guideline A-11 (MECP, 2017b).

A total of 6,438 receptors (2,324 gridded receptors, 4,009 Modelled Mine Boundary receptors and 105 special receptors) were utilized in the assessment.

The extended receptor grid around the Modelled Mine Boundary is shown in Appendix A of this assessment. The locations of the special receptors are shown in Appendix A Figure A.3 of this report.

4.3.5 Emission Source Data

The Project emissions sources were modelled following the protocols and procedures outlined in the MECP Guideline A-11 (MECP 2017b). The methodologies are described in detail in Appendix C of this assessment.

4.3.5.1 Construction Scenario

Detailed descriptions of the emissions sources for the Project are provided in Appendix C. A summary of the emission source parameters used in the AERMOD dispersion modelling is also provided in Appendix C. The locations of the emission sources are shown in Appendix A, Figure A.7 of this report.

4.3.5.1.1 Area Sources

The following emission sources were modelled as area sources to reflect the geometry and area of the sources they represent (unloading particulate emissions, material movement/grading/mobile emissions, and stockpile wind erosion) which follows the MECP Guideline A-11 (MECP 2017b) that stipulates that surface wind erosion emissions be modelled as area sources.

- WR1: waste rock impoundment unloading dust emissions
- WR2: Waste Rock Impoundment material movement/grading/mobile emissions
- WR3: Waste Rock Impoundment wind erosion

- LGE1: Low Grade Ore East unloading dust emissions
- LGE2: Low Grade Ore East material movement/grading/mobile emissions
- LGE3: Low Grade Ore East wind erosion
- ST1: Sand and Till Impoundment unloading dust emissions
- ST2: Sand and Till Impoundment material movement/grading/mobile emissions
- ST3: Sand and Till Impoundment wind erosion
- LGW2: Low Grade Ore West material movement/grading/mobile emissions
- WMEX1: Water Management excavation truck loading dust emissions
- WMEX2: Water Management excavation mobile emissions
- TMFEX1: TMF excavation truck loading dust emissions
- TMF1: TMF truck unloading dust emissions
- TMF2: TMF excavation mobile emissions
- RDSC1B: Roadstone Crusher finished product loading onto stockpiles
- RDSC1C: Roadstone Crusher finished product loading into truck3
- RDSC4: Roadstone Crusher - crushed material stockpile wind erosion
- CL1: Clay Impoundment unloading dust emissions
- CL2: Clay Impoundment material movement/grading/mobile emissions
- CL3: Clay Impoundment wind erosion
- PLANT_CONS: mobile emissions from construction equipment

4.3.5.1.2 Volume Sources

The MECP Guideline A-11 states the following for volume sources: *"Volume sources are used to model releases from a variety of industrial sources, such as building roof monitors, fugitive leaks from an industrial facility, multiple vents, and stacker drop points."* Stantec modelled the following as volume sources:

- RDSC1A: truck unloading rock to roadstone crusher
- RDSC2: primary crushing at roadstone crusher
- RDSC3: secondary crushing/screening at roadstone crusher

Emissions from paved and unpaved haul routes were modelled as series of volume (line volume) sources with parameters determined based on the recommended approach by the US EPA Haul Road Workgroup Final Report (US EPA 2012). The following sources were modelled as line volume sources:

- ACCESSAB: access road
- HAUL1AB: R1 to pit ring road

- HAUL2A: Haul1 around TMF perimeter - 1 way road
- HAUL3A: MZ entrance to pit ring road
- HAUL4AB: MZ1 to LG east entrance
- HAUL5A: LG east to EZ1 entrance
- HAUL6A: EZ1 entrance to pit ring road intersection
- HAUL7A: pit ring road to sand and till south end
- HAUL8A: pit ring road to clay impoundment south end
- HAUL9A: EZ1 entrance to HAUL6A
- HAUL16A: ring road to LG east stockpile
- HAUL21A: ring road into waste rock dump WRD1
- RAIL1: locomotive emissions from train idling at Canada Nickel
- RAIL2: locomotive emissions from new Canada Nickel rail spur

4.3.5.1.3 Point Sources

Point sources representing stacks or vents were not used for this scenario as there are none present for construction.

4.3.5.1.4 Open Pit Sources

The dispersion of emissions sources in the Open Pit were modelled using the Pit Source algorithm in AERMOD. This methodology accounts for the portion of particulate matter emissions that would be retained in the Open Pit due to the generally lower wind speeds found in Open Pit relative to the surface above. For use of this algorithm, the dimensions of the Open Pit (width, length) and volume are required. An equivalent, effective volume was calculated based on the average pit volume over Year -1. The following sources were modelled as pit sources:

- MZ: Main Zone Open Pit - Year -1
- MZ_BLAST: blasting emissions from Main Zone Open Pit - Year -1
- MZ_HAUL: haul road dust emissions from Main Zone Open Pit - Year -1
- EZ1: East Zone 2 Open Pit - Year -1
- EZ1_BLAST: blasting emissions from East Zone 1 Open Pit - Year -1
- EZ1_HAUL: haul road dust emissions from East Zone 1 Open Pit - Year -1

4.3.5.2 Operations Scenario

Detailed descriptions of the emissions sources for Project operations are provided in Appendix C of this assessment. A summary of the emission source parameters used in the AERMOD dispersion modelling is also provided in Appendix C of this assessment. The locations of the emission sources are shown on Figure A.8 in Appendix A of this report.

4.3.5.2.1 Area Sources

The following emission sources were modelled as area sources to reflect the geometry and area of the sources they represent (unloading dust emissions, material movement/grading/mobile emissions and stockpile wind erosion) which follows the MECP Guideline A-11 (MECP 2017b).

- WR1: Waste Rock Impoundment unloading dust emissions
- WR2: Waste Rock Impoundment material movement/grading/mobile emissions
- WR3: Waste Rock Impoundment wind erosion
- LGE1: Low Grade Ore East unloading dust emissions
- LGE2: Low Grade Ore East material movement/grading/mobile emissions
- LGE3: Low Grade Ore East wind erosion
- ST1: Sand and Till Impoundment unloading dust emissions
- ST2: Sand and Till Impoundment material movement/grading/mobile emissions
- ST3: Sand and Till Impoundment wind erosion
- LGW1: Low Grade Ore West unloading dust emissions
- LGW2: Low Grade Ore West material movement/grading/mobile emissions
- LGW3: Low Grade Ore West wind erosion
- TMF1: TMF truck unloading dust emissions
- TMF2: TMF excavation mobile emissions
- TMF3: TMF wind erosion
- RDSC1B: Roadstone Crusher - finished product loading onto stockpiles
- RDSC1C: Roadstone Crusher - finished product loading into trucks
- RDSC4: Roadstone Crusher - crushed material stockpile wind erosion
- CL1: Clay Impoundment unloading particulate emissions
- CL2: Clay Impoundment material movement/grading/mobile emissions
- CL3: Clay Impoundment wind erosion
- PLANT_OP: mobile emissions from processing plant equipment

4.3.5.2.2 Volume Sources

Stantec modelled the following as volume sources following MECP Guideline A-11 (MECP 2017b):

- RDSC1A: truck unloading rock to the Roadstone Crusher
- RDSC2: primary crushing at the Roadstone Crusher
- RDSC3: secondary crushing/screening at the Roadstone Crusher
- P1A: truck unloading to Primary Crusher 1
- P2A: truck unloading to Primary Crusher 2
- P1B: primary crushing and conveying at Primary Crusher 1
- P2B: primary crushing and conveying at Primary Crusher 2
- P1C: secondary screening/crushing/conveying at Secondary Crusher 1
- P2C: secondary screening/crushing/conveying at Secondary Crusher 2
- P1D: crushed ore stockpiling at Ore Stockpile 1
- P2D: crushed ore stockpiling at Ore Stockpile 2
- P1E: ore grinding at Processing Plant 1
- P2E: ore grinding at Processing Plant 2
- P1CL1: drop to concentrate pile inside Processing Plant 1
- P2CL1: drop to concentrate pile inside Processing Plant 2
- P1R1: reagents at Processing Plant 1
- P2R1: reagents at Processing Plant 2
- P1CL2: Railcar loading inside Processing Plant 1
- P2CL2: Railcar loading inside Processing Plant 2

Emissions from paved and unpaved haul routes were modelled as a series of volume (line volume) sources with parameters determined based on the recommended approach by the US EPA Haul Road Workgroup Final Report (US EPA 2012). The following sources were modelled as line volume sources:

- ACCESSAB: access road
- HAUL1AB: haul road - R1 to pit ring road
- HAUL2B: haul road - Haul1 around TMF perimeter
- HAUL4AB: haul road - MZ1A to LG east entrance
- HAUL5B: haul road - LG east to EZ2 entrance
- HAUL6B: haul road - EZ2 entrance to pit ring road intersection
- HAUL7B: haul road - pit ring road to sand and till

- HAUL8B: haul road - pit ring road to clay impoundment - one way road
- HAUL11B: haul road - S&T to WRD
- HAUL12B: haul road - WRD to future MZ3 entrance
- HAUL13B: haul road - future MZ3 entrance to LG west entrance
- HAUL14B: haul road - LG east to PC 2 entrance
- HAUL15B: haul road - PC 2 to MZ3 entrance
- HAUL16B: ring road to LG east stockpile
- HAUL17B: ring road to PC 2
- HAUL18B: ring road to LG west stockpile
- HAUL19B: ring road to waste rock impoundment
- HAUL20B: ring road to EZ2 entrance
- HAUL21B: ring road - MZ3 entrance to HAUL4AB
- RAIL1: locomotive emissions from train idling at Canada Nickel
- RAIL2: locomotive emissions from new Canada Nickel rail spur

4.3.5.2.3 Point Sources

The following were modeled as point sources because they emit through a stack or vent:

- P1DC1: primary crushing dust collector at Primary Crusher 1
- P2DC1: primary crushing dust collector at Primary Crusher 2
- P1DC2: secondary screening/crushing dust collector at Secondary Crusher 1
- P2DC2: secondary screening/crushing dust collector at Secondary Crusher 2
- P1DC3: crushed ore dust collector at Crushed Ore Stockpile 1
- P1DC4: crushed ore dust collector at Crushed Ore Stockpile 1
- P2DC3: crushed ore dust collector at Crushed Ore Stockpile 2
- P2DC4: crushed ore dust collector at Crushed Ore Stockpile 2

4.3.5.2.4 Open Pit Sources

The dispersion of emissions sources in the Open Pit were modelled using the Pit Source algorithm in AERMOD. The following sources were modeled as pit sources:

- MZ: main zone Open Pit - Year 7
- MZ_BLAST: blasting emissions from main zone Open Pit - Year 7
- MZ_HAUL: haul road dust emissions from main zone Open Pit - Year 7
- EZ2: east zone 2 Open Pit - Year 7

- EZ2_BLAST: blasting emissions from east zone Open Pit - Year 7
- EZ2_HAUL: haul road dust emissions from east zone Open Pit - Year 7

4.3.5.3 Particulate Deposition Data

Particulate deposition rates were predicted at special receptor locations for use in other technical data reports and for comparison to applicable MECP criteria. The AERMOD dispersion model requires additional input data to predict deposition.

Particle size distribution data were defined for six types of sources: unpaved roads, Storage Area/Stockpile handling, wind erosion, bulldozing, blasting and minerals processing.

Utilizing the particle sizes defined by the values of the constant “k” in the US EPA emission factor algorithm for each source type, a cumulative mass distribution for each source type was determined and a second order polynomial best fit curve was applied to allow derivation of 7 particle size categories for each source type. The representative mean aerodynamic diameter for each particle size category was calculated based on the US EPA HHRAP (US EPA, 2005). A summary of the particle size distributions used in the assessment is provided in Table 4.6.

Table 4.6 Summary of Particle Size Distributions used in the Assessment

Aerodynamic Diameter (um)			Mass Fraction					
Lower	Upper	Mean	Unpaved Roads	Handling Emissions	Wind Erosion	Bulldozing	Blasting	Minerals Processing
0.0	2.5	1.6	0.069	0.100	0.090	0.105	0.135	0.007
2.5	5.0	3.9	0.072	0.134	0.129	0.018	0.125	0.015
5.0	10.0	7.8	0.151	0.237	0.231	0.074	0.222	0.027
10.0	15.0	12.7	0.162	0.195	0.193	0.125	0.185	0.126
15.0	20.0	17.6	0.172	0.153	0.156	0.175	0.148	0.200
20.0	25.0	22.6	0.182	0.111	0.119	0.226	0.111	0.275
25.0	30.0	27.6	0.192	0.070	0.081	0.277	0.074	0.349
Total			1.001	0.997	1.000	1.000	0.999	1.000

Particle densities of 1 g/cm^3 were used for all sources as the particle size distributions are aerodynamic diameters that assume, by definition, a unit density.

4.3.5.4 Conversion of Nitric Oxide to Nitrogen Dioxide

Nitrogen oxides or NOx is composed of nitric oxide (NO) and nitrogen dioxide (NO_2). However, only NO_2 has an ambient air quality criteria. In combustion emissions, typically most of the NOx emissions are NO and only a small percentage are NO_2. Once in the ambient air, NO is oxidized by ground level O_3 to produce NO_2 as follows:

$$NO + O_3 \rightarrow NO_2 + O_2$$

The following lists different conversion treatments recommended by the US EPA:

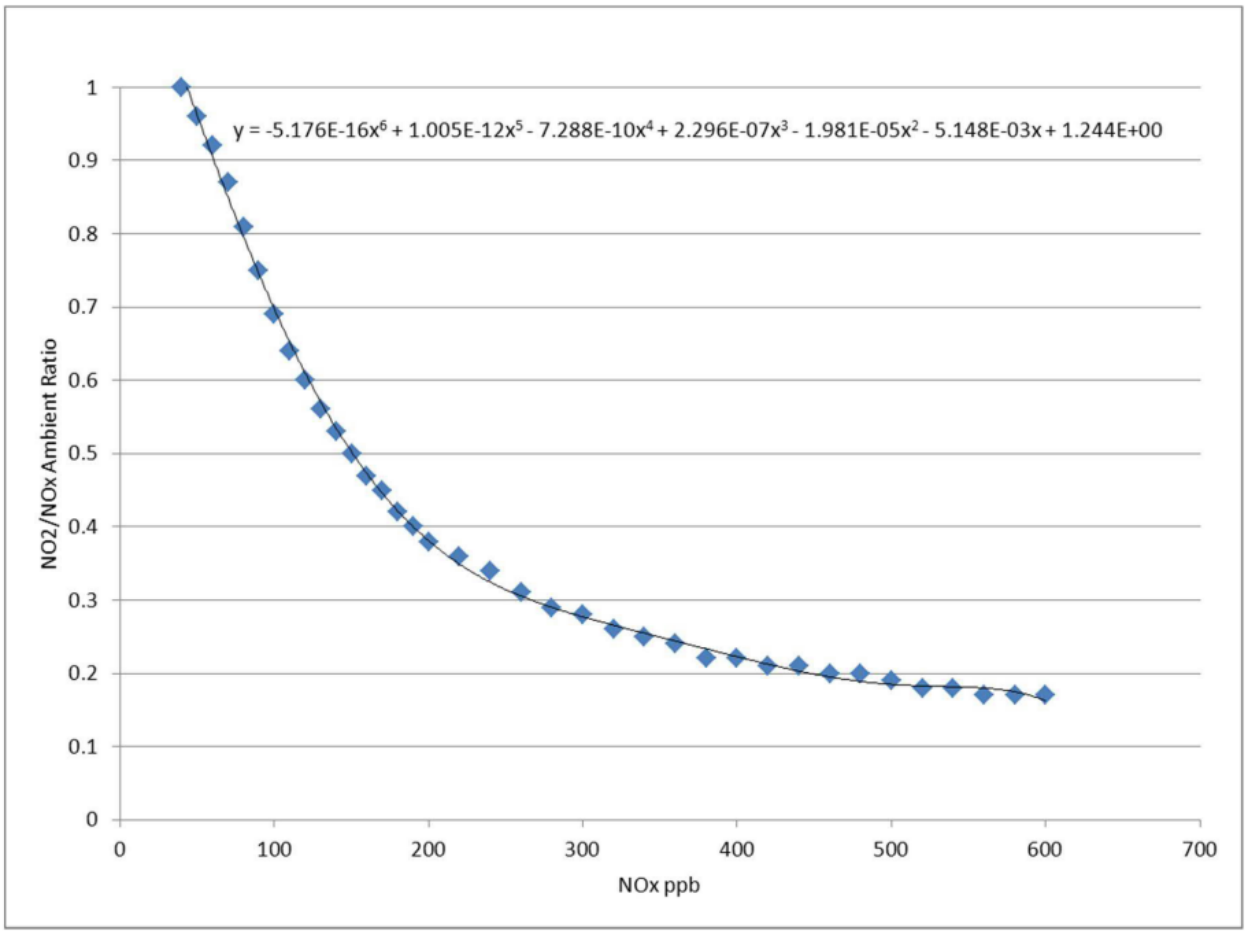
- Tier 1 - 100% of emitted NO_X converts to NO_2
- Tier 2 - Ambient Ratio Method (ARM2)
- Tier 3 - Ozone Limiting Method (OLM) or Plume Volume Molar Ratio Method (PVMRM)

In this assessment, the Ambient Ratio Method (ARM2) method was used to predict ambient NO_2 concentrations. The ARM2 module is built into the AERMOD model. This module applies a varying ambient ratio of NO_2 to total NO_X in the atmosphere to calculate NO_2 concentrations based on modelled NO_X concentrations (the ratio decreases with increasing NO_X concentrations). In the application of ARM2, the ratios assume that all NO_x/NO_2 concentrations are expressed in parts per billion (ppb) using the following equation from the British Columbia Ministry of Environment and Climate Change Strategy (BCMECCS 2022):

$$\mu g/m^3 = ppb * 1.88$$

Figure 4.4 presents the ambient ratios and the ARM2 equation (RTP, 2013).

Figure 4.4 Ambient NO_2/NOx Ratios and ARM2 Equation



The ratios applied in this study were constrained to a maximum of 0.90 and a minimum value of 0.50 to maintain an appropriate level of conservatism in the results (based on current US EPA recommendations for maximum and minimum equilibrium ratios).

4.3.5.5 Highway 655 Road Realignment Assessment

Emissions from offsite traffic associated with the Project and existing/future traffic levels on Highway 655 and the existing rail lines in combination with onsite mobile source emissions (haul roads and new rail spur) for Operations were assessed. Measured background concentrations were also considered to account for cumulative effects.

Traffic volumes data for the year 2020 and projected traffic volume for the year 2030 were provided for Highway 655 (between Kidd Creek Mine Road and Highway 11) in Traffic Impact Study (Appendix C.8 of the Impact Statement). A growth factor from year 2020 to 2030 was calculated and this was used to calculate the projected baseline (2024) and realigned highway (2040) offsite traffic volumes. The offsite vehicle emission rates for both the baseline and realigned highway were estimated using the US EPA

Motor Vehicle Emission Simulator version 3 (MOVES3). Paved road particulate emissions from re-suspended road surface material were estimated using US EPA AP-42 Chapter 13.2.1. Emissions of PM_{10}, $PM_{2.5}$, CO, NO_2, benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein and B(a)P were assessed consistent with the Ministry of Transportation (MTO) document "Ministry of Transportation Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects" (MTO, 2020).

The realigned Highway 655 and rail dispersion modelling predictions were conservatively combined with the AERMOD onsite Operation dispersion modelling predictions and measured background concentrations. The assessment was conducted for all identified special receptor locations. This methodology is expected to be conservative as it assumes that the maximum predicted concentration due to Highway 655 vehicle traffic occurs simultaneously with the maximum predicted concentration from the Project, which is expected to be infrequent.

Figure A.9 in Appendix A of this report shows the original and realigned Highway 655 and the rail corridor included in the dispersion modelling.

4.3.6 Model Options and Approaches

The following section provides additional detail on model inputs and modelling approaches used in the assessment.

4.3.6.1 Source and Receptor Base Elevations

Base elevations for all sources including special, gridded and Modelled Mine Boundary receptors were assigned using the CDED data acquired from the MECP.

4.3.6.2 On-Site Haul Road Volume Source Setup

The on-site haul routes will be double lanes and were modelled as two lanes with a road width of 35 m in the assessment. The truck width and heights that were used for calculating plume dimensions were based on weighted averages of the three major truck types (i.e., clay, sand and rock trucks) anticipated to be used for the Project. Based on this data, the release height, plume height and width were calculated as per the US EPA Memorandum "Haul Road Workgroup Final Report Submissions", March 2, 2012 (US EPA, 2012).

4.3.6.3 Off-Site Roads (Highway 655) Volume Source Setup

Emissions from Project traffic on Highway 655 were included in the assessment. Emissions from the highway included emissions from both existing (public) traffic as well as Project traffic. The existing and proposed Highway 655 realignment were modelled as two lanes with a road width of 7.5 m. The traffic heights that were used for calculating plume dimensions were based on the vehicle type distributions provided in the Traffic Impact Study (Appendix C.8 of the Impact Statement). The dispersion modelling of Highway 655 road emissions assessed concentrations at special receptors only, which follows guidance provided by the MTO Air Quality Guideline (MTO 2020).

4.3.6.4 On-Site Train Volume Source Setup

The on-site Canada Nickel trains were modelled as one lane in the assessment. The plume width is based on a locomotive width of 3 m and the plume height is based on a locomotive height of 4.2 m. Based on this data, the release height, plume height and width were calculated as per the US EPA Memorandum “Haul Road Workgroup Final Report Submissions”, March 2, 2012 (US EPA, 2012).

4.3.6.5 Off-Site Train Volume Source Setup

The off-site Kidd Mine trains were also modelled as one lane in the assessment using the same parameters as for the on-site train modelling.

4.3.6.6 Modelling Haul Roads and Stockpile Wind Erosion

Modelling of SPM, PM_{10}, $PM_{2.5}$ and metals emissions from haul roads and stockpile wind erosion was completed using three methodologies: i) the Base Method; ii) the Refined Method and iii) the MECP method. Modelling results are provided for each method.

The first methodology (Base Method) was to include emissions of SPM, PM_{10}, $PM_{2.5}$ and metals from these sources in the dispersion modelling assessment without accounting for deposition and depletion of particulate from the plume. This methodology is highly conservative as research has demonstrated that air quality models typically over-predict ambient air quality from these sources and that, in reality, air quality effects generally only extend a few hundred metres from the source. Much of the ground level fugitive dust is likely to be removed close to the source due to the low release height and turbulence which leaves the particles temporarily close to the ground where they are subject to removal by impaction on horizontal and nearby vertical surfaces (including vegetation and structures) (Countess et al 2001).

The second methodology (Refined Method) was to include emissions of SPM, PM_{10}, $PM_{2.5}$ and metals from these sources in the dispersion modelling assessment but to use the plume deposition and depletion algorithms in the AERMOD model to estimate ambient concentrations of these CoPCs accounting for a portion of the CoPCs being deposited on the ground between each source and receptor. This method is expected to provide a refinement to the conservative dispersion assumptions in the first method.

The third methodology followed MECP guidance provided in Chapter 7.4.1 of the MECP procedure document (MECP 2018). This document notes that for sectors where metals in fugitive dust must be considered, fugitive particulate from on-site roadways and storage piles may be excluded from the modelling assessment when a facility implements a best management plan (BMP). As it is expected that Canada Nickel will develop and maintain/implement a best management plan (BMP) to control fugitive dust from the Project, modelling of SPM, PM_{10} and $PM_{2.5}$ was conducted excluding emissions from haul roads and stockpile wind erosion and without plume deposition or depletion, and these model results were used for comparison to the applicable air quality standards for these CoPCs. The modelling assessment did, however, conservatively model all metal emissions from the haul roads and storage pile wind erosion This approach (MECP Method) is consistent with that used in other recent mining EAs in Ontario.

4.3.6.7 Open Pit Source Algorithm

The Open Pit source algorithm used in AERMOD requires additional inputs including the depth of the Open Pit and the average release height of emissions within the Open Pit. The parameters used in modelling the two operational pits (Main Zone and East Zone) in the construction and operations scenarios are presented in Table 4.7.

Table 4.7 Open Pit Model Parameters

Parameter	Construction		Operations	
Pit ID	MZ	EZ1	MZ	EZ2
Depth (m)	12.2	42.2	350	200
Width (m)	620	802	1100	620
Length (m)	620	802	1059	615
Average Release Height (m)	6.1	21.1	175	100

4.3.6.8 Particulate Deposition Calculations

Particulate depositions (i.e., dustfall) at special receptor locations were conservatively predicted with AERMOD using the particle size distributions and densities provided in Section 4.3.5.3. Maximum 30-day and total annual depositions were predicted by AERMOD.

4.3.6.9 Modelling Approach

A staged modelling approach was used in the assessment due to the large number of CoPCs, emission sources and receptors to be assessed, that resulted in prohibitively long model run times

Dispersion modelling was conducted for all CoPCs and special / Modelled Mine Boundary receptors using the Multi-Chemical Utility tool in Lakes AERMOD View. The Multi-Chemical run does not provide results by source group other than Group All, does not allow for special pollutant processing options such as ARM2, and does not provide results that exclude meteorological anomalies. The outputs from a Multi-Chemical run provides the maximum concentration at each receptor location. The emissions sources in mines are modelled as either at or slightly above ground level (e.g. on piles). For ground level (or near ground level) emissions sources, the maximum predicted concentration occurs close to the source and decreases with increasing distance from the source. Therefore, the maximum ground level concentration of each CoPC will occur at the Modelled Mine Boundary or a special receptor inside the Modelled Mine Boundary. The results of the Multi-Chemical modelling were used to identify CoPCs that exceeded their relevant criteria at special receptors or at the Modelled Mine Boundary, which were then assessed in individual model runs using the full receptor grid. Additionally, full grid runs were conducted for NO_2 using the ARM2 algorithm.

Individual model runs were completed for SPM, PM_{10}, $PM_{2.5}$, NO_2, aluminum, magnetite, muscovite and chrysotile asbestos. The model outputs from the individual CoPC runs were utilized to analyze concentrations by source groups, develop concentration contour plots, and to report the maximum concentrations excluding meteorological anomalies for selected CoPCs.

The MECP Guideline A-11 (MECP, 2017b), allows for the use of the 9th highest 1-hour modelled result in each year and the 2nd highest 24-hour average modelled result in each year to assess compliance with regulatory criteria. This approach accounts for potential anomalies in the meteorological dataset. In general, meteorological anomalies were, conservatively, not included in the dispersion model predictions except where indicated.

Dispersion modelling following MECP Guideline A-11 (MECP, 2017b) does allow for deposition and depletion of particulate and CoPCs in particulate from plumes as they travel from source to receptor to be accounted for in concentration predictions. As noted in Section 4.3.6.6, this methodology (where deposition and plume depletion are not included) is highly conservative as much ground level fugitive dust is likely to be removed by impaction on horizontal and nearby vertical surfaces (including vegetation and structures). To provide an estimate of the potential reduction in ambient CoPC concentrations due to plume depletion, the Multi-Chemical dispersion models were also run accounting for these effects, using the particle size distributions provided in Section 4.3.5.3. Predicted ambient CoPC concentrations both including and excluding plume particulate depletion are presented in Section 5; however, comparisons to air quality criteria are made using the predictions without plume depletion as per MECP guidelines.

5 Results and Discussion

This section presents the results of the dispersion modelling analyses. The results are presented for the Project Alone as well as the Project in conjunction with measured background concentrations. Addition of background concentrations to the predicted values was done to assess the potential for cumulative effects.

In this section, dispersion model predictions for particulates and metals are presented for the three dispersion modelling methods noted above:

> Base Method: dispersion model predictions including all emissions sources and excluding plume deposition and depletion. Excluding plume deposition and depletion follows MECP guidance (MECP 2017b) but is expected to substantially overpredict ambient particulate and metals concentrations as discussed in Section 4.3.6.6.
>
> Refined Method: dispersion model results including all emissions sources and including plume deposition and depletion (see Section 4.3.6.6).
>
> MECP Method: dispersion model results for SPM, PM_{10} and $PM_{2.5}$ excluding emissions from haul roads and stockpile wind erosion (and excluding plume deposition/depletion) which follows MECP guidance (MECP 2018) for dispersion modelling for ECA applications (see Section 4.3.6.6).

5.1 Assessment of Project Construction on Air Quality

5.1.1 Construction – Project Alone

In Table 5.1 the maximum predicted GLCs at and outside the Modelled Mine Boundary due to the Project construction emissions are presented. The values presented are the maximum predicted values over all the Modelled Mine Boundary receptors and gridded receptors (as noted). The maximum model-predicted values are compared to applicable regulatory limits to assess potential changes in air quality.

Of the 80 CoPCs assessed, 76 are predicted to be below applicable criteria for the Project Alone with only maximum predicted 24-hour average SPM, PM_{10}, muscovite, and aluminum exceeding their respective criteria.

The maximum predicted 24-hour average SPM GLC using the MECP Method is 22 µg/m^3 which is below the MECP AAQC. The maximum predicted 24-hour average SPM GLC using the Base Method is predicted to exceed the 24-hour criterion by 74% at the Modelled Mine Boundary during construction. A contour plot of maximum predicted 24-hour average SPM concentrations (Base Method) throughout the LSA for construction is presented on Figure I.01 in 0 of this report. The figure shows that the AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides. SPM exceedances in this area would be infrequent (no more than 18 days in 5 years or 1% of the time). The main sources contributing to elevated SPM GLCs are the haul roads, Open Pit and sand and till impoundment, with emissions from these sources accounting for concentrations of up to 87%, 24% and 7%, respectively, of

the maximum GLC. Using the Refined Method, the maximum predicted 24-hour average SPM GLC is below the MECP AAQC.

The maximum predicted 24-hour average PM_{10} concentration is below the AAQC using both the Refined and MECP Methods. The maximum predicted 24-hour average PM_{10} concentration using the Base Method exceeds its criterion by 24% for the construction scenario. A contour plot of the maximum predicted 24-hour average PM_{10} concentrations (using the Base Method) throughout the LSA is presented in Appendix I, Figure I.03 of this report. The figure shows that the AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides. PM_{10} exceedances in this area would be infrequent (no more than 5 days in 5 years or 0.3% of the time). The main sources contributing to elevated PM_{10} GLCs (using the Base Method) are the haul roads, Open Pit and the sand and till Impoundment Facility, with emissions from these sources accounting for concentrations of up to 84%, 31% and 7%, respectively, of the maximum predicted GLC.

Maximum predicted 24-hour average aluminum and muscovite concentrations (using the Base Method) were above their criteria by 25% and 195% respectively. The MECP aluminum and muscovite criteria are screening levels (referred to as a B2 value) – an exceedance of a B2 value indicates that further assessment is required to determine if there is a potential for an adverse effect. This assessment is provided in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). Contour plots of maximum predicted 24-hour average muscovite and aluminum concentrations (Base Method) are presented in Appendix I, Figures I.14 and I.15 of this report respectively. The area of exceedance of the screening level for 24-hour average aluminum is small and located close to the Modelled Mine Boundary to the north and east of the Impoundment Facility. The area for which predicted muscovite concentrations are above the MECP screening level extends between 1 - 7 km from the Modelled Mine Boundary. As seen on Figure I.39 in Appendix I of this report, the frequency of exceeding the muscovite screening level is low over most of this area, with exceedance great than 2% of the time only occurring within 1.5 km of the Modelled Mine Boundary. The main sources contributing to elevated muscovite GLCs are the haul roads, Open Pit and the sand and till Impoundment Facility, with emissions from these sources accounting for concentrations of up to 67%, 52% and 15% of the maximum muscovite GLC. For aluminum, the main sources contributing to elevated aluminum GLCs are the haul roads, the Open Pit and the roadstone crusher (up to 90%, 22% and 5% respectively).

For aluminum and muscovite Refined Method dispersion modelling, only 24-hour average muscovite is predicted to exceed its criterion, with the maximum predicted GLC being only 33% above the screening level.

Discussion of predicted ambient NO_2 concentrations with respect to the CAAQS are provided in Section 5.1.3 (Special Receptor Modelling) as the CAAQS are not intended to be used as property line criteria.

Contour plots of maximum predicted (Base Method) Construction phase, Project Alone SPM, PM_{10}, $PM_{2.5}$, NO_2, muscovite, aluminum, B(a)P and chrysotile asbestos concentrations for averaging periods with air quality criteria (or CAAQS) are presented in Appendix I, Figures I.01 through I.18 of this report.

Table 5.1 Maximum Predicted Concentrations for the Construction Scenario - Project Alone

CoPC	CAS No.	Averaging Period (hours)	Criteria	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method – With Plume Depletion	Base Method – Without Plume Depletion				
Total Suspended Particulate Matter (PM) [1]	N/A	24	120	93	208	174%	Mine Boundary	475137	5417904
		8760	60	9	23	38%	Mine Boundary	476793	5417060
Total Suspended Particulate Matter (PM) (MECP Method - excluding haul roads and wind erosion) [2]	N/A	24	120	-	22	19%	Mine Boundary	473839	5417914
		8760	60	-	2.7	5%	Mine Boundary	474279	5417910
Inhalable Particulate Matter (PM_{10}) [1]	N/A	24	50	28	65	129%	Mine Boundary	474858	5417906
Inhalable Particulate Matter (PM_{10}) (MECP Method - excluding haul roads and wind erosion) [2]	N/A	24	50	-	7	15%	Mine Boundary	473839	5417914
Fine Particulate Matter ($PM_{2.5}$) [1], [3]	N/A	24	27	3.2	7	27%	Mine Boundary	474239	5417911
		8760	8.8	0.3	0.8	9%	Mine Boundary	474877	5417906
Fine Particulate Matter ($PM_{2.5}$) (MECP Method - excluding haul roads and wind erosion) [2], [3]	N/A	24	27	-	2.1	8%	Mine Boundary	473839	5417914
		8760	8.8	-	0.3	3%	Mine Boundary	474279	5417910
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	2	N/A - no criteria	1.0	2.1	-	Mine Boundary	468199	5406463
		8760	N/A - no criteria	1.4E-02	2.6E-02	-	Mine Boundary	479418	5410066
Elemental Carbon (from diesel exhaust)	7440-44-0	24	15	0.1	0.3	2%	Mine Boundary	468183	5405668
Carbon Monoxide (CO)	630-08-0	0.5	6,000	-	1,370	23%	Mine Boundary	469673	5403630
		1	36,200	-	1,128	3%	Mine Boundary	469673	5403630
		8	15,700	-	1,426	9%	Mine Boundary	469673	5403630
Sulphur Dioxide (SO_2)	7446-09-5	0.17	178	-	36	20%	Mine Boundary	469673	5403630
		1	100	-	22	22%	Mine Boundary	469673	5403630
		8760	10	-	5.5E-03	<1%	Mine Boundary	479418	5410086
Nitrogen Dioxide (NO_2) [4]	10102-44-0	1	400	-	135	34%	Mine Boundary	472741	5417923
		24	200	-	15	8%	Mine Boundary	479418	5410166
Fluoride	7664-39-3	720	62,124	7.1E-06	1.8E-05	<1%	Mine Boundary	474039	5417912
		1440	46,593	5.8E-06	1.5E-05	<1%	Mine Boundary	474039	5417912
Chromium VI	18540-29-9	24	7.0E-04	6.6E-08	1.5E-07	<1%	Mine Boundary	474119	5417912
		8760	1.4E-04	6.4E-09	1.5E-08	<1%	Mine Boundary	474279	5417910
Chromium VI (in PM_{10})	18540-29-9	24	3.5E-04	2.4E-08	5.3E-08	<1%	Mine Boundary	474119	5417912
		8760	7.0E-05	2.2E-09	5.0E-09	<1%	Mine Boundary	474279	5417910
Mercury	7439-97-6	24	2.0	7.9E-10	1.6E-09	<1%	Mine Boundary	479418	5410166
Aluminum	7429-90-5	24	12	6.7	15	125%	Mine Boundary	475177	5417903
Silver	7440-22-4	24	1.0	2.3E-05	5.4E-05	<1%	Mine Boundary	474877	5417906
Arsenic	7440-38-2	24	0.3	2.4E-04	5.3E-04	<1%	Mine Boundary	474877	5417906
Barium	7440-39-3	24	10	1.1E-02	2.5E-02	<1%	Mine Boundary	474279	5417910

CoPC	CAS No.	Averaging Period (hours)	Criteria	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method – With Plume Depletion	Base Method – Without Plume Depletion				
Beryllium	7440-41-7	24	1.0E-02	1.4E-05	3.2E-05	<1%	Mine Boundary	474139	5417912
Boron	7440-42-8	24	120	8.7E-04	1.9E-03	<1%	Mine Boundary	479417	5411026
Bismuth	7440-69-9	24	2.5	5.5E-06	1.3E-05	<1%	Mine Boundary	474279	5417910
Calcium	7440-70-2	24	N/A - no criteria	8.1	19	-	Mine Boundary	474997	5417905
Cadmium	7440-43-9	24	2.5E-02	5.3E-06	1.2E-05	<1%	Mine Boundary	474877	5417906
		8760	5.0E-03	5.3E-07	1.2E-06	<1%	Mine Boundary	476793	5417060
Cobalt	7440-48-4	24	0.1	4.2E-03	9.4E-03	9%	Mine Boundary	474937	5417905
Chromium	7440-47-3	24	0.5	4.9E-02	0.1	22%	Mine Boundary	474957	5417905
Copper	7440-50-8	24	50	9.3E-03	2.1E-02	<1%	Mine Boundary	475037	5417904
Iron	7439-89-6	24	N/A	4.1	9.3	-	Mine Boundary	474877	5417906
Potassium	7440-09-7	24	10	0.3	0.8	8%	Mine Boundary	474239	5417911
Lithium	7439-93-2	24	20	1.2E-03	2.7E-03	<1%	Mine Boundary	474877	5417906
Magnesium	7439-95-4	24	72	6.5	15	20%	Mine Boundary	474977	5417905
Manganese	7439-96-5	24	0.4	0.1	0.2	50%	Mine Boundary	474937	5417905
Manganese (in PM_{10})	7439-96-5	24	0.2	2.7E-02	0.1	30%	Mine Boundary	474877	5417906
Manganese (in $PM_{2.5}$)	7439-96-5	24	0.1	2.8E-03	6.4E-03	6%	Mine Boundary	474877	5417906
Molybdenum	7439-98-7	24	120	5.1E-05	1.2E-04	<1%	Mine Boundary	474858	5417906
Silicon	7440-21-3	24	27	0.5	1.1	4%	Mine Boundary	479417	5411066
Sodium	7440-23-5	24	N/A - no criteria	0.8	1.8	-	Mine Boundary	479417	5411046
Nickel (in PM)	7440-02-0	24	0.2	2.1E-02	4.7E-02	24%	Mine Boundary	474877	5417906
		8760	4.0E-02	2.1E-03	4.6E-03	11%	Mine Boundary	476793	5417060
Nickel (in PM_{10})	7440-02-0	24	0.1	6.8E-03	1.4E-02	14%	Mine Boundary	479417	5411006
		8760	2.0E-02	6.6E-04	1.4E-03	7%	Mine Boundary	476793	5417060
Lead	7439-92-1	24	0.5	1.2E-04	2.8E-04	<1%	Mine Boundary	474039	5417912
		720	0.2	4.4E-05	3.6E-04	<1%	Mine Boundary	474039	5417912
Antimony	7440-36-0	24	25	3.9E-05	9.0E-05	<1%	Mine Boundary	474858	5417906
Selenium	7782-49-2	24	10	2.7E-05	6.4E-05	<1%	Mine Boundary	474858	5417906
Tin	7440-31-5	24	10	3.0E-04	7.0E-04	<1%	Mine Boundary	474877	5417906
Strontium	7440-24-6	24	120	1.2E-02	2.8E-02	<1%	Mine Boundary	474877	5417906
Titanium	7440-32-6	24	120	0.1	0.3	<1%	Mine Boundary	474877	5417906
Thallium	7440-28-0	24	0.5	3.9E-06	9.4E-06	<1%	Mine Boundary	474119	5417912
Uranium	7440-61-1	24	0.3	1.3E-05	3.3E-05	<1%	Mine Boundary	474039	5417912
		8760	6.0E-02	1.4E-06	3.4E-06	<1%	Mine Boundary	474279	5417910
Uranium (in PM_{10})	7440-61-1	24	0.15	4.5E-06	1.1E-05	<1%	Mine Boundary	474039	5417912
		8760	3.0E-02	4.8E-07	1.1E-06	<1%	Mine Boundary	474279	5417910

CoPC	CAS No.	Averaging Period (hours)	Criteria	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method – With Plume Depletion	Base Method – Without Plume Depletion				
Vanadium	7440-62-2	24	2	1.0E-02	2.4E-02	1%	Mine Boundary	474957	5417905
Tungsten	7440-33-7	24	5	1.5E-05	3.2E-05	<1%	Mine Boundary	479417	5410986
Yttrium	7440-65-5	24	5	4.8E-04	1.1E-03	<1%	Mine Boundary	474858	5417906
Zinc	7440-66-6	24	120	3.5E-03	7.8E-03	<1%	Mine Boundary	474877	5417906
Thorium	7440-29-1	24	N/A - no criteria	7.3E-05	1.6E-04	-	Mine Boundary	479417	5411086
Quartz (in PM_{10})	14808-60-7	24	5	1.0	2.1	41%	Mine Boundary	479418	5410146
Pyrite	12068-85-8	24	N/A - no criteria	1.7E-05	3.4E-05	-	Mine Boundary	479418	5410146
Biotite	1302-27-8	24	N/A - no criteria	0.5	1.1	-	Mine Boundary	474877	5417906
Magnetite	1309-38-2	24	25	0.5	1.1	4%	Mine Boundary	474538	5417908
Hematite	1317-60-8	24	25	1.9E-02	3.7E-02	<1%	Mine Boundary	479418	5410146
Chlorite	1318-59-8	24	120	10	24	20%	Mine Boundary	474937	5417905
Muscovite	1318-94-1	24	1.5	2.0	4.4	295%	Mine Boundary	474179	5417911
Talc (fibrous)	14807-96-6	24	2	0.1	0.2	8%	Mine Boundary	479418	5410146
Chrysotile Asbestos (units are fibres/cm³) [5]	132207-32-0	24	4.0E-02	1.1E-03	2.2E-03	5%	Mine Boundary	479418	5410146
1,3-butadiene	106-99-0	24	10	-	2.0E-03	<1%	Mine Boundary	468183	5405688
		8760	2	-	1.5E-04	<1%	Mine Boundary	479418	5410146
Acenaphthene	83-32-9	24	N/A - no criteria	-	1.5E-04	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	-	1.9E-05	-	Mine Boundary	474792	5394611
Acenaphthylene	208-96-8	24	N/A - no criteria	-	2.5E-04	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	-	3.9E-05	-	Mine Boundary	474792	5394611
Acetaldehyde	75-07-0	0.5	500	-	2.0	<1%	Mine Boundary	469673	5403630
		24	500	-	0.2	<1%	Mine Boundary	468183	5405688
Acrolein	107-02-8	1	4.5	-	0.2	5%	Mine Boundary	468193	5406265
		24	0.4	-	2.5E-02	6%	Mine Boundary	468183	5405688
Anthracene	120-12-7	24	N/A - no criteria	-	8.4E-05	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	-	6.6E-06	-	Mine Boundary	479418	5410066
Benzene	71-43-2	24	2.3	-	3.3E-02	1%	Mine Boundary	468183	5405688
		8760	0.45	-	2.5E-03	<1%	Mine Boundary	479418	5410106
Benzo(a)anthracene	56-55-3	24	N/A - no criteria	-	1.8E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	-	3.0E-07	-	Mine Boundary	474792	5394611
Benzo(a)pyrene	50-32-8	24	5.0E-05	-	1.1E-06	2%	Mine Boundary	468183	5405668
		8760	1.0E-05	-	9.1E-08	<1%	Mine Boundary	479418	5410046
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	24	N/A - no criteria	-	9.6E-07	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	-	1.3E-07	-	Mine Boundary	474792	5394611
Benzo(g,h,i)perylene	191-24-2	24	N/A - no criteria	-	9.6E-07	-	Mine Boundary	469365	5404346

CoPC	CAS No.	Averaging Period (hours)	Criteria	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method – With Plume Depletion	Base Method – Without Plume Depletion				
		8760	N/A - no criteria	-	2.3E-07	-	Mine Boundary	474792	5394611
Chrysene	218-01-9	24	N/A - no criteria	-	2.5E-06	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	-	3.4E-07	-	Mine Boundary	474792	5394611
Dibenzo(a,h) anthracene	53-70-3	24	N/A - no criteria	-	2.8E-07	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	-	2.6E-08	-	Mine Boundary	479418	5410046
Fluoranthene	206-44-0	24	N/A - no criteria	-	1.3E-04	-	Mine Boundary	468183	5405648
		8760	N/A - no criteria	-	1.0E-05	-	Mine Boundary	479418	5410066
Fluorene	86-73-7	24	N/A - no criteria	-	5.1E-04	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	-	3.9E-05	-	Mine Boundary	479418	5410066
Indeno(1,2,3,c,d)pyrene	193-39-5	24	N/A - no criteria	-	4.8E-07	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	-	4.7E-08	-	Mine Boundary	474792	5394611
Naphthalene	91-20-3	0.17	50	-	0.5	1%	Mine Boundary	468193	5406265
		24	22.5	-	3.9E-02	<1%	Mine Boundary	468183	5405688
Phenanthrene	85-01-8	24	N/A - no criteria	-	2.2E-03	-	Mine Boundary	468183	5405688
		8760	N/A - no criteria	-	1.7E-04	-	Mine Boundary	479418	5410186
Pyrene	129-00-0	24	N/A - no criteria	-	1.1E-04	-	Mine Boundary	468183	5405648
		8760	N/A - no criteria	-	8.6E-06	-	Mine Boundary	479418	5410066
Formaldehyde	50-00-0	24	65	-	0.5	<1%	Mine Boundary	468183	5405688
Hydrocarbons	N/A	24	N/A - no criteria	-	1.9	-	Mine Boundary	468183	5405688

Notes:

1. Model predictions for particulates including all emissions sources.
2. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
3. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the AAQC/CAAQS.
4. Maximum predicted 1-hr NO_2 concentrations using the ARM2 method.
5. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm³ using a conversion factor of 1µg/m³ = 0.03 fibres/cm³. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
6. Maximum predicted concentration without plume depletion is compared to the criteria.
7. Mine Boundary receptor location without plume depletion.

5.1.2 Construction - Cumulative Concentrations

Summaries of the maximum predicted cumulative outside Modelled Mine Boundary GLCs for Project Construction are presented in Table 5.2. The values presented in this table are the maximum predicted values over all the outside Modelled Mine Boundary receptors included in the modelling (mine boundary and gridded receptors). Estimated background concentrations, as discussed in Section 3.4, were added to the maximum model-predicted values and compared to applicable regulatory limits to assess potential cumulative changes in air quality. Where no data are available to characterize background levels, the background concentration is noted as (-) in Table 5.2 and was considered to be zero in the assessment.

Of the 80 CoPCs assessed, 75 are predicted to be below applicable criteria for the cumulative predictions (Project + background) with the Base Method. Maximum predicted cumulative SPM, PM_{10}, muscovite, aluminum and benzo(a)pyrene exceed their 24-hour average criteria by 96%, 50%, 32%, 195% and 29% respectively. As no background measurement data is available for muscovite, the maximum predicted cumulative concentration is the same as for the Project Alone. Additionally, cumulative 24-hour and annual average B(a)P are predicted to exceed their criteria by 8% and 2% respectively. The background concentration of B(a)P is above applicable air quality criteria, with the Project only providing a small (1%) contribution to the cumulative concentrations.

When plume deposition and depletion are included in the cumulative predictions (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion is muscovite, with the maximum predicted cumulative GLC being only 33% above the screening level.

The MECP Method (excluding emissions from haul roads and stockpiles) is not applicable to cumulative effects, as the Ontario permitting process does not require background concentrations to be included in the assessment.

Table 5.2 Maximum Predicted Concentrations for the Construction Scenario - Cumulative

CoPC	CAS No.	Averaging Period (hours)	Criteria	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)				% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
					Refined Method - With Plume Depletion		Base Methopd – Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Total Suspended Particulate Matter (PM) [1]	N/A	24	120	26	93	120	208	235	196%	Mine Boundary	475137	5417904
		8760	60	12	9.3	21	23	34	57%	Mine Boundary	476793	5417060
Total Suspended Particulate Matter (PM) (MECP Method - excluding haul roads and wind erosion) [2]	N/A	24	120	26	-	-	22	49	41%	Mine Boundary	473839	5417914
		8760	60	12	-	-	2.7	14	24%	Mine Boundary	474279	5417910
Inhalable Particulate Matter (PM_{10}) [1]	N/A	24	50	13	28	42	65	78	156%	Mine Boundary	474858	5417906
Inhalable Particulate Matter (PM_{10}) (MECP Method - excluding haul roads and wind erosion) [2]	N/A	24	50	13	-	-	7.3	20	41%	Mine Boundary	473839	5417914
Fine Particulate Matter ($PM_{2.5}$) [1], [3]	N/A	24	27	12	3.2	16	7.4	20	73%	Mine Boundary	474239	5417911
		8760	8.8	6.2	0.3	6.5	0.8	7.0	80%	Mine Boundary	474877	5417906
Fine Particulate Matter ($PM_{2.5}$) (MECP Method - excluding haul roads and wind erosion) [2], [3]	N/A	24	27	12.4	-	-	2.1	15	54%	Mine Boundary	473839	5417914
		8760	8.8	6.2	-	-	0.3	6.5	73%	Mine Boundary	474279	5417910
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	2	N/A - no criteria	0.2	1.0	1.2	2.1	2.3	-	Mine Boundary	468199	5406463
		8760	N/A - no criteria	1.8E-02	1.4E-02	3.2E-02	2.6E-02	4.4E-02	-	Mine Boundary	479418	5410066
Elemental Carbon (from diesel exhaust)	7440-44-0	24	15	9.4E-02	0.1	0.2	0.3	0.4	2%	Mine Boundary	468183	5405668
Carbon Monoxide (CO)	630-08-0	0.5	6,000	1,170	-	-	1,370	2,540	42%	Mine Boundary	469673	5403630
		1	36,200	965	-	-	1,128	2,093	6%	Mine Boundary	469673	5403630
		8	15,700	965	-	-	1,426	2,391	15%	Mine Boundary	469673	5403630
Sulphur Dioxide (SO_2)	7446-09-5	0.17	178	8.6	-	-	36	45	25%	Mine Boundary	469673	5403630
		1	100	5.2	-	-	22	27	27%	Mine Boundary	469673	5403630
		8760	10	0.4	-	-	5.5E-03	0.4	4%	Mine Boundary	479418	5410086
Nitrogen Dioxide (NO_2) [4]	10102-44-0	1	400	5.4	-	-	135	140	35%	Mine Boundary	472741	5417923
		24	200	2.2	-	-	15	18	9%	Mine Boundary	479418	5410166
Fluoride	7664-39-3	720	62,124	-	7.1E-06	7.1E-06	1.8E-05	1.8E-05	<1%	Mine Boundary	474039	5417912
		1440	46,593	-	5.8E-06	5.8E-06	1.5E-05	1.5E-05	<1%	Mine Boundary	474039	5417912
Chromium VI	18540-29-9	24	7.00E-04	-	6.6E-08	6.6E-08	1.5E-07	1.5E-07	<1%	Mine Boundary	474119	5417912
		8760	1.40E-04	-	6.4E-09	6.4E-09	1.5E-08	1.5E-08	<1%	Mine Boundary	474279	5417910
Chromium VI (in PM_{10})	18540-29-9	24	3.50E-04	-	2.4E-08	2.4E-08	5.3E-08	5.3E-08	<1%	Mine Boundary	474119	5417912
		8760	7.00E-05	-	2.2E-09	2.2E-09	5.0E-09	5.0E-09	<1%	Mine Boundary	474279	5417910
Mercury	7439-97-6	24	2	6.4E-05	7.9E-10	6.4E-05	1.6E-09	6.4E-05	<1%	Mine Boundary	479418	5410166
Aluminum	7429-90-5	24	12	0.4	6.7	7.1	15	15	129%	Mine Boundary	475177	5417903
Silver	7440-22-4	24	1	2.6E-04	2.3E-05	2.8E-04	5.4E-05	3.1E-04	<1%	Mine Boundary	474877	5417906

CoPC	CAS No.	Averaging Period (hours)	Criteria	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)				% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
					Refined Method - With Plume Depletion		Base Methopd – Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Arsenic	7440-38-2	24	0.3	1.3E-03	2.4E-04	1.5E-03	5.3E-04	1.8E-03	<1%	Mine Boundary	474877	5417906
Barium	7440-39-3	24	10	8.6E-03	1.1E-02	1.9E-02	2.5E-02	3.3E-02	<1%	Mine Boundary	474279	5417910
Beryllium	7440-41-7	24	1.0E-02	7.6E-04	1.4E-05	7.7E-04	3.2E-05	7.9E-04	8%	Mine Boundary	474139	5417912
Boron	7440-42-8	24	120	2.6E-02	8.7E-04	2.7E-02	1.9E-03	2.8E-02	<1%	Mine Boundary	479417	5411026
Bismuth	7440-69-9	24	2.5	1.3E-03	5.5E-06	1.3E-03	1.3E-05	1.3E-03	<1%	Mine Boundary	474279	5417910
Calcium	7440-70-2	24	N/A - no criteria	0.7	8.1	8.8	19	19	-	Mine Boundary	474997	5417905
Cadmium	7440-43-9	24	2.5E-02	2.6E-04	5.3E-06	2.7E-04	1.2E-05	2.7E-04	1%	Mine Boundary	474877	5417906
		8760	5.0E-02	2.6E-04	5.3E-07	2.6E-04	1.2E-06	2.6E-04	5%	Mine Boundary	476793	5417060
Cobalt	7440-48-4	24	0.1	7.6E-04	4.2E-03	5.0E-03	9.4E-03	1.0E-02	10%	Mine Boundary	474937	5417905
Chromium	7440-47-3	24	0.5	6.0E-03	4.9E-02	5.5E-02	0.1	0.1	23%	Mine Boundary	474957	5417905
Copper	7440-50-8	24	50	5.8E-03	9.3E-03	1.5E-02	2.1E-02	2.7E-02	<1%	Mine Boundary	475037	5417904
Iron	7439-89-6	24	N/A	0.2	4.1	4.4	9.3	9.5	-	Mine Boundary	474877	5417906
Potassium	7440-09-7	24	10	0.1	0.3	0.5	0.8	0.9	9%	Mine Boundary	474239	5417911
Lithium	7439-93-2	24	20	-	1.2E-03	1.2E-03	2.7E-03	2.7E-03	<1%	Mine Boundary	474877	5417906
Magnesium	7439-95-4	24	72	0.2	6.5	6.6	15	15	21%	Mine Boundary	474977	5417905
Manganese	7439-96-5	24	0.4	8.6E-03	0.1	9.6E-02	0.2	0.2	52%	Mine Boundary	474937	5417905
Manganese (in PM10)	7439-96-5	24	0.2	8.6E-03	2.7E-02	3.5E-02	5.9E-02	6.8E-02	34%	Mine Boundary	474877	5417906
Manganese (in PM2.5)	7439-96-5	24	0.1	8.6E-03	2.8E-03	1.1E-02	6.4E-03	1.5E-02	15%	Mine Boundary	474877	5417906
Molybdenum	7439-98-7	24	120	7.6E-04	5.1E-05	8.1E-04	1.2E-04	8.8E-04	<1%	Mine Boundary	474858	5417906
Silicon	7440-21-3	24	27	-	0.5	0.5	1.1	1.1	4%	Mine Boundary	479417	5411066
Sodium	7440-23-5	24	N/A - no criteria	0.5	0.8	1.4	1.8	2.3	-	Mine Boundary	479417	5411046
Nickel (in PM)	7440-02-0	24	0.2	2.6E-03	2.1E-02	2.4E-02	4.7E-02	5.0E-02	25%	Mine Boundary	474877	5417906
		8760	4.0E-02	1.7E-03	2.1E-03	3.8E-03	4.6E-03	6.2E-03	16%	Mine Boundary	476793	5417060
Nickel (in PM_{10})	7440-02-0	24	0.1	2.6E-03	6.8E-03	9.4E-03	1.4E-02	1.7E-02	17%	Mine Boundary	479417	5411006
		8760	2.0E-02	1.7E-03	6.6E-04	2.3E-03	1.4E-03	3.0E-03	15%	Mine Boundary	476793	5417060
Lead	7439-92-1	24	0.5	3.4E-03	1.2E-04	3.5E-03	2.8E-04	3.7E-03	<1%	Mine Boundary	474039	5417912
		720	0.2	1.3E-03	4.4E-05	1.4E-03	3.6E-04	1.7E-03	<1%	Mine Boundary	474039	5417912
Antimony	7440-36-0	24	25	1.3E-03	3.9E-05	1.3E-03	9.0E-05	1.4E-03	<1%	Mine Boundary	474858	5417906
Selenium	7782-49-2	24	10	2.6E-03	2.7E-05	2.6E-03	6.4E-05	2.7E-03	<1%	Mine Boundary	474858	5417906
Tin	7440-31-5	24	10	2.4E-03	3.0E-04	2.7E-03	7.0E-04	3.1E-03	<1%	Mine Boundary	474877	5417906
Strontium	7440-24-6	24	120	1.5E-03	1.2E-02	1.4E-02	2.8E-02	3.0E-02	<1%	Mine Boundary	474877	5417906
Titanium	7440-32-6	24	120	8.8E-03	0.1	0.1	0.3	0.3	<1%	Mine Boundary	474877	5417906
Thallium	7440-28-0	24	0.5	2.6E-04	3.9E-06	2.6E-04	9.4E-06	2.7E-04	<1%	Mine Boundary	474119	5417912
Uranium	7440-61-1	24	0.3	2.6E-04	1.3E-05	2.7E-04	3.3E-05	2.9E-04	<1%	Mine Boundary	474039	5417912

CoPC	CAS No.	Averaging Period (hours)	Criteria	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)				% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
					Refined Method - With Plume Depletion		Base Methopd – Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
		8760	0.06	2.6E-04	1.4E-06	2.6E-04	3.4E-06	2.6E-04	<1%	Mine Boundary	474279	5417910
Uranium (in PM_{10})	7440-61-1	24	0.15	2.6E-04	4.5E-06	2.6E-04	1.1E-05	2.7E-04	<1%	Mine Boundary	474039	5417912
		8760	0.03	2.6E-04	4.8E-07	2.6E-04	1.1E-06	2.6E-04	<1%	Mine Boundary	474279	5417910
Vanadium	7440-62-2	24	2	7.6E-04	1.0E-02	1.1E-02	2.4E-02	2.4E-02	1%	Mine Boundary	474957	5417905
Tungsten	7440-33-7	24	5	-	1.5E-05	1.5E-05	3.2E-05	3.2E-05	<1%	Mine Boundary	479417	5410986
Yttrium	7440-65-5	24	5	-	4.8E-04	4.8E-04	1.1E-03	1.1E-03	<1%	Mine Boundary	474858	5417906
Zinc	7440-66-6	24	120	1.5E-02	3.5E-03	1.8E-02	7.8E-03	2.3E-02	<1%	Mine Boundary	474877	5417906
Thorium	7440-29-1	24	N/A - no criteria	0	7.3E-05	7.3E-05	1.6E-04	1.6E-04	-	Mine Boundary	479417	5411086
Quartz (in PM_{10})	14808-60-7	24	5	1.0	1.0	2.0	2.1	3.0	61%	Mine Boundary	479418	5410146
Pyrite	12068-85-8	24	N/A - no criteria	-	1.7E-05	1.7E-05	3.4E-05	3.4E-05	-	Mine Boundary	479418	5410146
Biotite	1302-27-8	24	N/A - no criteria	0	0.5	0.5	1.1	1.1	-	Mine Boundary	474877	5417906
Magnetite	1309-38-2	24	25	ND	0.5	0.5	1.1	1.1	4%	Mine Boundary	474538	5417908
Hematite	1317-60-8	24	25	ND	1.9E-02	1.9E-02	3.7E-02	3.7E-02	<1%	Mine Boundary	479418	5410146
Chlorite	1318-59-8	24	120	ND	10	10	24	24	20%	Mine Boundary	474937	5417905
Muscovite	1318-94-1	24	1.5	ND	2.0	2.0	4.4	4.4	295%	Mine Boundary	474179	5417911
Talc (fibrous)	14807-96-6	24	2	ND	8.4E-02	8.4E-02	0.2	0.2	8%	Mine Boundary	479418	5410146
Chrysotile Asbestos (units are fibres/cm³) [5]	132207-32-0	24	4.0E-02	2.9E-03	1.1E-03	4.0E-03	2.2E-03	5.1E-03	13%	Mine Boundary	479418	5410146
1,3-butadiene	106-99-0	24	10	0.6	-	-	2.0E-03	0.6	6%	Mine Boundary	468183	5405688
		8760	2	0.6	-	-	1.5E-04	0.6	28%	Mine Boundary	479418	5410146
Acenaphthene	83-32-9	24	N/A - no criteria	4.4E-03	-	-	1.5E-04	4.6E-03	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	8.5E-04	-	-	1.9E-05	8.7E-04	-	Mine Boundary	474792	5394611
Acenaphthylene	208-96-8	24	N/A - no criteria	8.2E-03	-	-	2.5E-04	8.4E-03	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	1.6E-03	-	-	3.9E-05	1.6E-03	-	Mine Boundary	474792	5394611
Acetaldehyde	75-07-0	0.5	500	0	-	-	2.0	2.0	<1%	Mine Boundary	469673	5403630
		24	500	0	-	-	0.2	0.2	<1%	Mine Boundary	468183	5405688
Acrolein	107-02-8	1	4.5	0	-	-	0.2	0.2	5%	Mine Boundary	468193	5406265
		24	0.4	0	-	-	2.5E-02	2.5E-02	6%	Mine Boundary	468183	5405688
Anthracene	120-12-7	24	N/A - no criteria	1.6E-04	-	-	8.4E-05	2.5E-04	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	3.1E-05	-	-	6.6E-06	3.7E-05	-	Mine Boundary	479418	5410066
Benzene	71-43-2	24	2.3	0.5	-	-	3.3E-02	0.5	23%	Mine Boundary	468183	5405688
		8760	0.45	0.4	-	-	2.5E-03	0.4	83%	Mine Boundary	479418	5410106
Benzo(a)anthracene	56-55-3	24	N/A - no criteria	0	-	-	1.8E-06	1.8E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	0	-	-	3.0E-07	3.0E-07	-	Mine Boundary	474792	5394611
Benzo(a)pyrene	50-32-8	24	5.00E-05	5.3E-05	-	-	1.1E-06	5.4E-05	108%	Mine Boundary	468183	5405668

CoPC	CAS No.	Averaging Period (hours)	Criteria	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)				% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
					Refined Method - With Plume Depletion		Base Methopd – Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
		8760	1.00E-05	1.0E-05	-	-	9.1E-08	1.0E-05	102%	Mine Boundary	479418	5410046
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	24	N/A - no criteria	2.8E-04	-	-	9.6E-07	2.8E-04	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	5.3E-05	-	-	1.3E-07	5.4E-05	-	Mine Boundary	474792	5394611
Benzo(g,h,i)perylene	191-24-2	24	N/A - no criteria	0	-	-	9.6E-07	9.6E-07	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	0	-	-	2.3E-07	2.3E-07	-	Mine Boundary	474792	5394611
Chrysene	218-01-9	24	N/A - no criteria	3.4E-04	-	-	2.5E-06	3.4E-04	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	6.5E-05	-	-	3.4E-07	6.5E-05	-	Mine Boundary	474792	5394611
Dibenzo(a,h) anthracene	53-70-3	24	N/A - no criteria	0	-	-	2.8E-07	2.8E-07	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	0	-	-	2.6E-08	2.6E-08	-	Mine Boundary	479418	5410046
Fluoranthene	206-44-0	24	N/A - no criteria	8.2E-04	-	-	1.3E-04	9.5E-04	-	Mine Boundary	468183	5405648
		8760	N/A - no criteria	1.6E-04	-	-	1.0E-05	1.7E-04	-	Mine Boundary	479418	5410066
Fluorene	86-73-7	24	N/A - no criteria	1.5E-03	-	-	5.1E-04	2.0E-03	-	Mine Boundary	468183	5405668
		8760	N/A - no criteria	2.8E-04	-	-	3.9E-05	3.2E-04	-	Mine Boundary	479418	5410066
Indeno(1,2,3,c,d)pyrene	193-39-5	24	N/A - no criteria	-	-	-	4.8E-07	4.8E-07	-	Mine Boundary	468183	5405628
		8760	N/A - no criteria	0	-	-	4.7E-08	4.7E-08	-	Mine Boundary	474792	5394611
Naphthalene	91-20-3	0.17	50	0	-	-	0.5	0.5	1%	Mine Boundary	468193	5406265
		24	22.5	-	-	-	3.9E-02	3.9E-02	<1%	Mine Boundary	468183	5405688
Phenanthrene	85-01-8	24	N/A - no criteria	2.2E-03	-	-	2.2E-03	4.4E-03	-	Mine Boundary	468183	5405688
		8760	N/A - no criteria	4.2E-04	-	-	1.7E-04	6.0E-04	-	Mine Boundary	479418	5410186
Pyrene	129-00-0	24	N/A - no criteria	7.1E-04	-	-	1.1E-04	8.3E-04	-	Mine Boundary	468183	5405648
		8760	N/A - no criteria	1.4E-04	-	-	8.6E-06	1.5E-04	-	Mine Boundary	479418	5410066
Formaldehyde	50-00-0	24	65	0	-	-	0.5	0.5	<1%	Mine Boundary	468183	5405688
Hydrocarbons	N/A	24	N/A - no criteria	-	-	-	1.9	1.9	-	Mine Boundary	468183	5405688

Notes:

1. Model predictions for particulates including all emissions sources.
2. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
3. Maximum predicted 24-hour and annual PM2.5 concentrations are presented in the table and conservatively compared to the AAQC/CAAQS.
4. Maximum predicted 1-hr NO2 concentrations using the ARM2 method.
5. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
6. Maximum predicted concentration without plume depletion is compared to the criteria.
7. Mine Boundary receptor location without plume depletion.

5.1.3 Construction - Special Receptor Modelling Results

This section presents the dispersion model predictions of ambient CoPC concentrations at special receptor locations relevant to human and ecological exposure. Special receptor locations used to assess deposition onto LSA waterbodies are not included in the results provided in this section, as those locations were not identified as being pertinent for ambient air quality.

5.1.3.1 Construction – Project Alone

A summary of the maximum predicted CoPC GLCs over all assessed special receptors for the Project Alone, Construction scenario is presented in Table 5.3. The maximum predicted concentration of each CoPC at each special receptor is tabulated in Appendix D of this assessment. In Table 5-3, maximum CoPC concentrations are presented for special receptors inside and outside the Modelled Mine Boundary. The Modelled Mine Boundary delineates the buffer zone around the PA within which public access will be limited and no long term (24-hour or greater) human exposure will be possible. Dispersion model predictions both excluding (Base Method) and including plume deposition and depletion (Refined Method) are presented for particulate and metal CoPCs.

The maximum predicted concentrations of all CoPCs were below applicable criteria for all special receptors outside the Modelled Mine Boundary using the Base, Refined and MECP modelling methods other than muscovite, which was above its screening level by at most 46% at special receptor R9 (a Sensitive Receptor - Indigenous) for the conservative Base Method dispersion modelling, but below the screening level for the Refined Method modelling.

Exceedances of the Project Alone 24-hour average SPM, PM_{10}, aluminum, and muscovite ambient criteria are predicted at receptors inside the Modelled Mine Boundary using the Base Method, with the highest concentrations predicted at receptor R3 which is a camp on the West Buskegau River. This receptor is located approximately 1 km east of the East Ore Stockpile and it is expected that this camp will be removed prior to the start of construction. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.

When plume deposition and depletion are included in the dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion is muscovite, with the maximum predicted GLC being 66% above the screening level at R3. Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ concentrations are below their criteria at all assessed special receptors.

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 1 of the 3 special receptors assessed within the Modelled Mine Boundary and below at all outside Modelled Mine Boundary special receptors. The CAAQS are non-regulatory health and environmentally based ambient air objectives that are used to assess general air quality in air zones and reflect desirable concentrations of contaminants in air from all sources (MECP, 2024). The CAAQS are not used to assess compliance at a facility's property line or at specific locations, but rather are used to assess regional air quality. Predicted concentrations at individual locations above the CAAQS in proximity to the Project are therefore not considered exceedances, but rather are an indicator that air management actions should be considered to reduce ambient levels.

Table 5.3 Summary of Maximum Predicted Concentrations at Special Receptors (Project Alone) – Construction

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)				Special Receptors Outside Modelled Mine Boundary (1)			
			Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)
			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion		
Total Suspended Particulate Matter (SPM) (2)	24	120	90	252	210%	R3	31	93	77%	R9
	8760	60	14	29	48%	R3	1.3	2.7	4%	R9
Total Suspended Particulate Matter (PM) (MECP Method - excluding haul roads and wind erosion) (3)	24	120	-	-	-	-	-	6.1	5%	R9
	8760	60	-	-	-	-	-	0.3	<1%	R9
Inhalable Particulate Matter (PM_{10}) (2)	24	50	29	78	156%	R3	9.9	29	58%	R9
Inhalable Particulate Matter (PM_{10}) (MECP Method - excluding haul road and wind erosion) (3)	24	50	-	-	-	-	-	2.0	4%	R9
Fine Particulate Matter ($PM_{2.5}$) (2), (4)	24	27	3.1	8.4	31%	R3	1.1	3.2	12%	R9
	8760	8.8	0.5	1.0	11%	R3	4.3E-02	9.6E-02	1%	R9
Fine Particulate Matter ($PM_{2.5}$) (MECP Method - excluding haul road and wind erosion) (3), (4)	24	27	-	-	-	-	-	0.5	2%	R9
	8760	8.8	-	-	-	-	-	2.7E-02	<1%	R9
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	2	N/A - no criteria	1.5	3	-	R3	0.6	2.2	-	R9
	8760	N/A - no criteria	2.0E-02	4.4E-02	-	R3	2.2E-03	4.8E-03	-	R1
Elemental Carbon (from diesel exhaust)	24	15	0.2	0.4	3%	R3	4.3E-02	0.1	<1%	R9
Carbon Monoxide (CO)	0.5	6,000	-	1,475	25%	R3	-	1,127	19%	R9
	1	36,200	-	1,215	3%	R3	-	928	3%	R9
	8	15,700	-	679	4%	R3	-	518	3%	R9
Sulphur Dioxide (SO_2) (5)	0.17	178	-	42	24%	R3	-	31	18%	R9
	1	100	-	25	25%	R3	-	19	19%	R9
	1	193	-	25	14%	R3	-	19	10%	R9
	1	179	-	25	15%	R3	-	19	11%	R9
	8760	10	-	9.4E-03	<1%	R3	-	1.1E-03	<1%	R1
	8760	14	-	9.4E-03	<1%	R3	-	1.1E-03	<1%	R1
	8760	11	-	9.4E-03	<1%	R3	-	1.1E-03	<1%	R1
Nitrogen Dioxide (NO_2)	1 (6)	400	-	154	39%	R3	-	139	35%	R9
	1 (7)	119	-	135	113%	R3	-	39	33%	R8
	1 (7)	83	-	135	162%	R3	-	39	47%	R8
	24	200	-	24	12%	R3	-	7.1	4%	R9
	8760	34	-	4.9	14%	R3	-	0.6	2%	R1
	8760	24	-	4.9	20%	R3	-	0.6	3%	R1
Fluoride	720	62,124	3.5E-06	7.8E-06	<1%	R3	1.0E-06	3.2E-06	<1%	R9
	1440	46,593	2.9E-06	6.4E-06	<1%	R3	8.5E-07	2.7E-06	<1%	R9

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion		
Chromium VI	24	7.0E-04	7.5E-08	1.4E-07	<1%	R3	1.8E-08	5.3E-08	<1%	R9
	8760	1.4E-04	5.4E-09	1.1E-08	<1%	R3	4.7E-10	1.2E-09	<1%	R9
Chromium VI (in PM_{10})	24	3.5E-04	2.9E-08	5.4E-08	<1%	R3	7.0E-09	2.0E-08	<1%	R9
	8760	7.0E-05	2.0E-09	4.0E-09	<1%	R3	1.7E-10	4.1E-10	<1%	R9
Mercury	24	2	1.1E-09	2.0E-09	<1%	R3	2.5E-10	7.3E-10	<1%	R9
Aluminum	24	12	6.4	18	151%	R3	2.2	6.6	55%	R9
Silver	24	1	2.2E-05	6.3E-05	<1%	R3	7.8E-06	2.3E-05	<1%	R9
Arsenic	24	0.3	2.5E-04	6.5E-04	<1%	R3	8.3E-05	2.5E-04	<1%	R9
Barium	24	10	1.0E-02	2.7E-02	<1%	R3	3.5E-03	1.0E-02	<1%	R9
Beryllium	24	1.0E-02	1.4E-05	3.1E-05	<1%	R3	4.1E-06	1.2E-05	<1%	R9
Boron	24	120	1.0E-03	2.4E-03	<1%	R3	3.2E-04	9.2E-04	<1%	R9
Bismuth	24	2.5	5.9E-06	1.5E-05	<1%	R3	1.9E-06	5.6E-06	<1%	R9
Calcium	24	N/A - no criteria	7.5	21	-	R3	2.6	7.8	-	R9
Cadmium	24	2.5E-02	5.4E-06	1.4E-05	<1%	R3	1.8E-06	5.4E-06	<1%	R9
	8760	5.0E-03	7.7E-07	1.6E-06	<1%	R3	7.0E-08	1.5E-07	<1%	R9
Cobalt	24	0.1	4.1E-03	1.1E-02	11%	R3	1.4E-03	4.2E-03	4%	R9
Chromium	24	0.5	4.7E-02	0.1	26%	R3	1.7E-02	4.9E-02	10%	R9
Copper	24	50	8.8E-03	2.5E-02	<1%	R3	3.1E-03	9.1E-03	<1%	R9
Iron	24	N/A	4.0	11	-	R3	1.4	4.2	-	R9
Potassium	24	10	0.3	0.8	8%	R3	0.1	0.3	3%	R9
Lithium	24	20	1.1E-03	3.1E-03	<1%	R3	3.8E-04	1.1E-03	<1%	R9
Magnesium	24	72	6.2	17	24%	R3	2.2	6.4	9%	R9
Manganese	24	0.4	0.1	0.2	59%	R3	3.0E-02	0.1	22%	R9
Manganese (in PM_{10})	24	0.2	2.7E-02	0.1	37%	R3	9.3E-03	2.7E-02	14%	R9
Manganese (in $PM_{2.5}$)	24	0.1	2.8E-03	7.5E-03	8%	R3	9.6E-04	2.9E-03	3%	R9
Molybdenum	24	120	5.0E-05	1.4E-04	<1%	R3	1.7E-05	5.2E-05	<1%	R9
Silicon	24	27	0.5	1.4	5%	R3	0.2	0.5	2%	R9
Sodium	24	N/A - no criteria	0.9	2.3	-	R3	0.3	0.9	-	R9
Nickel (in PM)	24	0.2	2.1E-02	5.8E-02	29%	R3	7.5E-03	2.2E-02	11%	R9
	8760	4.0E-02	3.7E-03	7.4E-03	19%	R3	3.1E-04	6.6E-04	2%	R9
Nickel (in PM_{10})	24	0.1	7.3E-03	1.8E-02	18%	R3	2.4E-03	7.0E-03	7%	R9
	8760	2.0E-02	1.2E-03	2.3E-03	12%	R3	9.5E-05	2.0E-04	1%	R9
Lead	24	0.5	9.0E-05	2.2E-04	<1%	R3	2.8E-05	8.4E-05	<1%	R9
	720	0.2	3.5E-05	8.3E-05	<1%	R3	1.1E-05	3.2E-05	<1%	R9

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)				Special Receptors Outside Modelled Mine Boundary (1)			
			Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)
			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion		
Antimony	24	25	3.8E-05	1.1E-04	<1%	R3	1.3E-05	3.9E-05	<1%	R9
Selenium	24	10	2.6E-05	7.4E-05	<1%	R3	9.2E-06	2.7E-05	<1%	R9
Tin	24	10	2.9E-04	8.0E-04	<1%	R3	1.0E-04	3.0E-04	<1%	R9
Strontium	24	120	1.1E-02	3.2E-02	<1%	R3	4.0E-03	1.2E-02	<1%	R9
Titanium	24	120	0.1	0.3	<1%	R3	4.3E-02	0.1	<1%	R9
Thallium	24	0.5	3.0E-06	8.2E-06	<1%	R3	1.0E-06	3.1E-06	<1%	R9
Uranium	24	0.3	9.3E-06	2.2E-05	<1%	R3	2.8E-06	8.7E-06	<1%	R9
	8760	6.0E-02	1.0E-06	2.2E-06	<1%	R3	1.1E-07	2.6E-07	<1%	R9
Uranium (in PM_{10})	24	0.15	3.4E-06	7.5E-06	<1%	R3	1.0E-06	3.0E-06	<1%	R9
	8760	3.0E-02	3.4E-07	7.1E-07	<1%	R3	3.4E-08	8.4E-08	<1%	R9
Vanadium	24	2	1.0E-02	2.8E-02	1%	R3	3.5E-03	1.0E-02	<1%	R9
Tungsten	24	5	1.9E-05	4.2E-05	<1%	R3	5.6E-06	0.0	<1%	R9
Yttrium	24	5	5.2E-04	1.3E-03	<1%	R3	1.7E-04	5.0E-04	<1%	R9
Zinc	24	120	3.6E-03	9.5E-03	<1%	R3	1.2E-03	0.0	<1%	R9
Thorium	24	N/A - no criteria	8.3E-05	2.0E-04	-	R3	2.6E-05	0.0	-	R9
Quartz (in PM_{10})	24	5	1.4	2.6	52%	R3	0.3	9.4E-01	19%	R9
Pyrite	24	N/A - no criteria	2.4E-05	4.3E-05	-	R3	5.3E-06	0.0	-	R9
Biotite	24	N/A - no criteria	0.5	1.3	-	R3	0.2	0.5	-	R9
Magnetite	24	25	0.6	1.3	5%	R3	0.2	0.5	2%	R9
Hematite	24	25	2.6E-02	4.8E-02	<1%	R3	5.8E-03	1.7E-02	<1%	R9
Chlorite	24	120	9.7	27	23%	R3	3.4	10	8%	R9
Muscovite	24	1.5	2.5	5.7	378%	R3	0.7	2.2	146%	R9
Talc (fibrous)	24	2	0.1	0.2	11%	R3	2.6E-02	7.6E-02	4%	R9
Chrysotile Asbestos (units are fibres/cm³) (8)	24	4.0E-02	1.5E-03	2.7E-03	7%	R3	3.9E-04	1.1E-03	3%	R9
1,3-butadiene	24	10	-	2.2E-03	<1%	R3	-	6.0E-04	<1%	R7
	8760	2	-	2.6E-04	<1%	R3	-	3.2E-05	<1%	R1
Acenaphthene	24	N/A - no criteria	-	1.5E-04	-	R3	-	4.3E-05	-	R7
	8760	N/A - no criteria	-	1.8E-05	-	R3	-	3.7E-06	-	R1
Acenaphthylene	24	N/A - no criteria	-	2.4E-04	-	R3	-	7.2E-05	-	R7
	8760	N/A - no criteria	-	2.9E-05	-	R3	-	6.8E-06	-	R1
Acetaldehyde	0.5	500	-	1.6	<1%	R3	-	1.3	<1%	R9
	24	500	-	0.2	<1%	R3	-	5.3E-02	<1%	R7
Acrolein	1	4.5	-	0.2	4%	R3	-	0.1	3%	R9
	24	0.4	-	2.8E-02	7%	R3	-	7.5E-03	2%	R7

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)				Special Receptors Outside Modelled Mine Boundary (1)			
			Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)
			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion		
Anthracene	24	N/A - no criteria	-	9.4E-05	-	R3	-	2.6E-05	-	R7
	8760	N/A - no criteria	-	1.1E-05	-	R3	-	1.4E-06	-	R1
Benzene	24	2.3	-	3.6E-02	2%	R3	-	9.9E-03	<1%	R7
	8760	0.45	-	4.2E-03	<1%	R3	-	6.0E-04	<1%	R1
Benzo(a)anthracene	24	N/A - no criteria	-	1.3E-06	-	R2	-	4.9E-07	-	R7
	8760	N/A - no criteria	-	1.7E-07	-	R3	-	5.1E-08	-	R1
Benzo(a)pyrene	24	5E-05	-	1.3E-06	3%	R3	-	3.5E-07	<1%	R7
	8760	1E-05	-	1.5E-07	2%	R3	-	2.0E-08	<1%	R1
Benzo(b+k)fluoranthene	24	N/A - no criteria	-	1.1E-06	-	R3	-	3.0E-07	-	R7
	8760	N/A - no criteria	-	1.3E-07	-	R3	-	2.6E-08	-	R1
Benzo(g,h,i)perylene	24	N/A - no criteria	-	6.8E-07	-	R3	-	2.4E-07	-	R7
	8760	N/A - no criteria	-	8.6E-08	-	R3	-	3.3E-08	-	R1
Chrysene	24	N/A - no criteria	-	2.4E-06	-	R3	-	7.4E-07	-	R7
	8760	N/A - no criteria	-	3.0E-07	-	R3	-	6.5E-08	-	R1
Dibenzo(a,h) anthracene	24	N/A - no criteria	-	3.8E-07	-	R3	-	1.0E-07	-	R9
	8760	N/A - no criteria	-	4.4E-08	-	R3	-	4.8E-09	-	R1
Fluoranthene	24	N/A - no criteria	-	1.5E-04	-	R3	-	4.0E-05	-	R7
	8760	N/A - no criteria	-	1.7E-05	-	R3	-	2.2E-06	-	R1
Fluorene	24	N/A - no criteria	-	5.6E-04	-	R3	-	1.6E-04	-	R7
	8760	N/A - no criteria	-	6.6E-05	-	R3	-	9.2E-06	-	R1
Indeno(1,2,3,c,d)pyrene	24	N/A - no criteria	-	3.4E-07	-	R2	-	1.3E-07	-	R8
	8760	N/A - no criteria	-	3.9E-08	-	R3	-	1.1E-08	-	R1
Naphthalene	0.17	50	-	0.5	1%	R3	-	0.4	<1%	R9
	24	23	-	4.5E-02	<1%	R3	-	1.2E-02	<1%	R7
Phenanthrene	24	N/A - no criteria	-	2.5E-03	-	R3	-	6.7E-04	-	R7
	8760	N/A - no criteria	-	2.9E-04	-	R3	-	3.4E-05	-	R1
Pyrene	24	N/A - no criteria	-	1.2E-04	-	R3	-	3.4E-05	-	R7
	8760	N/A - no criteria	-	1.5E-05	-	R3	-	1.9E-06	-	R1
Formaldehyde	24	65	-	0.6	<1%	R3	-	0.2	<1%	R7

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)				Special Receptors Outside Modelled Mine Boundary (1)			
			Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)		% of Criteria (9)	Special Receptor ID (10)
			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion			Refined Method – With Plume Depletion	Base Method – Without Plume Depletion		
Hydrocarbons	24	N/A - no criteria	-	2.1	-	R3	-	0.6	-	R7

Notes:

1. Maximum Special Receptor Concentrations exclude surface water receptors.
2. Model predictions for particulates including all emissions sources.
3. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
4. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
5. Maximum predicted 10-minute, 1-hour and annual SO2 concentrations are presented in the table for direct comparison to the AAQC and conservatively compared to the CAAQS.
6. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
7. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average NO2 concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
8. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
9. Maximum predicted concentration without plume depletion is compared to the criteria.
10. Special receptor identified to have the maximum prediction without plume depletion.

5.1.3.2 Construction – Cumulative Effects

A summary of the maximum predicted CoPC GLCs over all assessed special receptors for the Project Alone, Construction scenario cumulatively with background air quality levels is presented in Table 5.4. The maximum predicted concentration of each CoPC at each special receptor is tabulated in Appendix D of this assessment. In Table 5.4, maximum cumulative CoPC concentrations are presented for special receptors inside and outside the Modelled Mine Boundary.

The maximum predicted cumulative concentrations of 78 of 80 CoPCs were below applicable criteria for all outside Modelled Mine Boundary special receptors for Project construction using the Base, Refined and MECP modelling methods other than muscovite, which was above its screening by at most 46% at special receptor R9 (for the conservative Base Method dispersion modelling, but below the screening level for the Refined Method modelling) and 24-hour and annual B(a)P (106% and 102% respectively). As discussed in Section 5.1.2, 24-hour and annual average background B(a)P concentrations exceed their applicable criteria alone with the Project only contributing a small increment above the background concentration.

Cumulative exceedances of the 24-hour average SPM, PM_{10}, aluminum, muscovite and B(a)P ambient criteria are predicted at receptors inside the Modelled Mine Boundary using the Base Method, with the highest cumulative concentrations predicted at receptor R3 (a camp on the West Buskegeau River). As discussed in Section 5.1.3.1, it is expected that this camp will be removed prior to the start of construction and public access will be limited within the Modelled Mine Boundary so that 24-hour exposure is not anticipated in this area. When plume deposition and depletion are included in the dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion inside the Modelled Mine Boundary is muscovite. Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ concentrations are below their criteria at all assessed special receptors

As the background CoPC concentrations used in this assessment for hourly and daily averages are 90th percentile values, combination of these background levels with the 98th percentile metrics used for comparison to the CAAQS will result in conservative cumulative concentration estimates. As with the Project Alone case, the maximum predicted cumulative 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at inside the Modelled Mine Boundary receptors and below for all outside Modelled Mine Boundary special receptors. Cumulative NO_2 concentrations above the CAAQS are predicted at 4 of the 32 special receptors assessed within the Modelled Mine Boundary.

Table 5.4 Summary of Maximum Predicted Cumulative Concentrations at Special Receptors - Construction

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Total Suspended Particulate Matter (SPM) (2)	24	120	26	90	116	252	279	232%	R3	31	58	93	119	100%	R9
	8760	60	12	14	26	29	40	67%	R3	1.3	13	2.7	14	24%	R9
Total Suspended Particulate Matter (PM) (MECP method - excluding haul roads and wind erosion) (3)	24	120	26	-	-	-	-	-	-	-	-	6.1	33	27%	R9
	8760	60	12	-	-	-	-	-	-	-	-	0.3	12	20%	R9
Inhalable Particulate Matter (PM_{10}) (2)	24	50	13	29	42	78	91	183%	R3	9.9	23	29	42	84%	R9
Inhalable Particulate Matter (PM_{10}) (MECP method - excluding haul road and wind erosion) (3)	24	50	13	-	-	-	-	-	-	-	-	2.0	15	30%	R9
Fine Particulate Matter ($PM_{2.5}$) (2), (4)	24	27	12	3.1	15	8.4	21	77%	R3	1.1	13	3.2	16	58%	R9
	8760	8.8	6.2	0.5	6.7	1.0	7.2	82%	R3	4.3E-02	6.2	9.6E-02	6.3	72%	R9
Fine Particulate Matter ($PM_{2.5}$) (MECP method - excluding haul road and wind erosion) (3), (4)	24	27	12	-	-	-	-	-	-	-	-	0.5	13	48%	R9
	8760	8.8	6.2	-	-	-	-	-	-	-	-	2.7E-02	6.2	71%	R9
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	2	N/A - no criteria	0.2	1.5	1.7	3.0	3.2	-	R3	0.6	0.8	2.2	2.4	-	R9
	8760	N/A - no criteria	1.8E-02	2.0E-02	3.8E-02	4.4E-02	6.2E-02	-	R3	2.2E-03	2.0E-02	4.8E-03	2.3E-02	-	R1
Elemental Carbon (from diesel exhaust)	24	15	9.4E-02	0.2	0.3	0.4	0.5	3%	R3	4.3E-02	0.1	0.1	0.2	1%	R9
Carbon Monoxide (CO)	0.5	6,000	1,170	-	-	1,475	2,645	44%	R3	-	-	1,127	2,297	38%	R9
	1	36,200	965	-	-	1,215	2,180	6%	R3	-	-	928	1,893	5%	R9
	8	15,700	965	-	-	679	1,644	10%	R3	-	-	518	1,483	9%	R9
Sulphur Dioxide (SO_2) (5)	0.17	178	8.6	-	-	42	51	28%	R3	-	-	31	40	22%	R9
	1	100	5.2	-	-	25	31	31%	R3	-	-	19	24	24%	R9
	1	193	5.2	-	-	25	31	16%	R3	-	-	19	24	13%	R9
	1	179	5.2	-	-	25	31	17%	R3	-	-	19	24	14%	R9
	8760	10	0.4	-	-	0.009433	0.4	4%	R3	-	-	1.1E-03	0.4	4%	R1
	8760	14	0.4	-	-	0.009433	0.4	3%	R3	-	-	1.1E-03	0.4	3%	R1
	8760	11	0.4	-	-	0.009433	0.4	3%	R3	-	-	1.1E-03	0.4	3%	R1
Nitrogen Dioxide (NO_2)	1 (6)	400	5.4	-	-	154	160	40%	R3	-	-	139	145	36%	R9
	1 (7)	119	5.4	-	-	135	140	118%	R3	-	-	39	44	37%	R8
	1 (7)	83	5.4	-	-	135	140	169%	R3	-	-	39	44	53%	R8
	24	200	2.2	-	-	24	27	13%	R3	-	-	7.1	9.4	5%	R9
	8760	34	0.3	-	-	4.9	5.2	15%	R3	-	-	0.6	1.0	3%	R1

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary [1]						Special Receptors Outside Modelled Mine Boundary [1]					
				Maximum Predicted Concentration (µg/m³)				% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m³)				% of Criteria [9]	Special Receptor ID [10]
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
	8760	24	0.3	-	-	4.9	5.2	22%	R3	-	-	0.6	1.0	4%	R1
Fluoride	720	62,124	0	3.5E-06	3.5E-06	7.8E-06	7.8E-06	<1%	R3	1.0E-06	1.0E-06	3.2E-06	3.2E-06	<1%	R9
	1440	46,593	0	2.9E-06	2.9E-06	6.4E-06	6.4E-06	<1%	R3	8.5E-07	8.5E-07	2.7E-06	2.7E-06	<1%	R9
Chromium VI	24	7.0E-04	-	7.5E-08	7.5E-08	1.4E-07	1.4E-07	<1%	R3	1.8E-08	1.8E-08	5.3E-08	5.3E-08	<1%	R9
	8760	1.4E-04	-	5.4E-09	5.4E-09	1.1E-08	1.1E-08	<1%	R3	4.7E-10	4.7E-10	1.2E-09	1.2E-09	<1%	R9
Chromium VI (in PM_{10})	24	3.5E-04	-	2.9E-08	2.9E-08	5.4E-08	5.4E-08	<1%	R3	7.0E-09	7.0E-09	2.0E-08	2.0E-08	<1%	R9
	8760	7.0E-05	-	2.0E-09	2.0E-09	4.0E-09	4.0E-09	<1%	R3	1.7E-10	1.7E-10	4.1E-10	4.1E-10	<1%	R9
Mercury	24	2	6.4E-05	1.1E-09	6.4E-05	2.0E-09	6.4E-05	<1%	R3	2.5E-10	6.4E-05	7.3E-10	6.4E-05	<1%	R9
Aluminum	24	12	0.4	6.4	6.8	18	19	155%	R3	2.2	2.7	6.6	7.1	59%	R9
Silver	24	1	2.6E-04	2.2E-05	2.8E-04	6.3E-05	3.2E-04	<1%	R3	7.8E-06	2.7E-04	2.3E-05	2.8E-04	<1%	R9
Arsenic	24	0.3	1.3E-03	2.5E-04	1.5E-03	6.5E-04	1.9E-03	<1%	R3	8.3E-05	1.3E-03	2.5E-04	1.5E-03	<1%	R9
Barium	24	10	8.6E-03	1.0E-02	1.9E-02	2.7E-02	3.6E-02	<1%	R3	3.5E-03	1.2E-02	1.0E-02	1.9E-02	<1%	R9
Beryllium	24	1.0E-02	7.6E-04	1.4E-05	7.7E-04	3.1E-05	7.9E-04	8%	R3	4.1E-06	7.6E-04	1.2E-05	7.7E-04	8%	R9
Boron	24	120	2.6E-02	1.0E-03	2.7E-02	2.4E-03	2.8E-02	<1%	R3	3.2E-04	2.6E-02	9.2E-04	2.7E-02	<1%	R9
Bismuth	24	2.5	1.3E-03	5.9E-06	1.3E-03	1.5E-05	1.3E-03	<1%	R3	1.9E-06	1.3E-03	5.6E-06	1.3E-03	<1%	R9
Calcium	24	N/A - no criteria	0.7	7.5	8.2	21	22	-	R3	2.6	3.3	7.8	8.4	-	R9
Cadmium	24	2.5E-02	2.6E-04	5.4E-06	2.7E-04	1.4E-05	2.7E-04	1%	R3	1.8E-06	2.6E-04	5.4E-06	2.7E-04	1%	R9
	8760	5.0E-03	2.6E-04	7.7E-07	2.6E-04	1.6E-06	2.6E-04	5%	R3	7.0E-08	2.6E-04	1.5E-07	2.6E-04	5%	R9
Cobalt	24	0.1	7.6E-04	4.1E-03	4.8E-03	1.1E-02	1.2E-02	12%	R3	1.4E-03	2.2E-03	4.2E-03	5.0E-03	5%	R9
Chromium	24	0.5	6.0E-03	4.7E-02	5.3E-02	0.1	0.1	27%	R3	1.7E-02	2.3E-02	4.9E-02	5.5E-02	11%	R9
Copper	24	50	5.8E-03	8.8E-03	1.5E-02	2.5E-02	3.1E-02	<1%	R3	3.1E-03	8.9E-03	9.1E-03	1.5E-02	<1%	R9
Iron	24	N/A	0.2	4.0	4.2	11	11	-	R3	1.4	1.6	4.2	4.4	-	R9
Potassium	24	10	0.1	0.3	0.4	0.8	1.0	10%	R3	0.1	0.2	0.3	0.4	4%	R9
Lithium	24	20	-	1.1E-03	1.1E-03	3.1E-03	3.1E-03	<1%	R3	3.8E-04	3.8E-04	1.1E-03	1.1E-03	<1%	R9
Magnesium	24	72	0.2	6.2	6.4	17	18	24%	R3	2.2	2.4	6.4	6.6	9%	R9
Manganese	24	0.4	8.6E-03	8.5E-02	9.3E-02	0.2	0.2	62%	R3	3.0E-02	3.8E-02	8.8E-02	9.6E-02	24%	R9
Manganese (in PM_{10})	24	0.2	8.6E-03	2.7E-02	3.6E-02	7.3E-02	8.2E-02	41%	R3	9.3E-03	1.8E-02	2.7E-02	3.6E-02	18%	R9
Manganese (in $PM_{2.5}$)	24	0.1	8.6E-03	2.8E-03	1.1E-02	7.5E-03	1.6E-02	16%	R3	9.6E-04	9.6E-03	2.9E-03	1.1E-02	11%	R9
Molybdenum	24	120	7.6E-04	5.0E-05	8.1E-04	1.4E-04	9.0E-04	<1%	R3	1.7E-05	7.8E-04	5.2E-05	8.1E-04	<1%	R9
Silicon	24	27	-	0.5	0.5	1.4	1.4	5%	R3	0.2	0.2	0.5	0.5	2%	R9
Sodium	24	N/A - no criteria	0.5	0.9	1.4	2.3	2.8	-	R3	0.3	0.8	0.9	1.4	-	R9
Nickel (in PM)	24	0.2	2.6E-03	2.1E-02	2.4E-02	5.8E-02	6.0E-02	30%	R3	7.5E-03	1.0E-02	2.2E-02	2.5E-02	12%	R9

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary [1]						Special Receptors Outside Modelled Mine Boundary [1]					
				Maximum Predicted Concentration (µg/m³)				% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m³)				% of Criteria [9]	Special Receptor ID [10]
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
	8760	4.0E-02	1.7E-03	3.7E-03	5.4E-03	7.4E-03	9.1E-03	23%	R3	3.1E-04	2.0E-03	6.6E-04	2.3E-03	6%	R9
Nickel (in PM_{10})	24	0.1	2.6E-03	7.3E-03	9.9E-03	1.8E-02	2.1E-02	21%	R3	2.4E-03	5.0E-03	7.0E-03	9.6E-03	10%	R9
	8760	2.0E-02	1.7E-03	1.2E-03	2.9E-03	2.3E-03	4.0E-03	20%	R3	9.5E-05	1.8E-03	2.0E-04	1.9E-03	9%	R9
Lead	24	0.5	3.4E-03	9.0E-05	3.5E-03	2.2E-04	3.6E-03	<1%	R3	2.8E-05	3.4E-03	8.4E-05	3.5E-03	<1%	R9
	720	0.2	1.3E-03	3.5E-05	1.3E-03	8.3E-05	1.4E-03	<1%	R3	1.1E-05	1.3E-03	3.2E-05	1.3E-03	<1%	R9
Antimony	24	25	1.3E-03	3.8E-05	1.3E-03	1.1E-04	1.4E-03	<1%	R3	1.3E-05	1.3E-03	3.9E-05	1.3E-03	<1%	R9
Selenium	24	10	2.6E-03	2.6E-05	2.6E-03	7.4E-05	2.7E-03	<1%	R3	9.2E-06	2.6E-03	2.7E-05	2.6E-03	<1%	R9
Tin	24	10	2.4E-03	2.9E-04	2.7E-03	8.0E-04	3.2E-03	<1%	R3	1.0E-04	2.5E-03	3.0E-04	2.7E-03	<1%	R9
Strontium	24	120	1.5E-03	1.1E-02	1.3E-02	3.2E-02	3.4E-02	<1%	R3	4.0E-03	5.5E-03	1.2E-02	1.3E-02	<1%	R9
Titanium	24	120	8.8E-03	0.1	0.1	0.3	0.3	<1%	R3	4.3E-02	5.1E-02	0.1	0.1	<1%	R9
Thallium	24	0.5	2.6E-04	3.0E-06	2.6E-04	8.2E-06	2.7E-04	<1%	R3	1.0E-06	2.6E-04	3.1E-06	2.6E-04	<1%	R9
Uranium	24	0.3	2.6E-04	9.3E-06	2.7E-04	2.2E-05	2.8E-04	<1%	R3	2.8E-06	2.6E-04	8.7E-06	2.7E-04	<1%	R9
	8760	6.0E-02	2.6E-04	1.0E-06	2.6E-04	2.2E-06	2.6E-04	<1%	R3	1.1E-07	2.6E-04	2.6E-07	2.6E-04	<1%	R9
Uranium (in PM_{10})	24	0.15	2.6E-04	3.4E-06	2.6E-04	7.5E-06	2.7E-04	<1%	R3	1.0E-06	2.6E-04	3.0E-06	2.6E-04	<1%	R9
	8760	3.0E-02	2.6E-04	3.4E-07	2.6E-04	7.1E-07	2.6E-04	<1%	R3	3.4E-08	2.6E-04	8.4E-08	2.6E-04	<1%	R9
Vanadium	24	2	7.6E-04	1.0E-02	1.1E-02	2.8E-02	2.9E-02	1%	R3	3.5E-03	4.3E-03	1.0E-02	1.1E-02	<1%	R9
Tungsten	24	5	-	1.9E-05	1.9E-05	4.2E-05	4.2E-05	<1%	R3	5.6E-06	5.6E-06	1.6E-05	1.6E-05	<1%	R9
Yttrium	24	5	-	5.2E-04	5.2E-04	1.3E-03	1.3E-03	<1%	R3	1.7E-04	1.7E-04	5.0E-04	5.0E-04	<1%	R9
Zinc	24	120	1.5E-02	3.6E-03	1.9E-02	9.5E-03	2.5E-02	<1%	R3	1.2E-03	1.6E-02	3.6E-03	1.9E-02	<1%	R9
Thorium	24	N/A - no criteria	0	8.3E-05	8.3E-05	2.0E-04	2.0E-04	-	R3	2.6E-05	2.6E-05	7.7E-05	7.7E-05	-	R9
Quartz (in PM_{10})	24	5	1.0	1.4	2.4	2.6	3.6	72%	R3	0.3	1.3	0.9	1.9	38%	R9
Pyrite	24	N/A - no criteria	-	2.4E-05	2.4E-05	4.3E-05	4.3E-05	-	R3	5.3E-06	5.3E-06	1.5E-05	1.5E-05	-	R9
Biotite	24	N/A - no criteria	0	0.5	0.5	1.3	1.3	-	R3	0.2	0.2	0.5	0.5	-	R9
Magnetite	24	25	ND	0.6	0.6	1.3	1.3	5%	R3	0.2	0.2	0.5	0.5	2%	R9
Hematite	24	25	ND	2.6E-02	2.6E-02	4.8E-02	4.8E-02	<1%	R3	5.8E-03	5.8E-03	1.7E-02	1.7E-02	<1%	R9
Chlorite	24	120	ND	9.7	9.7	27	27	23%	R3	3.4	3.4	10.0	10.0	8%	R9
Muscovite	24	1.5	ND	2.5	2.5	5.7	5.7	378%	R3	0.7	0.7	2.2	2.2	146%	R9
Talc (fibrous)	24	2	ND	0.1	0.1	0.2	0.2	11%	R3	2.6E-02	2.6E-02	7.6E-02	7.6E-02	4%	R9
Chrysotile Asbestos (units are fibres/cm³) [8]	24	0.04	2.9E-03	1.5E-03	4.4E-03	2.7E-03	5.6E-03	14%	R3	3.9E-04	3.3E-03	1.1E-03	4.0E-03	10%	R9
1,3-butadiene	24	10	0.6	-	-	2.2E-03	0.6	6%	R3	-	-	6.0E-04	0.6	6%	R7
	8760	2	0.6	-	-	2.6E-04	0.6	28%	R3	-	-	3.2E-05	0.6	28%	R1

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Acenaphthene	24	N/A - no criteria	4.4E-03	-	-	1.5E-04	4.6E-03	-	R3	-	-	4.3E-05	4.5E-03	-	R7
	8760	N/A - no criteria	8.5E-04	-	-	1.8E-05	8.6E-04	-	R3	-	-	3.7E-06	8.5E-04	-	R1
Acenaphthylene	24	N/A - no criteria	8.2E-03	-	-	2.4E-04	8.4E-03	-	R3	-	-	7.2E-05	8.2E-03	-	R7
	8760	N/A - no criteria	1.6E-03	-	-	2.9E-05	1.6E-03	-	R3	-	-	6.8E-06	1.6E-03	-	R1
Acetaldehyde	0.5	500	0	-	-	1.6	1.6	<1%	R3	-	-	1.3	1.3	<1%	R9
	24	500	0	-	-	0.2	0.2	<1%	R3	-	-	5.3E-02	5.3E-02	<1%	R7
Acrolein	1	4.5	0	-	-	0.2	0.2	4%	R3	-	-	0.1	0.1	3%	R9
	24	0.4	0	-	-	2.8E-02	2.8E-02	7%	R3	-	-	7.5E-03	7.5E-03	2%	R7
Anthracene	24	N/A - no criteria	1.6E-04	-	-	9.4E-05	2.6E-04	-	R3	-	-	2.6E-05	1.9E-04	-	R7
	8760	N/A - no criteria	3.1E-05	-	-	1.1E-05	4.2E-05	-	R3	-	-	1.4E-06	3.2E-05	-	R1
Benzene	24	2.3	0.5	-	-	3.6E-02	0.5	23%	R3	-	-	9.9E-03	0.5	22%	R7
	8760	0.45	0.4	-	-	4.2E-03	0.4	83%	R3	-	-	6.0E-04	0.4	82%	R1
Benzo(a)anthracene	24	N/A - no criteria	0	-	-	1.3E-06	1.3E-06	-	R2	-	-	4.9E-07	4.9E-07	-	R7
	8760	N/A - no criteria	0	-	-	1.7E-07	1.7E-07	-	R3	-	-	5.1E-08	5.1E-08	-	R1
Benzo(a)pyrene	24	5E-05	5.3E-05	-	-	1.3E-06	5.4E-05	108%	R3	-	-	3.5E-07	5.3E-05	106%	R7
	8760	1E-05	1.0E-05	-	-	1.5E-07	1.0E-05	103%	R3	-	-	2.0E-08	1.0E-05	102%	R1
Benzo(b+k)fluoranthene	24	N/A - no criteria	2.8E-04	-	-	1.1E-06	2.8E-04	-	R3	-	-	3.0E-07	2.8E-04	-	R7
	8760	N/A - no criteria	5.3E-05	-	-	1.3E-07	5.4E-05	-	R3	-	-	2.6E-08	5.3E-05	-	R1
Benzo(g,h,i)perylene	24	N/A - no criteria	0	-	-	6.8E-07	6.8E-07	-	R3	-	-	2.4E-07	2.4E-07	-	R7
	8760	N/A - no criteria	0	-	-	8.6E-08	8.6E-08	-	R3	-	-	3.3E-08	3.3E-08	-	R1
Chrysene	24	N/A - no criteria	3.4E-04	-	-	2.4E-06	3.4E-04	-	R3	-	-	7.4E-07	3.4E-04	-	R7
	8760	N/A - no criteria	6.5E-05	-	-	3.0E-07	6.5E-05	-	R3	-	-	6.5E-08	6.5E-05	-	R1
Dibenzo(a,h) anthracene	24	N/A - no criteria	0	-	-	3.8E-07	3.8E-07	-	R3	-	-	1.0E-07	1.0E-07	-	R9
	8760	N/A - no criteria	0	-	-	4.4E-08	4.4E-08	-	R3	-	-	4.8E-09	4.8E-09	-	R1
Fluoranthene	24	N/A - no criteria	8.2E-04	-	-	1.5E-04	9.6E-04	-	R3	-	-	4.0E-05	8.5E-04	-	R7
	8760	N/A - no criteria	1.6E-04	-	-	1.7E-05	1.7E-04	-	R3	-	-	2.2E-06	1.6E-04	-	R1
Fluorene	24	N/A - no criteria	1.5E-03	-	-	5.6E-04	2.0E-03	-	R3	-	-	1.6E-04	1.6E-03	-	R7
	8760	N/A - no criteria	2.8E-04	-	-	6.6E-05	3.5E-04	-	R3	-	-	9.2E-06	2.9E-04	-	R1
Indeno(1,2,3,c,d)pyrene	24	N/A - no criteria	-	-	-	3.4E-07	3.4E-07	-	R2	-	-	1.3E-07	1.3E-07	-	R8
	8760	N/A - no criteria	0	-	-	3.9E-08	3.9E-08	-	R3	-	-	1.1E-08	1.1E-08	-	R1
Naphthalene	0.17	50	-	-	-	0.5	0.5	1%	R3	-	-	0.4	0.4	<1%	R9
	24	23	-	-	-	4.5E-02	4.5E-02	<1%	R3	-	-	1.2E-02	1.2E-02	<1%	R7

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Phenanthrene	24	N/A - no criteria	2.2E-03	-	-	2.5E-03	4.7E-03	-	R3	-	-	6.7E-04	2.9E-03	-	R7
	8760	N/A - no criteria	4.2E-04	-	-	2.9E-04	7.2E-04	-	R3	-	-	3.4E-05	4.6E-04	-	R1
Pyrene	24	N/A - no criteria	7.1E-04	-	-	1.2E-04	8.4E-04	-	R3	-	-	3.4E-05	7.5E-04	-	R7
	8760	N/A - no criteria	1.4E-04	-	-	1.5E-05	1.5E-04	-	R3	-	-	1.9E-06	1.4E-04	-	R1
Formaldehyde	24	65	0	-	-	0.6	0.6	<1%	R3	-	-	0.2	0.2	<1%	R7
Hydrocarbons	24	N/A - no criteria	-	-	-	2.1	2.1	-	R3	-	-	0.6	0.6	-	R7

Notes:

1. Maximum Special Receptor Concentrations exclude surface water receptors.
2. Model predictions for particulates including all emissions sources.
3. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
4. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
5. Maximum predicted 10-minute, 1-hour and annual SO_2 concentrations are presented in the table for direct comparison to the AAQC and conservatively compared to the CAAQS.
6. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
7. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average NO2 concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
8. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
9. Maximum predicted concentration without plume depletion is compared to the criteria.
10. Special receptor identified to have the maximum prediction without plume depletion.

5.2 Assessment of Project Operations on Air Quality

5.2.1 Operations – Project Alone

The maximum predicted GLCs at and outside the Modelled Mine Boundary due to the Project Operations emissions are presented in Table 5.5. The values presented are the maximum predicted values over all the Modelled Mine Boundary receptors and gridded receptors (as noted). The maximum model-predicted values are compared to applicable regulatory limits to assess potential changes in air quality.

Contour plots of maximum predicted operations phase, Project Alone SPM, PM_{10}, $PM_{2.5}$, NO_2, aluminum, muscovite, RCS, benzo(a)pyrene and chrysotile asbestos concentrations (Base Method), for averaging periods with air quality criteria (or CAAQS) are presented in Appendix I of this report, Figures I.19 through I.38.

Of the 85 CoPCs assessed for Project Operations, 80 are predicted to be below their applicable criteria for the Project Alone. The maximum predicted 24-hour average concentrations of SPM, PM_{10}, aluminum, manganese and muscovite exceed their respective criteria and are discussed in the following sections.

5.2.1.1 SPM

The maximum predicted 24-hour average SPM GLC using the MECP Method is 34 µg/m^3 which is below the MECP AAQC.

The maximum predicted 24-hour average SPM GLC using the Base Method is predicted to exceed the 24-hour criterion by 322% at the Modelled Mine Boundary during operations. A contour plot of maximum predicted 24-hour average SPM concentrations (Base Method) throughout the LSA for Operations is presented on Figure I.19 in 0 of this report. A figure plotting the frequency of exceedance of the SPM AAQC (using the Base Method) is presented on Figure I.40. The figures show that while the AAQC is predicted to be exceeded in a large area around the Modelled Mine Boundary using this conservative methodology, frequencies of exceedance greater than 5% only occur within 2 km of the north Modelled Mine Boundary and less than 1 km from the east boundary. The main sources contributing to elevated SPM GLCs are the haul roads, Open Pit and sand and till impoundment, with emissions from these sources accounting for concentrations of up to 93%, 37% and 8%, respectively, of the maximum GLC.

Using the Refined Method, the maximum predicted 24-hour average SPM GLC is 63% above the MECP AAQC.

Additional mitigation measures (see Section 6.8) may be considered to reduce particulate (and metals) emissions from the haul roads, which are the major contributor to the modelled SPM exceedances predicted for both the Base and Refined Methods. With the use of two additional mitigation measures discussed in Section 6.8 (limiting haul truck speeds and use of dust control with water or a surfactant with a 90% control efficiency) the maximum predicted 24-hour average SPM exceedance using the Base Method would reduce to 111%, while the maximum predicted 24-hour average SPM concentration would be below the AAQC for the Refined Method. Contour plots of the maximum predicted 24-hour average

SPM concentrations (Base Method) and frequencies of exceedance with implementation of these additional mitigation measures are shown on Figures I.44 and I.45. With additional mitigation, the predicted area of SPM exceedance is substantially reduced and concentrations exceeding the AAQC by more than 0.5% of the time only occurring within 2-km of the north Modelled Mine Boundary.

5.2.1.2 PM_{10}

The maximum predicted 24-hour average PM_{10} concentration is below the AAQC using both the Refined and MECP Methods. The maximum predicted 24-hour average PM_{10} concentration using the Base Method is above its criterion by 196% for the Operations scenario. A contour plot of the maximum predicted 24-hour average PM_{10} concentrations (Base Method) throughout the LSA is presented in Appendix I, Figure I.21 of this report and a contour plot of the predicted frequencies of exceedance of the PM_{10} 24-hour average criterion is presented on Figure I.41. The figures show that while the AAQC is predicted to be exceeded in a large area around the Modelled Mine Boundary, the frequency of exceedance over most of this area would be infrequent with frequencies of exceedance greater than 2% occurring within 1.5-km of the north Modelled Mine Boundary. The main sources contributing to elevated PM_{10} GLCs are the haul roads, Open Pit and the TMF, with emissions from these sources accounting for concentrations of up to 94%, 37% and 15%, respectively, of the maximum predicted GLC.

With the additional mitigation discussed in Section 5.2.1.1, the maximum predicted 24-hour average PM_{10} exceedance using the Base Method would reduce to 48%. Contour plots of the maximum predicted 24-hour average PM_{10} concentrations (Base Method) and frequencies of exceedance with implementation of these additional mitigation measures are shown on Figures I.46 and I.47. With additional mitigation, the predicted area of PM_{10} exceedance is substantially reduced with concentrations exceeding the AAQC by more than 0.2% of the time only occurring within 2-km from the north Modelled Mine Boundary.

5.2.1.3 Metals

Maximum predicted aluminum concentrations are predicted using the Base Method to exceed the 24-hour screening level by 208% at the Modelled Mine Boundary during operations. The MECP aluminum criterion is a screening level that indicates that further assessment is required to determine if there is a potential for an adverse effect. This assessment is provided in Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). A contour plot of maximum predicted 24-hour average aluminum concentrations (Base Method) for Project Operations is presented on Figure I.32 in Appendix I of this report and a contour plot of the predicted frequencies of exceedance of the aluminum 24-hour average criterion is presented on Figure I.43. The figures show that while the AAQC is predicted to be exceeded within 6-7 km from the Modelled Mine Boundary, the frequency of exceedance over most of this area would be infrequent with frequencies greater than 2% only occurring within 1.5 km from the north Modelled Mine Boundary and less than 0.5 km from the east. The main sources contributing to elevated aluminum GLCs are the haul roads, the Open Pit and the roadstone crusher (up to 96%, 34% and 2.5% respectively). The maximum predicted 24-hour average aluminum concentration using the refined modelling method is 16% above the criterion.

The maximum predicted 24-hour average manganese concentration using the Base Method is above its criterion by 21%. A contour plot of maximum predicted 24-hour average manganese concentration (Base Method) is presented in Appendix I of this report, Figure I.33. The area of exceedance for 24-hour average manganese is small and located on the west Modelled Mine Boundary. Exceedances are predicted to occur infrequently (no more than 5 days in 5 years or 0.3% of the time. The main sources contributing to elevated manganese GLCs are the haul roads, Open Pit and the TMF, with emissions from these sources accounting for concentrations of up to 91%, 37% and 7% of the maximum manganese GLC. The maximum predicted 24-hour average manganese GLC using the Refined Method is below the criteria.

The maximum muscovite concentration (Base Method) is predicted to exceed the 24-hour criterion by 706% at the Modelled Mine Boundary during operations. The MECP muscovite criterion is a screening level that indicates that further assessment is required to determine if there is a potential for an adverse effect. This assessment is provided in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). A contour plot of maximum predicted 24-hour average muscovite concentrations is presented in Appendix I of this report, Figure I.34 and a contour plot of the predicted frequencies of exceedance of the muscovite 24-hour average screening level is presented on Figure I.42. The area for which predicted muscovite concentrations are above the MECP screening level extends through most of the LSA. Predicted muscovite exceedances will occur no more than 549 days in 5 years or 30% of the time at the Modelled Mine Boundary, with frequencies greater than 5% occurring within 6 km from the north, 2 km from the east and 5 km from the west Modelled Mine Boundary. The main sources contributing to elevated muscovite GLCs are the Open Pit, haul roads and blasting, with emissions from these sources accounting for concentrations of up to 65%, 57% and 8% of the maximum muscovite GLC. The maximum predicted 24-hour average muscovite concentration using the refined modelling method is 262% above the screening level.

With the additional mitigation discussed in Section 5.2.1.1, the maximum predicted 24-hour average aluminum exceedance using the Base Method would reduce to 54% and the maximum muscovite exceedance would decrease to 304% of their applicable screening levels, while the maximum predicted 24-hour average manganese concentration would be below it’s criterion.

Table 5.5 Maximum Predicted Concentrations for the Operation Scenario – Project Alone

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m³)	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method - With Plume Depletion	Base Method - Without Plume Depletion				
Total Suspended Particulate Matter (PM) [1]	N/A	24	120	196	507	422%	Mine Boundary	472123	5417928
		8760	60	19	50	83%	Mine Boundary	473161	5417919
Total Suspended Particulate Matter (PM) (MECP method – excluding haul roads and wind erosion) [2]	N/A	24	120	-	34	28%	Mine Boundary	474259	5417911
		8760	60	-	5.2	9%	Mine Boundary	474299	5417910
Inhalable Particulate Matter (PM_{10}) [1]	N/A	24	50	57	148	296%	Mine Boundary	472123	5417928
Inhalable Particulate Matter (PM_{10}) (MECP method – excluding haul roads and wind erosion) [2]	N/A	24	50	-	10	20%	Mine Boundary	468189	5413927
Fine Particulate Matter ($PM_{2.5}$) [1], [3]	N/A	24	27	6	16	59%	Mine Boundary	472123	5417928
		8760	8.8	1	2	20%	Mine Boundary	474358	5417910
Fine Particulate Matter ($PM_{2.5}$) (MECP method – excluding haul roads and wind erosion) [2], [3]	N/A	24	27	-	3.2	12%	Mine Boundary	474259	5417911
		8760	8.8	-	0.5	5%	Mine Boundary	474299	5417910
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	2	N/A - no criteria	2.0	3.7	-	Mine Boundary	472781	5417922
		8760	N/A - no criteria	3.0E-02	6.5E-02	-	Mine Boundary	472801	5417922
Elemental Carbon (from diesel exhaust)	7440-44-0	24	15	0.37	0.7	4%	Mine Boundary	468189	5413927
Carbon Monoxide (CO)	630-08-0	0.5	6,000	-	3,932	66%	Mine Boundary	469235	5417929
		1	36,200	-	3,238	9%	Mine Boundary	469235	5417929
		8	15,700	-	1,809	12%	Mine Boundary	469235	5417929
Sulphur Dioxide (SO_2)	7446-09-5	0.17	178	-	121	68%	Mine Boundary	469235	5417929
		1	100	-	73	73%	Mine Boundary	469235	5417929
		8760	10	-	1.21E-02	<1%	Mine Boundary	473280	5417918
Nitrogen Dioxide (NO_2) [4]	10102-44-0	1	400	-	227	57%	Mine Boundary	468183	5405169
		24	200	-	42	21%	Mine Boundary	472442	5417925
Fluoride	7664-39-3	720	62,124	1.3E-05	2.6E-05	<1%	Mine Boundary	474199	5417911
		1440	46,593	1.1E-05	2.1E-05	<1%	Mine Boundary	474199	5417911
Chromium VI	18540-29-9	24	7.00E-04	1.9E-07	4.0E-07	<1%	Mine Boundary	468183	5404989
		8760	1.40E-04	1.5E-08	3.0E-08	<1%	Mine Boundary	474398	5417910
Chromium VI (in PM_{10})	18540-29-9	24	3.50E-04	5.4E-08	1.1E-07	<1%	Mine Boundary	468183	5404989
		8760	7.00E-05	4.9E-09	9.6E-09	<1%	Mine Boundary	474398	5417910
Mercury	7439-97-6	24	2	6.2E-07	1.1E-06	<1%	Mine Boundary	477388	5401089
Aluminum	7429-90-5	24	12	14	37	308%	Mine Boundary	472123	5417928
Silver	7440-22-4	24	1	4.9E-05	1.3E-04	<1%	Mine Boundary	468183	5405588
Arsenic	7440-38-2	24	0.3	5.6E-04	1.5E-03	<1%	Mine Boundary	468183	5405588
Barium	7440-39-3	24	10	2.2E-02	5.7E-02	<1%	Mine Boundary	468183	5405588

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m³)	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method - With Plume Depletion	Base Method - Without Plume Depletion				
Beryllium	7440-41-7	24	1.00E-02	3.2E-05	7.6E-05	<1%	Mine Boundary	468183	5404949
Boron	7440-42-8	24	120	2.2E-03	5.8E-03	<1%	Mine Boundary	468183	5405528
Bismuth	7440-69-9	24	2.5	1.3E-05	3.3E-05	<1%	Mine Boundary	468183	5405189
Calcium	7440-70-2	24	N/A - no criteria	17	45	-	Mine Boundary	472402	5417925
Cadmium	7440-43-9	24	0.025	1.2E-05	3.1E-05	<1%	Mine Boundary	468183	5405588
		8760	0.005	1.1E-06	2.7E-06	<1%	Mine Boundary	474199	5417911
Cobalt	7440-48-4	24	0.1	9.0E-03	2.5E-02	25%	Mine Boundary	468183	5405828
Chromium	7440-47-3	24	0.5	0.1	0.3	58%	Mine Boundary	468183	5405828
Copper	7440-50-8	24	50	2.0E-02	5.2E-02	<1%	Mine Boundary	472402	5417925
Iron	7439-89-6	24	N/A - no criteria	8.9	24	-	Mine Boundary	468183	5405728
Potassium	7440-09-7	24	10	0.7	1.7	17%	Mine Boundary	468183	5405568
Lithium	7439-93-2	24	20	2.4E-03	6.3E-03	<1%	Mine Boundary	472402	5417925
Magnesium	7439-95-4	24	72	14	38	53%	Mine Boundary	468183	5405848
Manganese	7439-96-5	24	0.4	1.85E-01	4.84E-01	121%	Mine Boundary	472123	5417928
Manganese (in PM_{10})	7439-96-5	24	0.2	5.4E-02	1.43E-01	71%	Mine Boundary	472202	5417927
Manganese (in $PM_{2.5}$)	7439-96-5	24	0.1	5.6E-03	1.5E-02	15%	Mine Boundary	468183	5405828
Molybdenum	7439-98-7	24	120	1.1E-04	2.9E-04	<1%	Mine Boundary	472163	5417927
Silicon	7440-21-3	24	27	1.2	3.1	11%	Mine Boundary	468183	5405588
Sodium	7440-23-5	24	N/A - no criteria	2.0	5.1	-	Mine Boundary	468183	5405548
Nickel (in PM)	7440-02-0	24	0.2	5.9E-02	0.2	76%	Mine Boundary	468183	5405848
		8760	0.04	4.6E-03	1.1E-02	27%	Mine Boundary	473280	5417918
Nickel (in PM_{10})	7440-02-0	24	0.1	1.5E-02	3.9E-02	39%	Mine Boundary	468183	5405828
		8760	0.02	1.3E-03	3.0E-03	15%	Mine Boundary	473280	5417918
Lead	7439-92-1	24	0.5	2.0E-04	4.8E-04	<1%	Mine Boundary	468183	5405009
		720	0.2	7.7E-05	1.8E-04	<1%	Mine Boundary	468183	5405009
Antimony	7440-36-0	24	25	8.2E-05	2.2E-04	<1%	Mine Boundary	468183	5405688
Selenium	7782-49-2	24	10	5.7E-05	1.5E-04	<1%	Mine Boundary	468183	5405568
Tin	7440-31-5	24	10	6.2E-04	1.7E-03	<1%	Mine Boundary	468183	5405728
Strontium	7440-24-6	24	120	2.5E-02	6.5E-02	<1%	Mine Boundary	472202	5417927
Titanium	7440-32-6	24	120	0.3	0.7	<1%	Mine Boundary	468183	5405588
Thallium	7440-28-0	24	0.5	6.4E-06	1.6E-05	<1%	Mine Boundary	468183	5405588
Uranium	7440-61-1	24	0.3	2.4E-05	5.1E-05	<1%	Mine Boundary	474179	5417911
		8760	0.06	3.2E-06	6.5E-06	<1%	Mine Boundary	474358	5417910
Uranium (in PM_{10})	7440-61-1	24	0.15	7.6E-06	1.6E-05	<1%	Mine Boundary	474179	5417911
		8760	0.03	1.0E-06	2.1E-06	<1%	Mine Boundary	474358	5417910

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m³)	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method - With Plume Depletion	Base Method - Without Plume Depletion				
Vanadium	7440-62-2	24	2	2.2E-02	5.8E-02	3%	Mine Boundary	472202	5417927
Tungsten	7440-33-7	24	5	4.2E-05	1.1E-04	<1%	Mine Boundary	468183	5405069
Yttrium	7440-65-5	24	5	1.1E-03	2.9E-03	<1%	Mine Boundary	468183	5405548
Zinc	7440-66-6	24	120	7.9E-03	2.1E-02	<1%	Mine Boundary	468183	5405588
Thorium	7440-29-1	24	N/A - no criteria	1.8E-04	4.6E-04	-	Mine Boundary	468183	5405169
Quartz (in PM10)	14808-60-7	24	5	2.74	4.89	98%	Mine Boundary	470110	5417937
Pyrite	12068-85-8	24	N/A - no criteria	2.0E-04	3.4E-04	-	Mine Boundary	477328	5401090
Biotite	1302-27-8	24	N/A - no criteria	1.0	2.7	-	Mine Boundary	472202	5417927
Magnetite	1309-38-2	24	25	2	4.6	18%	Mine Boundary	468183	5405728
Hematite	1317-60-8	24	25	6.6E-02	1.40E-01	<1%	Mine Boundary	468183	5404989
Chlorite	1318-59-8	24	120	22	56	47%	Mine Boundary	472402	5417925
Muscovite	1318-94-1	24	1.5	5.43	12.1	806%	Mine Boundary	467382	5409474
Talc (fibrous)	14807-96-6	24	2	0.3	0.6	32%	Mine Boundary	468183	5404989
Phosphorus	7723-14-0	24	0.5	1.1E-07	2.2E-07	<1%	Mine Boundary	468189	5406106
Platinum	7440-06-4	24	0.2	3.4E-11	6.4E-11	<1%	Mine Boundary	468189	5406106
Palladium	7440-05-3	24	10	1.2E-10	2.2E-10	<1%	Mine Boundary	468189	5406106
Chrysotile Asbestos (units are fibres/cm³) [5]	132207-32-0	24	0.04	9.6E-03	1.7E-02	43%	Mine Boundary	477388	5401089
1,3-butadiene	106-99-0	24	10	-	3.4E-03	<1%	Mine Boundary	468189	5413927
		8760	2	-	3.3E-04	<1%	Mine Boundary	472761	5417923
Acenaphthene	83-32-9	24	N/A - no criteria	-	2.4E-04	-	Mine Boundary	468656	5404313
		8760	N/A - no criteria	-	2.2E-05	-	Mine Boundary	472801	5417922
Acenaphthylene	208-96-8	24	N/A - no criteria	-	3.9E-04	-	Mine Boundary	468656	5404313
		8760	N/A - no criteria	-	4.2E-05	-	Mine Boundary	474792	5394611
Acetaldehyde	75-07-0	0.5	500	-	2.8	<1%	Mine Boundary	468194	5406285
		24	500	-	0.3	<1%	Mine Boundary	468189	5413927
Acrolein	107-02-8	1	4.5	-	0.3	7%	Mine Boundary	469274	5417930
		24	0.4	-	4.2E-02	11%	Mine Boundary	468189	5413927
Anthracene	120-12-7	24	N/A - no criteria	-	1.5E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	1.4E-05	-	Mine Boundary	472801	5417922
Benzene	71-43-2	24	2.3	-	5.5E-02	2%	Mine Boundary	468189	5413927
		8760	0.45	-	5.4E-03	1%	Mine Boundary	472801	5417922
Benzo(a)anthracene	56-55-3	24	N/A - no criteria	-	2.3E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	-	3.1E-07	-	Mine Boundary	474792	5394611
Benzo(a)pyrene	50-32-8	24	5.00E-05	-	2.2E-06	4%	Mine Boundary	468189	5413927
		8760	1.00E-05	-	2.2E-07	2%	Mine Boundary	472801	5417922

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m³)	Maximum Predicted Concentration (µg/m³)		% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
				Refined Method - With Plume Depletion	Base Method - Without Plume Depletion				
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	24	N/A - no criteria	-	1.9E-06	-	Mine Boundary	468715	5404315
		8760	N/A - no criteria	-	1.9E-07	-	Mine Boundary	472801	5417922
Benzo(g,h,i)perylene	191-24-2	24	N/A - no criteria	-	1.4E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	-	2.3E-07	-	Mine Boundary	474792	5394611
Chrysene	218-01-9	24	N/A - no criteria	-	4.1E-06	-	Mine Boundary	468715	5404315
		8760	N/A - no criteria	-	3.8E-07	-	Mine Boundary	472801	5417922
Dibenzo(a,h) anthracene	53-70-3	24	N/A - no criteria	-	8.8E-07	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	8.8E-08	-	Mine Boundary	473280	5417918
Fluoranthene	206-44-0	24	N/A - no criteria	-	2.3E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	2.2E-05	-	Mine Boundary	472801	5417922
Fluorene	86-73-7	24	N/A - no criteria	-	8.6E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	8.5E-05	-	Mine Boundary	472682	5417923
Indeno(1,2,3,c,d)pyrene	193-39-5	24	N/A - no criteria	-	6.0E-07	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	-	5.0E-08	-	Mine Boundary	474792	5394611
Naphthalene	91-20-3	0.17	50	-	0.8	2%	Mine Boundary	469274	5417930
		24	22.5	-	9.2E-02	<1%	Mine Boundary	468189	5413927
Phenanthrene	85-01-8	24	N/A - no criteria	-	5.2E-03	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	5.2E-04	-	Mine Boundary	473260	5417919
Pyrene	129-00-0	24	N/A - no criteria	-	2.6E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	-	2.6E-05	-	Mine Boundary	473280	5417918
Formaldehyde	50-00-0	24	65	-	0.9	1%	Mine Boundary	468189	5413927
Potassium amyl xanthate	2720-73-2	24	N/A - no criteria	0.05	9.2E-02	-	Mine Boundary	468183	5405888
Sodium hexametaphosphate	10124-56-8	24	15	0.09	0.1	<1%	Mine Boundary	468183	5405888
Hydrocarbons	N/A	24	N/A - no criteria	-	3.3	-	Mine Boundary	468189	5413927

Notes:

1. Model predictions for particulates including all emissions sources.
2. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
3. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the AAQC/CAAQS.
4. Maximum predicted 1-hr NO_2 concentrations using the ARM2 method.
5. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm³ using a conversion factor of 1µg/m³ = 0.03 fibres/cm³. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
6. Maximum predicted concentration without plume depletion is compared to the criteria.
7. Mine Boundary receptor location without plume depletion.

5.2.2 Operation - Cumulative Concentrations

Summaries of the maximum predicted cumulative outside Modelled Mine Boundary GLCs for Project Operation are presented in Table 5.6. The values presented in this table are the maximum predicted values over all the outside Modelled Mine Boundary receptors included in the modelling (mine boundary and gridded receptors). Estimated background concentrations, as discussed in Section 3.4, were added to the maximum model-predicted values and compared to applicable regulatory limits to assess potential cumulative changes in air quality. Where no data is available to characterize background levels, the background concentration is noted as (-) in Table 5.6.

Of the 85 CoPCs assessed, 7 are predicted (Base Method) to be above applicable criteria for the cumulative (Project + background) case:

- The highest predicted 24-hour average cumulative Suspended Particulate Matter (SPM) GLC (Base Method) is 345% above the criterion, while the highest predicted annual average SPM concentration is 3% above its criterion
- The highest predicted 24-hour average cumulative PM_{10} GLC (Base Method) is 222% above the criterion
- The highest predicted 24-hour average cumulative $PM_{2.5}$ GLC (Base Method) is 5% above the criterion. However, the model prediction is the maximum daily average concentration rather than a 98^{th} percentile value and therefore provides a conservative comparison to the MECP AAQC
- The highest predicted 24-hour average cumulative aluminum and manganese GLCs (Base Method) are 212% and 23% of their respective MECP screening levels
- The maximum predicted 24-hour average cumulative RCS concentration is above its criteria by 17%
- As no background measurement data is available for muscovite, the maximum predicted cumulative concentration (Base Method) is the same as for the Project Alone
- The maximum predicted cumulative B(a)P concentrations are predicted to exceed the applicable 24-hour and annual criteria at the Modelled Mine Boundary by 10% and 3%, respectively. The background level of B(a)P is above applicable air quality criteria, with the Project Operations scenario only providing a small (2%) contribution to the cumulative concentrations

When plume deposition and depletion are considered in the dispersion modelling (Refined Method), the only particulate or metal CoPCs predicted to exceed their criteria are SPM and muscovite with their maximum predicted GLCs decreasing by greater than 50% relative to the conservative no plume depletion (Base Case) assessment.

The MECP Method (excluding emissions from haul roads and stockpiles) is not applicable to cumulative effects, as the Ontario permitting process does not require background concentrations to be included in the assessment.

With the additional mitigation discussed in Section 5.2.1.1, the maximum predicted (Base Case) 24-hour average cumulative $PM_{2.5,}$ RCS and manganese concentrations would be below their respective criteria, as would annual average SPM. The aluminum exceedance observed using the Base Method would reduce to 56% and the maximum muscovite exceedance would decrease to 304% of their applicable screening levels. The highest predicted 24-hour average cumulative SPM GLC would reduce to 223% above the criterion and the highest predicted 24-hour average PM_{10} GLC would decrease to 74% of its criterion.

Table 5.6 Maximum Predicted Concentrations for the Operation Scenario - Cumulative

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m³)	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)				% of Criteria (6)	Receptor Type	Easting (m) (7)	Northing (m) (7)
					Refined Method - With Plume Depletion		Base Method - Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Total Suspended Particulate Matter (PM) (1)	N/A	24	120	26	196	223	507	533	445%	Mine Boundary	472123	5417928
		8760	60	12	18.5	30	49.9	62	103%	Mine Boundary	473161	5417919
Total Suspended Particulate Matter (PM) (MECP method - excluding haul roads and wind erosion) (2)	N/A	24	120	26	-	-	33.9	60	50%	Mine Boundary	474259	5417911
		8760	60	12	-	-	5.2	17	28%	Mine Boundary	474299	5417910
Inhalable Particulate Matter (PM_{10}) (1)	N/A	24	50	13	57	70	148	161	322%	Mine Boundary	472123	5417928
Inhalable Particulate Matter (PM_{10}) (MECP method - excluding haul roads and wind erosion) (2)	N/A	24	50	13	-	-	10	23	46%	Mine Boundary	468189	5413927
Fine Particulate Matter ($PM_{2.5}$) (1), (3)	N/A	24	27	12	6.20	19	16.04	28	105%	Mine Boundary	472123	5417928
		8760	8.8	6.2	0.7	6.9	1.7	8	90%	Mine Boundary	474358	5417910
Fine Particulate Matter ($PM_{2.5}$) (MECP method - excluding haul roads and wind erosion) (2), (3)	N/A	24	27	12	-	-	3.2	16	58%	Mine Boundary	474259	5417911
		8760	8.8	6.2	-	-	0.5	7	76%	Mine Boundary	474299	5417910
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	N/A	2	N/A - no criteria	0.19	1.99	2.18	3.72	3.91	-	Mine Boundary	472781	5417922
		8760	N/A - no criteria	1.8E-02	3.0E-02	4.8E-02	6.5E-02	8.3E-02	-	Mine Boundary	472801	5417922
Elemental Carbon (from diesel exhaust)	7440-44-0	24	15	9.4E-02	0.37	0.47	0.66	0.76	5%	Mine Boundary	468189	5413927
Carbon Monoxide (CO)	630-08-0	0.5	6,000	1,170	-	-	3,932	5,102	85%	Mine Boundary	469235	5417929
		1	36,200	965	-	-	3,238	4,203	12%	Mine Boundary	469235	5417929
		8	15,700	965	-	-	1,809	2,348	15%	Mine Boundary	469235	5417929
Sulphur Dioxide (SO_2)	7446-09-5	0.17	178	8.6	-	-	121	129	73%	Mine Boundary	469235	5417929
		1	100	5.2	-	-	73	78	78%	Mine Boundary	469235	5417929
		8760	10	0.4	-	-	1.2E-02	3.65E-01	4%	Mine Boundary	473280	5417918
Nitrogen Dioxide (NO_2) (4)	10102-44-0	1	400	5.4	-	-	227	232	58%	Mine Boundary	468183	5405169
		24	200	2.2	-	-	42	44	22%	Mine Boundary	472442	5417925
Fluoride	7664-39-3	720	62,124	-	1.3E-05	1.3E-05	2.6E-05	2.6E-05	<1%	Mine Boundary	474199	5417911
		1440	46,593	-	1.1E-05	1.1E-05	2.1E-05	2.1E-05	<1%	Mine Boundary	474199	5417911
Chromium VI	18540-29-9	24	7.0E-04	-	1.9E-07	1.9E-07	4.0E-07	4.0E-07	<1%	Mine Boundary	468183	5404989
		8760	1.4E-04	-	1.5E-08	1.5E-08	3.0E-08	3.0E-08	<1%	Mine Boundary	474398	5417910
Chromium VI (in PM_{10})	18540-29-9	24	3.5E-04	-	5.4E-08	5.4E-08	1.1E-07	1.1E-07	<1%	Mine Boundary	468183	5404989
		8760	7.0E-05	-	4.9E-09	4.9E-09	9.6E-09	9.6E-09	<1%	Mine Boundary	474398	5417910
Mercury	7439-97-6	24	2.0	6.4E-05	6.2E-07	6.5E-05	1.1E-06	6.5E-05	<1%	Mine Boundary	477388	5401089
Aluminum	7429-90-5	24	12	0.4	14.4	14.8	37	37.38	312%	Mine Boundary	472123	5417928
Silver	7440-22-4	24	1	2.6E-04	4.9E-05	3.1E-04	1.3E-04	3.9E-04	<1%	Mine Boundary	468183	5405588

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m^3)	Background Concentration (µg/m^3)	Maximum Predicted Concentration (µg/m^3)				% of Criteria (6)	Receptor Type	Easting (m) (7)	Northing (m) (7)
					Refined Method - With Plume Depletion		Base Method - Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Arsenic	7440-38-2	24	0.3	1.3E-03	5.6E-04	1.8E-03	1.5E-03	2.8E-03	<1%	Mine Boundary	468183	5405588
Barium	7440-39-3	24	10	8.6E-03	2.2E-02	3.0E-02	5.7E-02	6.5E-02	<1%	Mine Boundary	468183	5405588
Beryllium	7440-41-7	24	1.0E-02	7.6E-04	3.2E-05	7.9E-04	7.6E-05	8.4E-04	8%	Mine Boundary	468183	5404949
Boron	7440-42-8	24	120	2.6E-02	2.2E-03	2.8E-02	5.8E-03	3.2E-02	<1%	Mine Boundary	468183	5405528
Bismuth	7440-69-9	24	2.5	1.3E-03	1.3E-05	1.3E-03	3.3E-05	1.3E-03	<1%	Mine Boundary	468183	5405189
Calcium	7440-70-2	24	N/A - no criteria	0.7	17	18	45	46	-	Mine Boundary	472402	5417925
Cadmium	7440-43-9	24	0.025	2.6E-04	1.2E-05	2.7E-04	3.1E-05	2.9E-04	1%	Mine Boundary	468183	5405588
		8760	0.005	2.6E-04	1.1E-06	2.6E-04	2.7E-06	2.6E-04	5%	Mine Boundary	474199	5417911
Cobalt	7440-48-4	24	0.1	7.6E-04	9.0E-03	9.7E-03	2.5E-02	2.6E-02	26%	Mine Boundary	468183	5405828
Chromium	7440-47-3	24	0.5	6.0E-03	0.1	0.1	0.3	0.3	59%	Mine Boundary	468183	5405828
Copper	7440-50-8	24	50	5.8E-03	2.0E-02	2.6E-02	5.2E-02	5.8E-02	<1%	Mine Boundary	472402	5417925
Iron	7439-89-6	24	N/A	0.2	8.9	9.2	24	24	-	Mine Boundary	468183	5405728
Potassium	7440-09-7	24	10	0.1	0.7	0.8	1.7	1.9	19%	Mine Boundary	468183	5405568
Lithium	7439-93-2	24	20	-	2.4E-03	2.4E-03	6.3E-03	6.3E-03	<1%	Mine Boundary	472402	5417925
Magnesium	7439-95-4	24	72	0.2	14	14	38	38	53%	Mine Boundary	468183	5405848
Manganese	7439-96-5	24	0.4	8.6E-03	0.2	0.2	0.5	0.5	123%	Mine Boundary	472123	5417928
Manganese (in PM_{10})	7439-96-5	24	0.2	8.6E-03	5.4E-02	6.3E-02	0.1	0.2	76%	Mine Boundary	472202	5417927
Manganese (in $PM_{2.5}$)	7439-96-5	24	0.1	8.6E-03	5.6E-03	1.4E-02	1.5E-02	2.4E-02	24%	Mine Boundary	468183	5405828
Molybdenum	7439-98-7	24	120	7.6E-04	1.1E-04	8.7E-04	2.9E-04	1.1E-03	<1%	Mine Boundary	472163	5417927
Silicon	7440-21-3	24	27	-	1.2	1.2	3.1	3.1	11%	Mine Boundary	468183	5405588
Sodium	7440-23-5	24	N/A - no criteria	5.2E-01	2.0	2.5	5.1	5.2	-	Mine Boundary	468183	5405548
Nickel (in PM)	7440-02-0	24	0.2	2.6E-03	5.9E-02	6.2E-02	0.2	0.2	78%	Mine Boundary	468183	5405848
		8760	4.0E-02	1.7E-03	4.6E-03	6.2E-03	1.1E-02	1.3E-02	31%	Mine Boundary	473280	5417918
Nickel (in PM_{10})	7440-02-0	24	0.1	2.6E-03	1.5E-02	1.8E-02	3.9E-02	4.2E-02	42%	Mine Boundary	468183	5405828
		8760	2.0E-02	1.7E-03	1.3E-03	2.9E-03	3.0E-03	4.7E-03	23%	Mine Boundary	473280	5417918
Lead	7439-92-1	24	0.5	3.4E-03	2.0E-04	3.6E-03	4.8E-04	3.9E-03	<1%	Mine Boundary	468183	5405009
		720	0.2	1.3E-03	7.7E-05	1.4E-03	1.8E-04	1.5E-03	<1%	Mine Boundary	468183	5405009
Antimony	7440-36-0	24	25	1.3E-03	8.2E-05	1.3E-03	2.2E-04	1.5E-03	<1%	Mine Boundary	468183	5405688
Selenium	7782-49-2	24	10	2.6E-03	5.7E-05	2.7E-03	1.5E-04	2.8E-03	<1%	Mine Boundary	468183	5405568
Tin	7440-31-5	24	10	2.4E-03	6.2E-04	3.0E-03	1.7E-03	4.1E-03	<1%	Mine Boundary	468183	5405728
Strontium	7440-24-6	24	120	1.5E-03	2.5E-02	2.7E-02	6.5E-02	6.7E-02	<1%	Mine Boundary	472202	5417927
Titanium	7440-32-6	24	120	8.8E-03	0.3	0.3	0.7	0.7	<1%	Mine Boundary	468183	5405588
Thallium	7440-28-0	24	0.5	2.6E-04	6.4E-06	2.7E-04	1.6E-05	2.8E-04	<1%	Mine Boundary	468183	5405588

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m^3)	Background Concentration (µg/m^3)	Maximum Predicted Concentration (µg/m^3)				% of Criteria [6]	Receptor Type	Easting (m) [7]	Northing (m) [7]
					Refined Method - With Plume Depletion		Base Method - Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Uranium	7440-61-1	24	0.3	2.6E-04	2.4E-05	2.8E-04	5.1E-05	3.1E-04	<1%	Mine Boundary	474179	5417911
		8760	6.0E-02	2.6E-04	3.2E-06	2.6E-04	6.5E-06	2.7E-04	<1%	Mine Boundary	474358	5417910
Uranium (in PM_{10})	7440-61-1	24	0.15	2.6E-04	7.6E-06	2.7E-04	1.6E-05	2.8E-04	<1%	Mine Boundary	474179	5417911
		8760	3.0E-02	2.6E-04	1.0E-06	2.6E-04	2.1E-06	2.6E-04	<1%	Mine Boundary	474358	5417910
Vanadium	7440-62-2	24	2	7.6E-04	2.2E-02	2.3E-02	5.8E-02	5.9E-02	3%	Mine Boundary	472202	5417927
Tungsten	7440-33-7	24	5	-	4.2E-05	4.2E-05	1.1E-04	1.1E-04	<1%	Mine Boundary	468183	5405069
Yttrium	7440-65-5	24	5	-	1.1E-03	1.1E-03	2.9E-03	2.9E-03	<1%	Mine Boundary	468183	5405548
Zinc	7440-66-6	24	120	1.5E-02	7.9E-03	2.3E-02	2.1E-02	3.6E-02	<1%	Mine Boundary	468183	5405588
Thorium	7440-29-1	24	N/A - no criteria	0	1.8E-04	1.8E-04	4.6E-04	4.6E-04	-	Mine Boundary	468183	5405169
Quartz (in PM10)	14808-60-7	24	5	0.99	2.7	3.7	4.9	5.9	117%	Mine Boundary	470110	5417937
Pyrite	12068-85-8	24	N/A - no criteria	-	2.0E-04	2.0E-04	3.4E-04	3.4E-04	-	Mine Boundary	477328	5401090
Biotite	1302-27-8	24	N/A - no criteria	0	1.0	1.0	2.7	2.7	-	Mine Boundary	472202	5417927
Magnetite	1309-38-2	24	25	ND	1.9	1.9	4.6	4.6	18%	Mine Boundary	468183	5405728
Hematite	1317-60-8	24	25	ND	6.6E-02	6.6E-02	0.14	0.14	<1%	Mine Boundary	468183	5404989
Chlorite	1318-59-8	24	120	ND	22	22	56	56	-	Mine Boundary	472402	5417925
Muscovite	1318-94-1	24	1.5	ND	5.4	5.4	12	12	806%	Mine Boundary	467382	5409474
Talc (fibrous)	14807-96-6	24	2	ND	0.3	0.3	0.6	0.6	32%	Mine Boundary	468183	5404989
Phosphorus	7723-14-0	24	0.5	-	1.1E-07	1.1E-07	2.2E-07	2.2E-07	<1%	Mine Boundary	468189	5406106
Platinum	7440-06-4	24	0.2	-	3.4E-11	3.4E-11	6.4E-11	6.4E-11	<1%	Mine Boundary	468189	5406106
Palladium 2	7440-05-3	24	10	-	1.2E-10	1.2E-10	2.2E-10	2.2E-10	<1%	Mine Boundary	468189	5406106
Chrysotile Asbestos (units are fibres/cm^3) [5]	132207-32-0	24	0.04	2.9E-03	9.6E-03	1.3E-02	1.7E-02	2.0E-02	50%	Mine Boundary	477388	5401089
1,3-butadiene	106-99-0	24	10	0.6	-	-	3.4E-03	0.6	6%	Mine Boundary	468189	5413927
		8760	2	0.6	-	-	3.3E-04	0.6	28%	Mine Boundary	472761	5417923
Acenaphthene	83-32-9	24	N/A - no criteria	4.4E-03	-	-	2.4E-04	4.6E-03	-	Mine Boundary	468656	5404313
		8760	N/A - no criteria	8.5E-04	-	-	2.2E-05	8.7E-04	-	Mine Boundary	472801	5417922
Acenaphthylene	208-96-8	24	N/A - no criteria	8.2E-03	-	-	3.9E-04	8.5E-03	-	Mine Boundary	468656	5404313
		8760	N/A - no criteria	1.6E-03	-	-	4.2E-05	1.6E-03	-	Mine Boundary	474792	5394611
Acetaldehyde	75-07-0	0.5	500	0	-	-	2.8	2.8	<1%	Mine Boundary	468194	5406285
		24	500	0	-	-	0.3	0.3	<1%	Mine Boundary	468189	5413927
Acrolein	107-02-8	1	4.5	0	-	-	0.3	0.3	7%	Mine Boundary	469274	5417930
		24	0.4	0	-	-	4.2E-02	4.2E-02	11%	Mine Boundary	468189	5413927
Anthracene	120-12-7	24	N/A - no criteria	1.6E-04	-	-	1.5E-04	3.1E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	3.1E-05	-	-	1.4E-05	4.5E-05	-	Mine Boundary	472801	5417922

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m^3)	Background Concentration (µg/m^3)	Maximum Predicted Concentration (µg/m^3)				% of Criteria (6)	Receptor Type	Easting (m) (7)	Northing (m) (7)
					Refined Method - With Plume Depletion		Base Method - Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Benzene	71-43-2	24	2.3	0.5	-	-	5.5E-02	0.5	24%	Mine Boundary	468189	5413927
		8760	0.45	0.4	-	-	5.4E-03	0.4	83%	Mine Boundary	472801	5417922
Benzo(a)anthracene	56-55-3	24	N/A - no criteria	0	-	-	2.3E-06	2.3E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	0	-	-	3.1E-07	3.1E-07	-	Mine Boundary	474792	5394611
Benzo(a)pyrene	50-32-8	24	5.0E-05	5.3E-05	-	-	2.2E-06	5.5E-05	110%	Mine Boundary	468189	5413927
		8760	1.0E-05	1.0E-05	-	-	2.2E-07	1.0E-05	103%	Mine Boundary	472801	5417922
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	24	N/A - no criteria	2.8E-04	-	-	1.9E-06	2.8E-04	-	Mine Boundary	468715	5404315
		8760	N/A - no criteria	5.4E-05	-	-	1.9E-07	5.4E-05	-	Mine Boundary	472801	5417922
Benzo(g,h,i)perylene	191-24-2	24	N/A - no criteria	0	-	-	1.4E-06	1.4E-06	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	0	-	-	2.3E-07	2.3E-07	-	Mine Boundary	474792	5394611
Chrysene	218-01-9	24	N/A - no criteria	3.4E-04	-	-	4.1E-06	3.4E-04	-	Mine Boundary	468715	5404315
		8760	N/A - no criteria	6.5E-05	-	-	3.8E-07	6.5E-05	-	Mine Boundary	472801	5417922
Dibenzo(a,h) anthracene	53-70-3	24	N/A - no criteria	0	-	-	8.8E-07	8.8E-07	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	0	-	-	8.8E-08	8.8E-08	-	Mine Boundary	473280	5417918
Fluoranthene	206-44-0	24	N/A - no criteria	8.2E-04	-	-	2.3E-04	1.0E-03	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	1.6E-04	-	-	2.2E-05	1.8E-04	-	Mine Boundary	472801	5417922
Fluorene	86-73-7	24	N/A - no criteria	1.5E-03	-	-	8.6E-04	2.3E-03	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	2.8E-04	-	-	8.5E-05	3.7E-04	-	Mine Boundary	472682	5417923
Indeno(1,2,3,c,d)pyrene	193-39-5	24	N/A - no criteria	-	-	-	6.0E-07	6.0E-07	-	Mine Boundary	469365	5404346
		8760	N/A - no criteria	0	-	-	5.0E-08	5.0E-08	-	Mine Boundary	474792	5394611
Naphthalene	91-20-3	0.17	50	0	-	-	0.9	0.9	2%	Mine Boundary	469274	5417930
		24	22.5	-	-	-	9.2E-02	9.2E-02	<1%	Mine Boundary	468189	5413927
Phenanthrene	85-01-8	24	N/A - no criteria	2.2E-03	-	-	5.2E-03	7.4E-03	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	4.2E-04	-	-	5.2E-04	9.4E-04	-	Mine Boundary	473260	5417919
Pyrene	129-00-0	24	N/A - no criteria	7.1E-04	-	-	2.6E-04	9.7E-04	-	Mine Boundary	468189	5413927
		8760	N/A - no criteria	1.4E-04	-	-	2.6E-05	1.6E-04	-	Mine Boundary	473280	5417918
Formaldehyde	50-00-0	24	65	0	-	-	0.9	0.9	1%	Mine Boundary	468189	5413927
Potassium amyl xanthate	2720-73-2	24	N/A - no criteria	ND	5.4E-02	5.4E-02	9.2E-02	9.2E-02	-	Mine Boundary	468183	5405888
Sodium hexametaphosphate	10124-56-8	24	15	ND	8.7E-02	8.7E-02	0.1	0.1	<1%	Mine Boundary	468183	5405888

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m^3)	Background Concentration (µg/m^3)	Maximum Predicted Concentration (µg/m^3)				% of Criteria (6)	Receptor Type	Easting (m) (7)	Northing (m) (7)
					Refined Method - With Plume Depletion		Base Method - Without Plume Depletion					
					Project Alone	Project + Background	Project Alone	Project + Background				
Hydrocarbons	7440-61-1	24	N/A - no criteria	-	-	-	3.3	3.3	-	Mine Boundary	468189	5413927

Notes:

1. Model predictions for particulates including all emissions sources.
2. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
3. Maximum predicted 24-hour and annual PM2.5 concentrations are presented in the table and conservatively compared to the AAQC/CAAQS.
4. Maximum predicted 1-hr NO2 concentrations using the ARM2 method.
5. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
6. Maximum predicted concentration without plume depletion is compared to the criteria.
7. Mine Boundary receptor location without plume depletion

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5.2.3 Operations - Special Receptor Modelling Results

This section presents the dispersion model predictions of ambient CoPC concentrations at special receptor locations relevant to human and ecological exposure. Special receptor locations used to assess deposition onto LSA waterbodies are not included in the results provided in this section, as those locations were not identified as being pertinent for ambient air quality.

5.2.3.1 Operations – Project Alone

A summary of the maximum predicted CoPC GLCs over all assessed special receptors for the Project Alone, Operations scenario is presented in Table 5.7. The maximum predicted concentration of each CoPC at each special receptor is tabulated in Appendix D of this assessment. In Table 5.7, maximum CoPC concentrations are presented for special receptors inside and outside the Modelled Mine Boundary. The Modelled Mine Boundary delineates the buffer zone around the PA within which public access will be limited and no long term (24-hour or greater) human exposure will be possible. Dispersion model predictions both excluding (Base Method) and including plume deposition and depletion (Refined Method) are presented for particulate and metal CoPCs.

The maximum predicted concentrations (Base Method) of SPM, $PM_{10,}$ aluminum and muscovite are above their applicable 24-hour average criteria for special receptors outside the Modelled Mine Boundary. Additionally, the maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS.

The maximum predicted 24-hour average SPM concentration (Base Method) at the outside Modelled Mine Boundary special receptors was 67% above its criterion at receptor R8, which is identified as being a Sensitive Receptor - Indigenous location where occupancy is likely to be in infrequent. SPM concentrations are predicted to be above the 24-hour average criterion no more than 13 days in 5 years, or 0.7% of the time at this location.

The maximum predicted 24-hour average PM_{10} and aluminum concentrations (Base Method) at the outside Modelled Mine Boundary special receptors were 16% and 21% above their criteria with both occurring at receptor R8 (a Sensitive Receptor - Indigenous) where occupancy would be in infrequent. PM_{10} and aluminum concentrations are predicted to be above their respective 24-hour average criteria no more than 2 days in 5 years, or 0.1% of the time at this location. As previously noted, the aluminum criterion is a screening level that indicates that further assessment is required to determine if there is a potential for an adverse effect.

The maximum predicted 24-hour average muscovite concentration (Base Method) at the outside Modelled Mine Boundary special receptors was 267% above its criterion at receptor R1, which is a house south of the mine about 300-m from Highway 655. The muscovite criterion is a screening level that indicates that further assessment is required to determine if there is a potential for an adverse effect. Muscovite exceedances are predicted to occur infrequently (no more than 56 days in 5 years or 3.1% of the time) and at 10 receptors outside the Modelled Mine Boundary (R1, and R5-R13).

When plume deposition and depletion are included in the dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion outside of the Modelled Mine Boundary is muscovite, with the maximum predicted GLC being 65% above the screening level at R1. Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ concentrations are below their criteria at all assessed outside Modelled Mine Boundary special receptors.

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 3 of the10 special receptors assessed outside the Modelled Mine Boundary, with the maximum prediction being 41% above the CAQQS. Predicted concentrations at individual locations above the CAAQS in proximity to the Project are not considered exceedances, but rather are an indicator that air management actions should be considered to reduce ambient levels. Maximum predicted hourly and 24-hour average NO_2 concentrations at all outside Modelled Mine Boundary receptors are well below their respective MECP criteria.

Exceedances (using the Base Method) of the Project Alone 24-hour average SPM, PM_{10}, aluminum, RCS, manganese and muscovite ambient criteria are predicted at receptors inside the Modelled Mine Boundary, with the highest concentrations predicted at receptor R3 which is a camp on the West Buskegeau River. This receptor is located approximately 1 km east of the East Ore Stockpile and it is expected that this camp will be removed prior to the start of construction. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at all the special receptors assessed within the Modelled Mine Boundary, with the highest prediction being 71% above the CAAQS. Maximum predicted hourly and 24-hour average NO_2 concentrations at all inside Modelled Mine Boundary receptors are well below their respective MECP criteria.

Table 5.7 Summary of Maximum Predicted Concentrations at Special Receptors (Project Alone) – Operations

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		
Total Suspended Particulate Matter (SPM) [2]	24	120	214	539	450%	R3	77	200	167%	R8
	8760	60	26	57	95%	R3	5	9	15%	R9
Total Suspended Particulate Matter (SPM) (MECP method - excluding haul roads and wind erosion) [3]	24	120	-	-	-	-	-	11	10%	R9
	8760	60	-	-	-	-	-	0.7	1%	R9
Inhalable Particulate Matter (PM_{10}) [2]	24	50	62	156	311%	R3	23	58	116%	R8
Inhalable Particulate Matter (PM_{10}) (MECP method - excluding haul road and wind erosion) [3]	24	50	-	-	-	-	-	2.9	6%	R9
Fine Particulate Matter ($PM_{2.5}$) [2], [4]	24	27	7	17	63%	R3	2.5	6.5	24%	R7
	8760	8.8	0.9	1.9	21%	R3	0.2	0.3	4%	R9
Fine Particulate Matter ($PM_{2.5}$) (MECP method - excluding haul road and wind erosion) [3], [4]	24	27	-	-	-	-	-	0.9	3%	R8
	8760	8.8	-	-	-	-	-	6.0E-02	<1%	R9
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	2	N/A - no criteria	1.4	3.4	-	R3	1.0	2.1	-	R1
	8760	N/A - no criteria	3.1E-02	8.4E-02	-	R3	5.9E-03	1.4E-02	-	R9
Elemental Carbon (from diesel exhaust)	24	15	0.2	0.7	4%	R2	8.1E-02	0.3	2%	R1
Carbon Monoxide (CO)	0.5	6,000	-	2,880	48%	R4	-	1841.0	31%	R9
	1	36,200	-	2,372	7%	R4	-	1516.2	4%	R9
	8	15,700	-	1,325	8%	R4	-	847.0	5%	R9
Sulphur Dioxide (SO_2) [5]	0.17	178	-	87	49%	R4	-	56.1	31%	R9
	1	100	-	53	53%	R4	-	34.0	34%	R9
	1	186	-	53	28%	R4	-	34.0	18%	R9
	1	173	-	53	30%	R4	-	34.0	20%	R9
	8760	10	-	1.7E-02	<1%	R3	-	0.0	<1%	R9
	8760	13.3	-	1.7E-02	<1%	R3	-	0.0	<1%	R9
	8760	10.6	-	1.7E-02	<1%	R3	-	0.0	<1%	R9
Nitrogen Dioxide (NO_2)	1 [6]	400	-	245	61%	R4	-	152.9	38%	R9
	1 [7]	119	-	142	119%	R3	-	116.7	98%	R9
	1 [7]	83	-	142	171%	R3	-	116.7	141%	R9
	24	200	-	44	22%	R3	-	19.3	10%	R1
	8760	34	-	9.4	28%	R3	-	1.7	5%	R8
	8760	24	-	9.4	39%	R3	-	1.7	7%	R8

CoPC	Averaging Period (hours)	Criteria (µg/m^3)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		
Fluoride	720	62,124	1.0E-05	2.1E-05	<1%	R3	3.6E-06	0.0	<1%	R1
	1440	46,593	8.5E-06	1.7E-05	<1%	R3	3.0E-06	0.0	<1%	R1
Chromium VI	24	7.0E-04	2.4E-07	4.8E-07	<1%	R3	7.9E-08	0.0	<1%	R1
	8760	1.4E-04	1.5E-08	2.9E-08	<1%	R3	1.9E-09	0.0	<1%	R9
Chromium VI (in PM_{10})	24	3.5E-04	6.8E-08	1.4E-07	<1%	R3	2.3E-08	0.0	<1%	R1
	8760	7.0E-05	4.4E-09	8.5E-09	<1%	R3	5.4E-10	0.0	<1%	R9
Mercury	24	2	1.2E-06	1.8E-06	<1%	R4	7.6E-08	0.0	<1%	R9
Aluminum	24	12	17	38	313%	R3	6.0	14.5	121%	R8
Silver	24	1	5.4E-05	1.4E-04	<1%	R3	1.9E-05	0.0	<1%	R7
Arsenic	24	0.3	7.4E-04	1.6E-03	<1%	R3	2.5E-04	0.0	<1%	R1
Barium	24	10	2.8E-02	6.2E-02	<1%	R3	9.5E-03	0.0	<1%	R1
Beryllium	24	1.0E-02	4.1E-05	8.9E-05	<1%	R3	1.5E-05	0.0	<1%	R1
Boron	24	120	2.8E-03	6.5E-03	<1%	R3	9.9E-04	0.0	<1%	R1
Bismuth	24	2.5	1.6E-05	3.7E-05	<1%	R3	5.7E-06	0.0	<1%	R1
Calcium	24	N/A - no criteria	16	42	-	R3	5.8	17.6	-	R8
Cadmium	24	2.5E-02	1.4E-05	3.3E-05	<1%	R3	5.0E-06	0.0	<1%	R1
	8760	5.0E-03	1.5E-06	3.2E-06	<1%	R3	2.7E-07	0.0	<1%	R9
Cobalt	24	0.1	1.0E-02	2.5E-02	25%	R3	3.6E-03	0.0	9%	R7
Chromium	24	0.5	0.1	0.3	59%	R3	4.2E-02	0.1	22%	R7
Copper	24	50	2.0E-02	5.1E-02	<1%	R3	7.2E-03	0.0	<1%	R8
Iron	24	N/A	10	25	-	R3	3.7	9.2	-	R7
Potassium	24	10	0.8	1.9	19%	R3	0.3	0.7	7%	R1
Lithium	24	20	2.5E-03	6.3E-03	<1%	R3	9.1E-04	0.0	<1%	R8
Magnesium	24	72	15	38	52%	R3	5.3	14.4	20%	R7
Manganese	24	0.4	0.2	0.5	129%	R3	7.4E-02	0.2	48%	R7
Manganese (in PM_{10})	24	0.2	5.9E-02	0.1	74%	R3	2.1E-02	5.4E-02	27%	R8
Manganese (in $PM_{2.5}$)	24	0.1	6.3E-03	1.6E-02	16%	R3	2.3E-03	5.9E-03	6%	R7
Molybdenum	24	120	1.3E-04	3.1E-04	<1%	R3	4.5E-05	1.1E-04	<1%	R7
Silicon	24	27	1.4	3.4	13%	R3	0.5	1.2	4%	R1
Sodium	24	N/A - no criteria	2.4	5.7	-	R3	0.9	2.0	-	R1
Nickel (in PM)	24	0.2	6.2E-02	0.1	74%	R3	2.1E-02	5.6E-02	28%	R7
	8760	4.0E-02	7.9E-03	1.6E-02	40%	R3	1.4E-03	2.7E-03	7%	R9

CoPC	Averaging Period (hours)	Criteria (µg/m^3)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		
Nickel (in PM_{10})	24	0.1	2.9E-02	4.4E-02	44%	R4	5.9E-03	1.5E-02	15%	R7
	8760	2.0E-02	2.2E-03	4.4E-03	22%	R3	3.7E-04	7.1E-04	4%	R9
Lead	24	0.5	2.5E-04	5.5E-04	<1%	R3	9.1E-05	2.0E-04	<1%	R1
	720	0.2	9.6E-05	2.1E-04	<1%	R3	3.5E-05	7.8E-05	<1%	R1
Antimony	24	25	1.4E-04	2.3E-04	<1%	R3	3.6E-05	8.4E-05	<1%	R7
Selenium	24	10	6.3E-05	1.6E-04	<1%	R3	2.3E-05	5.8E-05	<1%	R7
Tin	24	10	6.9E-04	1.7E-03	<1%	R3	2.5E-04	6.3E-04	<1%	R7
Strontium	24	120	2.6E-02	6.7E-02	<1%	R3	9.6E-03	2.6E-02	<1%	R8
Titanium	24	120	0.3	0.8	<1%	R3	0.1	0.3	<1%	R1
Thallium	24	0.5	7.8E-06	1.8E-05	<1%	R3	2.8E-06	6.7E-06	<1%	R1
Uranium	24	0.3	2.6E-05	5.7E-05	<1%	R3	9.6E-06	2.1E-05	<1%	R1
	8760	6.0E-02	2.2E-06	4.6E-06	<1%	R3	3.3E-07	7.0E-07	<1%	R9
Uranium (in PM_{10})	24	0.15	7.7E-06	1.7E-05	<1%	R3	2.9E-06	6.4E-06	<1%	R1
	8760	3.0E-02	6.7E-07	1.4E-06	<1%	R3	1.0E-07	2.1E-07	<1%	R9
Vanadium	24	2	2.4E-02	6.0E-02	3%	R3	8.5E-03	2.2E-02	1%	R8
Tungsten	24	5	5.4E-05	1.2E-04	<1%	R3	1.9E-05	4.2E-05	<1%	R1
Yttrium	24	5	1.4E-03	3.2E-03	<1%	R3	4.9E-04	1.1E-03	<1%	R1
Zinc	24	120	9.6E-03	2.3E-02	<1%	R3	3.4E-03	8.0E-03	<1%	R1
Thorium	24	N/A - no criteria	2.2E-04	5.2E-04	-	R3	8.0E-05	1.8E-04	-	R1
Quartz (in PM_{10})	24	5	3.4	7.0	139%	R3	1.3	2.5	51%	R1
Pyrite	24	N/A - no criteria	3.5E-04	5.4E-04	-	R4	2.6E-05	5.4E-05	-	R1
Biotite	24	N/A - no criteria	1.1	2.8	-	R3	0.4	1.0	-	R7
Magnetite	24	25	2.3	4.6	18%	R3	0.7	1.6	7%	R7
Hematite	24	25	8.3E-02	0.2	<1%	R3	2.9E-02	6.0E-02	<1%	R1
Chlorite	24	120	35	56	47%	R3	7.9	22	18%	R8
Muscovite	24	1.5	6.9	16	1041%	R3	2.5	5.5	367%	R1
Talc (fibrous)	24	2	0.6	0.8	38%	R3	0.1	0.3	14%	R1
Phosphorus	24	0.5	7.2E-08	1.2E-07	<1%	R2	1.9E-08	4.4E-08	<1%	R8
Platinum	24	0.2	2.1E-11	3.7E-11	<1%	R2	5.7E-12	1.3E-11	<1%	R8
Palladium [2]	24	10	7.3E-11	1.3E-10	<1%	R2	2.0E-11	4.4E-11	<1%	R8
Chrysotile Asbestos (units are fibres/cm^3) [8]	24	4.0E-02	1.8E-02	2.7E-02	69%	R4	2.0E-03	4.2E-03	11%	R7
1,3-butadiene	24	10	-	3.5E-03	<1%	R2	-	1.3E-03	<1%	R1

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m³)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		
	8760	2	-	4.4E-04	<1%	R3	-	7.5E-05	<1%	R9
Acenaphthene	24	N/A - no criteria	-	2.3E-04	-	R2	-	8.8E-05	-	R1
	8760	N/A - no criteria	-	2.9E-05	-	R3	-	6.4E-06	-	R1
Acenaphthylene	24	N/A - no criteria	-	3.8E-04	-	R2	-	1.4E-04	-	R1
	8760	N/A - no criteria	-	4.8E-05	-	R3	-	1.1E-05	-	R1
Acetaldehyde	0.5	500	-	2.3	<1%	R3	-	1.6	<1%	R8
	24	500	-	0.3	<1%	R2	-	0.1	<1%	R1
Acrolein	1	4.5	-	0.3	6%	R4	-	0.2	3%	R9
	24	0.4	-	4.4E-02	11%	R2	-	1.7E-02	4%	R1
Anthracene	24	N/A - no criteria	-	1.5E-04	-	R2	-	5.7E-05	-	R1
	8760	N/A - no criteria	-	1.9E-05	-	R3	-	3.2E-06	-	R9
Benzene	24	2.3	-	5.7E-02	2%	R2	-	2.2E-02	<1%	R1
	8760	0.45	-	7.1E-03	2%	R3	-	1.3E-03	<1%	R1
Benzo(a)anthracene	24	N/A - no criteria	-	2.1E-06	-	R2	-	7.7E-07	-	R1
	8760	N/A - no criteria	-	2.6E-07	-	R3	-	7.0E-08	-	R1
Benzo(a)pyrene	24	5.0E-05	-	2.3E-06	5%	R2	-	8.8E-07	2%	R1
	8760	1.0E-05	-	2.8E-07	3%	R3	-	4.9E-08	<1%	R9
Benzo(b+k)fluoranthene	24	N/A - no criteria	-	1.9E-06	-	R2	-	7.4E-07	-	R1
	8760	N/A - no criteria	-	2.4E-07	-	R3	-	4.9E-08	-	R1
Benzo(g,h,i)perylene	24	N/A - no criteria	-	1.1E-06	-	R2	-	4.2E-07	-	R1
	8760	N/A - no criteria	-	1.4E-07	-	R3	-	4.5E-08	-	R1
Chrysene	24	N/A - no criteria	-	4.0E-06	-	R2	-	1.5E-06	-	R1
	8760	N/A - no criteria	-	5.0E-07	-	R3	-	1.1E-07	-	R1
Dibenzo(a,h) anthracene	24	N/A - no criteria	-	1.0E-06	-	R3	-	3.5E-07	-	R1
	8760	N/A - no criteria	-	1.3E-07	-	R3	-	2.0E-08	-	R9
Fluoranthene	24	N/A - no criteria	-	2.3E-04	-	R2	-	8.9E-05	-	R1
	8760	N/A - no criteria	-	2.9E-05	-	R3	-	5.0E-06	-	R9
Fluorene	24	N/A - no criteria	-	9.0E-04	-	R2	-	3.4E-04	-	R1
	8760	N/A - no criteria	-	1.1E-04	-	R3	-	2.0E-05	-	R1
Indeno(1,2,3,c,d)pyrene	24	N/A - no criteria	-	5.8E-07	-	R3	-	2.1E-07	-	R1
	8760	N/A - no criteria	-	7.7E-08	-	R3	-	1.6E-08	-	R1
Naphthalene	0.17	50	-	0.7	1%	R4	-	0.4	<1%	R9

CoPC	Averaging Period (hours)	Criteria (µg/m^3)	Special Receptors Within Modelled Mine Boundary [1]				Special Receptors Outside Modelled Mine Boundary [1]			
			Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]	Maximum Predicted Concentration (µg/m^3)		% of Criteria [9]	Special Receptor ID [10]
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		
	24	22.5	-	0.1	<1%	R3	-	3.7E-02	<1%	R1
Phenanthrene	24	N/A - no criteria	-	6.1E-03	-	R3	-	2.1E-03	-	R1
	8760	N/A - no criteria	-	8.0E-04	-	R3	-	1.2E-04	-	R9
Pyrene	24	N/A - no criteria	-	3.0E-04	-	R3	-	1.0E-04	-	R1
	8760	N/A - no criteria	-	4.0E-05	-	R3	-	6.0E-06	-	R9
Formaldehyde	24	65	-	1.0	1%	R2	-	0.4	<1%	R1
Potassium amyl xanthate	24	N/A - no criteria	2.6E-02	4.4E-02	-	R2	9.4E-03	2.0E-02	-	R8
Sodium hexametaphosphate	24	15	4.3E-02	7.1E-02	<1%	R2	1.5E-02	3.3E-02	<1%	R8
Hydrocarbons	24	N/A - no criteria	-	3.4	-	R2	-	1.3	-	R1

Notes:

1. Maximum Special Receptor Concentrations exclude surface water receptors.
2. Model predictions for particulates including all emissions sources.
3. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
4. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
5. Maximum predicted 10-minute, 1-hour and annual SO2 concentrations are presented in the table for direct comparison to the AAQC and conservatively compared to the CAAQS.
6. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
7. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average NO2 concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
8. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
9. Maximum predicted concentration without plume depletion is compared to the criteria.
10. Special receptor identified to have the maximum prediction without plume depletion.

5.2.3.2 Operations – Cumulative Effects

A summary of the maximum predicted CoPC GLCs over all assessed special receptors for the Project Alone cumulatively with background air quality levels is presented in Table 5.8. The maximum predicted concentration of each CoPC at each special receptor is tabulated in Appendix D of this assessment. In Table 5.8, maximum CoPC concentrations are presented for special receptors inside and outside the Modelled Mine Boundary.

The maximum predicted (Base Method) cumulative concentrations of SPM, $PM_{10,}$ aluminum, muscovite and B(a)P are above applicable criteria for special receptors outside the Modelled Mine Boundary. The maximum predicted 24-hour average cumulative concentrations of 24-hour average SPM, $PM_{10,}$ aluminum and muscovite are 89%, 42%, 25% and 267% above their respective criteria. B(a)P for 24-hour and annual averages is predicted to be 6% and 2% above the respective criteria. As discussed in Section 5.1.2, 24-hour and annual average background B(a)P concentrations exceed their applicable criteria alone with the Project only contributing a small increment above the background concentration.

When plume deposition and depletion (Refined Method) are included in the cumulative predictions, the only particulate or metal CoPC predicted to exceed its criterion at outside Modelled Mine Boundary special receptors is muscovite. Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ concentrations are below their criteria at all assessed special receptors.

As the background CoPC concentrations used in this assessment for hourly and daily averages are 90th percentile values, combination of these background levels with the 98th percentile metrics used for comparison to the CAAQS will result in conservative cumulative concentration estimates. The outside Modelled Mine Boundary cumulative 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS by 47%.

Exceedances of the 24-hour SPM, PM_{10}, aluminum, RCS, magnetite and muscovite, 24-hour and annual B(a)P ambient criteria are predicted at inside Modelled Mine Boundary receptors. The maximum predicted cumulative inside Modelled Mine Boundary concentrations occurred predominantly at receptor R3 (Camp on the West Buskegeau River). As with the Project Alone case, the maximum predicted cumulative 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at all inside the Modelled Mine Boundary receptors. Within the Modelled Mine Boundary human presence is expected to infrequent and short term (less than 24-hours).

Table 5.8 Summary of Maximum Predicted Cumulative Concentrations at Special Receptors - Operations

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Total Suspended Particulate Matter (SPM) (2)	24	120	26	214	241	539	566	472%	R3	77	104	200	227	189%	R8
	8760	60	12	26	38	57	68	114%	R3	5.0	17	9.2	21	35%	R9
Total Suspended Particulate Matter (SPM) (MECP method excluding haul roads and wind erosion) (3)	24	120	26	-	-	-	-	-	-	-	-	11	38	32%	R9
	8760	60	12	-	-	-	-	-	-	-	-	0.7	12	21%	R9
Inhalable Particulate Matter (PM_{10}) (2)	24	50	13	62	75	156	169	337%	R3	23	36	58	71	142%	R8
Inhalable Particulate Matter (PM_{10}) (MECP method excluding haul road and wind erosion) (3)	24	50	13	-	-	-	-	-	-	-	-	2.9	16	32%	R9
Fine Particulate Matter ($PM_{2.5}$) (2), (4)	24	27	12	6.8	19	17	29	109%	R3	2.5	15	6.5	19	70%	R7
	8760	8.8	6.2	0.9	7.1	1.9	8.1	92%	R3	0.2	6.4	0.3	6.5	74%	R9
Fine Particulate Matter ($PM_{2.5}$) (MECP method excluding haul road and wind erosion) (3), (4)	24	27	12	-	-	-	-	-	-	-	-	0.9	13	49%	R8
	8760	8.8	6.2	-	-	-	-	-	-	-	-	0.1	6.3	71%	R9
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	2	N/A - no criteria	0.2	1.4	1.6	3.4	3.6	-	R3	1.0	1.2	2.1	2.3	-	R1
	8760	N/A - no criteria	1.8E-02	3.1E-02	5.0E-02	8.4E-02	0.1	-	R3	5.9E-03	2.4E-02	1.4E-02	3.2E-02	-	R9
Elemental Carbon (from diesel exhaust)	24	15	9.4E-02	0.2	0.3	0.7	0.8	5%	R2	8.1E-02	0.2	0.3	0.4	2%	R1
Carbon Monoxide (CO)	0.5	6,000	1,170	-	-	2,880	4,050	67%	R4	-	-	1,841	3,011	50%	R9
	1	36,200	965	-	-	2,372	3,337	9%	R4	-	-	1,516	2,481	7%	R9
	8	15700	965	-	-	1,325	2,290	15%	R4	-	-	847	1,812	12%	R9
Sulphur Dioxide (SO_2) (5)	0.17	178	8.6	-	-	87	96	54%	R4	-	-	56	65	36%	R9
	1	100	5.2	-	-	53	58	58%	R4	-	-	34	39	39%	R9
	1	193	5.2	-	-	53	58	30%	R4	-	-	34	39	20%	R9
	1	179	5.2	-	-	53	58	32%	R4	-	-	34	39	22%	R9
	8760	10	0.4	-	-	1.7E-02	0.4	4%	R3	-	-	2.8E-03	0.4	4%	R9
	8760	13.8	0.4	-	-	1.7E-02	0.4	3%	R3	-	-	2.8E-03	0.4	3%	R9
	8760	11	0.4	-	-	1.7E-02	0.4	3%	R3	-	-	2.8E-03	0.4	3%	R9
Nitrogen Dioxide (NO_2)	1 (6)	400	5.4	-	-	245	250	63%	R4	-	-	153	158	40%	R9
	1 (7)	119	5.4	-	-	142	148	124%	R3	-	-	117	122	103%	R9
	1 (7)	83	5.4	-	-	142	148	178%	R3	-	-	117	122	147%	R9
	24	200	2.2	-	-	44	46	23%	R3	-	-	19	22	11%	R1
	8760	34	0.3	-	-	9.4	9.7	29%	R3	-	-	1.7	2.0	6%	R8
	8760	24	0.3	-	-	9.4	9.7	40%	R3	-	-	1.7	2.0	9%	R8

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Fluoride	720	62,124	0	1.0E-05	1.0E-05	2.1E-05	2.1E-05	<1%	R3	3.6E-06	3.6E-06	8.0E-06	8.0E-06	<1%	R1
	1440	46,593	0	8.5E-06	8.5E-06	1.7E-05	1.7E-05	<1%	R3	3.0E-06	3.0E-06	6.6E-06	6.6E-06	<1%	R1
Chromium VI	24	7.0E-04	-	2.4E-07	2.4E-07	4.8E-07	4.8E-07	<1%	R3	7.9E-08	7.9E-08	1.6E-07	1.6E-07	<1%	R1
	8760	1.4E-04	-	1.5E-08	1.5E-08	2.9E-08	2.9E-08	<1%	R3	1.9E-09	1.9E-09	4.1E-09	4.1E-09	<1%	R9
Chromium VI (in PM_{10})	24	3.5E-04	-	6.8E-08	6.8E-08	1.4E-07	1.4E-07	<1%	R3	2.3E-08	2.3E-08	4.8E-08	4.8E-08	<1%	R1
	8760	7.0E-05	-	4.4E-09	4.4E-09	8.5E-09	8.5E-09	<1%	R3	5.4E-10	5.4E-10	1.2E-09	1.2E-09	<1%	R9
Mercury	24	2.0	6.4E-05	1.2E-06	6.5E-05	1.8E-06	6.6E-05	<1%	R4	7.6E-08	6.4E-05	1.5E-07	6.4E-05	<1%	R9
Aluminum	24	12	0.4	17	17	38	38	316%	R3	6.0	6.4	15	15	125%	R8
Silver	24	1.0	2.6E-04	5.4E-05	3.1E-04	1.4E-04	4.0E-04	<1%	R3	1.9E-05	2.8E-04	5.0E-05	3.1E-04	<1%	R7
Arsenic	24	0.3	1.3E-03	7.4E-04	2.0E-03	1.6E-03	2.9E-03	<1%	R3	2.5E-04	1.5E-03	5.6E-04	1.8E-03	<1%	R1
Barium	24	10	8.6E-03	2.8E-02	3.6E-02	6.2E-02	7.0E-02	<1%	R3	9.5E-03	1.8E-02	2.2E-02	3.1E-02	<1%	R1
Beryllium	24	1.0E-02	7.6E-04	4.1E-05	8.0E-04	8.9E-05	8.5E-04	8%	R3	1.5E-05	7.7E-04	3.2E-05	7.9E-04	8%	R1
Boron	24	120	2.6E-02	2.8E-03	2.9E-02	6.5E-03	3.2E-02	<1%	R3	9.9E-04	2.7E-02	2.2E-03	2.8E-02	<1%	R1
Bismuth	24	2.5	1.3E-03	1.6E-05	1.3E-03	3.7E-05	1.3E-03	<1%	R3	5.7E-06	1.3E-03	1.3E-05	1.3E-03	<1%	R1
Calcium	24	N/A - no criteria	0.7	16	16	42	42	-	R3	5.8	6.5	18	18	-	R8
Cadmium	24	2.5E-02	2.6E-04	1.4E-05	2.7E-04	3.3E-05	2.9E-04	1%	R3	5.0E-06	2.6E-04	1.2E-05	2.7E-04	1%	R1
	8760	5.0E-03	2.6E-04	1.5E-06	2.6E-04	3.2E-06	2.6E-04	5%	R3	2.7E-07	2.6E-04	5.2E-07	2.6E-04	5%	R9
Cobalt	24	0.1	7.6E-04	1.0E-02	1.1E-02	2.5E-02	2.6E-02	26%	R3	3.6E-03	4.4E-03	9.4E-03	1.0E-02	10%	R7
Chromium	24	0.5	6.0E-03	0.1	0.1	0.3	0.3	60%	R3	4.2E-02	4.8E-02	0.1	0.1	23%	R7
Copper	24	50	5.8E-03	2.0E-02	2.6E-02	5.1E-02	5.7E-02	<1%	R3	7.2E-03	1.3E-02	2.0E-02	2.6E-02	<1%	R8
Iron	24	N/A - no criteria	0.2	10	10	25	25	-	R3	3.7	3.9	9.2	9.4	-	R7
Potassium	24	10	0.1	0.8	0.9	1.9	2.1	21%	R3	0.3	0.4	0.7	0.8	8%	R1
Lithium	24	20	-	2.5E-03	2.5E-03	6.3E-03	6.3E-03	<1%	R3	9.1E-04	9.1E-04	2.5E-03	2.5E-03	<1%	R8
Magnesium	24	72	0.2	15	15	38	38	53%	R3	5.3	5.5	14	15	20%	R7
Manganese	24	0.4	8.6E-03	0.2	0.2	0.5	0.5	131%	R3	7.4E-02	8.2E-02	0.2	0.2	50%	R7
Manganese (in PM_{10})	24	0.2	8.6E-03	5.9E-02	6.8E-02	0.1	0.2	78%	R3	2.1E-02	3.0E-02	5.4E-02	6.3E-02	31%	R8
Manganese (in $PM_{2.5}$)	24	0.1	8.6E-03	6.3E-03	1.5E-02	1.6E-02	2.4E-02	24%	R3	2.3E-03	1.1E-02	5.9E-03	1.5E-02	15%	R7
Molybdenum	24	120	7.6E-04	1.3E-04	8.9E-04	3.1E-04	1.1E-03	<1%	R3	4.5E-05	8.1E-04	1.1E-04	8.7E-04	<1%	R7
Silicon	24	27	-	1.4	1.4	3.4	3.4	13%	R3	0.5	0.5	1.2	1.2	4%	R1
Sodium	24	N/A - no criteria	0.5	2.4	2.9	5.7	6.3	-	R3	0.9	1.4	2.0	2.5	-	R1
Nickel (in PM)	24	0.2	2.6E-03	6.2E-02	6.5E-02	0.1	0.1	75%	R3	2.1E-02	2.4E-02	5.6E-02	5.9E-02	29%	R7
	8760	4.0E-02	1.7E-03	7.9E-03	9.6E-03	1.6E-02	1.8E-02	44%	R3	1.4E-03	3.1E-03	2.7E-03	4.3E-03	11%	R9

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Nickel (in PM_{10})	24	0.1	2.6E-03	2.9E-02	3.2E-02	4.4E-02	4.6E-02	46%	R4	5.9E-03	8.5E-03	1.5E-02	1.7E-02	17%	R7
	8760	2.0E-02	1.7E-03	2.2E-03	3.8E-03	4.4E-03	6.0E-03	30%	R3	3.7E-04	2.0E-03	7.1E-04	2.4E-03	12%	R9
Lead	24	0.5	3.4E-03	2.5E-04	3.6E-03	5.5E-04	4.0E-03	<1%	R3	9.1E-05	3.5E-03	2.0E-04	3.6E-03	<1%	R1
	720	0.2	1.3E-03	9.6E-05	1.4E-03	2.1E-04	1.5E-03	<1%	R3	3.5E-05	1.3E-03	7.8E-05	1.4E-03	<1%	R1
Antimony	24	25	1.3E-03	1.4E-04	1.4E-03	2.3E-04	1.5E-03	<1%	R3	3.6E-05	1.3E-03	8.4E-05	1.3E-03	<1%	R7
Selenium	24	10	2.6E-03	6.3E-05	2.7E-03	1.6E-04	2.8E-03	<1%	R3	2.3E-05	2.6E-03	5.8E-05	2.7E-03	<1%	R7
Tin	24	10	2.4E-03	6.9E-04	3.1E-03	1.7E-03	4.1E-03	<1%	R3	2.5E-04	2.6E-03	6.3E-04	3.0E-03	<1%	R7
Strontium	24	120	1.5E-03	2.6E-02	2.8E-02	6.7E-02	6.8E-02	<1%	R3	9.6E-03	1.1E-02	2.6E-02	2.7E-02	<1%	R8
Titanium	24	120	8.8E-03	0.3	0.3	0.8	0.8	<1%	R3	0.1	0.1	0.3	0.3	<1%	R1
Thallium	24	0.5	2.6E-04	7.8E-06	2.7E-04	1.8E-05	2.8E-04	<1%	R3	2.8E-06	2.6E-04	6.7E-06	2.7E-04	<1%	R1
Uranium	24	0.3	2.6E-04	2.6E-05	2.9E-04	5.7E-05	3.2E-04	<1%	R3	9.6E-06	2.7E-04	2.1E-05	2.8E-04	<1%	R1
	8760	6.0E-02	2.6E-04	2.2E-06	2.6E-04	4.6E-06	2.6E-04	<1%	R3	3.3E-07	2.6E-04	7.0E-07	2.6E-04	<1%	R9
Uranium (in PM_{10})	24	0.15	2.6E-04	7.7E-06	2.7E-04	1.7E-05	2.8E-04	<1%	R3	2.9E-06	2.6E-04	6.4E-06	2.7E-04	<1%	R1
	8760	3.0E-02	2.6E-04	6.7E-07	2.6E-04	1.4E-06	2.6E-04	<1%	R3	1.0E-07	2.6E-04	2.1E-07	2.6E-04	<1%	R9
Vanadium	24	2.0	7.6E-04	2.4E-02	2.4E-02	6.0E-02	6.0E-02	3%	R3	8.5E-03	9.3E-03	2.2E-02	2.3E-02	1%	R8
Tungsten	24	5.0	-	5.4E-05	5.4E-05	1.2E-04	1.2E-04	<1%	R3	1.9E-05	1.9E-05	4.2E-05	4.2E-05	<1%	R1
Yttrium	24	5.0	-	1.4E-03	1.4E-03	3.2E-03	3.2E-03	<1%	R3	4.9E-04	4.9E-04	1.1E-03	1.1E-03	<1%	R1
Zinc	24	120	1.5E-02	9.6E-03	2.5E-02	2.3E-02	3.8E-02	<1%	R3	3.4E-03	1.8E-02	8.0E-03	2.3E-02	<1%	R1
Thorium	24	N/A - no criteria	0	2.2E-04	2.2E-04	5.2E-04	5.2E-04	-	R3	8.0E-05	8.0E-05	1.8E-04	1.8E-04	-	R1
Quartz (in PM_{10})	24	5	1.0	3.4	4.4	7.0	7.9	159%	R3	1.3	2.3	2.5	3.5	71%	R1
Pyrite	24	N/A - no criteria	-	3.5E-04	3.5E-04	5.4E-04	5.4E-04	-	R4	2.6E-05	2.6E-05	5.4E-05	5.4E-05	-	R1
Biotite	24	N/A - no criteria	0	1.1	1.1	2.8	2.8	-	R3	0.4	0.4	1.0	1.0	-	R7
Magnetite	24	25	ND	2.3	2.3	4.6	4.6	18%	R3	0.7	0.7	1.6	1.6	7%	R7
Hematite	24	25	ND	8.3E-02	8.3E-02	0.2	0.2	<1%	R3	2.9E-02	2.9E-02	6.0E-02	6.0E-02	<1%	R1
Chlorite	24	120	ND	35	35	56	56	47%	R3	7.9	7.9	22	22	18%	R8
Muscovite	24	1.5	ND	6.9	6.9	16	16	1041%	R3	2.5	2.5	5.5	5.5	367%	R1
Talc (fibrous)	24	2	ND	0.6	0.6	0.8	0.8	38%	R3	0.1	0.1	0.3	0.3	14%	R1
Phosphorus	24	0.5	-	7.2E-08	7.2E-08	1.2E-07	1.2E-07	<1%	R2	1.9E-08	1.9E-08	4.4E-08	4.4E-08	<1%	R8
Platinum	24	0.2	-	2.1E-11	2.1E-11	3.7E-11	3.7E-11	<1%	R2	5.7E-12	5.7E-12	1.3E-11	1.3E-11	<1%	R8
Palladium	24	10	-	7.3E-11	7.3E-11	1.3E-10	1.3E-10	<1%	R2	2.0E-11	2.0E-11	4.4E-11	4.4E-11	<1%	R8
Chrysotile Asbestos (units are fibres/cm³) (8)	24	0.04	2.9E-03	1.8E-02	2.1E-02	2.7E-02	3.0E-02	76%	R4	2.0E-03	4.9E-03	4.2E-03	7.1E-03	18%	R7
1,3-butadiene	24	10	0.6	-	-	3.5E-03	0.6	6%	R2	-	-	1.3E-03	0.6	6%	R1
	8760	2	0.6	-	-	4.4E-04	0.6	28%	R3	-	-	7.5E-05	0.6	28%	R9

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Acenaphthene	24	N/A - no criteria	4.4E-03	-	-	2.3E-04	4.6E-03	-	R2	-	-	8.8E-05	4.5E-03	-	R1
	8760	N/A - no criteria	8.5E-04	-	-	2.9E-05	8.8E-04	-	R3	-	-	6.4E-06	8.5E-04	-	R1
Acenaphthylene	24	N/A - no criteria	8.2E-03	-	-	3.8E-04	8.5E-03	-	R2	-	-	1.4E-04	8.3E-03	-	R1
	8760	N/A - no criteria	1. 6E-03	-	-	4.8E-05	1.6E-03	-	R3	-	-	1.1E-05	1.6E-03	-	R1
Acetaldehyde	0.5	500	0	-	-	2.3	2.3	<1%	R3	-	-	1.6	1.6	<1%	R8
	24	500	0	-	-	0.3	0.3	<1%	R2	-	-	0.1	0.1	<1%	R1
Acrolein	1	4.5	0	-	-	0.3	0.3	6%	R4	-	-	0.2	0.2	3%	R9
	24	0.4	0	-	-	4.4E-02	4.4E-02	11%	R2	-	-	1.7E-02	1.7E-02	4%	R1
Anthracene	24	N/A - no criteria	1.6E-04	-	-	1.5E-04	3.1E-04	-	R2	-	-	5.7E-05	2.2E-04	-	R1
	8760	N/A - no criteria	3.1E-05	-	-	1.9E-05	5.0E-05	-	R3	-	-	3.2E-06	3.4E-05	-	R9
Benzene	24	2.3	0.5	-	-	5.7E-02	0.5	24%	R2	-	-	2.2E-02	0.5	22%	R1
	8760	0.45	0.4	-	-	7.1E-03	0.4	84%	R3	-	-	1.3E-03	0.4	83%	R1
Benzo(a)anthracene	24	N/A - no criteria	0	-	-	2.1E-06	2.1E-06	-	R2	-	-	7.7E-07	7.7E-07	-	R1
	8760	N/A - no criteria	0	-	-	2.6E-07	2.6E-07	-	R3	-	-	7.0E-08	7.0E-08	-	R1
Benzo(a)pyrene	24	5.0E-05	5.3E-05	-	-	2.3E-06	5.5E-05	110%	R2	-	-	8.8E-07	5.4E-05	108%	R1
	8760	1.0E-05	1.0E-05	-	-	2.8E-07	1.0E-05	104%	R3	-	-	4.9E-08	1.0E-05	102%	R9
Benzo(b+k)fluoranthene	24	N/A - no criteria	2.8E-04	-	-	1.9E-06	2.8E-04	-	R2	-	-	7.4E-07	2.8E-04	-	R1
	8760	N/A - no criteria	5.4E-05	-	-	2.4E-07	5.4E-05	-	R3	-	-	4.9E-08	5.4E-05	-	R1
Benzo(g,h,i)perylene	24	N/A - no criteria	0	-	-	1.1E-06	1.1E-06	-	R2	-	-	4.2E-07	4.2E-07	-	R1
	8760	N/A - no criteria	0	-	-	1.4E-07	1.4E-07	-	R3	-	-	4.5E-08	4.5E-08	-	R1
Chrysene	24	N/A - no criteria	3.4E-04	-	-	4.0E-06	3.4E-04	-	R2	-	-	1.5E-06	3.4E-04	-	R1
	8760	N/A - no criteria	6.5E-05	-	-	5.0E-07	6.5E-05	-	R3	-	-	1.1E-07	6.5E-05	-	R1
Dibenzo(a,h) anthracene	24	N/A - no criteria	0	-	-	1.0E-06	1.0E-06	-	R3	-	-	3.5E-07	3.5E-07	-	R1
	8760	N/A - no criteria	0	-	-	1.3E-07	1.3E-07	-	R3	-	-	2.0E-08	2.0E-08	-	R9
Fluoranthene	24	N/A - no criteria	8.2E-04	-	-	2.3E-04	1.0E-03	-	R2	-	-	8.9E-05	9.0E-04	-	R1
	8760	N/A - no criteria	1. 6E-04	-	-	2.9E-05	1.9E-04	-	R3	-	-	5.0E-06	1.6E-04	-	R9
Fluorene	24	N/A - no criteria	1.5E-03	-	-	9.0E-04	2.4E-03	-	R2	-	-	3.4E-04	1.8E-03	-	R1
	8760	N/A - no criteria	2.8E-04	-	-	1.1E-04	3.9E-04	-	R3	-	-	2.0E-05	3.0E-04	-	R1
Indeno(1,2,3,c,d)pyrene	24	N/A - no criteria	-	-	-	5.8E-07	5.8E-07	-	R3	-	-	2.1E-07	2.1E-07	-	R1
	8760	N/A - no criteria	0	-	-	7.7E-08	7.7E-08	-	R3	-	-	1.6E-08	1.6E-08	-	R1
Naphthalene	0.17	50	-	-	-	0.7	0.7	1%	R4	-	-	0.4	0.4	<1%	R9
	24	22.5	-	-	-	0.1	0.1	<1%	R3	-	-	3.7E-02	3.7E-02	<1%	R1

CoPC	Averaging Period	Criteria (µg/m³)	Background Concentration (µg/m³)	Special Receptors Within Modelled Mine Boundary (1)						Special Receptors Outside Modelled Mine Boundary (1)					
				Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)	Maximum Predicted Concentration (µg/m³)				% of Criteria (9)	Special Receptor ID (10)
				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion				Refined Method - With Plume Depletion		Base Method - Without Plume Depletion			
				Project Alone	Project + Background	Project Alone	Project + Background			Project Alone	Project + Background	Project Alone	Project + Background		
Phenanthrene	24	N/A - no criteria	2.2E-03	-	-	6.1E-03	8.3E-03	-	R3	-	-	2.1E-03	4.3E-03	-	R1
	8760	N/A - no criteria	4.2E-04	-	-	8.0E-04	1.2E-03	-	R3	-	-	1.2E-04	5.4E-04	-	R9
Pyrene	24	N/A - no criteria	7.1E-04	-	-	3.0E-04	1.0E-03	-	R3	-	-	1.0E-04	8.2E-04	-	R1
	8760	N/A - no criteria	1.4E-04	-	-	4.0E-05	1.8E-04	-	R3	-	-	6.0E-06	1.4E-04	-	R9
Formaldehyde	24	65	0	-	-	1.0	1.0	1%	R2	-	-	0.4	0.4	<1%	R1
Potassium amyl xanthate	24	N/A - no criteria	ND	2.6E-02	2.6E-02	4.4E-02	4.4E-02	-	R2	9.4E-03	9.4E-03	2.0E-02	2.0E-02	-	R8
Sodium hexametaphosphate	24	15	ND	4.3E-02	4.3E-02	7.1E-02	7.1E-02	<1%	R2	1.5E-02	1.5E-02	3.3E-02	3.3E-02	<1%	R8
Hydrocarbons	24	N/A - no criteria	-			3.4	3.4	-	R2			1.3	1.3	-	R1

Notes:

1. Maximum Special Receptor Concentrations exclude surface water receptors.
2. Model predictions for particulates including all emissions sources.
3. Model predictions for particulates excluding roads and stockpile wind erosion as allowed by MECP Guideline A-10, Section 7.4.1 for facilities with a fugitive dust BMP. These model predictions were used for comparison to the applicable criteria.
4. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
5. Maximum predicted 10-minute, 1-hour and annual SO_2 concentrations are presented in the table for direct comparison to the AAQC and conservatively compared to the CAAQS.
6. Maximum predicted 1-hr NO_2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
7. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average NO_2 concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
8. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm^3 using a conversion factor of 1µg/m^3 = 0.03 fibres/cm^3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly
9. Maximum predicted concentration without plume depletion is compared to the criteria.
10. Special receptor identified to have the maximum prediction without plume depletion.

5.3 Assessment of Air Quality at Indigenous Receptors

Air quality levels at sensitive/representative Indigenous receptors (See Section 3.3) were included in the assessment of potential air quality effects. Receptor locations were selected to represent potential areas of current use for traditional purposes by Indigenous nations and were identified based on engagement with Indigenous nations. These locations may be used for traditional activities including fishing, hunting, trapping, and plant gathering. The dispersion modelling included 6 receptor locations. Of these 6 areas, none were identified to be inside the Modelled Mine Boundary which delineates a buffer zone around the PA within which public access will be limited and no long term (24-hour or greater) human exposure will be possible.

A summary of the maximum predicted CoPC GLCs at sensitive/representative Indigenous receptors outside the Modelled Mine Boundary for the construction and operations scenarios for the Project Alone and the Project cumulatively with background air quality levels are presented in Table 5.9. In this table, dispersion model predictions both excluding and including plume deposition and depletion are presented for particulate and metal CoPCs, however comparisons to criteria are only made with the predictions excluding deposition and depletion (Base Method) following MECP guidance (MECP 2017b). Excluding plume deposition and depletion is conservative and is expected to substantially overpredict ambient particulate and metals concentrations. Of the 80 CoPCs assessed for Project Construction, 79 were below their applicable criteria for both the Project Alone and Cumulative cases, with only muscovite predicted to be above its MECP screening level by 46%. Predictions above an MECP screening level indicates that further assessment is required to determine if there is a potential for an adverse effect. This assessment is provided in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement).

Of the 85 CoPCs assessed for Project Operations, 80 are predicted to be below their applicable criteria for the Project Alone. The maximum predicted 24-hour average concentrations of SPM, PM_{10}, aluminum and muscovite are above their respective MECP criteria by 67%, 16%, 21% and 227% respectively. The maximum frequency that SPM, PM_{10}, aluminum and muscovite are above their criteria at an Indigenous receptor are 0.7%, 0.1%, 0.1% and 3.1% respectively. The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 2 Indigenous receptors, with the maximum prediction being 41% above the CAQQS. Maximum predicted hourly and 24-hour average NO_2 concentrations at all the assessed Indigenous receptors are well below their respective MECP criteria.

For both construction and operations maximum predicted cumulative B(a)P concentrations are predicted to exceed the applicable 24-hour and annual criteria. The background level of B(a)P is above the applicable air quality criteria, with the Project only providing a small contribution to the cumulative concentrations.

When plume deposition and depletion are considered in the dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criteria is muscovite (for both construction and operations) with their maximum predicted GLCs decreasing by than 67% relative to the conservative Base Method which does not consider plume depletion.

Table 5.9 Summary of Maximum Predicted Project Alone and Cumulative Concentrations at Indigenous Receptors

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Construction					Operation				
			Project Alone			Cumulative (Project + Background)		Project Alone			Cumulative (Project + Background)	
			Maximum Predicted Concentration (µg/m³)			Maximum Predicted Concentration (µg/m³)		Maximum Predicted Concentration (µg/m³)			Maximum Predicted Concentration (µg/m³)	
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion	Project Alone - % of Criteria	Base Method - Without Plume Depletion	Cumulative - % of Criteria	Refined Method - With Plume Depletion	Base Method - Without Plume Depletion	Project Alone - % of Criteria	Base Method - Without Plume Depletion	Cumulative % of Criteria
Total Suspended Particulate Matter (SPM)	24	120	31	93	77%	119	100%	60	200	167%	227	189%
	8760	60	1.3	2.7	4%	14	24%	5.0	9.2	15%	21	35%
Inhalable Particulate Matter (PM_{10})	24	50	9.9	29	58%	42	84%	17	58	116%	71	142%
Fine Particulate Matter ($PM_{2.5}$) (1)	24	27	1.1	3.2	12%	16	58%	1.9	6.5	24%	19	70%
	8760	8.8	4.3E-02	9.6E-02	1%	6.3	72%	0.2	0.3	4%	6.5	74%
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	2	N/A - no criteria	0.6	2.2	-	2.4	-	0.6	1.8	-	2.0	-
	8760	N/A - no criteria	2.0E-03	4.8E-03	-	2.3E-02	-	5.9E-03	1.4E-02	-	3.2E-02	-
Elemental Carbon (from diesel exhaust)	24	15	4.3E-02	0.1	<1%	0.2	1%	0.1	0.2	1%	0.3	2%
Carbon Monoxide (CO)	0.5	6,000	-	1,127	19%	2,298	38%	-	1,841	0	3,013	50%
	1	36,200	-	928	3%	1,893	5%	-	1,516	0	2,481	7%
	8	15,700	-	518	3%	1,057	7%	-	847	0	2,481	16%
Sulphur Dioxide (SO_2) (2)	0.17	178	-	13	7%	40	22%	-	56	0	65	36%
	1	100	-	19	19%	24	24%	-	34	0	39	39%
	1	186	-	19	10%	24	13%	-	34	0	39	21%
	1	173	-	19	11%	24	14%	-	34	0	39	23%
	8760	10	-	1.0E-03	<1%	0.4	4%	-	2.8E-03	<1%	0.4	4%
	8760	13.3	-	1.0E-03	<1%	0.4	3%	-	2.8E-03	<1%	0.4	3%
	8760	10.6	-	1.0E-03	<1%	0.4	3%	-	2.8E-03	<1%	0.4	3%
Nitrogen Dioxide (NO_2)	1 (3)	400	-	139	35%	145	36%	-	153	38%	158	40%
	1 (4)	119	-	39	33%	44	37%	-	117	98%	122	103%
	1 (4)	83	-	39	47%	44	53%	-	117	141%	122	147%
	24	200	-	7.1	4%	10	5%	-	16	8%	18	9%
	8760	34	-	0.5	2%	0.9	3%	-	1.7	5%	2.0	6%
	8760	24	-	0.5	2%	0.9	4%	-	1.7	7%	2.0	9%
Fluoride	720	62124	1.0E-06	3.2E-06	<1%	3.2E-06	<1%	2.6E-06	5.6E-06	<1%	5.6E-06	<1%
	1440	46593	8.5E-07	2.7E-06	<1%	2.7E-06	<1%	2.1E-06	4.6E-06	<1%	4.6E-06	<1%
Chromium VI	24	7.00E-04	1.8E-08	5.3E-08	<1%	5.3E-08	<1%	5.6E-08	1.2E-07	<1%	1.2E-07	<1%
	8760	1.40E-04	4.7E-10	1.2E-09	<1%	1.2E-09	<1%	1.9E-09	4.1E-09	<1%	4.1E-09	<1%

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Construction					Operation				
			Project Alone			Cumulative (Project + Background)		Project Alone			Cumulative (Project + Background)	
			Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative - % of Criteria	Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative % of Criteria
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion		Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion	
Chromium VI (in PM_{10})	24	3.50E-04	7.0E-09	2.0E-08	<1%	2.0E-08	<1%	1.6E-08	3.5E-08	<1%	3.5E-08	<1%
	8760	7.00E-05	1.7E-10	4.1E-10	<1%	4.1E-10	<1%	5.4E-10	1.2E-09	<1%	1.2E-09	<1%
Mercury	24	2	2.5E-10	7.3E-10	<1%	6.4E-05	<1%	7.6E-08	1.5E-07	<1%	6.4E-05	<1%
Aluminum	24	12	2.2	6.6	55%	7.1	59%	4.7	15	121%	15	125%
Silver	24	1	7.8E-06	2.3E-05	<1%	2.8E-04	<1%	1.5E-05	5.0E-05	<1%	3.1E-04	<1%
Arsenic	24	0.3	8.3E-05	2.5E-04	<1%	1.5E-03	<1%	2.2E-04	5.6E-04	<1%	1.8E-03	<1%
Barium	24	10	3.5E-03	1.0E-02	<1%	1.9E-02	<1%	8.0E-03	2.2E-02	<1%	3.0E-02	<1%
Beryllium	24	0.01	4.1E-06	1.2E-05	<1%	7.7E-04	8%	9.6E-06	2.7E-05	<1%	7.9E-04	8%
Boron	24	120	3.2E-04	9.2E-04	<1%	2.7E-02	<1%	6.8E-04	2.1E-03	<1%	2.8E-02	<1%
Bismuth	24	2.5	1.9E-06	5.6E-06	<1%	1.3E-03	<1%	3.8E-06	1.2E-05	<1%	1.3E-03	<1%
Calcium	24	N/A - no criteria	2.6	7.8	-	8.4	-	4.8	18	-	18	-
Cadmium	24	0.025	1.8E-06	5.4E-06	<1%	2.7E-04	1%	3.6E-06	1.2E-05	<1%	2.7E-04	1%
	8760	0.005	7.0E-08	1.5E-07	<1%	2.6E-04	5%	2.7E-07	5.2E-07	<1%	2.6E-04	5%
Cobalt	24	0.1	1.4E-03	4.2E-03	4%	5.0E-03	5%	2.8E-03	9.4E-03	9%	1.0E-02	10%
Chromium	24	0.5	1.7E-02	4.9E-02	10%	5.5E-02	11%	3.2E-02	0.1	22%	0.1	23%
Copper	24	50	3.1E-03	9.1E-03	<1%	1.5E-02	<1%	5.8E-03	2.0E-02	<1%	2.6E-02	<1%
Iron	24	N/A	1.4	4.2	-	4.4	-	2.7	9.2	-	9.4	-
Potassium	24	10	0.1	0.3	3%	0.4	4%	0.2	0.7	7%	0.8	8%
Lithium	24	20	3.8E-04	1.1E-03	<1%	1.1E-03	<1%	7.1E-04	2.5E-03	<1%	2.5E-03	<1%
Magnesium	24	72	2.2	6.4	9%	6.6	9%	4.2	14	20%	15	20%
Manganese	24	0.4	3.0E-02	8.8E-02	22%	9.6E-02	24%	0.1	0.2	48%	0.2	50%
Manganese (in PM_{10})	24	0.2	9.3E-03	2.7E-02	14%	3.6E-02	18%	1.6E-02	5.4E-02	27%	6.3E-02	31%
Manganese (in $PM_{2.5}$)	24	0.1	9.6E-04	2.9E-03	3%	1.1E-02	11%	1.7E-03	5.9E-03	6%	1.5E-02	15%
Molybdenum	24	120	1.7E-05	5.2E-05	<1%	8.1E-04	<1%	3.4E-05	1.1E-04	<1%	8.7E-04	<1%
Silicon	24	27	0.2	0.5	2%	0.5	2%	0.4	1.2	4%	1.2	4%
Sodium	24	N/A - no criteria	0.3	0.9	-	1.4	-	0.6	1.9	-	2.4	-
Nickel (in PM)	24	0.2	7.5E-03	2.2E-02	11%	2.5E-02	12%	1.8E-02	5.6E-02	28%	5.9E-02	29%
	8760	0.04	3.1E-04	6.6E-04	2%	2.3E-03	6%	1.4E-03	2.7E-03	7%	4.3E-03	11%
Nickel (in PM_{10})	24	0.1	2.4E-03	7.0E-03	7%	9.6E-03	10%	4.5E-03	1.5E-02	15%	1.7E-02	17%
	8760	0.02	9.5E-05	2.0E-04	1%	1.9E-03	9%	3.7E-04	7.1E-04	4%	2.4E-03	12%

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Construction					Operation				
			Project Alone			Cumulative (Project + Background)		Project Alone			Cumulative (Project + Background)	
			Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative - % of Criteria	Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative % of Criteria
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion		Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion	
Lead	24	0.5	2.8E-05	8.4E-05	<1%	3.5E-03	<1%	6.0E-05	1.7E-04	<1%	3.6E-03	<1%
	720	0.2	1.1E-05	3.2E-05	<1%	1.3E-03	<1%	2.3E-05	6.5E-05	<1%	1.4E-03	<1%
Antimony	24	25	1.3E-05	3.9E-05	<1%	1.3E-03	<1%	2.9E-05	8.4E-05	<1%	1.3E-03	<1%
Selenium	24	10	9.2E-06	2.7E-05	<1%	2.6E-03	<1%	1.7E-05	5.8E-05	<1%	2.7E-03	<1%
Tin	24	10	1.0E-04	3.0E-04	<1%	2.7E-03	<1%	1.9E-04	6.3E-04	<1%	3.0E-03	<1%
Strontium	24	120	4.0E-03	1.2E-02	<1%	1.3E-02	<1%	7.5E-03	2.6E-02	<1%	2.7E-02	<1%
Titanium	24	120	4.3E-02	0.1	<1%	0.1	<1%	8.5E-02	0.3	<1%	0.3	<1%
Thallium	24	0.5	1.0E-06	3.1E-06	<1%	2.6E-04	<1%	2.0E-06	6.2E-06	<1%	2.7E-04	<1%
Uranium	24	0.3	2.8E-06	8.7E-06	<1%	2.7E-04	<1%	6.4E-06	1.7E-05	<1%	2.8E-04	<1%
	8760	0.06	1.1E-07	2.6E-07	<1%	2.6E-04	<1%	3.3E-07	7.0E-07	<1%	2.6E-04	<1%
Uranium (in PM_{10})	24	0.15	1.0E-06	3.0E-06	<1%	2.6E-04	<1%	1.9E-06	4.9E-06	<1%	2.6E-04	<1%
	8760	0.03	3.4E-08	8.4E-08	<1%	2.6E-04	<1%	1.0E-07	2.1E-07	<1%	2.6E-04	<1%
Vanadium	24	2	3.5E-03	1.0E-02	<1%	1.1E-02	<1%	6.6E-03	2.2E-02	1%	2.3E-02	1%
Tungsten	24	5	5.6E-06	1.6E-05	<1%	1.6E-05	<1%	1.2E-05	3.8E-05	<1%	3.8E-05	<1%
Yttrium	24	5	1.7E-04	5.0E-04	<1%	5.0E-04	<1%	3.4E-04	1.1E-03	<1%	1.1E-03	<1%
Zinc	24	120	1.2E-03	3.6E-03	<1%	1.9E-02	<1%	2.4E-03	7.9E-03	<1%	2.3E-02	<1%
Thorium	24	N/A - no criteria	2.6E-05	7.7E-05	-	7.7E-05	-	5.4E-05	1.7E-04	-	1.7E-04	-
Quartz (in PM_{10})	24	5	0.3	0.9	19%	1.9	38%	0.8	1.8	35%	2.7	55%
Pyrite	24	N/A - no criteria	5.3E-06	1.5E-05	-	1.5E-05	-	2.4E-05	4.7E-05	-	4.7E-05	-
Biotite	24	N/A - no criteria	0.2	0.5	-	0.5	-	0.3	1.0	-	1.0	-
Magnetite	24	25	0.2	0.5	2%	0.5	2%	0.7	1.6	7%	1.6	7%
Hematite	24	25	5.8E-03	1.7E-02	<1%	1.7E-02	<1%	2.0E-02	4.2E-02	<1%	4.2E-02	<1%
Chlorite	24	120	3.4	10	8%	10	8%	6.3	22	18%	22	18%
Muscovite	24	1.5	0.7	2.2	146%	2.2	146%	1.6	4.9	327%	4.9	327%
Talc (fibrous)	24	2	2.6E-02	7.6E-02	4%	7.6E-02	4%	0.1	0.2	10%	0.2	10%
Phosphorus	24	0.5	-	-	-	-	-	1.9E-08	4.4E-08	<1%	4.4E-08	<1%
Platinum	24	0.2	-	-	-	-	-	5.7E-12	1.3E-11	<1%	1.3E-11	<1%
Palladium 2	24	10	-	-	-	-	-	2.0E-11	4.4E-11	<1%	4.4E-11	<1%
Chrysotile Asbestos (units are fibres/cm³) (5)	24	0.04	3.9E-04	1.1E-03	3%	4.0E-03	10%	1.8E-03	4.2E-03	11%	7.1E-03	18%

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Construction					Operation				
			Project Alone			Cumulative (Project + Background)		Project Alone			Cumulative (Project + Background)	
			Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative - % of Criteria	Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative % of Criteria
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion		Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion	
1,3-butadiene	24	10	-	6.0E-04	<1%	0.6	6%	4.0E-04	1.1E-03	<1%	0.6	6%
	8760	2	-	3.1E-05	<1%	0.6	28%	4.1E-05	7.5E-05	<1%	0.6	28%
Acenaphthene	24	N/A - no criteria	-	4.3E-05	-	4.5E-03	-	2.7E-05	7.6E-05	-	4.5E-03	-
	8760	N/A - no criteria	-	2.8E-06	-	8.5E-04	-	2.9E-06	5.7E-06	-	8.5E-04	-
Acenaphthylene	24	N/A - no criteria	-	7.2E-05	-	8.2E-03	-	4.3E-05	1.3E-04	-	8.3E-03	-
	8760	N/A - no criteria	-	5.0E-06	-	1.6E-03	-	4.7E-06	9.6E-06	-	1.6E-03	-
Acetaldehyde	0.5	500	-	0.5	<1%	1.3	<1%	0.6	1.6	<1%	1.6	<1%
	24	500	-	5.3E-02	<1%	0.05256	<1%	3.5E-02	9.8E-02	<1%	9.8E-02	<1%
Acrolein	1	4.5	-	0.1	3%	0.1	3%	6.9E-02	0.2	3%	0.2	3%
	24	0.4	-	7.5E-03	2%	7.5E-03	2%	5.0E-03	1.4E-02	3%	1.4E-02	3%
Anthracene	24	N/A - no criteria	-	2.6E-05	-	1.9E-04	-	1.7E-05	4.8E-05	-	2.1E-04	-
	8760	N/A - no criteria	-	1.3E-06	-	3.2E-05	-	1.8E-06	3.2E-06	-	3.4E-05	-
Benzene	24	2.3	-	9.9E-03	<1%	0.5	22%	6.4E-03	1.8E-02	<1%	0.5	22%
	8760	0.45	-	5.4E-04	<1%	0.4	82%	6.7E-04	1.2E-03	<1%	0.4	82%
Benzo(a)anthracene	24	N/A - no criteria	-	4.9E-07	-	4.9E-07	-	2.2E-07	7.2E-07	-	7.2E-07	-
	8760	N/A - no criteria	-	3.6E-08	-	3.6E-08	-	2.7E-08	5.7E-08	-	5.7E-08	-
Benzo(a)pyrene	24	5.00E-05	-	3.5E-07	<1%	5.3E-05	106%	2.6E-07	7.1E-07	1%	5.4E-05	107%
	8760	1.00E-05	-	1.9E-08	<1%	1.0E-05	101%	2.7E-08	4.9E-08	<1%	1.0E-05	102%
Benzo(b+k)fluoranthene	24	N/A - no criteria	-	3.0E-07	-	2.8E-04	-	2.2E-07	6.2E-07	-	2.8E-04	-
	8760	N/A - no criteria	-	2.0E-08	-	5.3E-05	-	2.4E-08	4.5E-08	-	5.4E-05	-
Benzo(g,h,i)perylene	24	N/A - no criteria	-	2.4E-07	-	2.4E-07	-	1.2E-07	4.0E-07	-	4.0E-07	-
	8760	N/A - no criteria	-	2.1E-08	-	2.1E-08	-	1.6E-08	3.4E-08	-	3.4E-08	-
Chrysene	24	N/A - no criteria	-	7.4E-07	-	3.4E-04	-	4.5E-07	1.3E-06	-	3.4E-04	-
	8760	N/A - no criteria	-	4.9E-08	-	6.5E-05	-	4.9E-08	9.8E-08	-	6.5E-05	-
Dibenzo(a,h) anthracene	24	N/A - no criteria	-	1.0E-07	-	1.0E-07	-	1.0E-07	3.0E-07	-	3.0E-07	-
	8760	N/A - no criteria	-	4.8E-09	-	4.8E-09	-	1.1E-08	2.0E-08	-	2.0E-08	-
Fluoranthene	24	N/A - no criteria	-	4.0E-05	-	8.5E-04	-	2.7E-05	7.4E-05	-	8.9E-04	-
	8760	N/A - no criteria	-	2.1E-06	-	1.6E-04	-	2.7E-06	5.0E-06	-	1.6E-04	-
Fluorene	24	N/A - no criteria	-	1.6E-04	-	1.6E-03	-	1.0E-04	2.9E-04	-	1.8E-03	-
	8760	N/A - no criteria	-	8.4E-06	-	2.9E-04	-	1.1E-05	2.0E-05	-	3.0E-04	-

CoPC	Averaging Period (hours)	Criteria (µg/m³)	Construction					Operation				
			Project Alone			Cumulative (Project + Background)		Project Alone			Cumulative (Project + Background)	
			Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative - % of Criteria	Maximum Predicted Concentration (µg/m³)		Project Alone - % of Criteria	Maximum Predicted Concentration (µg/m³)	Cumulative % of Criteria
			Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion		Refined Method - With Plume Depletion	Base Method - Without Plume Depletion		Base Method - Without Plume Depletion	
Indeno(1,2,3,c,d)pyrene	24	N/A - no criteria	-	1.3E-07	-	1.3E-07	-	5.5E-08	1.9E-07	-	1.9E-07	-
	8760	N/A - no criteria	-	8.6E-09	-	8.6E-09	-	6.5E-09	1.4E-08	-	1.4E-08	-
Naphthalene	0.17	50	-	0.2	<1%	0.2	<1%	0.2	0.4	<1%	0.4	<1%
	24	22.5	-	1.2E-02	<1%	1.2E-02	<1%	1.1E-02	3.1E-02	<1%	3.1E-02	<1%
Phenanthrene	24	N/A - no criteria	-	6.7E-04	-	2.9E-03	-	6.1E-04	1.7E-03	-	3.9E-03	-
	8760	N/A - no criteria	-	3.4E-05	-	4.6E-04	-	6.5E-05	1.2E-04	-	5.4E-04	-
Pyrene	24	N/A - no criteria	-	3.4E-05	-	7.5E-04	-	3.0E-05	8.6E-05	-	8.0E-04	-
	8760	N/A - no criteria	-	1.8E-06	-	1.4E-04	-	3.2E-06	6.0E-06	-	1.4E-04	-
Formaldehyde	24	65	-	0.2	<1%	0.2	<1%	0.1	0.3	<1%	0.3	<1%
Potassium amyl xanthate	24	N/A - no criteria	-	-	-	-	-	9.4E-03	2.0E-02	-	2.0E-02	-
Sodium hexametaphosphate	24	15	-	-	-	-	-	1.5E-02	3.3E-02	<1%	3.3E-02	<1%
Hydrocarbons	24	N/A - no criteria	-	0.6	-	0.6	-	0.4	1.1	-	1.1	-

Notes:

1. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
2. Maximum predicted 10-minute, 1-hour and annual SO_2 concentrations are presented in the table for direct comparison to the AAQC and conservatively compared to the CAAQS.
3. Maximum predicted 1-hr NO_2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
4. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
5. Maximum predicted 24-hour Chrysotile Asbestos concentration was converted to fibres/cm3 using a conversion factor of 1µg/m3 = 0.03 fibres/cm3. The conversion factor was taken from Table 4-2 of the National Research Council (US) Asbestiform Fibers: Nonoccupational Health Risks document. https://www.ncbi.nlm.nih.gov/books/NBK216742/table/ttt00007/?report=objectonly

5.4 Assessment of Highway 655 Realignment and the New Rail Spur on Air Quality

Changes in air quality were assessed for the following components that are ancillary to the Project, but are included in the activities considered in the assessment of effects since they are required for the operation of the mine:

- Rail spur line connecting the process plant to the existing Ontario Northland Railway spur line at the Kidd Mine
- Realigned segment of Highway 655 owned, operated and maintained by the MTO

Changes in air quality at the outside Modelled Mine Boundary special receptors due to these ancillary components were assessed independently of the Project and then combined with the Project Operations scenario predictions to assess the cumulative impact of the Project plus the ancillary components. Measured background concentrations were also considered to account for cumulative effects. In this section, only model predictions without plume deposition or depletion are presented.

The ancillary component air quality assessment followed guidance from the MTO's "Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects" (MTO Guide) (MTO, 2020). The CoPCs of concern for transportation projects (as noted in the MTO Guide) were assessed for the following scenarios:

- Baseline Conditions (2024) - existing conditions and traffic levels
- Future No Build (2040) – existing Highway 655 alignment with predicted 2040 traffic levels
- Future Build (2040) – realigned Highway 655 with 2040 traffic levels plus additional highway traffic due to the Project (provided by Canada Nickel) and the new rail spur in operation

The maximum dispersion model prediction at each assessed special receptor for the Future Build (2040) scenario were conservatively combined with the maximum Project Alone Operations scenario prediction at the same receptor to provide a conservative estimate of the change in air quality associated with the ancillary components plus the project at each special receptor. The background air quality levels described in Section 3.4.13 were added to the model predictions to provide an estimate of cumulative air quality.

Table 5.10 summarizes the results of this assessment. In the table, the highest predicted concentration over all outside Modelled Mine Boundary special receptors is provided for each CoPC considered in the assessment. Dispersion model predictions for the three ancillary component scenarios discussed above is provided as well as the ancillary component predictions combined with the Project Alone Operations predictions and also combined with background levels. Tables of the model predictions at all the individual receptors considered are presented in Appendix E of this assessment.

The ancillary component model predictions alone generally show small differences in predicted CoPC concentrations between the existing (2024) and Future No Build (2040) scenarios. For some CoPCs, the maximum predicted Future No Build (2040) concentrations are lower than the current Baseline (2024) concentrations, which is due to the change in emissions due to increased 2040 traffic levels being offset by projected decreases in individual vehicle emissions due to expected technology improvements (US EPA 2021). Changes in maximum CoPC concentrations between the Baseline (2024) and Future Build (2040) ancillary components scenario are likewise predicted to be small and all are below the applicable criteria.

When the ancillary components predictions are combined with the Project Alone Operations predictions the maximum predicted special receptor concentrations either remained unchanged (the change in concentration due to the ancillary components was negligible relative to that from the Project) or only increased by minor amounts. The maximum predicted 24-hour average PM_{10} special receptor concentration was unchanged from that for the Project and is predicted to exceed its criteria by the same percentage (16%). The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted increase by 7% relative to the Project Alone Operations prediction and to be above the 1-hour NO_2 (2025) CAAQS. All other CoPCs assessed were below their criteria for the ancillary components combined with Project Alone Operations.

For the ancillary components combined with Project Alone Operations plus background, the maximum predicted cumulative B(a)P concentrations are predicted to exceed the applicable 24-hour and annual criteria. The background level of B(a)P is above the applicable air quality criteria, with the Project and ancillary components only providing a small contribution to the cumulative concentrations.

Table 5.10 Summary of Maximum Predicted Changes in Ground Level Concentrations over the Assessed Special Receptors due to Highway 655 Realignment

CoPC	Averaging Period	Criteria ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Highway and Rail Spur Predictions Alone			Highway and Rail Spur + Project Operations Predictions			
				Existing (2024)	Future No Build (2040)	Future Build (2040) - Realigned Highway 655 and New Rail Spur	Future Build (2040) - Realigned Highway 655 & Rail Spur + Project (Operation)	Future Build (2040) - Realigned Highway 655 & Rail Spur + Project (Operation) + Background	Future Build (2040) - Realigned Highway 655 & Rail Spur + Project (Operation)	Future Build (2040) - Realigned Highway 655 & Rail Spur + Project (Operation) + Background
	hours	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	% of Criteria	% of Criteria
Inhalable Particulate Matter (PM_{10})	24	50	13	0.9	0.9	0.5	58.2	71	116%	143%
Fine Particulate Matter ($PM_{2.5}$) (1)	24	27	12	0.3	0.2	0.1	6.5	19	24%	70%
	8760	8.8	6.2	3.6E-02	2.9E-02	3.2E-02	0.3	6.5	4%	74%
Carbon Monoxide (CO)	0.5	6,000	1,170	208	278	297	1,942	3,112	32%	52%
	1	36,200	965	172	229	244	1,599	2,564	4%	7%
	8	15,700	965	71	89	92	896	1,861	6%	12%
Nitrogen Dioxide (NO_2)	1 (2)	400	5.4	28	11	13	157	163	39%	41%
	1 (3)	83	5.4	18	7	11	123	128	148%	154%
	24	200	2.2	3.0	1.1	0.7	20	22	10%	11%
	8760	34	0.3	1.2	0.5	0.7	2.3	2.6	7%	8%
	8760	24	0.3	1.2	0.5	0.7	2.3	2.6	10%	11%
1,3-butadiene	24	10	0.6	4.1E-04	4.2E-05	9.5E-05	1.3E-03	0.6	<1%	6%
	8760	2.0	0.6	5.3E-05	5.7E-06	1.2E-05	7.7E-05	0.6	<1%	28%
Acetaldehyde	0.5	500	-	0.4	0.5	0.6	1.7	1.7	<1%	<1%
	24	500	-	3.6E-02	4.2E-02	2.3E-02	0.1	0.1	<1%	<1%
Acrolein	1	4.5	-	9.0E-03	5.7E-03	1.7E-02	0.2	0.2	3%	3%
	24	0.4	-	9.3E-04	4.3E-04	9.6E-04	1.7E-02	1.7E-02	4%	4%
Benzene	24	2.3	0.5	2.8E-03	1.6E-03	2.9E-03	2.3E-02	0.5	<1%	22%
	8760	0.5	0.4	5.6E-07	4.4E-08	3.8E-04	1.5E-03	0.4	<1%	83%
Benzo(a)pyrene	24	5.0E-05	5.3E-05	4.4E-06	3.4E-07	2.0E-07	1.1E-06	5.4E-05	2%	108%
	8760	1.0E-05	1.0E-05	5.6E-07	4.4E-08	5.1E-08	9.9E-08	1.0E-05	<1%	102%
Formaldehyde	24	65	-	4.7E-02	5.0E-02	2.8E-02	0.4	0.4	<1%	<1%

Notes:
1. Maximum predicted 24-hour and annual $PM_{2.5}$ concentrations are presented in the table and conservatively compared to the CAAQS.
2. Maximum predicted 1-hr NO_2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
3. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour NO_2 average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.

5.5 Deposition Results

Summaries of the predicted maximum monthly and total annual CoPC deposition at each special receptor are presented in Appendix F of this assessment for both the Construction and Operation scenarios. Project Alone and Cumulative predicted maximum monthly particulate matter depositions over the outside Modelled Mine Boundary special receptors are compared against the MECP monthly AAQC for dustfall in Table 5.11. Also presented in the table are the maximum predicted total annual particulate depositions (which does not have a MECP criterion). Over the modelled special receptors, the highest predicted Project Alone particulate deposition relative to the regulatory criteria was 11% for Construction and 37 % for Operations and occurred at receptor R1 (House South of Site, At Lake 300m East of Highway 655) and R8 (a Sensitive Receptor - Indigenous Location), respectively. The highest predicted cumulative particulate depositions were 32% for Construction and 58% for Operations.

Based on the maximum predicted deposition levels noted in Table 5.11, it is expected that the potential for visible soiling of surfaces due to the Project is low.

Table 5.11 Maximum Predicted Particulate Depositions

CoPC	Mill Phase	Averaging Period	Criteria	UTM Coordinates of Maximum Predicted Total Deposition		Receptor ID	Background Dustfall	Project Alone		Cumulative (Project + Background)	
								Maximum Predicted Deposition	% of Criteria	Maximum Predicted Cumulative Deposition	
			g/m^2	Easting (m)	Northing (m)		g/m^2	g/m^2		g/m^3	% of Criteria
Particulate Deposition (dustfall)	Construction	30 days	7	473500.1	5398566	R1	1.5	0.8	11%	2.3	32%
		Annual (total)	NA	474773.4	5398595	R9	-	4.0	NA	NA	NA
	Operation	30 days	7	464609.8	5406478	R8	1.5	2.6	37%	4.0	58%
		Annual (total)	NA	474773.4	5398595	R9	-	14	NA	NA	NA

5.6 Ozone Formation

Where a proposed facility emits NO_X and/or VOCs, there may be a potential for an increase in ozone concentrations due to the additional NO_X and VOCs, particularly in warmer months around mid-day. This occurs when the precursor compounds (NOx and VOCs) are present in conjunction with specific meteorological conditions (i.e., strong solar radiation, high temperatures and low wind speeds). In the immediate vicinity of NO_X emission sources, O_3 concentrations may be decreased due to the NO to NO_2 conversion reaction:

$NO + O_3 \rightarrow NO_2 + O_2$

NOx emissions from vehicle combustion (the primary NOx source for the Project) are primarily NO with only small proportion being NO_2. Therefore, available ambient ozone will be consumed in the conversion of the NO to NO_2 in the vicinity of the Project.

The chemical reactions for the ground level ozone formation do not take place instantaneously but can take hours or days. Ozone levels at a particular location may result from VOC and NOx emissions hundreds or even thousands of kilometres away. Maximum concentrations generally occur well downwind of the source areas of the precursor pollutant emissions (UK APIS 2024), therefore ambient ozone levels in the LSA are not expected to increase due to the Project.

5.7 Potential Acid Input

Potential Acid Input (PAI) is defined as the difference between deposited acidic anions and basic cations. It is expressed in terms of kiloequivalents of hydrogen ion per hectare per year (keq H^+ ha^{-1} y^{-1}). Anion deposition is comprised of total sulphate and nitrate equivalents which are calculated by considering the total deposition of all modelled sulphur and nitrogen species as follows:

where the deposition equivalents in the above equations are expressed in units of kg ha^{-1} yr^{-1}, and the

$$\left[SO_4^{2-}\right]_{dep.equiv} = 1.5\ \left[SO_2\right]_{dep} + 1.0\ \left[SO_4^{2-}\right]_{dep}$$

$$\left[NO_3^{-}\right]_{dep.equiv} = 2.07\ \left[NO\right]_{dep} + 1.35\ \left[NO_2\right]_{dep} + 0.98\left[HNO_3\right]_{dep} + 1.0\ \left[NO_3^{-}\right]_{dep}$$

leading constants are the respective ratios of the molecular mass of sulphate/nitrate to that of the species associated with the constant.

The potential acid impact (PAI) can then be calculated from the sulphur and nitrogen deposition rates according to the following equation:

$$PAI = \frac{\left[SO_4^{2-}\right]_{dep.equiv}}{48} + \frac{\left[NO_3^{-}\right]_{dep.equiv}}{62}$$

For this study, PAI were calculated using yearly sulphur and nitrogen deposition fluxes conservatively predicted by AERMOD for each scenario. The sulphur deposition flux was estimated by assuming that either there was no chemical transformation of SO_2 to SO_4^{2-} or there was 100% transformation and the SO_4^{2-} deposition flux was predicted assuming that all SO_4^{2-} was particulate in the $PM_{2.5}$ size range. The larger of these two alternatives was used to conservatively estimate the SO_4^{2-} deposition equivalent. Likewise, the NO_3^- deposition equivalent was conservatively estimated by assuming no chemical transformation to nitates (NO and NO_2 estimated by running AERMOD with and without the ARM2 option) or or there was 100% transformation and the NO_3^- deposition flux was predicted assuming that all NO_3^- was particulate in the $PM_{2.5}$ size range. The larger of these two alternatives was used to conservatively estimate the NO_3^- deposition equivalent.

Background PAI, for the purposes of the study, was assumed to be insignifcant due to the distance of the Project from other notable industrial sources of SO_2 and NO_x emissions. The PAI deposition modelling results demonstrate the incremental effects of the Project PAI deposition in the LSA. Acid deposition is discussed further in the Technical Data Report Surface Water Resources Assessment.

Maximum predicted annual PAI, total N and S loading over all special receptors is presented in Table 5.12. A listing of the preditions for individual special receptors is provided in Appendix G of this assessment.

Table 5.12 Maximum Predicted PAI, S and N Deposition Fluxes

Project Phase	Special Receptor ID	UTM Easting (m)	UTM Northing (m)	Max PAI (keq H^+ ha^{-1} y^{-1})	Max N (kg ha^{-1} y^{-1})	Max S (kg ha^{-1} y^{-1})
Construction	R3	477544	5408361	1.1E-02	0.3	8.2E-04
Operations	W4	469834	5409446	2.1E-02	0.6	1.1E-03

5.8 Model Sensitivity to Road Dust Mitigation Measures

This section examines the sensitivity of the model results for $PM_{2.5}$ to the haul road control efficiency assumed in the assessment.

As noted in Section 4.2.4.6, a summertime unpaved road control efficiency of 85% was used in the assessment. The 85% control efficiency was based on assuming a combination of water and/or chemical dust suppression which have been documented in the literature to reduce road dust resuspension and contribute to controlling fugitive dust emissions relative to uncontrolled levels.

To examine the potential air quality effects if this level of control efficiency cannot be continuously maintained, a modelling sensitivity study was conducted in which the haul road control efficiencies were varied from the baseline levels assumed in the assessment (85% in the summer and 95% in the winter) to 70% and 50% in the summer. To allow for the effect of varying the control efficiency of the haul roads on predicted $PM_{2.5}$ levels to be examined, the results in this section conservatively include $PM_{2.5}$ emissions from haul roads and Storage Areas/Stockpile. Research has demonstrated that air quality models typically over-predict ambient air quality from these sources and that, in reality, air quality effects

generally only extend a few hundred metres from the source (see Section 4.3.6.6). Therefore, the model results presented in this section are expected to provide a conservative prediction (i.e. over-estimate) of ambient $PM_{2.5}$ levels with varying haul road control efficiency. The modelling was done using the Base Method (no plume deposition and depletion) which is also very conservative.

Three scenarios were examined for this sensitivity study, which were:

- Baseline – haul road control efficiency of 85% in the summer and 95% in the winter. $PM_{2.5}$ emissions from haul roads and Storage Areas/Stockpile are modelled in this and all subsequent scenarios
- Haul road control efficiency of 70% in the summer and 95% in the winter
- Haul road control efficiency of 50% in the summer and 95% in the winter

These scenarios were examined for both construction and operations and for 24-hour and annual averaging periods.

Contour plots of the maximum predicted 24-hour and annual average $PM_{2.5}$ concentrations predicted over the LSA for Construction for each of the three control efficiency scenarios are presented in Appendix H of this report, Figures H.01 to H.06. Contour plots for Operation are presented in Appendix H, Figures H.07 to H.12. The maximum predicted $PM_{2.5}$ concentration (outside the Modelled Mine Boundary) for each control efficiency scenario, Project phase and averaging period are presented in Table 5.13. The ratio of the maximum predicted $PM_{2.5}$ concentration for haul road control efficiencies of 70% and 50% to the baseline (85%) case are also presented in this table. A decrease in control efficiency from baseline to 70% results in an approximate increase in maximum predicted $PM_{2.5}$ concentrations in the LSA for construction and operations of about 2.0 times for the maximum predicted 24-hour average and 1.6 times for annual averages. For a control efficiency of 50% the maximum predicted $PM_{2.5}$ concentrations relative to baseline increase by factors of 3.0 - 3.2 and 2.4 - 2.5 for 24-hour and annual averaging periods respectively.

The maximum predicted concentration in the LSA occurs at the Project Modelled Mine Boundary for all scenarios. The changes in the ambient $PM_{2.5}$ levels outside of the Modelled Mine Boundary can be seen in the contour plots in Appendix H of this assessment. As the haul road efficiency decreases the distance from the Modelled Mine Boundary to an equivalent concentration level increases, with the change in distance being variable depending on the proximity to the $PM_{2.5}$ emissions sources in the PA.

As noted previously, an 85% - 90% control efficiency may be achieved through a combination of control measures. The 70% scenario was included in the assessment as an unlikely worst-case situation - a haul road control efficiency of greater than 70% would be expected to be consistently maintained, with proper fugitive dust management plan implementation.

It should be noted that these model predictions are expected to be conservative for a number of reasons including the following:

- The dispersion model is expected to over-predict the air quality effects of emissions from the haul roads (as noted above, research has demonstrated that air quality models typically over-predict ambient air quality from roads) and the presented model predictions do not include plume deposition or depletion.
- The emissions scenarios for both construction and operations are based on the maximum material movements over all years in each phase.
- There are typically about 108 days a year with rainfall and 36 days with rainfall greater than 5 mm in the Timmins area. There are about 20 days a year with snowfall greater than 5 cm. For days with precipitation greater than 2.5 mm (0.1 inch), which would be more than 36 days per year, mitigation measures are normally not required as the rainfall and wet surface naturally mitigates emissions. The modelling conservatively assumed that there were no precipitation days.

Table 5.13 Summary of Maximum Predicted $PM_{2.5}$ Concentrations for Varying Haul Road Control Efficiencies

Averaging Period	Project Phase	Location	Maximum Predicted $PM_{2.5}$ Concentration			Ratio of Max Predicted Concentration to Max Baseline Prediction	
			Baseline (85% CE)	70% CE	50% CE		
			µg/m³	µg/m³	µg/m³	70% CE	50% CE
24	Construction	Max Over LSA	6.8	13.5	21.5	2.0	3.2
		Max Spec Rec (outside Mine Boundary)	5.2	9.7	15.9	1.9	3.1
	Operations	Max Over LSA	16.9	31.3	50.6	1.9	3.0
		Max Spec Rec (outside Mine Boundary)	10.7	20.1	32.6	1.9	3.0
Annual	Construction	Max Over LSA	0.8	1.3	2.0	1.6	2.5
		Max Spec Rec (inside Mine Boundary)	0.7	1.1	1.7	1.6	2.4
	Operations	Max Over LSA	1.7	2.8	4.1	1.6	2.4
		Max Spec Rec (outside Mine Boundary)	1.3	2.1	3.1	1.6	2.4

Note:
CE – control efficiency

5.9 Follow-Up and Ambient Monitoring

5.9.1 Construction and Operations Air Quality Monitoring

An Air Quality Follow-up Program Plan (AQFUP) will be developed for Project construction and operations. The AQFUP will specify the proposed ambient air quality monitoring program including the type of monitoring, the CoPCs to monitor and the frequency of monitoring

5.9.2 Closure Air Quality Monitoring

No follow-up ambient air quality monitoring is proposed for Closure.

5.9.3 Emissions Reporting

Canada Nickel will need to submit the required annual report under the federal government's NPRI program under the *Canadian Environmental Protection Act* (1999).

6 Summary and Conclusions

The potential for Project-related emissions of air contaminants to cause adverse environmental effects on the atmospheric environment was assessed in this study. The ambient air quality assessment was done for the most part, by comparing the maximum model-predicted concentrations to ambient air criteria for each assessment case. As such, the assessment focused on the conservative scenario with the highest potential to cause environmental effects.

A summary of the key atmospheric findings relating to the Project follows.

6.1 Background Air Quality

Ambient air quality monitoring data were used to characterize air quality in the LSA and to develop background concentration levels to be used in the assessment. Onsite ambient monitoring was used to characterise SPM, metals in SPM, PM_{10}, $PM_{2.5}$, dustfall, NO_2, SO_2, VOCs, B(a)P, RCS, asbestos and elemental carbon. Baseline air quality for CO and O_3 was assessed through a review of historical air quality measurements from NAPS stations operated by Environment Canada. The background levels of all CoPCs were below applicable MECP air quality criteria except for 24-hour and annual average B(a)P.

6.2 Project Construction

6.2.1 Project Alone

Dispersion modelling using the Base Method discussed in Section 4.3.6.6 (not accounting for plume deposition and depletion for particulates and metals) which is expected to over-predict ambient GLCs had the following results:

- SPM: The maximum predicted 24-hour average SPM GLC using the Base Method is predicted to exceed the 24-hour AAQC by 74% at the Modelled Mine Boundary during construction. The AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides and would be infrequent (no more than 1% of the time). The limiting effect for the MECP SPM AAQC is visibility and the area around the Project is primarily forested where human presence is expected to be infrequent.
- PM_{10}: The maximum predicted 24-hour average PM_{10} concentration using the Base Method exceeds its AAQC by 24% for the construction scenario. The AAQC is only exceeded close to the Modelled Mine Boundary on the north and east sides and exceedances in this area would be infrequent (no more than 0.3% of the time).
- Muscovite and Aluminum: Maximum predicted 24-hour average aluminum and muscovite concentrations (using the Base Method) are above their MECP screening levels by 25% and 195% respectively. Exceedance of a screening level indicates that further assessment is required to determine if there is a potential for an adverse effect on health. This assessment is provided in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement).

- The maximum GLCs of all other CoPCs are predicted (using the conservative Base Method) to be below their applicable criteria

Dispersion modelling using the Refined Method discussed in Section 4.3.6.6 (accounting for plume deposition and depletion for particulates and metals) which is expected to provide a more representative prediction of ambient GLCs had the following results:

- Maximum predicted 24-hour average muscovite concentrations (using the Refined Method) is above its MECP screening levels by 33%
- The maximum GLCs of all other CoPCs are predicted (using the Refined Method) to be below their applicable criteria

Maximum predicted SPM, PM_{10} and $PM_{2.5}$ concentrations using the MECP Method (excluding emissions from haul roads and stockpiles), which is the method utilized in Environmental Compliance Approval applications for these CoPCs, are all below their criteria.

6.2.2 Cumulative (Project + Background) Effects

The cumulative (Project + Background) effects assessment for Project Construction using the Base Method (not accounting for plume deposition and depletion for particulates and metals) which is expected to over-predict ambient GLCs had the following results:

- Maximum predicted cumulative SPM, PM_{10}, muscovite, aluminum exceed their 24-hour average criteria by 96%, 50%, 195% and 29% respectively. As no background measurement data is available for muscovite, the maximum predicted cumulative concentration is the same as for Project Alone.
- Cumulative 24-hour and annual average B(a)P are predicted to exceed their criteria by 8% and 2% respectively. The background concentration of B(a)P is above applicable air quality criteria, with the Project only providing a small (1%) contribution to the cumulative concentrations, therefore mitigation is not expected to be required.

When plume deposition and depletion are included in the cumulative predictions (Refined Method) which is expected to provide more representative predictions, the only particulate or metal CoPC predicted to exceed its criterion is muscovite, with the maximum predicted cumulative GLC being only 33% above its screening level.

The MECP Method (excluding emissions from haul roads and stockpiles) is not applicable to cumulative effects, as the Ontario permitting process does not require background concentrations to be included in the assessment.

6.3 Project Operations

6.3.1 Project Alone

Dispersion modelling using the Base Method for Project Operations (not accounting for plume deposition and depletion for particulates and metals) which is expected to over-predict ambient GLCs had the following results:

- SPM: The maximum predicted 24-hour average SPM GLC using the Base Method is predicted to exceed the 24-hour criterion by 322% at the Modelled Mine Boundary during operations. While the AAQC is predicted to be exceeded in a large area around the Modelled Mine Boundary, using this conservative methodology, frequencies of exceedance greater than 5% only occur within 2 km of the north Modelled Mine Boundary and less than 1 km from the east boundary. With additional technically feasible and available mitigation implemented, the maximum predicted 24-hour average SPM exceedance could reduce to 111% with the predicted area of exceedance being substantially reduced and concentrations exceeding the AAQC by more than 0.5% of the time only occurring within 2-km of the north Modelled Mine Boundary. The limiting effect for the MECP SPM AAQC is visibility and the area around the Project is primarily forested where human presence is expected to be infrequent.
- PM_{10}: The maximum predicted 24-hour average PM_{10} concentration using the Base Method is above its criterion by 196% for the Operations scenario. Frequencies of exceedance greater than 2% occur within 1.5-km of the north Modelled Mine Boundary. With additional mitigation implemented, the maximum predicted 24-hour average PM_{10} exceedance using the Base Method would reduce to 48%. The predicted area of PM_{10} exceedance is substantially reduced with concentrations exceeding the AAQC by more than 0.2% of the time only occurring within 2-km from the north Modelled Mine Boundary.
- Aluminum and Muscovite: Maximum predicted 24-hour average aluminum and muscovite concentrations (using the Base Method) were above their MECP screening levels by 208% and 706% respectively. Exceedance of a screening level indicates that further assessment is required to determine if there is a potential for an adverse effect. This assessment is provided in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). With additional mitigation implemented, the maximum predicted 24-hour average aluminum and muscovite exceedances using the Base Method would reduce to 54% and 304% respectively.
- Manganese: The maximum predicted 24-hour average manganese concentration using the Base Method is above its criterion by 21%. The area above the AAQC is small and located on the west Modelled Mine Boundary. Exceedances in this area would be infrequent (no more than 0.3% of the time). With additional mitigation implemented, the maximum predicted 24-hour average manganese concentration would be below its AAQC.
- The maximum GLCs of all other CoPCs are predicted (using the conservative Base Method) to be below their applicable criteria

Dispersion modelling using the Refined Method (accounting for plume deposition and depletion for particulates and metals) which is expected to provide a more representative prediction of ambient GLCs had the following results for the Operations scenario:

- Using the Refined Method, the maximum predicted 24-hour average SPM GLC is 63% above the MECP AAQC.
- The maximum predicted 24-hour average aluminum concentration using the refined modelling method is 16% above its screening level.
- Maximum predicted 24-hour average muscovite concentrations (using the Refined Method) was above its MECP screening level by 262%.
- The maximum GLCs of all other CoPCs are predicted (using the Refined Method) to be below their applicable criteria.

Maximum predicted SPM, PM_{10} and $PM_{2.5}$ concentrations using the MECP Method (excluding emissions from haul roads and stockpiles), which is the method utilized in Environmental Compliance Approval applications for these CoPCs, are all below their criteria for the Operations scenario.

6.3.2 Cumulative (Project + Background) Effects

The cumulative effects assessment for Project Operations using the Base Method (not accounting for plume deposition and depletion for particulates and metals) which is expected to over-predict ambient GLCs, had the following results:

- Maximum predicted cumulative SPM, PM_{10}, muscovite, aluminum and manganese exceed their 24-hour average criteria by 345%, 222%, 706%, 212% and 23% respectively. As no background measurement data is available for muscovite, the maximum predicted cumulative concentration is the same as for the Project Alone.
- The highest predicted annual average cumulative SPM concentration is 3% above its criterion.
- The highest predicted 24-hour average cumulative $PM_{2.5}$ GLC (Base Method) is 5% above the criterion. However, the model prediction is the maximum daily average concentration rather than a 98th percentile value and therefore provides a conservative comparison to the MECP AAQC.
- The maximum predicted 24-hour average cumulative RCS concentration is above its criteria by 17%.
- Cumulative 24-hour and annual average B(a)P are predicted to exceed their criteria by 10% and 3% respectively. The background concentration of B(a)P is above applicable air quality criteria, with the Project only providing a small (1%) contribution to the cumulative concentrations, therefore mitigation is not expected to be required.
- With additional mitigation, the maximum predicted (Base Case) 24-hour average cumulative $PM_{2.5,}$ RCS and manganese concentrations would be below their respective criteria, as would annual average SPM. The aluminum exceedance using the Base Method would reduce to 56% and the maximum muscovite exceedance would decrease to 304% of their applicable screening levels. The highest predicted 24-hour average cumulative SPM GLC would reduce to 223%

above the criterion and the highest predicted 24-hour average cumulative PM_{10} GLC would reduce to 74% above the criterion.

When plume deposition and depletion are considered in the dispersion modelling (Refined Method) which is expected to provide more representative predictions, the only particulate or metal CoPCs predicted to exceed their criteria are SPM and muscovite with their maximum predicted GLCs decreasing by greater than 50% relative to the conservative no plume depletion (Base Case) assessment.

The MECP Method (excluding emissions from haul roads and stockpiles) is not applicable to cumulative effects, as the Ontario permitting process does not require background concentrations to be included in the assessment.

6.4 Outside Modelled Mine Boundary Special Receptors

6.4.1 Construction

The maximum predicted concentrations of all Project Alone CoPCs were below applicable criteria for all special receptors outside the Modelled Mine Boundary using the Base, Refined and MECP modelling methods other than muscovite, which was above its screening level by at most 46% at special receptor R9 (a Sensitive Receptor - Indigenous location) for the conservative Base Method dispersion modelling, but was below the screening level for the Refined Method modelling.

The maximum predicted cumulative concentrations of 78 of 80 CoPCs are below applicable criteria for all outside Modelled Mine Boundary special receptors for Project construction using the Base, Refined and MECP modelling methods. Muscovite is above its screening level by at most 46% at special receptor R9 for the conservative Base Method dispersion modelling, but below the screening level for the Refined Method modelling. B(a)P was above its 24-hour and annual criteria by 6% and 2% respectively. As previously discussed, 24-hour and annual average background B(a)P concentrations exceed their applicable criteria alone, with the Project only contributing a small increment above the background concentrations.

6.4.2 Operations

Project Alone dispersion modelling using the Base Method for Project Operations (not accounting for plume deposition and depletion for particulates and metals) which is expected to over-predict ambient GLCs had the following results for the outside Modelled Mine Boundary special receptors:

- SPM: The maximum predicted 24-hour average SPM concentration (Base Method) at the outside Modelled Mine Boundary special receptors was 67% above its criterion at receptor R8 (a Sensitive Receptor – Indigenous location) where occupancy would be in infrequent. SPM concentrations are predicted to be above the 24-hour average criterion infrequently at this location (no more than 0.7% of the time).

- PM_{10} and aluminum: The maximum predicted 24-hour average PM_{10} and aluminum concentrations (Base Method) at the outside Modelled Mine Boundary special receptors were 16% and 21% above their criteria with both occurring at receptor R8 (a Sensitive Receptor - Indigenous location) where occupancy is expected to be infrequent. PM_{10} and aluminum concentrations are predicted to be above their respective 24-hour average criteria infrequently (no more than 0.1% of the time at this location).
- Muscovite: The maximum predicted 24-hour average muscovite concentration (Base Method) at the outside Modelled Mine Boundary special receptors was 267% above its criterion at receptor R1 (a house south of the mine about 300-m from Highway 655). It is noted that Canada Nickel will impose restrictions at this receptor (See Section 3.3) Muscovite exceedances are predicted to occur infrequently (no more than 3.1% of the time).
- The maximum GLCs of all other CoPCs are predicted (using the conservative Base Method) to be below their applicable criteria.
- NO_2: The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 3 of the10 special receptors assessed outside the Modelled Mine Boundary, with the maximum prediction being 41% above the CAQQS. Predicted concentrations at individual locations above the CAAQS in proximity to the Project are not considered exceedances, but rather is an indicator that air management actions should be considered to reduce ambient levels. Potential NOx mitigation measures that may be considered are discussed in Section 6.8.

When plume deposition and depletion are included in the Project Alone dispersion modelling (Refined Method) which is expected to provide more representative predictions, the only particulate or metal CoPC predicted to exceed its criterion is muscovite, with the maximum predicted GLC being 65% above the screening level at R1.

Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ concentrations are below their criteria at all assessed outside Modelled Mine Boundary special receptors for the Project Alone.

The maximum predicted (Base Method) cumulative concentrations of SPM, $PM_{10,}$ aluminum, muscovite and B(a)P are above applicable criteria for special receptors outside the Modelled Mine Boundary. The maximum predicted 24-hour average cumulative concentrations of 24-hour average SPM, $PM_{10,}$ aluminum and muscovite are 89%, 42%, 25% and 267% above their respective criteria. B(a)P for 24-hour and annual averages is predicted to be 8% and 2% above the respective criteria with the 24-hour and annual average background B(a)P concentrations exceeding their applicable criteria alone.

When plume deposition and depletion (Refined Method) are included in the cumulative predictions, the only particulate or metal CoPC predicted to exceed its criterion at outside Modelled Mine Boundary special receptors is muscovite.

Using the MECP Method, SPM, PM_{10} and $PM_{2.5}$ cumulative concentrations are below their criteria at all assessed outside Modelled Mine Boundary special receptors.

6.5 Inside Modelled Mine Boundary Special Receptors

There are 3 special receptors located inside of the Modelled Mine Boundary including R2, R3 and R4. These receptors were identified as existing Non-Indigenous locations where current overnight use has been confirmed or assumed and are therefore air quality impacts at these locations are included in the assessment for completeness. As discussed in Section 3.3, Canada Nickel will impose restrictions within the Modelled Mine Boundary.

6.5.1 Construction

Project Alone dispersion modelling using the Base Method for Project Construction (not accounting for plume deposition and depletion for particulates and metals) predicted exceedances of the Project Alone, 24-hour average SPM, PM_{10}, aluminum, and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary.

When plume deposition and depletion are included in the Project alone dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion at the inside Modelled Mine Boundary special receptors is muscovite.

As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 1 of the 3 special receptors assessed within the Modelled Mine Boundary. The CAAQS are not used to assess compliance at a facility's property line or at specific locations, but rather are used to assess regional air quality. Predicted concentrations at individual locations above the CAAQS are an indicator that air management actions should be considered to reduce ambient levels. Potential NOx mitigation measures that may be considered are discussed in Section 6.8.

Cumulative exceedances of the 24-hour average SPM, PM_{10}, aluminum, muscovite and B(a)P ambient criteria are predicted at receptors inside the Modelled Mine Boundary using the Base Method. When plume deposition and depletion are included in the dispersion modelling (Refined Method), the only particulate or metal CoPC predicted to exceed its criterion inside the Modelled Mine Boundary is muscovite. The B(a)P cumulative concentration exceedances are attributable to the background levels alone were above applicable criteria, therefore mitigation is not expected to be required.

6.5.2 Operations

Project Alone dispersion modelling using the Base Method for Project Operations (not accounting for plume deposition and depletion for particulates and metals) predicted exceedances of the Project Alone, 24-hour average SPM, PM_{10}, aluminum, RCS, manganese and muscovite ambient criteria at special receptors inside the Modelled Mine Boundary. As public access will be limited within the Modelled Mine Boundary, 24-hour exposure is not anticipated in this area.

When plume deposition and depletion are included in the Project Alone dispersion modelling (Refined Method), the only particulate or metal CoPCs predicted to exceed their criteria at the inside Modelled Mine Boundary special receptors are 24-hour average SPM, $PM_{10,}$ aluminum and muscovite.

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at all the special receptors assessed within the Modelled Mine Boundary, with the highest prediction being 71% above the CAAQS. Maximum predicted hourly and 24-hour average NO_2 concentrations at all inside Modelled Mine Boundary receptors are well below their respective MECP criteria. As previously noted, the CAAQS are used to assess regional air quality. Predicted concentrations at individual locations above the CAAQS are an indicator that air management actions should be considered to reduce ambient levels. Potential NOx mitigation measures that may be considered are discussed in Section 6.8.

Cumulative exceedances of the 24-hour average SPM, PM_{10}, $PM_{2.5}$, aluminum, RCS, manganese, muscovite and benzo(a)pyrene (24-hour and annual) ambient criteria are predicted at receptors inside the Modelled Mine Boundary using the conservative Base Method. The B(a)P cumulative concentration exceedances are attributable to the background levels alone were above applicable criteria, therefore mitigation is not expected to be required.

When plume deposition and depletion are included in the dispersion modelling (Refined Method), the only particulate or metal CoPCs predicted to cumulatively exceed their criteria inside the Modelled Mine Boundary are SPM, PM_{10}, aluminum and muscovite. Within the Modelled Mine Boundary human presence is expected to infrequent and short term (less than 24-hours).

6.6 Indigenous Receptors

Of the 80 CoPCs assessed for Project Construction, 79 were below their applicable criteria for the Project Alone case at all Indigenous receptors outside the Modelled Mine Boundary, with only muscovite predicted to be above its MECP screening level by 46% (which indicates that further assessment is required to determine if there is a potential for an adverse effect).

For Project operations, 85 CoPCs were assessed and 80 are predicted (Base Method) to be below their applicable criteria at all Indigenous receptors outside the Modelled Mine Boundary for the Project Alone. The maximum predicted 24-hour average concentrations of SPM and PM_{10}, are above their respective MECP criteria by 67% and 16%, while aluminum and muscovite are above their MECP screening levels by 21% and 227% respectively. The SPM, PM_{10}, aluminum and muscovite concentrations are above their criteria at an Indigenous receptor infrequently, with the maximum frequencies being 0.7%, 0.1%, 0.1% and 3.1% respectively. The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS at 2 Indigenous special receptor, with the maximum prediction being 41% above the CAQQS.

For both construction and operations maximum predicted cumulative B(a)P concentrations are predicted to exceed the applicable 24-hour and annual criteria at Indigenous receptor locations. The background level of B(a)P is above the applicable air quality criteria, with the Project only providing a small contribution to the cumulative concentrations.

6.7 Highway 655 Realignment and New Rail Spur

When the predicted changes in air quality for Project ancillary components (Highway 655 realignment and new rail spur) are assessed collectively with the Project Alone Operations predictions the maximum predicted outside Modelled Mine Boundary special receptor concentrations either remained unchanged (the change in concentration due to the ancillary components is negligible relative to that from the Project) or only increased by minor amounts. The maximum predicted 24-hour average PM_{10} special receptor concentration was unchanged from that for the Project and is predicted to exceed its criteria by the same percentage (16%). The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to increase by 7% relative to the Project Alone Operations prediction and to be above the 1-hour NO_2 (2025) CAAQS. All other CoPCs assessed were below their criteria for the ancillary components combined with Project Alone Operations.

When the Project plus realigned Highway 655 and rail spur were considered cumulatively with background air quality levels, 24-hour average PM_{10} and 24-hour and annual B(a)P exceeded their MECP criteria and the 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration continue to be above the CAAQS. The background levels of B(a)P are above applicable air quality criteria, with the Project and ancillary components providing a small contribution to the cumulative concentration.

6.8 Additional Enhanced Mitigation Measure

A summary of the particulate and metal CoPCs that are predicted to be above their applicable criteria outside the modeled mine boundary for the Project Alone construction and operations phases is provided in Table 6.1. In this table, results for the conservative Base Modelling method (excluding plume deposition and depletion), the Refined Method (including plume deposition and depletion) which is expected to provide a more representative assessment of ambient air quality and the MECP Method (excluding SPM, PM_{10} and $PM_{2.5}$ emissions from haul roads and stockpiles) used for environmental permitting are presented. Aluminum and muscovite are predicted to be above MECP screening levels which are triggers for additional assessment to ensure that the predicted concentrations will not result in adverse effects, which is addressed in the Human Health and Ecological Risk Assessment (Appendix C.7 of the Impact Statement). Of the remaining CoPCs in this table, only manganese for the operations phase is predicted to exceed its AAQC for all modelling methods. This indicates that additional enhanced dust mitigation measures will be required.

Table 6.1 Summary of CoPCs Predicted to Exceed Criteria for the Project Alone

Modelling Method	Construction	Operations
Base Method	AAQC: SPM, PM_{10} Screening Level: aluminum, muscovite	AAQC: SPM, PM_{10}, manganese Screening Level: aluminum, muscovite
Refined Method	AAQC: None Screening Level: muscovite	AAQC: SPM, PM_{10}, manganese Screening Level: aluminum, muscovite
MECP Method	AAQC: None Screening Level: muscovite	AAQC: manganese Screening Level: aluminum, muscovite

For all the CoPCs identified in Table 6.1, the major source contributing to their predicted ambient concentrations is the Project haul roads. Potential additional enhanced mitigation measures that that may be identified through the provincial permitting process for air emissions (i.e., Environmental Compliance Approval) and detailed design, may include:

- Limiting haul truck speeds on the Open Pit ramps and the haul roads. The amount of dust emissions from an unpaved road is directly related to the speed and type of vehicle using the road, with emissions varying linearly with vehicle speed (Figure 3-3, NRC, 2005). For example, limiting vehicles speeds to 55 km/hr is estimated to reduce haul road emissions by 24% and limiting speeds to 40 km/hr would reduce dust emissions by 44% (Table 6-6, WRAP, 2006)
- Use of a commercially available surfactant or water additives to achieve greater than 85% control efficiency.
- Where possible, maintain existing vegetation along the haul roads to act as a wind break

The maximum predicted 3-year average 98th percentile daily maximum 1-hour average NO_2 concentration is predicted to be above the 1-hour NO_2 (2025) CAAQS for the Project Alone at outside Modelled Mine Boundary locations for the operations scenario. Predicted concentrations at individual locations above the CAAQS in proximity to the Project are not considered exceedances, but rather is an indicator that air management actions should be considered to reduce ambient levels. Potential actions that may be considered by Canada Nickel include selecting an electric haul truck fleet to replace, in total or in part, the main fleet required to haul material from the Open Pit during operations. At such time as a viable model in the size class(es) required is commercially available, this would likely be the preferred option for any further truck purchases over the remaining life of mine.

7 References

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Appendices

Appendix A Figures

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CANADA NICKEL COMPANY

Legend

- Project Area
- Local Study Area (10km Buffer of PA)
- Regional Study Area (40km Buffer of PA)

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Watercourse

0 5 10 km

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Notes

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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.1

Title
Project Area, Local Study Area and Regional Study Area

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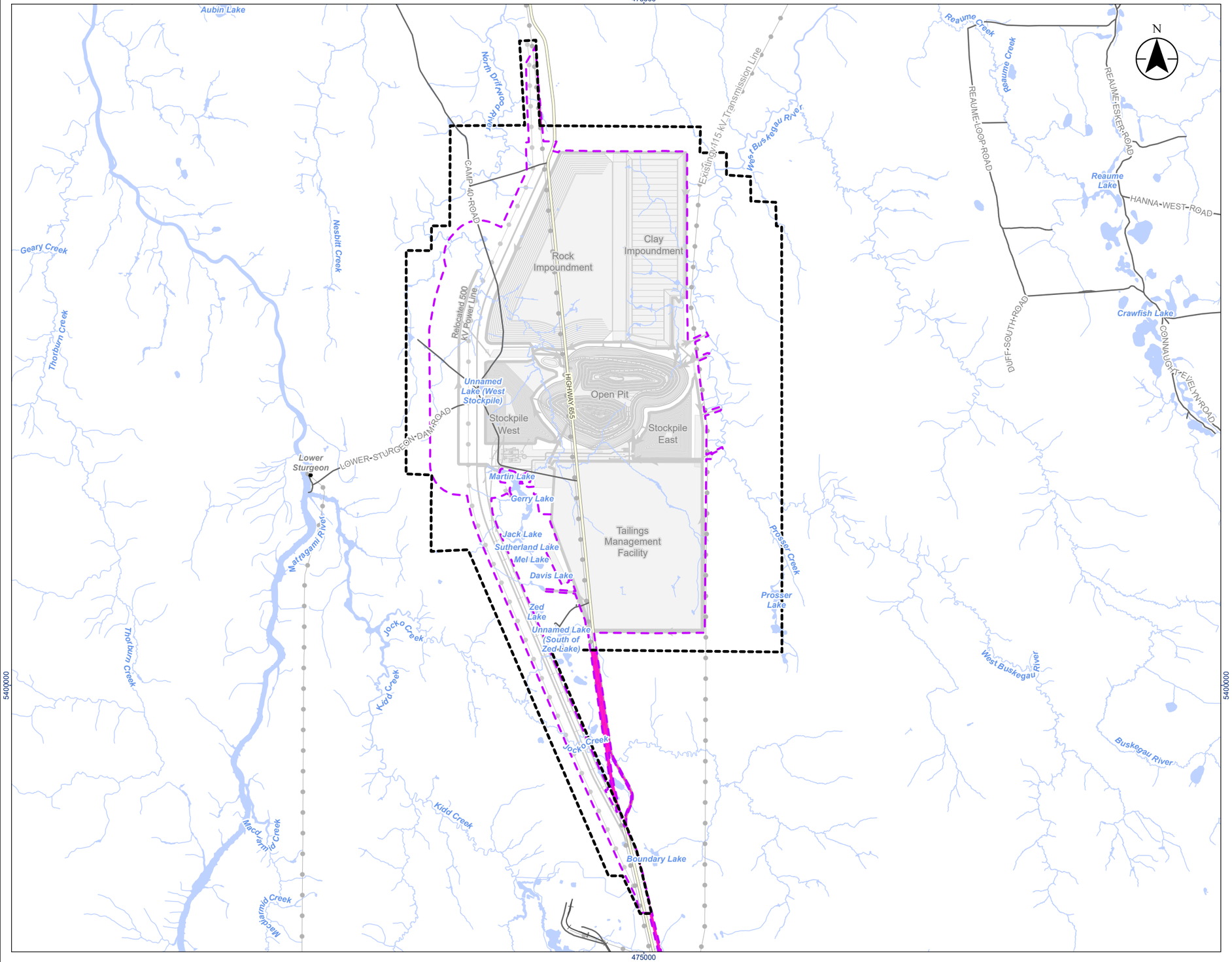

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

0 2 4 km

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Client/Project
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Crawford Nickel Project

Figure No.
A.2

Title
Extent of Modelled Mine Boundary Used in the Air Quality Assessment

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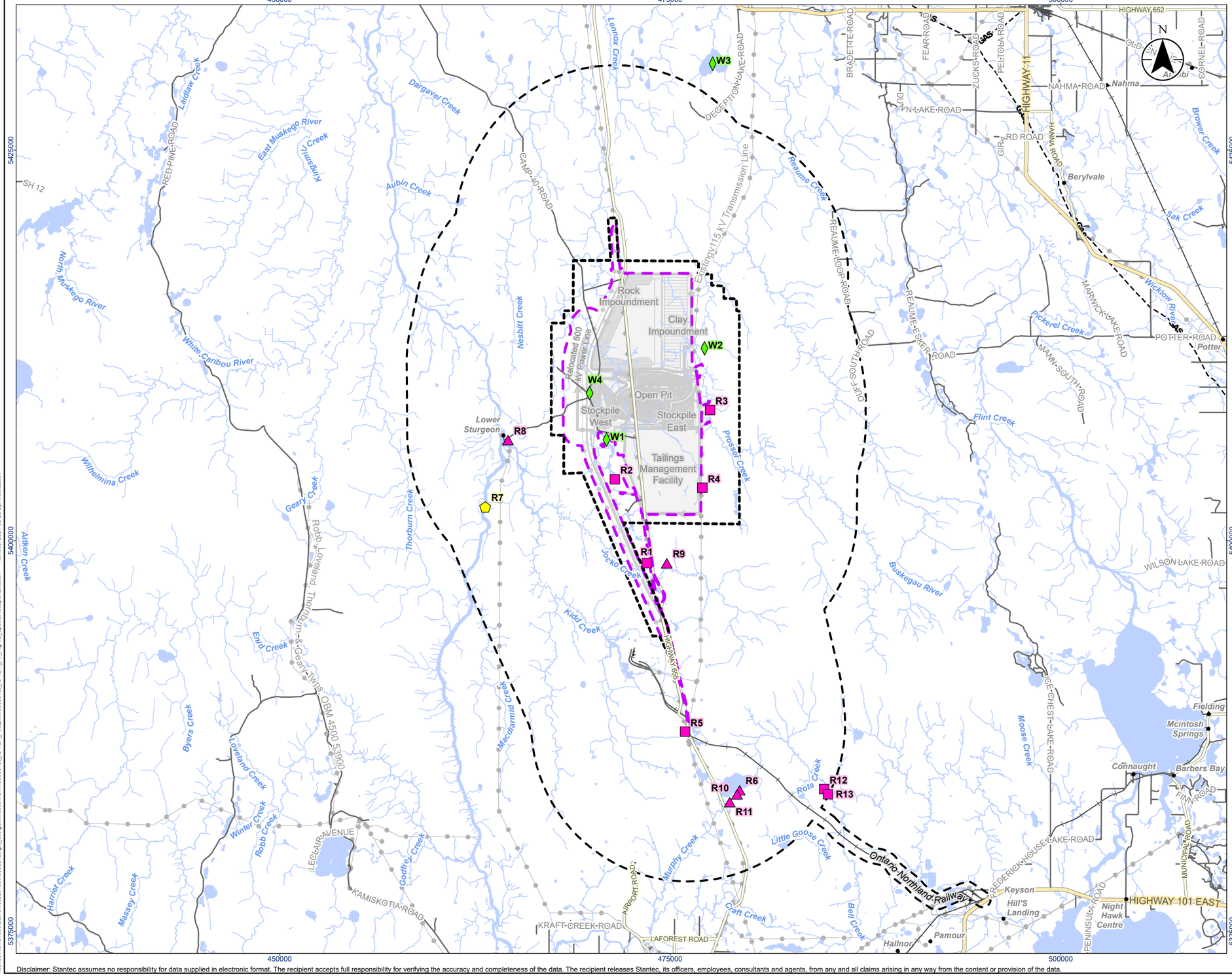

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CANADA NICKEL COMPANY

Legend

- Project Area
- Local Study Area (10km Buffer of PA)

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Natural Gas Pipeline
- Water Pipeline
- Unknown Pipeline
- Watercourse
- Waterbody
- Proposed Project Components
- Sensitive Receptor - Non-Indigenous
- Sensitive Receptor - Indigenous
- Representative Receptor - Indigenous
- Surface Water Receptor
- Modelled Mine Boundary

0 5 10 km

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.3

Title
Special Receptor Locations

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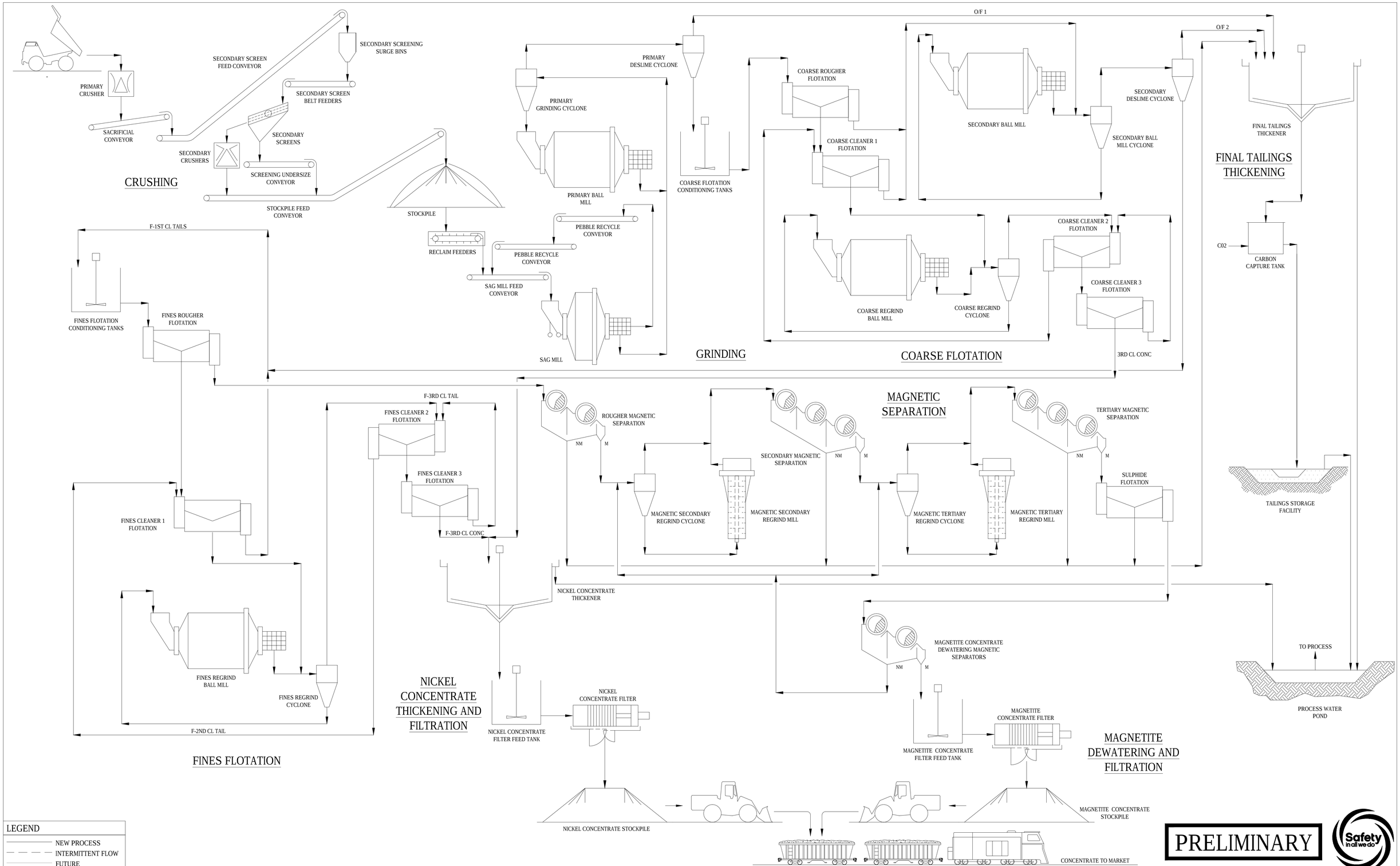
Figure A.4 Process Flow Diagram



LEGEND

- NEW PROCESS
- INTERMITTENT FLOW
- FUTURE

PRELIMINARY

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PHASE 1 - 60 KTPD
OVERALL PROCESS
PROCESS FLOW DIAGRAM

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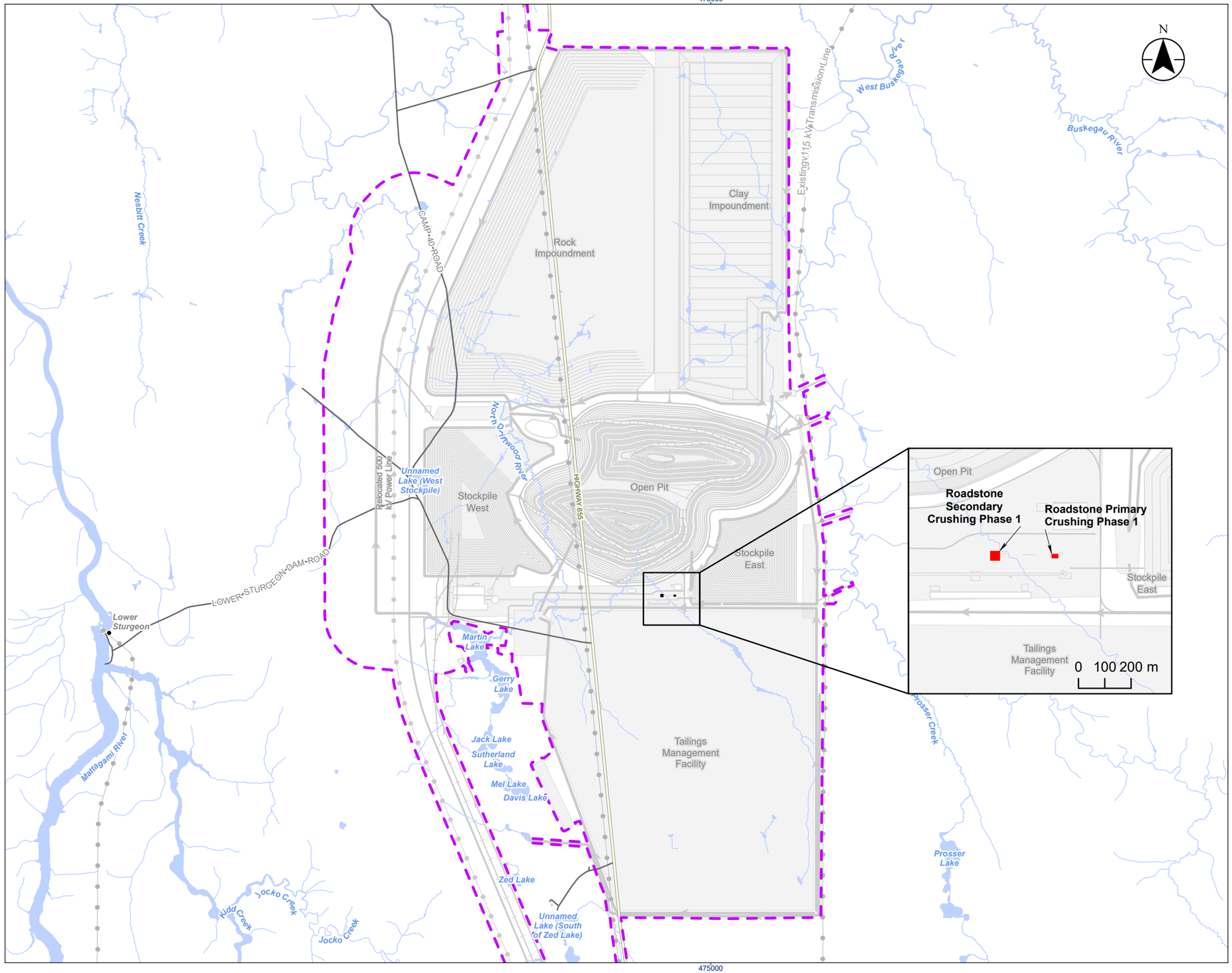

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CANADA NICKEL COMPANY

Legend

- Project Area
- Plant Buildings for Operation (Year -1)

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

0 2 4 km

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Crawford Nickel Project

Figure No.
A.5.1

Title
Processing Plant Area Building Layout - Construction

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N

Nesbitt Creek

CAMP-40-ROAD

Clay Impoundment

Rock Impoundment

Existing 115 kV Transmission Line

West Buskegau River

Buskegau River

North Dowmont River

Relocated 500 kV Power Line

Unnamed Lake (West Stockpile)

Stockpile West

HIGHWAY 655

Open Pit

Stockpile East

DAM-ROAD

Martin Lake

Gerry Lake

Jack Lake

Sutherland Lake

Mel Lake

Davis Lake

Zed Lake

Unnamed Lake (South of Zed Lake)

Tailings Management Facility

Prosser Creek

Prosser Lake

Mattagami River

Kidd Creek

Jocko Creek

Jocko Creek

475000

Stockpile West

Primary Crushing Phase 2

Process Plant Building Phase 2

Secondary Crushing Phase 2

Concentrate Loadout Building Phase 2

Concentrate Loadout Building Phase 1

Process Plant Building Phase 1

0 250 500 m

Open Pit

Roadstone Secondary Crushing Phase 1

Secondary Crushing Phase 1

Roadstone Primary Crushing Phase 1

Primary Crushing Phase 1

Tailings Management Facility

0 100 200 m

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Plant Buildings for Operation (Year 7)

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

0 2 4 km

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.5.2

Title
Processing Plant Area Building Layout - Operation

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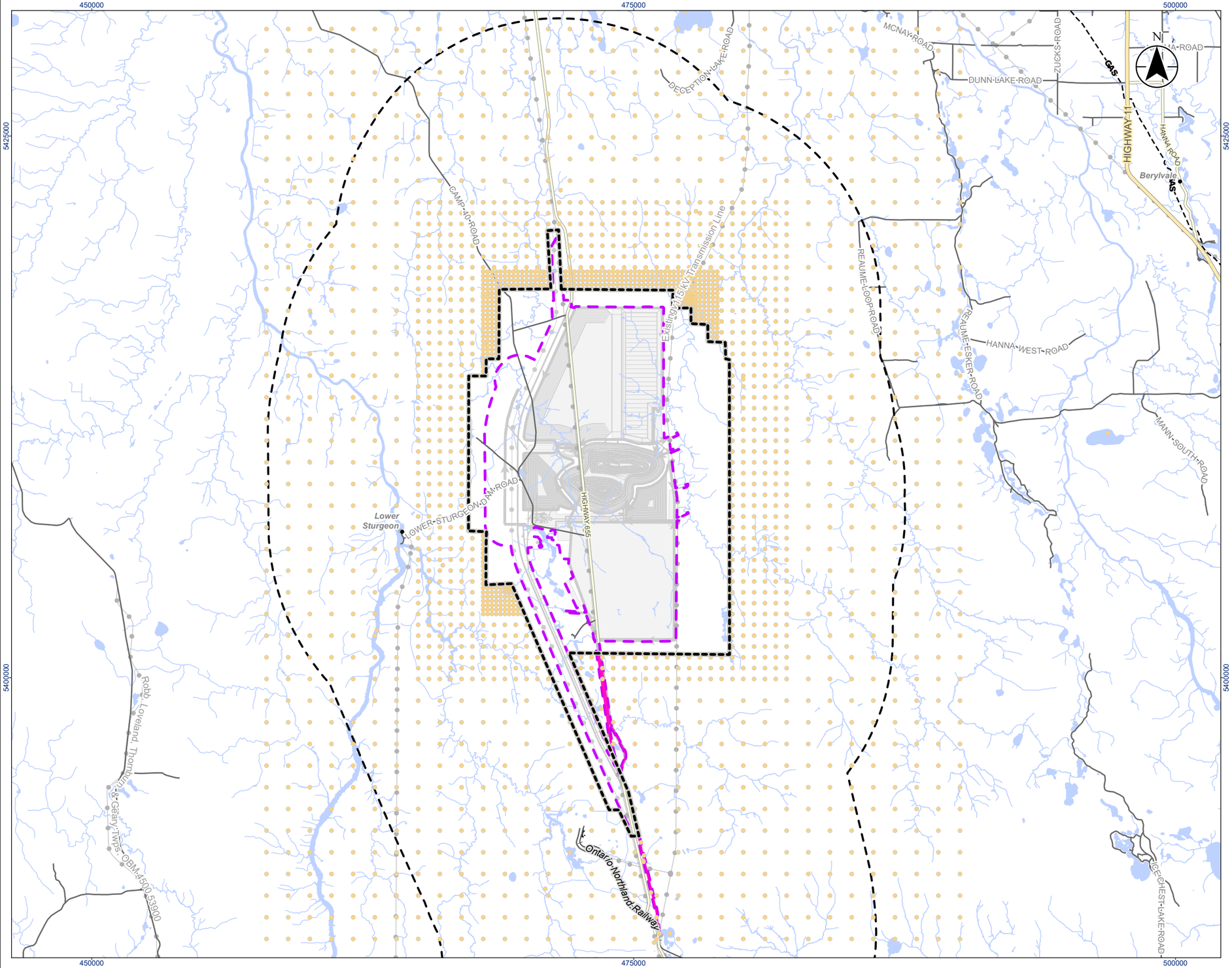

Legend

- Project Area
- Local Study Area (4km Buffer of PA)
- Project Area - Existing Highway 655 and Transmission Line
- Receptor Grid
- Modelled Mine Boundary

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- GAS Natural Gas Pipeline
- UP Unknown Pipeline
- Watercourse
- Waterbody
- Proposed Project Components

0 5 10 km

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Crawford Nickel Project

Figure No.
A.6

Title
Extended Receptor Grid

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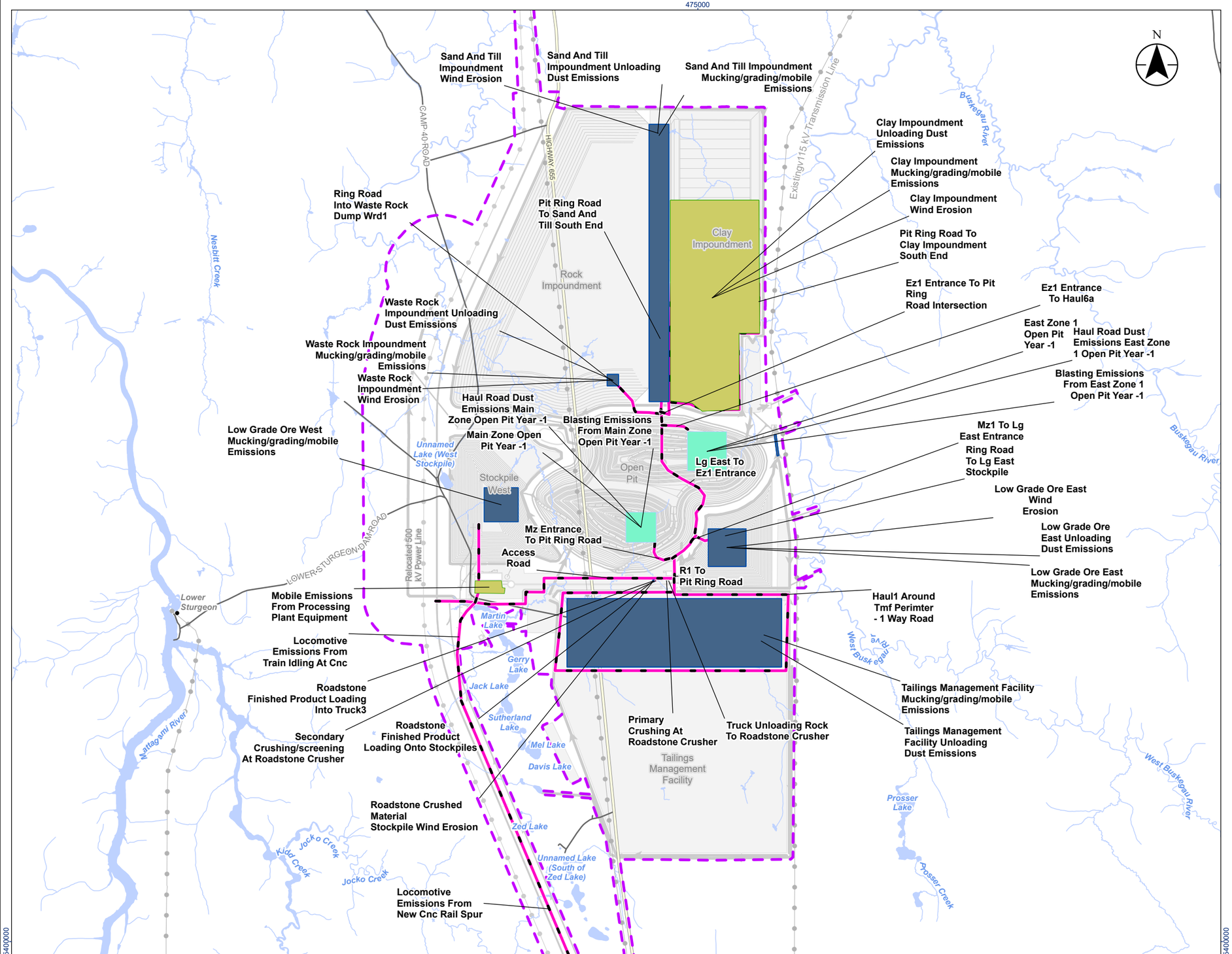

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CANADA NICKEL COMPANY

Legend

- Project Area
- Line Volume Source
- Area Source
- Open Pit Source
- Poly Area Source
- Volume Source
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody

0 2 4 km

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Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.7

Title
Location of Air Emission Sources - Construction

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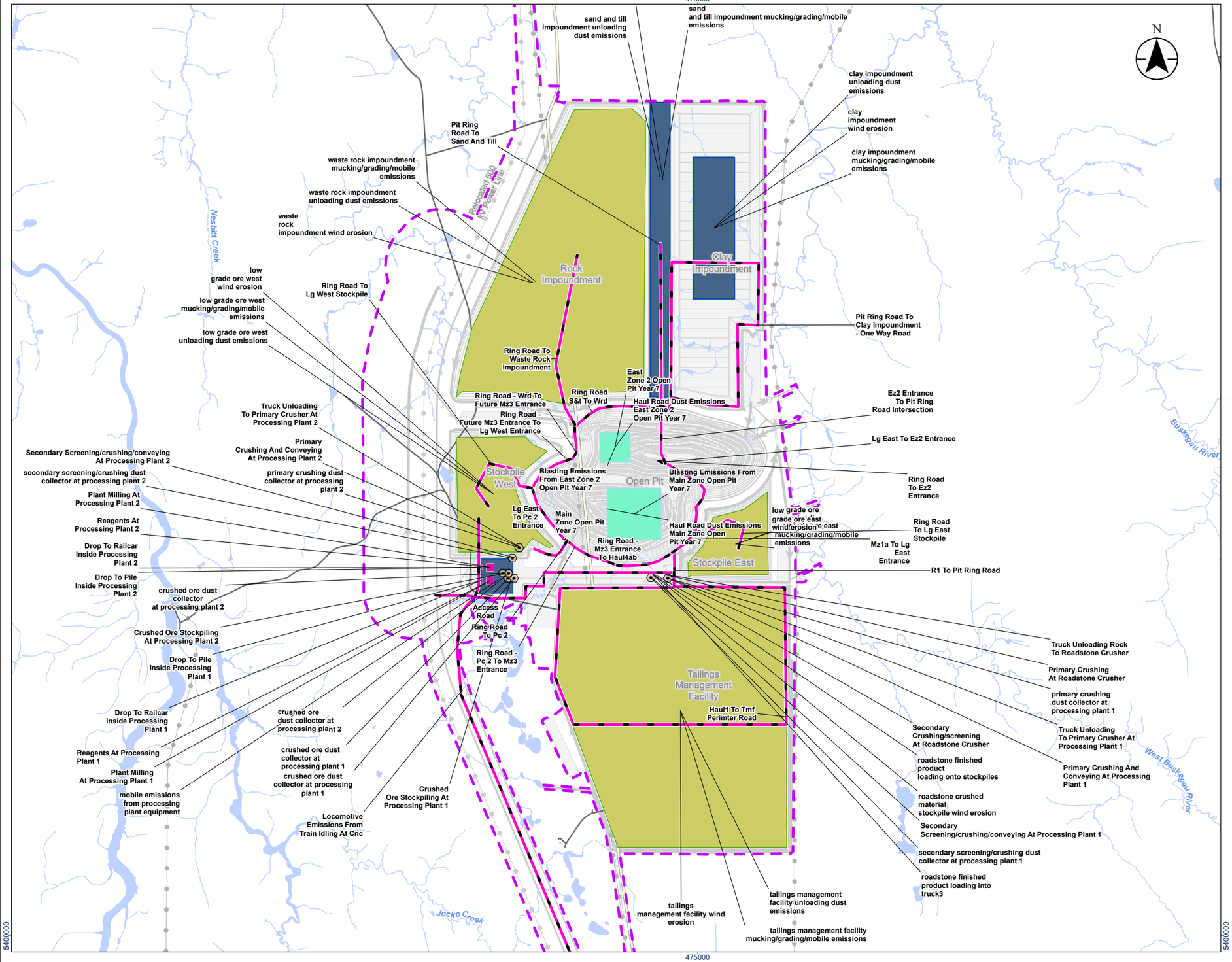

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Point Source
- Line Volume Source
- Area Source
- Open Pit Source
- Poly Area Source
- Volume Source
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Existing Transmission Line
- Watercourse
- Waterbody
- Other Named Place

0 2 4 km

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Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.8

Title
Location of Air Emission Sources - Operation

\\srt004-fil01\609\active\160930456\160930456gis_cad\gis\mxds\ISTDR\160930456_IS-TDR_Air.aprx\160930456_IS-TDR_AirFig4.8_AirEmissionSources_Operation Revised: 2024-09-26 By: malcazaren

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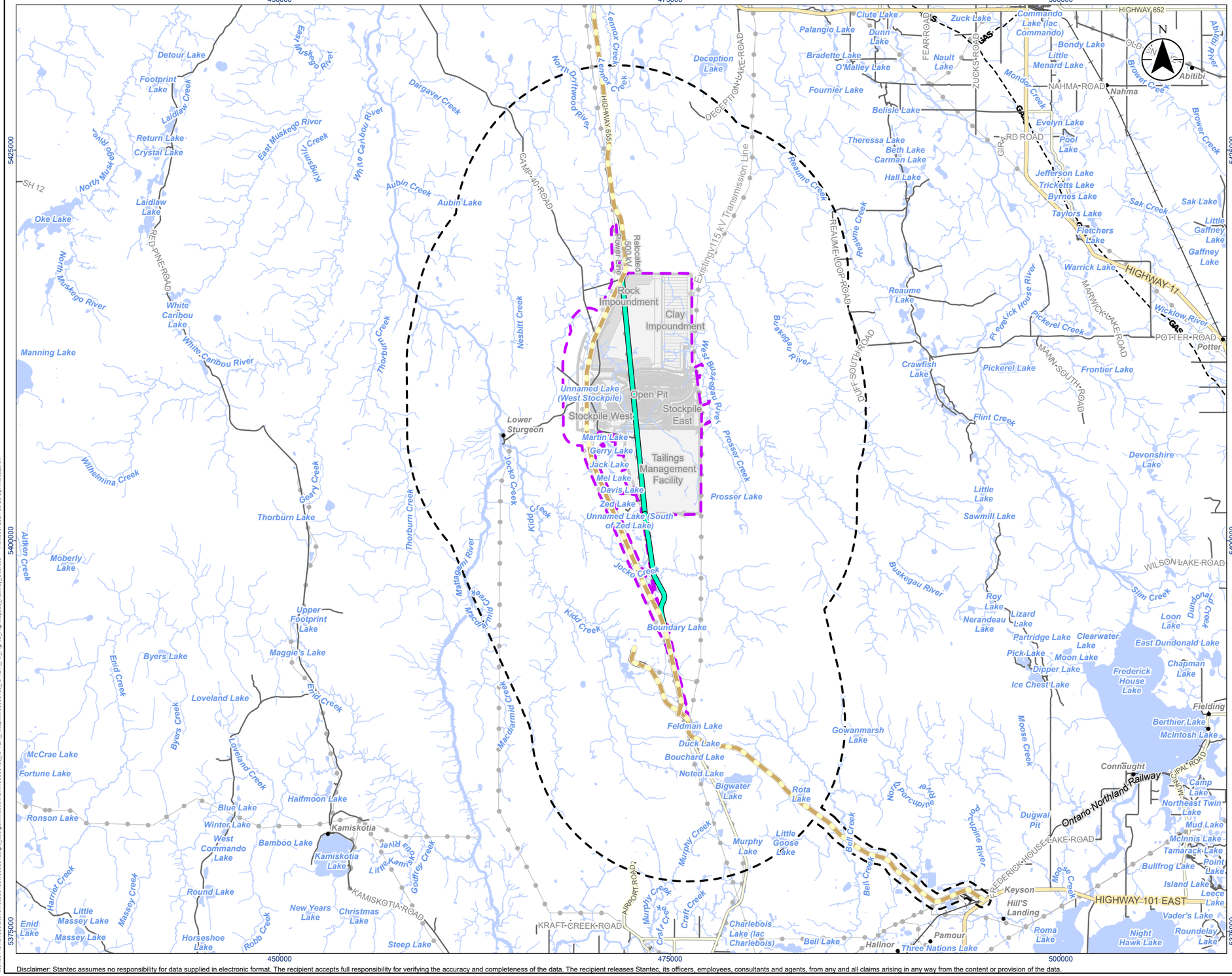

Legend

- Project Area
- Local Study Area (10km Buffer of PA)
- Future Line Volume Source
- Existing Line Volume Source
- Proposed Project Components

Base Features

- Expressway / Highway
- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- -GAS- Natural Gas Pipeline
- -WA- Water Pipeline
- -UP- Unknown Pipeline
- Watercourse
- Waterbody

0 5 10 km

1:250,000 (At original document size of 11x17)

Notes

1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
A.9

Title
Highway 655 and Railway Sources

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Appendix B Special Receptors

Special Receptors

Receptor #	Receptor Description	Receptor Type	Inside or Outside Modelled Mine Boundary?	Zone	UTM E (m)	UTM N (m)
R1	House South of Site, At Lake 300m East of Highway 655	Sensitive Receptor - Non-Indigenous	Outside	17	473500.1	5398566
R2	Camp/Cottage on Davis Lake	Sensitive Receptor - Non-Indigenous	Inside	17	471449.9	5403929
R3	Camp on the West Buskegeau River	Sensitive Receptor - Non-Indigenous	Inside	17	477544.4	5408361
R4	Camp/Cottage East of Site	Sensitive Receptor - Non-Indigenous	Inside	17	477052.3	5403390
R5	Camp/Cottage Near Highway 655 South of Site	Sensitive Receptor - Non-Indigenous	Outside	17	475946.3	5387777
R6	Campground at Bigwater Lake	Sensitive Receptor - Indigenous	Outside	17	479442	5384066
R7	Mattagami River - Indigenous Site	Sensitive Receptor - Indigenous/Non-Indigenous	Outside	17		
R8	Overnight Indigenous Habitation Location	Sensitive Receptor - Indigenous	Outside	17		
R9	Overnight Indigenous Habitation Location	Sensitive Receptor - Indigenous	Outside	17		
R10	Overnight Indigenous Habitation Location	Sensitive Receptor - Indigenous	Outside	17		
R11	Overnight Indigenous Habitation Location	Sensitive Receptor - Indigenous	Outside	17		
R12	Camp/Cottage North of Existing Rail Corridor	Sensitive Receptor - Non-Indigenous	Outside	17	484849.9	5384101
R13	Camp/Cottage North of Existing Rail Corridor	Sensitive Receptor - Non-Indigenous	Outside	17	485094.5	5383767
W1	Martin Lake - closest lake to PA; headwaters of proposed diversion channel	Surface Water Receptor	Inside	17	470919.10	5406465.53
W2	WB-P-142 - unnamed pond in tributary of West Buskegau River east of PA	Surface Water Receptor	Inside	17	477193.31	5412314.37
W3	Deception Lake - closest named lake north of PA	Surface Water Receptor	Outside	17	477710.10	5430534.88
W4	ND-P-045 - Unnamed Lake (West Stockpile)	Surface Water Receptor	Inside	17	469833.83	5409445.60

Appendix C Emission Inventory

Table 1 - General Inputs

Project Component	Parameter	Units	Value	Reference	Notes
Mine	Hours of Operation	hr/day	24	DP/CNC	
Mine	Days of Operation	day/week	7	DP/CNC	
Mine	Days of Operation	days/year	365	DP/CNC	
Open Pit	Shifts	per day	2	DP/CNC	
Open Pit	Shift Hours	hours	12	DP/CNC	
Personnel	Max Work force in construction (Pre-stripping)	FTE	418	DP/CNC	
Personnel	Max Work force in Phase 1	FTE	994	DP/CNC	
Personnel	Max Work force in Phase 2 (Year 6)	FTE	1135	DP/CNC	
Personnel	Max Work force in Phase 3	FTE	89	DP/CNC	
Personnel	Method to transport personnel to Site		See Production Data	DP/CNC	
Personnel	Vehicle/day		See Production Data	DP/CNC	
Annual Average 10-m Windspeed		m/s	3.29	MECP	5-year average wind speed from the site specific meteorological dataset
Annual Average Wind speed in Pit		m/s	2.10		10-m windspeed converted to 2 m
				DP/CNC	
Pre-split drill	Hole Diameter	mm dia	114	DP/CNC	
Pre-split drill	Hole Depth	m	15	DP/CNC	
Production Drill	Hole Diameter	mm dia	229/271	DP/CNC	
Production Drill	Hole Depth - pits to 90 m depth below surface	m	7.5	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 16.3.1, Page 309
	Hole Depth - pits > 90 m below surface	m	15		
Process Plant	Plant Design Capacity – Phase 1	kt/d	60	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant	Plant Design Capacity – Phase 1	Mt/a	21.9	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant	Plant Design Capacity – Phase 1 & 2 (Total)	kt/d	120	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant	Plant Design Capacity – Phase 1 & 2 (Total)	Mt/a	43.8	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Operating Availability	Crushing	%	75	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Operating Availability	Grinding, Flotation and Magnetic Recovery	%	91.3	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Operating Availability	Concentrate Filtration	%	84	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Plant Feed Grades, Design	Nickel	%	0.28	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Plant Feed Grades, Design	Cobalt	%	0.014	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Plant Feed Grades, Design	Iron	%	7.42	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Plant Feed Grades, Design	Chromium	%	0.69	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Process Plant, Plant Feed Grades, Design	Sulphur	%	0.27	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Ore Characteristics, Design	Specific Gravity		2.65	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Ore Characteristics, Design	Moisture Content	%	3	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Ore Characteristics, Design	Bulk Density for Volume calculations	t/m3	1.58	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Ore Characteristics, Design	Bulk Density for Weight Calculations	t/m3	1.72	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Ore Characteristics, Design	Silt Content	%	2	DP/CNC	CNC - Effectively 0 - 2% used for conservatism
Waste Rock Characteristics	Specific Gravity		2.83	DP/CNC	
Waste Rock Characteristics	Moisture Content	%	3	DP/CNC	Assumed same as ore
Waste Rock Characteristics	Bulk Density for Volume calculations			DP/CNC	
Waste Rock Characteristics	Bulk Density for Weight Calculations			DP/CNC	
Waste Rock Characteristics	Silt Content	%	2	DP/CNC	CNC - Effectively 0 - 2% used for conservatism
Clay Characteristics	Specific Gravity		1.71	DP/CNC	
Clay Characteristics	Moisture Content	%	28	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Clay Characteristics	Bulk Density for Volume calculations			DP/CNC	
Clay Characteristics	Bulk Density for Weight Calculations			DP/CNC	
Clay Characteristics	Silt Content	%	76.4	DP/CNC	Clay Content multiplied by the ratio of average Silt to Clay contents in Overburden (ratio = 1.91) determined from the Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Clay Characteristics	Clay Fraction	%	40		NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Sand and Till Characteristics	Specific Gravity		1.94	DP/CNC	
Sand and Till Characteristics	Moisture Content	%	14	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-2
Sand and Till Characteristics	Bulk Density for Volume calculations			DP/CNC	
Sand and Till Characteristics	Bulk Density for Weight Calculations			DP/CNC	
Sand and Till Characteristics	Silt Content	%	51.57	DP/CNC	Clay Content multiplied by the ratio of average Silt to Clay contents in Overburden (ratio = 1.91) determined from the Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Sand and Till Characteristics	Clay Fraction	%	27		NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-2
Concentrate	Moisture Content	%	11	DP/CNC	
Overburden (Reclaim) Characteristics	Moisture Content	%	19.50	CNC	Average of 375 Overburden Samples - Table 6.1, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Overburden (Reclaim) Characteristics	Silt Content	%	36.3		Average of 336 Overburden Samples - Table 6.3, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Particle Size Distributions, Design	Primary Crusher Feed, F80	mm	500	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Grinding Circuit Feed, F80	mm	40	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Primary Ball Mill Product, P80	µm	230	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Secondary Ball Mill Product, P80	µm	100	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Deslime Cyclone Overflow, P80	µm	8	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Flotation Cleaner Regrind Product, P80	µm	55	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Magnetic Secondary Regrind Product, P80	µm	60	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Particle Size Distributions, Design	Magnetic Tertiary Regrind Product, P80	µm	25	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-2
Primary Crushing	Nominal Capacity	t/h	3333	Ausenco	
Primary Crushing	gyratory crusher power	kW	750	Ausenco	
Primary Crushing	Mobile rock breaker - make/model		Kobelco tracked excavator SK500LC-10 with BTI BXR85 hammer	Ausenco	
Primary Crushing	Mobile rock breaker - % utilization	% per hour	25% - can vary greatly as it is heavily dependent on quality of blasting	Ausenco	
Primary Crushing	Mobile rock breaker - Manufacturer's Sound Level	dB	124	Ausenco	
Primary Crushing	Baghouse - capacity	m3/h	64,000	Ausenco	
Primary Crushing	Baghouse - Stack diameter	m	1.2	Ausenco	
Primary Crushing	Baghouse - stack height above ground	m	12	Ausenco	
Primary Crushing	Baghouse - blower motor	hp	100	Ausenco	
Primary Crushing	Baghouse - blower motor sound level	dB	85	Ausenco	
Secondary Crushing	Cone crushers (2) - nominal feed rate for each unit	t/h	1200	Ausenco	
Secondary Crushing	Baghouse - capacity	m3/h	10,000	Ausenco	
Secondary Crushing	Baghouse - Stack diameter	m	1.2	Ausenco	
Secondary Crushing	Baghouse - stack height above ground	m	12	Ausenco	
Secondary Crushing	Baghouse - blower motor	hp	40	Ausenco	
Secondary Crushing	Baghouse - blower motor sound level	dB	85	Ausenco	
Secondary Crushing	Vibrating screens (2 units) sound level	dB	<85 each	Ausenco	
Crushed Ore Stockpile	Live Capacity	t	32,860	Ausenco	
Crushed Ore Stockpile	Total Capacity	t	155,770	Ausenco	
Crushed Ore Stockpile	Mitigation		Dome covered with 2 baghouses	Ausenco	
Crushed Ore Stockpile	Baghouse - capacity	m3/h per unit	25,000	Ausenco	
Crushed Ore Stockpile	Baghouse - Stack diameter	m	1.2	Ausenco	
Crushed Ore Stockpile	Baghouse - stack height above ground	m	12	Ausenco	
Crushed Ore Stockpile	Baghouse - blower motor	hp	60	Ausenco	
Crushed Ore Stockpile	Baghouse - blower motor sound level	dB	85	Ausenco	
Primary Grinding Circuit	Nominal Feed Rate	t/h	2,738	Ausenco	
Primary Grinding Circuit	SAG mill	MW	18	Ausenco	
Primary Grinding Circuit	Ball mill	MW	18	Ausenco	
Tailings Management Facility	Dry Area	ha	2300	Ausenco	
Haul Roads	Material		gabbro and basalt rock only (>99% Basalt)	DP/CNC	
Haul Roads	Width for 290 t trucks	m	35	DP/CNC	
Haul Roads	Width for trolley assist in pit	m	50	DP/CNC	
Haul Roads	Width other roads	m	15	DP/CNC	
Haul Roads	Watering frequency	applications/day	Haul roads will be watered as a function of evaporation, with 750mm of water being placed annually (34mm Q1, 318 Q2, 344 Q3, 51 Q4) on each metre of active road. Works out to 34m m3 over the life of mine.	DP/CNC	
Haul Roads	Expected Summer dust control	%	85%	DP/CNC	Haul roads will be watered as a function of evaporation, with 750mm of water being placed annually (34mm Q1, 318 Q2, 344 Q3, 51 Q4) on each metre of active road. Works out to 34m m3 over the life of mine.
Haul Roads	Winter months natural mitigation control efficiency	%	95%		
Pit Dewatering	Pump horsepower	kW	676	DP/CNC	
Pit Dewatering	Number of Pumps above Saddle	-	3	DP/CNC	
Pit Dewatering	Number of Pumps per stage below saddle	-	2	DP/CNC	
Pit Dewatering	Vertical stage height	m	150	DP/CNC	
Pit Dewatering	Pump Fuel		Electric	DP/CNC	NI 43-101 Technical Report and Feasibility Study, Section 16.3.1, Page 309 - power supplied to pit
Roadstone Crusher	Configuration	-	Primary Jaw Crusher Secondary Cone Crusher Screening Plant	Ausenco	NI 43-101 Technical Report and Feasibility Study, Section 16.4.3.4, Page 387 - Roadstone Crusher
Roadstone Crusher	Capacity	Mt/a	3.6	Ausenco	
Roadstone Crusher	Capacity	t/d	Average daily tonnages (all products) - Yr -1: 7.6 ktpd - Max (Q4): 14.2 ktpd - LOM: 4.5 ktpd	Ausenco	Average daily tonnages (all products) - Yr -1: 7.6 ktpd - Max (Q4): 14.2 ktpd - LOM: 4.5 ktpd
Pit Roads	Trolley assist fuel reduction factor	%	50	Ausenco	Crawford FS Final Report. Installed in MZ Year 2.

Table 2: Pit Data

Pit Data	Year -1	Year 7	Units		Reference
Ramp Gradient	0.10	N/A			Typical quarry ramp gradient
Pit Depth - Mz	22.50	337.50	m		
Pit Depth - Ez1	82.50	195.00			
Pit Depth - EZ2	0.00	30.00			
Ramp Lengths in pit (m)			m		
Mz	225	1,710	m		ABB - trolley assist specifications for Year 7. Max 10% ramp grade assumed for Year -1.
EZ1	825	N/A	m		No trolley assist - assume maz grade of 10% - standard quarry spec.
EZ2	N/A	300	m		No trolley assist - assume maz grade of 10% - standard quarry spec.
Number of times pit roads are graded	2	2	times/ day		Assumed
Pit Surface Road Silt Content (%)	9.1	9.1	%		Mean silt content (%) for unpaved roads at Ontario mining sites from Table 2, Centre for Excellence in Mining Inovation (CEMI), Literature Review of Current Fugitive Dust Control Practices within the Mining Industry, 2012.
Haul Road Silt Content (%)	9.1	9.1	%		Mean silt content (%) for unpaved roads at Ontario mining sites from Table 2, Centre for Excellence in Mining Inovation (CEMI), Literature Review of Current Fugitive Dust Control Practices within the Mining Industry, 2012.
Bench Depth for Blasting	7.5	15	m		7.5 m benches above 90 m depth, 15 m benches below 90 m - NI 43-101 Technical Report and Feasibility Study, Section 16.3.1

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

All emission rates within each pit are summed together for use as a single source for the model (except for blasting). Blasting is not continuous and is modeled as a separate source from the continuously operating pit emissions within the same model. Winter and summer conditions have differing degrees of dust mitigation from use of unpaved roads and are modeled as separate sources Pit emissions include the following:
1) Haul trucks transport ore from the pit to the primary crushing building and waste storage piles by using an unpaved road (P1)
2) Truck Loading (MZ, EZ1, EZ2)
3) Grading (MZ, EZ1, EZ2)
4) Drilling in pit (MZ, EZ1, EZ2)
5) Mobile Emissions (P5)

A separate pit source is used for blasting which occurs discretely
1) Blasting in Pit (MZB)

Source : Haul trucks transport ore in the pits on unpaved roads (P1)

Description:
After the haul truck is loaded with ore, overburden or waste rock, it will travel via onsite unpaved roads until it reaches the surface. Emissions due to loaded truck travelling in the pit are estimated in this sheet.

Contaminant(s) of Concern:
Particulate, metals, NOx, VOCs, PAHs, CO and SO2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC, VOCs, PAHs, CO and SO2 are calculated in the "Mobile Emissions" sheet

Methodology: Emission Factor (EF)
Emission factor for material loading was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.2 (Unpaved Road). The equation is:

$$E = k\,(s/12)^{a}\,(W/3)^{b}$$

where:
k, a, b, c and d are empirical constants (US EPA AP-42 document Chapter 13.2.2)
E = size-specific emission factor (lb/VMT) (1 lb/VMT = 281.9 g/VKT)
s = surface material silt content (%)
W = mean vehicle weight (tons)

Parameter	Year -1	Year 7	Units	Reference	
Max 24 Hour Production Factor	1.17	1.03			
Max Number of Truck Trips per Day					
Clay Truck	1449	1050			
Sand Truck	419	742			
Rock Truck	404	1850			
Total Trips per Day	**2272**	**3642**			
Truck Tare Weight					
Clay Truck	68	68	tonnes		
Sand Truck	163	163	tonnes		
Rock Truck	521	521	tonnes		
Truck Load Capacity					
Clay Truck	39	39	tonnes		
Sand Truck	89	89	tonnes		
Rock Truck	290	290	tonnes		
Average Round Trip Truck Weight					
Clay Truck	87	87	tonnes		
Sand Truck	208	208	tonnes		
Rock Truck	666	666	tonnes		
Percent of Trips to Each Pit					
MZ	32%	94%	%		
EZ1	68%	0%	%		
EZ2	0%	6%	%		
Weighted Average Round Trip Truck Weight	213	406	tonnes		
Operating time	8760	8760	hours/year		
	365	365	day/year		
Hours of Operation per day	24	24	hours		
Watering road during non-precipitation days in summer control efficiency	85%	85%	%	Summer - assumed a combination of watering, chemical suppressant. Winter - Based on "Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada", Golder Associates, 2012. Assumed average control efficiency.	
Winter months natural mitigation control efficiency	95%	95%	%		

Emission Factor (E) Calculation:

Contaminant	Emission Constants[1]			Silt Content	Emission Factor - Year -1		Emission Factor - Year 7	
	k	a	b					
	(lb./VMT)			(%)	(lb./VMT)	(g/VKT)	(lb./VMT)	(g/VKT)
PM	4.9	0.7	0.45	9.10	28.69	8.087	38.38	10,818
PM_{10}	1.5	0.9	0.45	9.10	8.31	2,342	11.12	3,133
$PM_{2.5}$	0.15	0.9	0.45	9.10	0.83	234	1.11	313

Note:
(1) USEPA AP-42 Table 13.2.2-2, factors rating B and C.

Emission Rate Calculation:

Contaminant	Summer Control Efficiency	Winter Control Efficiency	Year -1						Year 7					
			MZ				EZ1				MZ			
			Assumed Round Trip Road Length	Total Uncontrolled Emissions	Summer Controlled Short-Term Emission Rate	Winter Naturally Mitigated Short-Term Emission Rate	Assumed Round Trip Road Length	Total Uncontrolled Emissions	Summer Controlled Short-Term Emission Rate	Winter Naturally Mitigated Short-Term Emission Rate	Assumed Round Trip Road Length	Total Uncontrolled Emissions	Summer Controlled Short-Term Emission Rate	Winter Naturally Mitigated Short-Term Emission Rate
			(km)	(kg/day)	(g/s)	(g/s)	(km)	(kg/day)	(g/s)	(g/s)	(km)	(kg/day)	(g/s)	(g/s)
PM	85%	95%	0.45	2,631	4.57	1.52	1.65	20,670	35.89	11.96	3.42	126,318	219.30	73.10
PM_{10}	85%	95%	0.45	762	1.32	0.44	1.65	8,010	13.91	4.64	3.42	36,588	63.52	21.17
$PM_{2.5}$	85%	95%	0.45	76	0.13	0.04	1.65	801	1.39	0.46	3.42	3,659	6.35	2.12
Speciated Metals	**CAS#**	**Haul Road Metals Speciation** **Construction Waste Rock**	Year -1				Year -1				Year 7			
			Summer Emission Rate (g/s)	Winter Emission Rate (g/s)			Summer Emission Rate (g/s)	Winter Emission Rate (g/s)			Summer Emission Rate (g/s)	Winter Emission Rate (g/s)		
Fluoride	7664-39-3	2.16E-07	9.87E-07	3.29E-07			7.76E-06	2.59E-06			4.74E-05	1.58E-05		
Chromium VI	18540-29-9	1.99E-09	9.09E-09	3.03E-09			7.14E-08	2.38E-08			4.37E-07	1.46E-07		
Mercury	7439-97-6	3.00E-11	1.37E-10	4.57E-11			1.08E-09	3.59E-10			6.58E-09	2.19E-09		
Aluminum	7429-90-5	6.66E-02	3.04E-01	1.01E-01			2.39E+00	7.97E-01			1.46E+01	4.87E+00		
Silver	7440-22-4	2.50E-07	1.14E-06	3.81E-07			8.97E-06	2.99E-06			5.48E-05	1.83E-05		
Arsenic	7440-38-2	3.77E-06	1.72E-05	5.73E-06			1.35E-04	4.51E-05			8.26E-04	2.75E-04		
Barium	7440-39-3	1.40E-04	6.39E-04	2.13E-04			5.02E-03	1.67E-03			3.07E-02	1.02E-02		
Beryllium	7440-41-7	2.91E-07	1.33E-06	4.43E-07			1.05E-05	3.48E-06			6.39E-05	2.13E-05		
Boron	7440-42-8	1.73E-05	7.88E-05	2.63E-05			6.19E-04	2.06E-04			3.79E-03	1.26E-03		
Bismuth	7440-69-9	9.70E-08	4.43E-07	1.48E-07			3.48E-06	1.16E-06			2.13E-05	7.09E-06		
Calcium	7440-70-2	6.24E-02	2.85E-01	9.50E-02			2.24E+00	7.47E-01			1.37E+01	4.56E+00		
Cadmium	7440-43-9	7.66E-08	3.50E-07	1.17E-07			2.75E-06	9.16E-07			1.68E-05	5.60E-06		
Cobalt	7440-48-4	4.68E-05	2.14E-04	7.13E-05			1.68E-03	5.60E-04			1.03E-02	3.42E-03		
Chromium	7440-47-3	5.55E-04	2.53E-03	8.45E-04			1.99E-02	6.64E-03			1.22E-01	4.06E-02		
Copper	7440-50-8	8.76E-05	3.97E-04	1.32E-04			3.12E-03	1.04E-03			1.91E-02	6.36E-03		
Iron	7439-89-6	5.05E-02	2.31E-01	7.69E-02			1.81E+00	6.04E-01			1.11E+01	3.69E+00		
Potassium	7440-09-7	4.84E-03	2.21E-02	7.37E-03			1.74E-01	5.79E-02			1.06E+00	3.54E-01		
Lithium	7439-93-2	1.13E-05	5.15E-05	1.72E-05			4.04E-04	1.35E-04			2.47E-03	8.23E-04		
Magnesium	7439-95-4	6.45E-02	2.95E-01	9.82E-02			2.31E+00	7.71E-01			1.41E+01	4.71E+00		
Manganese	7439-96-5	9.70E-04	4.43E-03	1.48E-03			3.48E-02	1.16E-02			2.13E-01	7.09E-02		
Molybdenum	7439-98-7	6.46E-07	2.95E-06	9.83E-07			2.32E-05	7.72E-06			1.42E-04	4.72E-05		
Silicon	7440-21-3	8.13E-03	3.71E-02	1.24E-02			2.92E-01	9.72E-02			1.78E+00	5.94E-01		
Sodium	7440-23-5	1.46E-02	6.65E-02	2.22E-02			5.23E-01	1.74E-01			3.19E+00	1.06E+00		
Nickel	7440-02-0	2.78E-04	1.27E-03	4.23E-04			9.97E-03	3.32E-03			6.05E-02	2.03E-02		
Lead	7439-92-1	1.73E-06	7.91E-06	2.64E-06			6.22E-05	2.07E-05			3.80E-04	1.27E-04		
Antimony	7440-36-0	4.35E-07	1.99E-06	6.63E-07			1.56E-05	5.21E-06			9.54E-05	3.18E-05		
Selenium	7782-49-2	2.98E-07	1.36E-06	4.54E-07			1.07E-05	3.57E-06			6.54E-05	2.18E-05		
Tin	7440-31-5	3.26E-06	1.49E-05	4.96E-06			1.17E-04	3.90E-05			7.14E-04	2.38E-04		
Strontium	7440-24-6	1.21E-04	5.58E-04	1.85E-04			4.36E-03	1.45E-03			2.66E-02	8.88E-03		
Titanium	7440-32-6	1.94E-03	8.88E-03	2.96E-03			6.98E-02	2.33E-02			4.26E-01	1.42E-01		
Thallium	7440-28-0	4.55E-08	2.08E-07	6.93E-08			1.63E-06	5.45E-07			9.99E-06	3.33E-06		
Uranium	7440-61-1	1.91E-07	8.72E-07	2.91E-07			6.85E-06	2.28E-06			4.19E-05	1.40E-05		
Vanadium	7440-62-2	1.10E-04	5.03E-04	1.68E-04			3.95E-03	1.32E-03			2.41E-02	8.05E-03		
Tungsten	7440-33-7	3.65E-07	1.67E-06	5.56E-07			1.31E-05	4.37E-06			8.01E-05	2.67E-05		
Yttrium	7440-65-5	8.06E-06	3.68E-05	1.23E-05			2.89E-04	9.64E-05			1.77E-03	5.89E-04		
Zinc	7440-66-6	5.35E-05	2.44E-04	8.15E-05			1.92E-03	6.40E-04			1.17E-02	3.91E-03		
Thorium	7440-29-1	1.38E-06	6.23E-06	2.08E-06			4.90E-05	1.63E-05			2.99E-04	9.97E-05		
Quartz (in PM10)	14808-60-7	9.98E-02	1.32E-01	4.40E-02			1.39E+00	4.63E-01			6.34E+00	2.11E+00		
Pyrite	12068-85-8	6.50E-07	2.97E-06	9.90E-07			2.33E-05	7.78E-06			1.43E-04	4.75E-05		
Biotite	1302-27-8	5.78E-03	2.64E-02	8.80E-03			2.08E-01	6.92E-02			1.27E+00	4.23E-01		
Magnetite	1309-38-2	1.13E-02	5.17E-02	1.72E-02			4.06E-01	1.35E-01			2.48E+00	8.27E-01		
Hematite	1317-60-8	7.16E-04	3.27E-03	1.09E-03			2.57E-02	8.56E-03			1.57E-01	5.23E-02		
Chlorite	1318-59-8	9.58E-02	4.38E-01	1.46E-01			3.44E+00	1.15E+00			2.10E+01	7.00E+00		
Muscovite	1318-94-1	4.60E-02	2.10E-01	7.01E-02			1.65E+00	5.51E-01			1.01E+01	3.37E+00		
Talc (fibrous)	14807-96-6	3.20E-03	1.46E-02	4.95E-03			1.17E-01	3.89E-02			7.13E-01	2.38E-01		
Phosphorus	7723-14-0	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00			0.00E+00	0.00E+00		
Platinum	7440-06-4	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00			0.00E+00	0.00E+00		
Palladium	7440-05-3	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00			0.00E+00	0.00E+00		
Nickel (in PM10)	<<Ni_PM10>>	2.78E-04	3.67E-04	1.22E-04			3.86E-03	1.29E-03			1.76E-02	5.88E-03		
Uranium (in PM10)	<<U_PM10>>	1.91E-07	2.53E-07	8.42E-08			2.66E-06	8.86E-07			1.21E-05	4.04E-06		
Chrysotile Asbestos	132207-32-0	1.25E-03	5.70E-03	1.90E-03			4.48E-02	1.49E-02			2.74E-01	9.12E-02		
Manganese (in PM10)	<<Mn_PM10>>	9.70E-04	1.28E-03	4.28E-04			1.35E-02	4.50E-03			6.16E-02	2.05E-02		
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.70E-04	1.28E-04	4.28E-05			1.35E-03	4.50E-04			6.16E-03	2.05E-03		
Chromium VI (in PM10)	<<Cr6_PM10>>	1.99E-09	2.63E-09	8.78E-10			2.77E-08	9.23E-09			1.26E-07	4.22E-08		

[1]Dust control efficiency is assumed for water and chemical suppressant on unpaved road when there is no precipitation.
* Metals speciation data from: WSP Canada Inc. Crawford Geochemistry Characterization Geochemical Characterization Report dated April 5, 2024.
*Haul roads are >99% Basalt

Sample Calculation PM emissions:
PM annual uncontrolled emission rate (kg/day) = 2800 g/VKT x 0.45 km x 2272 loads/day x 32% x 1 kg/1000 g = 2,631 kg/day
Summer PM short-term controlled emission rate (g/s) = 911 kg/day x 1000 g/kg x 1 day/24 h x 1h/3600s x (1-80%) = 4.57 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the trucks operating continuously at its maximum production rate. The calculated emission rate should be conservative.

Source: Truck Loading (P2)

Description:
There will be dust emissions when excavators and wheel loaders transfer waste rock, overburden or ore onto haul trucks.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, and metals emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016) \frac{\left(\frac{U}{5.0}\right)^{1.3}}{\left(\frac{M}{2.0}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 15 µm	0.48	
	< 10 µm	0.35	
	< 5 µm	0.2	
	< 2.5 um	0.053	

The emission calculation for each unit is listed in the following table:

Parameter	Year -1	Year 7	Unit	Reference
Material Loaded				
Ore	15,473,193	50,609,473	tonnes/year	
Waste Rock	27,367,781	145,424,335	tonnes/year	
Clay	20,599,389	14,923,502	tonnes/year	
Sand and Till	13,669,148	24,214,461	tonnes/year	
Moisture Contents (M)				
Ore	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Waste Rock	3	3	%	Assumed same as ore
Clay	28	28	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Sand and Till	14	14	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-2
Mean wind speed (U)	2.1	2.1	m/s	5-year average wind speed from the site specific meteorological dataset 10-m windspeed converted to 2 m
Calculated emission factor - uncontrolled (E)				
Ore	8.52E-04	8.52E-04	kg/tonne	Calculated
Waste Rock	8.52E-04	8.52E-04	kg/tonne	Calculated
Clay	3.74E-05	3.74E-05	kg/tonne	Calculated
Sand and Till	9.86E-05	9.86E-05	kg/tonne	Calculated
Control Efficiency	0%	0%	%	No control assumed
Calculated PM Emissions (24-hour)				
Ore	3.09E-01	1.01E+00	g/s	0.74 Multiplier from US EPA AP-42, Chapter 13.2.4.
Waste Rock	3.09E-01	1.01E+00	g/s	
Clay	1.36E-02	4.44E-02	g/s	
Sand and Till	3.58E-02	1.17E-01	g/s	
Total PM	6.68E-01	2.18E+00	g/s	
PM_{10} Emissions				
Ore	1.46E-01	4.78E-01	g/s	0.35 Multiplier from US EPA AP-42, Chapter 13.2.4.
Waste Rock	1.46E-01	4.78E-01	g/s	
Clay	6.41E-03	2.10E-02	g/s	
Sand and Till	1.69E-02	5.54E-02	g/s	
Total PM10	3.16E-01	1.03E+00	g/s	
$PM_{2.5}$ Emissions				
Ore	2.22E-02	7.25E-02	g/s	0.053 Multiplier from US EPA AP-42, Chapter 13.2.4.
Waste Rock	2.22E-02	7.25E-02	g/s	
Clay	9.71E-04	3.18E-03	g/s	
Sand and Till	2.56E-03	8.38E-03	g/s	
Total PM	4.78E-02	1.56E-01	g/s	

CoPC	CAS	Units	Year -1		Year 7	
			MZ	EZ1	MZ	EZ2
PM	<<Ptub>>	g/s	2.13E-01	4.55E-01	2.05E+00	1.37E-01
PM_{10}	<<PM10>>	g/s	1.01E-01	2.15E-01	9.69E-01	6.46E-02
$PM_{2.5}$	<<PM2.5>>	g/s	1.52E-02	3.26E-02	1.47E-01	9.78E-03
Fluoride	7664-39-3	g/s	7.67E-08	1.64E-07	7.33E-07	4.89E-08
Chromium VI	18540-29-9	g/s	4.21E-10	9.01E-10	2.99E-09	2.00E-10
Mercury	7439-97-6	g/s	7.12E-12	1.53E-11	6.81E-11	4.54E-12
Aluminum	7429-90-5	g/s	8.05E-03	1.73E-02	8.81E-02	5.87E-03
Silver	7440-22-4	g/s	5.31E-08	1.14E-07	5.12E-07	3.41E-08
Arsenic	7440-38-2	g/s	8.32E-07	1.78E-06	1.20E-05	8.00E-07
Barium	7440-39-3	g/s	2.23E-05	4.77E-05	3.10E-04	2.07E-05
Beryllium	7440-41-7	g/s	4.74E-08	1.02E-07	7.49E-07	4.99E-08
Boron	7440-42-8	g/s	3.66E-06	7.84E-06	4.27E-05	2.85E-06
Bismuth	7440-69-9	g/s	1.66E-08	3.55E-08	2.24E-07	1.49E-08
Calcium	7440-70-2	g/s	8.78E-03	1.88E-02	6.53E-02	4.35E-03
Cadmium	7440-43-9	g/s	1.22E-08	2.61E-08	1.52E-07	1.01E-08
Cobalt	7440-48-4	g/s	1.66E-05	3.57E-05	1.41E-04	9.42E-06
Chromium	7440-47-3	g/s	1.87E-04	4.02E-04	1.45E-03	9.64E-05
Copper	7440-50-8	g/s	1.31E-05	2.80E-05	1.01E-04	6.70E-06
Iron	7439-89-6	g/s	1.18E-02	2.53E-02	1.11E-01	7.42E-03
Potassium	7440-09-7	g/s	7.58E-04	1.62E-03	1.09E-02	7.25E-04
Lithium	7439-93-2	g/s	1.79E-06	3.83E-06	1.89E-05	1.26E-06
Magnesium	7439-95-4	g/s	2.76E-02	5.92E-02	2.26E-01	1.50E-02
Manganese	7439-96-5	g/s	2.01E-04	4.31E-04	1.83E-03	1.22E-04
Molybdenum	7439-98-7	g/s	9.02E-08	1.93E-07	1.17E-06	7.77E-08
Silicon	7440-21-3	g/s	1.11E-03	2.37E-03	1.36E-02	9.00E-04
Sodium	7440-23-5	g/s	1.44E-03	3.09E-03	2.46E-02	1.64E-03
Nickel	7440-02-0	g/s	2.36E-04	5.06E-04	2.05E-03	1.36E-04
Lead	7439-92-1	g/s	3.69E-07	7.91E-07	5.20E-06	3.46E-07
Antimony	7440-36-0	g/s	8.92E-08	1.91E-07	8.59E-07	5.73E-08
Selenium	7782-49-2	g/s	6.44E-08	1.38E-07	6.23E-07	4.16E-08
Tin	7440-31-5	g/s	7.19E-07	1.54E-06	7.06E-06	4.71E-07
Strontium	7440-24-6	g/s	1.62E-05	3.89E-05	2.08E-04	1.39E-05
Titanium	7440-32-6	g/s	2.63E-04	5.64E-04	3.64E-03	2.43E-04
Thallium	7440-28-0	g/s	1.09E-08	2.33E-08	1.34E-07	8.93E-09
Uranium	7440-61-1	g/s	4.31E-08	9.24E-08	6.15E-07	4.10E-08
Vanadium	7440-62-2	g/s	1.43E-05	3.07E-05	1.46E-04	9.76E-06
Tungsten	7440-33-7	g/s	4.44E-08	9.52E-08	6.19E-07	4.13E-08
Yttrium	7440-65-5	g/s	1.12E-06	2.40E-06	1.58E-05	1.06E-06
Zinc	7440-66-6	g/s	1.02E-05	2.19E-05	1.19E-04	7.93E-06
Thorium	7440-29-1	g/s	1.85E-07	3.96E-07	2.53E-06	1.68E-07
Quartz (in PM10)	14808-60-7	g/s	6.21E-03	1.33E-02	1.22E-01	8.13E-03
Pyrite	12068-85-8	g/s	7.44E-08	1.59E-07	1.60E-06	1.06E-07
Biotite	1302-27-8	g/s	6.35E-04	1.36E-03	9.31E-03	6.21E-04
Magnetite	1309-38-2	g/s	1.12E-02	2.40E-02	9.94E-02	6.63E-03
Hematite	1317-60-8	g/s	8.18E-05	1.75E-04	1.75E-03	1.17E-04
Chlorite	1318-59-8	g/s	1.48E-02	3.17E-02	1.29E-01	8.60E-03
Muscovite	1318-94-1	g/s	5.18E-03	1.11E-02	9.48E-02	6.32E-03
Talc (fibrous)	14807-96-6	g/s	3.72E-04	7.97E-04	7.98E-03	5.32E-04
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	1.12E-04	2.39E-04	9.68E-04	6.45E-05
Uranium (in PM10)	<<U_PM10>>	g/s	2.04E-08	4.37E-08	2.91E-07	1.94E-08
Chrysotile Asbestos	132207-32-0	g/s	1.49E-03	3.20E-03	1.29E-02	8.52E-04
Manganese (in PM10)	<<Mn_PM10>>	g/s	9.51E-05	2.04E-04	8.64E-04	5.76E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	1.44E-05	3.09E-05	1.31E-04	8.72E-06
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	1.99E-10	4.26E-10	1.42E-09	9.44E-11

Sample Calculation PM emissions:
Ore Emission factor - uncontrolled (kg/tonne) = 1 x 0.0016 x (2.2/2.2)^1.3 / (3/2)^1.4 = 8.52E-04 kg/tonne
PM hourly emissions - with controls (kg/hr) = 15,473,193 tonne/year x 9.23E-04 kg/tonne x 1yr/365 day x 1 day/24hour x (1-0%) = 1.505 kg/hr
PM short-term emission rate - with controls (g/s) = 1.631 kg/hr x 0.74 x 1000 g/kg / 3600 s/hr = 3.09E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum production rate. The calculated emission rate should be conservative.

Source: Grading (P3)

Description:
A Grader maintains haul roads for efficient operation of haul trucks moving around the pit. It is assumed the grader will grade haul roads in the pit four times per day.

Contaminant(s) of Concern:
PM, PM10, PM2.5, metals, NOx, VOCs, PAHs, CO and SO2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um) **$E=0.0056(S)^{2.5}$ (TSP<=15um)**
where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Parameter	Year -1		Year 7		Units	Reference
	MZ	EZ1	MZ	EZ2		
Grader Speed	8	8	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
Emission factor (uncontrolled)	0.62	0.62	0.62	0.62	kg/vkt	TSP calculated
Emission factor (uncontrolled)	0.36	0.36	0.36	0.36	kg/vkt	TSP <15um calculated
Control Efficiency	0%	0%	0%	0%	%	
Length of roads that require grading within the pit	0.2	0.8	1.7	0.3	km	
Frequency of grading	4	4	4	4	times/ day	Assumed the in-pit roads are graded 4 times/ day
Total length of road graded per day	0.9	3.3	6.8	1.2	vkt/day	Calculated based on length of road that requires grading x number of times roads need to graded/day
PM Emission rate (g/s)	6.41E-03	2.35E-02	4.87E-02	8.55E-03	g/s	Calculated
PM_{10} Emission rate (g/s)	2.24E-03	8.21E-03	1.70E-02	2.99E-03	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
$PM_{2.5}$ Emission rate (g/s)	1.99E-04	7.29E-04	1.51E-03	2.65E-04	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Grading Emissions (g/s)

COPC	CAS	Year -1			Year 7		
		Metals Speciation Factor for Haul Roads	MZ (g/s)	EZ1 (g/s)	Metals Speciation Factor for Haul Roads	MZ (g/s)	EZ2 (g/s)
PM	<<PM>>	-	6.41E-03	2.35E-02	-	4.87E-02	8.55E-03
PM_{10}	<<PM10>>	-	2.24E-03	8.21E-03	-	1.70E-02	2.99E-03
$PM_{2.5}$	<<PM2.5>>	-	1.99E-04	7.29E-04	-	1.51E-03	2.65E-04
Fluoride	7664-39-3		-	-		-	-
Chromium VI	18540-29-9		-	-		-	-
Mercury	7439-97-6		-	-		-	-
Aluminum	7429-90-5	7.41E-02	4.75E-04	1.74E-03	7.41E-02	3.61E-03	6.33E-04
Silver	7440-22-4	2.50E-07	1.60E-09	5.88E-09	2.50E-07	1.22E-08	2.14E-09
Arsenic	7440-38-2	2.28E-06	1.46E-08	5.36E-08	2.28E-06	1.11E-07	1.95E-08
Barium	7440-39-3	9.66E-05	6.20E-07	2.27E-06	9.66E-05	4.71E-06	8.26E-07
Beryllium	7440-41-7	6.74E-08	4.32E-10	1.58E-09	6.74E-08	3.29E-09	5.76E-10
Boron	7440-42-8	7.76E-06	4.97E-08	1.82E-07	7.76E-06	3.78E-07	6.63E-08
Bismuth	7440-69-9	4.66E-08	2.99E-10	1.10E-09	4.66E-08	2.27E-09	3.99E-10
Calcium	7440-70-2	9.07E-02	5.82E-04	2.13E-03	9.07E-02	4.42E-03	7.76E-04
Cadmium	7440-43-9	5.13E-08	3.29E-10	1.21E-09	5.13E-08	2.50E-09	4.39E-10
Cobalt	7440-48-4	4.49E-05	2.88E-07	1.06E-06	4.49E-05	2.19E-06	3.84E-07
Chromium	7440-47-3	5.19E-04	3.33E-06	1.22E-05	5.19E-04	2.53E-05	4.44E-06
Copper	7440-50-8	1.03E-04	6.63E-07	2.43E-06	1.03E-04	5.04E-06	8.84E-07
Iron	7439-89-6	4.35E-02	2.79E-04	1.02E-03	4.35E-02	2.12E-03	3.72E-04
Potassium	7440-09-7	2.68E-03	1.72E-05	6.30E-05	2.68E-03	1.31E-04	2.29E-05
Lithium	7439-93-2	1.24E-05	7.92E-08	2.90E-07	1.24E-05	6.02E-07	1.06E-07
Magnesium	7439-95-4	7.02E-02	4.50E-04	1.65E-03	7.02E-02	3.42E-03	6.00E-04
Manganese	7439-96-5	9.47E-04	6.07E-06	2.23E-05	9.47E-04	4.61E-05	8.09E-06
Molybdenum	7439-98-7	5.30E-07	3.40E-09	1.25E-08	5.30E-07	2.58E-08	4.53E-09
Silicon	7440-21-3	5.02E-03	3.22E-05	1.18E-04	5.02E-03	2.45E-04	4.29E-05
Sodium	7440-23-5	8.00E-03	5.13E-05	1.88E-04	8.00E-03	3.90E-04	6.84E-05
Nickel	7440-02-0	2.14E-04	1.37E-06	5.04E-06	2.14E-04	1.04E-05	1.83E-06
Lead	7439-92-1	4.55E-07	2.92E-09	1.07E-08	4.55E-07	2.22E-08	3.89E-09
Antimony	7440-36-0	4.18E-07	2.68E-09	9.83E-09	4.18E-07	2.04E-08	3.58E-09
Selenium	7782-49-2	2.87E-07	1.84E-09	6.75E-09	2.87E-07	1.40E-08	2.45E-09
Tin	7440-31-5	3.13E-06	2.01E-08	7.36E-08	3.13E-06	1.53E-07	2.68E-08
Strontium	7440-24-6	1.28E-04	8.21E-07	3.01E-06	1.28E-04	6.24E-06	1.09E-06
Titanium	7440-32-6	1.17E-03	7.47E-06	2.74E-05	1.17E-03	5.68E-05	9.96E-06
Thallium	7440-28-0	2.46E-08	1.58E-10	5.79E-10	2.46E-08	1.20E-09	2.11E-10
Uranium	7440-61-1	3.59E-08	2.30E-10	8.45E-10	3.59E-08	1.75E-09	3.07E-10
Vanadium	7440-62-2	1.14E-04	7.30E-07	2.68E-06	1.14E-04	5.55E-06	9.74E-07
Tungsten	7440-33-7	1.21E-07	7.76E-10	2.85E-09	1.21E-07	5.90E-09	1.04E-09
Yttrium	7440-65-5	4.48E-06	2.87E-08	1.05E-07	4.48E-06	2.18E-07	3.83E-08
Zinc	7440-66-6	3.38E-05	2.17E-07	7.95E-07	3.38E-05	1.65E-06	2.89E-07
Thorium	7440-29-1	6.80E-07	4.36E-09	1.60E-08	6.80E-07	3.31E-08	5.81E-09
Quartz (in PM10)	14808-60-7	1.33E-03	2.97E-06	1.09E-05	1.33E-03	2.26E-05	3.96E-06
Pyrite	12068-85-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biotite	1302-27-8	4.88E-03	3.13E-05	1.15E-04	4.88E-03	2.38E-04	4.17E-05
Magnetite	1309-38-2	3.43E-03	2.20E-05	8.05E-05	3.43E-03	1.67E-04	2.93E-05
Hematite	1317-60-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorite	1318-59-8	1.12E-01	7.18E-04	2.63E-03	1.12E-01	5.46E-03	9.57E-04
Muscovite	1318-94-1	1.62E-02	1.04E-04	3.81E-04	1.62E-02	7.89E-04	1.38E-04
Talc (fibrous)	14807-96-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0		-	-		-	-
Platinum	7440-06-4		-	-		-	-
Palladium	7440-05-3		-	-		-	-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04	4.80E-07	1.76E-06	2.14E-04	3.65E-06	6.40E-07
Uranium (in PM10)	<<U_PM10>>	3.59E-08	8.05E-11	2.95E-10	3.59E-08	6.12E-10	1.07E-10
Chrysotile Asbestos	132207-32-0	2.49E-06	1.59E-08	5.85E-08	2.49E-06	1.21E-07	2.13E-08
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04	2.12E-06	7.77E-06	9.47E-04	1.61E-05	2.83E-06
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04	1.88E-07	6.90E-07	9.47E-04	1.43E-06	2.51E-07
Chromium VI (in PM10)	<<Cr6_PM10>>		-	-		-	-

Sample Calculation PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x 8^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.5 km/day x 0.62 kg/vkt x 1000 g/kg x 1/24 day/hr x 1/3600 h/s x (1-0%) = 6.41E-03 g/s

Data Quality: Average, Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Drilling in pit (P4)

Description:
Explosives are placed in various holes for blasting. These holes are drilled continuously and their emissions are calculated here.

Contaminant(s) of Concern:
PM, PM10, PM2.5, metals, NOx, VOCs, PAHs, CO and SO2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
TSP Drilling emission factors from USEPA Table 11.9-4. Australia NPI (National Pollutant Inventory) technical manual for Mining, Version 3.1 provides PM10 emission factors. It is assumed $PM_{2.5}$ = 10% of PM_{10}

E = EF (kg/hole) x Number of holes drilled /day

Where E = kg of emissions /day

Parameter	Year -1		Year 7		Units	Reference
	Mz	EZ1	Mz	EZ2		
Holes drilled/ day	28	156	110	296	holes/ day	US Office of Mine Safety and Health Research (2014) estimates wet drilling eliminates up to 97% of respirable dust. Control of 90% equivalent to a moderate water flow rate of 0.8 gpm assumed for control efficiency.
Control Efficiency	90%	90%	90%	90%	%	
Averaging Period	24	24	24	24	hours/day	

Drilling emission factor **MZ** **EZ**

COPC	Drilling emission factor (kg/hole)	Drilling emission factor (kg/hole)	Reference
PM	0.5900	0.5900	TSP (PM) Drilling emission factors from USEPA Table 11.9-4. Australia NPI (National Pollutant Inventory) technical manual for Mining, Version 3.1 (January 2012) provides PM10 emission factors. It is assumed $PM_{2.5}$ = 10% of PM_{10}
PM_{10}	0.3068	0.3068	
$PM_{2.5}$	0.0307	0.0307	

Drilling emissions (g/s)

COPC	CAS	Year -1			Year 7		
		Speciation Factor for Waste Rock	MZ (g/s)	EZ1 (g/s)	Speciation Factor for Waste Rock	MZ (g/s)	EZ2 (g/s)
PM	<<PM>>	-	1.94E-02	1.07E-01	-	7.52E-02	2.02E-01
PM_{10}	<<PM10>>	-	1.01E-02	5.56E-02	-	3.91E-02	1.05E-01
$PM_{2.5}$	<<PM2.5>>	-	1.01E-03	5.55E-03	-	3.91E-03	1.05E-02
Fluoride	7664-39-3	2.16E-07	4.19E-09	2.31E-08	2.10E-07	1.58E-08	4.26E-08
Chromium VI	18540-29-9	1.90E-09	3.86E-11	2.13E-10	8.89E-10	6.68E-11	1.80E-10
Mercury	7439-97-6	3.00E-11	5.81E-13	3.20E-12	3.00E-11	2.26E-12	6.07E-12
Aluminum	7429-90-5	6.66E-02	1.29E-03	7.11E-03	7.57E-02	5.70E-03	1.53E-02
Silver	7440-22-4	2.50E-07	4.84E-09	2.67E-08	2.50E-07	1.88E-08	5.06E-08
Arsenic	7440-38-2	3.77E-06	7.30E-08	4.02E-07	6.14E-06	4.62E-07	1.24E-06
Barium	7440-39-3	1.40E-04	2.71E-06	1.49E-05	2.27E-04	1.71E-05	4.59E-05
Beryllium	7440-41-7	2.91E-07	5.64E-09	3.11E-08	5.83E-07	4.38E-08	1.18E-07
Boron	7440-42-8	1.73E-05	3.34E-07	1.84E-06	2.61E-05	1.96E-06	5.27E-06
Bismuth	7440-69-9	9.70E-08	1.88E-09	1.04E-08	1.65E-07	1.24E-08	3.33E-08
Calcium	7440-70-2	6.24E-02	1.21E-03	6.67E-03	3.92E-02	2.95E-03	7.94E-03
Cadmium	7440-43-9	7.66E-08	1.48E-09	8.18E-09	1.10E-07	8.27E-09	2.22E-08
Cobalt	7440-48-4	4.68E-05	9.08E-07	5.00E-06	2.89E-05	2.17E-06	5.85E-06
Chromium	7440-47-3	5.50E-04	1.06E-05	5.92E-05	1.95E-04	1.47E-05	3.96E-05
Copper	7440-50-8	8.70E-05	1.69E-06	9.29E-06	5.84E-05	4.39E-06	1.18E-05
Iron	7439-89-6	5.05E-02	9.78E-04	5.39E-03	4.76E-02	3.58E-03	9.62E-03
Potassium	7440-09-7	4.84E-03	9.38E-05	5.17E-04	8.51E-03	6.40E-04	1.72E-03
Lithium	7439-93-2	1.13E-05	2.18E-07	1.20E-06	1.18E-05	8.89E-07	2.39E-06
Magnesium	7439-95-4	6.40E-02	1.25E-03	6.89E-03	2.73E-02	2.05E-03	5.53E-03
Manganese	7439-96-5	9.70E-04	1.88E-05	1.04E-04	8.34E-04	6.27E-05	1.69E-04
Molybdenum	7439-98-7	6.46E-07	1.25E-08	6.90E-08	9.27E-07	6.97E-08	1.88E-07
Silicon	7440-21-3	8.13E-03	1.57E-04	8.68E-04	1.12E-02	8.42E-04	2.27E-03
Sodium	7440-23-5	1.46E-02	2.82E-04	1.56E-03	2.58E-02	1.94E-03	5.22E-03
Nickel	7440-02-0	2.78E-04	5.38E-06	2.97E-05	1.29E-04	9.72E-06	2.62E-05
Lead	7439-92-1	1.73E-06	3.36E-08	1.85E-07	3.42E-06	2.57E-07	6.92E-07
Antimony	7440-36-0	4.35E-07	8.43E-09	4.65E-08	4.32E-07	3.25E-08	8.74E-08
Selenium	7782-49-2	2.98E-07	5.78E-09	3.19E-08	3.04E-07	2.29E-08	6.15E-08
Tin	7440-31-5	3.26E-06	6.31E-08	3.48E-07	3.40E-06	2.56E-07	6.89E-07
Strontium	7440-24-6	1.21E-04	2.35E-06	1.30E-05	1.51E-04	1.14E-05	3.06E-05
Titanium	7440-32-6	1.94E-03	3.77E-05	2.08E-04	3.01E-03	2.26E-04	6.10E-04
Thallium	7440-28-0	4.56E-08	8.82E-10	4.86E-09	7.51E-08	5.65E-09	1.52E-08
Uranium	7440-61-1	1.91E-07	3.70E-09	2.04E-08	3.94E-07	2.96E-08	7.98E-08
Vanadium	7440-62-2	1.10E-04	2.13E-06	1.18E-05	1.14E-04	8.58E-06	2.31E-05
Tungsten	7440-33-7	3.60E-07	7.06E-09	3.90E-08	5.67E-07	4.26E-08	1.15E-07
Yttrium	7440-65-5	8.06E-06	1.56E-07	8.60E-07	1.30E-05	9.81E-07	2.64E-06
Zinc	7440-66-6	5.35E-05	1.04E-06	5.71E-06	7.42E-05	5.58E-06	1.50E-05
Thorium	7440-29-1	1.36E-06	2.64E-08	1.46E-07	2.18E-06	1.64E-07	4.42E-07
Quartz (in PM10)	14808-60-7	9.98E-02	1.01E-03	5.54E-03	2.29E-01	8.95E-03	2.41E-02
Pyrite	1206-8-8	6.50E-07	1.26E-08	6.95E-08	1.52E-06	1.14E-07	3.07E-07
Biotite	1302-27-8	5.78E-03	1.12E-04	6.18E-04	8.78E-03	6.60E-04	1.78E-03
Magnetite	1309-38-2	1.13E-02	2.19E-04	1.21E-03	8.22E-03	6.18E-04	1.66E-03
Hematite	1317-60-8	7.16E-04	1.39E-05	7.64E-05	1.67E-03	1.25E-04	3.38E-04
Chlorite	1318-59-8	9.58E-02	1.86E-03	1.02E-02	7.77E-02	5.84E-03	1.57E-02
Muscovite	1318-94-1	4.60E-02	8.92E-04	4.92E-03	8.98E-02	6.75E-03	1.82E-02
Talc (fibrous)	14807-96-6	3.25E-03	6.30E-05	3.47E-04	7.58E-03	5.70E-04	1.53E-03
Phosphorus	7723-14-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.78E-04	2.80E-06	1.54E-05	1.29E-04	5.05E-06	1.36E-05
Uranium (in PM10)	<<U_PM10>>	1.91E-07	1.92E-09	1.06E-08	3.94E-07	1.54E-08	4.15E-08
Chrysotile Asbestos	132207-32-0	1.25E-03	2.42E-05	1.33E-04	4.83E-04	3.63E-05	9.77E-05
Manganese (in PM10)	<<Mn_PM10>>	9.70E-04	9.78E-06	5.39E-05	8.34E-04	3.26E-05	8.77E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.70E-04	9.78E-07	5.39E-06	8.34E-04	3.26E-06	8.77E-06
Chromium VI (in PM10)	<<Cr6_PM10>>	1.99E-09	2.01E-11	1.11E-10	8.89E-10	3.47E-11	9.35E-11

Sample Calculation PM emissions:
Emission rate (g/s) = 0.59 kg/hole * 28 holes/day / (24hrs/day) * 1hr/3600s * 1000g/kg * (1-90%) = 0.0194 g/s

Data Quality: Average, Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (PS)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Summary of Pit Operation Emissions (24-Hour):

CoPC	CAS #	Tailpipe Emissions (g/s) (From Non Road - Mobile Emissions Tab)				Haul Road Dust Emissions (g/s)								Material Handling Emissions (g/s)												Total Pit Emissions excluding road dust (Tailpipe Emissions + Material Handling Emissions) (g/s)			
						Summer				Winter				Truck Loading				Grading				Drilling							
		Year -1		Year 7		Year -1		Year 7		Year -1		Year 7		Year -1		Year 7		Year -1		Year 7		Year -1		Year 7		Year -1		Year 7	
		MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2	MZ	EZ1	MZ	EZ2
PM	<<Pb>>	4.72E-02	9.08E-02	1.46E-01	8.55E-02	4.57E+00	3.59E+01	2.19E+02	1.28E+00	1.52E+00	1.20E+01	7.31E+01	4.27E-01	2.13E-01	4.55E-01	2.05E+00	1.37E-01	6.41E-03	2.35E-02	4.87E-02	8.55E-03	1.94E-02	1.07E-01	7.52E-02	2.02E-01	2.85E-01	6.77E-01	2.32E+00	4.33E-01
PM_{10}	<<PM10>>	4.72E-02	9.08E-02	1.46E-01	8.55E-02	1.32E+00	1.39E+01	6.35E+01	3.71E-01	4.41E-01	4.64E+00	2.12E+01	1.24E-01	1.01E-01	2.15E-01	9.69E-01	6.46E-02	2.24E-03	8.21E-03	1.70E-02	2.99E-03	1.01E-02	5.55E-02	3.91E-02	1.05E-01	1.60E-01	3.70E-01	1.17E+00	2.58E-01
$PM_{2.5}$	<<PM2.5>>	4.72E-02	9.08E-02	1.46E-01	8.55E-02	1.32E-01	1.39E+00	6.35E+00	3.71E-02	4.41E-02	4.64E-01	2.12E+00	1.24E-02	1.52E-02	3.26E-02	1.47E-01	9.78E-03	1.99E-04	7.29E-04	1.51E-03	2.65E-04	1.01E-03	5.55E-03	3.91E-03	1.05E-02	6.36E-02	1.30E-01	2.98E-01	1.06E-01
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4.72E-02	9.08E-02	1.46E-01	8.55E-02																					4.72E-02	9.08E-02	1.46E-01	8.55E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	4.72E-02	9.08E-02	1.46E-01	8.55E-02																					4.72E-02	9.08E-02	1.46E-01	8.55E-02
CO	630-08-0	6.22	8.01	12.80	8.71																					6.22E+00	8.01E+00	1.28E+01	8.71E+00
SO_2	7446-09-5	9.99E-03	1.29E-02	2.06E-02	1.40E-02																					9.99E-03	1.29E-02	2.06E-02	1.40E-02
Non-methane hydrocarbons	<<NMHC>>	3.37E-01	4.35E-01	6.95E-01	4.73E-01																					3.37E-01	4.35E-01	6.95E-01	4.73E-01
NOx	10102-44-0	2.52	7.90	12.80	6.53																					2.52E+00	7.90E+00	1.28E+01	6.53E+00
Fluoride	7664-39-3					9.87E-07	7.76E-06	4.74E-05	2.77E-07	3.29E-07	2.59E-06	1.58E-05	9.24E-08	7.67E-08	1.64E-07	7.33E-07	4.89E-08	-	-	-	-	4.19E-09	2.31E-08	1.58E-08	4.26E-08	8.06E-08	1.87E-07	7.49E-07	5.15E-08
Chromium VI	18540-29-9					9.09E-09	7.14E-08	4.37E-07	2.55E-09	3.03E-09	2.38E-08	1.46E-07	8.51E-10	4.21E-10	9.01E-10	2.99E-09	2.00E-10	-	-	-	-	3.86E-11	2.13E-10	6.68E-11	1.80E-10	4.59E-10	1.11E-09	3.06E-09	3.79E-10
Mercury	7439-97-6					1.37E-10	1.08E-09	6.58E-09	3.85E-11	4.57E-11	3.59E-10	2.19E-09	1.28E-11	7.12E-12	1.53E-11	6.81E-11	4.54E-12					3.58E-13	3.20E-12	2.25E-12	6.07E-12	7.70E-12	1.85E-11	7.04E-11	1.06E-11
Aluminum	7429-90-5					1.04E-01	2.39E+00	1.46E+01	8.54E-02	1.01E-01	7.97E-01	4.87E+00	2.85E-02	8.55E-03	1.73E-02	8.81E-02	5.87E-03	4.75E-04	1.74E-03	3.61E-03	6.33E-04	1.29E-03	7.11E-03	5.70E-03	1.53E-02	9.82E-03	2.61E-02	9.74E-02	2.18E-02
Silver	7440-22-4					1.14E-06	8.97E-06	5.48E-05	3.21E-07	3.81E-07	2.99E-06	1.83E-05	1.07E-07	5.31E-08	1.14E-07	5.12E-07	3.41E-08	1.60E-09	5.88E-09	1.22E-08	2.14E-09	4.84E-09	2.67E-08	1.88E-08	5.09E-08	5.96E-08	1.46E-07	5.43E-07	8.69E-08
Arsenic	7440-38-2					1.72E-05	1.35E-04	8.26E-04	4.83E-06	5.73E-06	4.51E-05	2.75E-04	1.61E-06	8.32E-07	1.78E-06	1.20E-05	8.00E-07	1.46E-08	5.36E-08	1.11E-07	1.95E-08	7.30E-08	4.02E-07	4.62E-07	1.24E-06	9.20E-07	2.24E-06	1.26E-05	2.96E-06
Barium	7440-39-3					6.39E-04	5.02E-03	3.07E-02	1.79E-04	2.13E-04	1.67E-03	1.02E-02	5.98E-05	2.23E-05	4.77E-05	3.10E-04	2.07E-05	6.20E-07	2.27E-06	4.71E-06	8.26E-07	2.71E-06	1.49E-05	1.71E-05	4.59E-05	2.56E-05	6.49E-05	3.32E-04	6.74E-05
Beryllium	7440-41-7					1.33E-06	1.05E-05	6.39E-05	3.74E-07	4.43E-07	3.48E-06	2.13E-05	1.25E-07	4.74E-08	1.02E-07	7.49E-07	4.99E-08	4.32E-10	1.58E-09	3.29E-09	5.76E-10	5.64E-09	3.11E-08	4.98E-08	1.18E-07	5.35E-08	1.34E-07	7.96E-07	1.69E-07
Boron	7440-42-8					7.88E-05	6.19E-04	3.78E-03	2.21E-05	2.62E-05	2.06E-04	1.26E-03	7.37E-06	3.66E-06	7.84E-06	4.27E-05	2.85E-06	4.97E-08	1.82E-07	3.78E-07	6.63E-08	3.34E-07	1.84E-06	1.96E-06	5.27E-06	3.99E-06	9.68E-06	4.47E-05	8.12E-06
Bismuth	7440-69-9					4.43E-07	3.48E-06	2.13E-05	1.24E-07	1.48E-07	1.16E-06	7.09E-06	4.15E-08	1.66E-08	3.55E-08	2.24E-07	1.49E-08	2.66E-10	1.10E-09	2.27E-09	3.99E-10	1.88E-09	1.04E-08	1.24E-08	3.33E-08	1.87E-08	4.69E-08	2.38E-07	4.86E-08
Calcium	7440-70-2					2.85E-01	2.24E+00	1.37E+01	8.00E-02	9.92E-02	7.47E-01	4.56E+00	2.67E-02	8.78E-03	1.88E-02	6.53E-02	4.35E-03	5.82E-04	2.13E-03	4.42E-03	7.76E-04	1.21E-03	6.67E-03	2.96E-03	7.94E-03	1.06E-02	2.76E-02	7.26E-02	1.31E-02
Cadmium	7440-43-9					3.50E-07	2.75E-06	1.68E-05	9.82E-08	1.17E-07	9.16E-07	5.60E-06	3.27E-08	1.22E-08	2.61E-08	1.52E-07	1.01E-08	3.29E-10	1.21E-09	2.50E-09	4.39E-10	1.48E-09	8.18E-09	8.27E-09	2.22E-08	1.40E-08	3.54E-08	1.63E-07	3.28E-08
Cobalt	7440-48-4					1.14E-04	1.03E-02	6.01E-05	2.14E-06	2.13E-06	7.15E-05	5.60E-04	3.42E-03	2.00E-05	1.66E-05	3.57E-05	1.41E-04	9.42E-06	2.88E-07	1.06E-06	2.19E-06	3.84E-07	9.08E-07	5.00E-06	2.17E-06	5.85E-06	1.73E-05	4.17E-05	1.54E-05
Chromium	7440-47-3					2.53E-03	1.22E-01	7.12E-04	6.49E-04	4.06E-02	2.37E-04	1.87E-04	4.02E-04	1.45E-03	9.64E-05	3.33E-06	1.22E-05	2.53E-05	4.44E-06	1.08E-05	5.93E-06	1.47E-05	3.96E-05	2.02E-04	4.73E-04	1.49E-03	1.40E-04	
Copper	7440-50-8					3.97E-04	3.12E-03	1.91E-02	1.12E-04	1.32E-04	1.04E-03	6.36E-03	3.72E-05	1.31E-05	2.80E-05	1.01E-04	6.70E-06	6.63E-07	2.43E-06	5.04E-06	8.84E-07	1.69E-06	9.29E-06	4.39E-06	1.18E-05	1.54E-05	3.98E-05	1.10E-04	1.94E-05
Iron	7439-89-6					2.31E-01	1.81E+00	1.11E+01	6.47E-02	7.69E-02	3.66E+00	2.16E-02	4.83E-02	1.18E-02	2.53E-02	1.11E-01	7.42E-03	2.79E-04	1.02E-03	2.12E-03	3.72E-04	9.78E-04	5.39E-03	3.58E-03	9.62E-03	8.31E-03	2.20E-02	3.17E-02	1.17E-02
Potassium	7440-09-7					2.21E-02	1.74E-01	1.06E+00	6.21E-03	7.37E-03	5.79E-02	3.54E-01	2.07E-03	7.58E-04	1.62E-03	1.09E-02	7.25E-04	1.72E-05	6.30E-05	1.31E-04	2.29E-05	9.38E-05	5.17E-04	6.40E-04	1.72E-03	8.69E-04	2.20E-03	1.16E-02	2.47E-03
Lithium	7439-93-2					4.04E-04	2.47E-03	1.44E-02	8.27E-02	1.72E-05	1.38E-04	8.23E-04	4.82E-06	1.79E-06	3.83E-06	1.89E-05	1.26E-06	7.92E-08	2.90E-07	6.02E-07	1.06E-07	2.18E-07	1.20E-06	8.89E-07	2.09E-06	5.32E-06	2.04E-05	2.34E-05	2.12E-02
Magnesium	7439-95-4					2.95E-01	2.31E+00	1.41E+01	8.27E-02	9.82E-02	7.71E-01	4.71E+00	2.76E-02	2.76E-02	5.92E-02	2.26E-01	1.50E-02	4.50E-04	1.65E-03	3.42E-03	6.00E-04	1.25E-03	6.89E-03	2.05E-03	5.53E-03	2.93E-02	6.77E-02	2.31E-01	2.12E-02
Manganese	7439-96-5					3.48E-02	2.13E-01	1.24E-03	1.48E-03	1.16E-02	7.09E-02	4.15E-04	2.01E-04	4.31E-04	1.83E-03	1.22E-04	6.07E-06	2.23E-05	4.61E-05	8.09E-06	1.88E-05	1.04E-04	6.27E-05	1.69E-04	2.26E-04	5.57E-04	1.94E-03	2.99E-04
Molybdenum	7439-98-7					2.95E-06	2.32E-05	1.42E-04	8.28E-07	9.83E-07	7.72E-06	4.72E-05	2.76E-07	9.02E-08	1.93E-07	1.17E-06	7.77E-08	3.40E-09	1.25E-08	2.58E-08	4.53E-09	1.06E-08	6.97E-08	7.88E-08	1.87E-07	1.06E-07	2.75E-07	1.26E-06	2.70E-07
Silicon	7440-21-3					3.71E-02	2.92E-01	1.78E+00	1.04E-02	1.24E-02	9.72E-02	5.94E-01	3.47E-03	1.11E-03	2.37E-03	1.35E-02	9.00E-04	3.22E-05	1.18E-04	2.45E-04	4.29E-05	1.57E-04	8.68E-04	8.42E-04	2.27E-03	1.26E-03	3.24E-03	1.43E-02	3.17E-03
Sodium	7440-23-5					3.19E-01	1.67E-02	1.07E-02	2.22E-02	1.06E+00	6.23E-03	1.74E-01	1.30E-03	6.94E-04	1.48E-03	2.44E-02	1.64E-03	5.13E-05	1.88E-04	3.90E-04	6.84E-05	2.92E-04	1.56E-03	1.94E-03	5.22E-03	2.43E-04	5.41E-04	2.07E-03	1.64E-04
Nickel	7440-02-0					2.65E-03	6.09E-02	3.56E-04	4.23E-04	3.32E-03	2.03E-02	1.19E-04	2.36E-04	2.36E-04	5.06E-04	2.05E-03	1.36E-04	1.37E-06	5.04E-06	1.04E-05	1.62E-06	5.38E-06	2.97E-05	9.72E-06	2.62E-05	2.43E-04	5.41E-04	2.07E-03	1.64E-04
Lead	7439-92-1					7.91E-06	6.22E-05	3.80E-04	2.22E-06	2.64E-06	2.07E-05	1.27E-04	7.41E-07	3.69E-07	7.91E-07	5.20E-06	3.46E-07	2.92E-09	1.07E-08	2.22E-08	3.89E-09	3.36E-08	1.85E-07	2.57E-07	6.92E-07	4.06E-07	9.87E-07	5.48E-06	1.04E-06
Antimony	7440-36-0					1.99E-06	1.56E-05	9.54E-05	5.58E-07	6.63E-07	5.21E-06	3.18E-05	1.86E-07	8.92E-08	1.91E-07	8.56E-07	5.73E-08	2.68E-09	9.83E-09	2.04E-08	3.58E-09	8.43E-09	4.65E-08	3.26E-08	8.74E-08	8.74E-07	1.00E-06	2.48E-07	1.97E-06
Selenium	7782-49-2					1.07E-05	6.54E-05	3.83E-07	4.54E-07	3.57E-06	2.18E-05	1.28E-07	6.44E-08	1.38E-07	6.23E-07	4.16E-08	1.84E-09	6.75E-09	1.40E-08	2.45E-09	5.78E-09	3.19E-08	2.29E-08	6.15E-08	7.21E-08	1.77E-07	6.60E-07	1.06E-07
Tin	7440-31-5					1.17E-04	1.14E-04	4.18E-05	1.64E-05	4.69E-06	3.96E-05	2.38E-04	1.39E-05	6.79E-06	1.54E-05	4.71E-05	2.01E-06	1.39E-06	5.44E-07	2.68E-06	1.20E-06	6.31E-08	3.48E-07	2.96E-06	6.88E-07	8.02E-07	1.47E-06	3.66E-06	1.43E-06
Strontium	7440-24-6					5.55E-04	4.36E-03	2.66E-02	1.56E-04	1.85E-04	1.45E-03	8.88E-03	5.19E-05	1.82E-05	3.89E-05	2.08E-04	1.39E-05	8.21E-07	3.01E-06	6.24E-06	1.09E-06	2.35E-06	1.30E-05	1.14E-05	3.06E-05	2.13E-05	5.49E-05	2.26E-04	4.56E-05
Titanium	7440-32-6					8.88E-03	6.98E-02	4.26E-01	2.49E-03	2.96E-03	2.33E-02	1.42E-01	8.31E-04	2.63E-04	5.84E-04	3.64E-03	2.43E-04	7.77E-06	2.74E-05	5.68E-05	9.96E-06	3.77E-05	2.08E-04	2.26E-04	6.10E-04	3.98E-04	7.99E-04	3.92E-03	8.62E-04
Thallium	7440-61-1					2.98E-07	1.63E-06	9.96E-06	5.84E-08	6.96E-08	5.48E-07	3.33E-06	1.95E-08	1.06E-08	2.33E-08	1.34E-07	8.93E-09	1.58E-10	5.79E-10	1.20E-09	2.11E-10	8.82E-10	4.86E-09	6.65E-09	1.52E-08	1.19E-08	2.87E-08	1.41E-07	2.43E-08
Uranium	7440-61-1					8.72E-07	6.85E-06	4.19E-05	2.45E-07	2.91E-07	2.28E-06	1.40E-05	8.16E-08	4.31E-08	9.24E-08	6.15E-07	4.10E-08	2.30E-10	8.45E-10	1.75E-09	3.07E-10	3.70E-09	2.04E-08	2.96E-08	7.98E-08	4.71E-08	1.14E-07	6.47E-07	1.21E-07
Zinc	7440-66-6					2.53E-04	1.41E-04	5.19E-05	1.41E-05	1.32E-03	8.05E-04	4.71E-05	1.32E-05	1.43E-05	3.07E-05	1.44E-05	9.70E-07	7.37E-07	2.66E-06	5.25E-06	9.74E-07	2.13E-06	1.15E-05	5.98E-06	2.31E-05	1.61E-05	4.52E-05	1.61E-05	3.94E-06
Tungsten	7440-33-7					1.67E-06	1.31E-05	8.01E-05	4.68E-07	5.56E-07	4.37E-06	2.67E-05	1.56E-07	4.44E-08	9.52E-08	6.19E-07	4.13E-08	7.76E-10	2.85E-09	5.90E-09	1.04E-09	7.08E-09	3.90E-08	4.26E-08	1.15E-07	5.15E-08	1.34E-07	6.62E-07	1.56E-07
Yttrium	7440-65-5					3.68E-05	2.89E-04	1.77E-03	1.03E-05	1.23E-05	9.64E-05	5.89E-04	3.44E-06	1.12E-06	2.40E-06	1.58E-05	1.06E-06	2.87E-08	1.05E-07	2.18E-07	3.83E-08	1.56E-07	8.60E-07	9.81E-07	2.64E-06	1.31E-06	3.37E-06	1.70E-05	3.73E-06
Zinc	7440-66-6					2.44E-04	1.91E-03	1.17E-02	6.86E-05	8.15E-05	6.40E-04	3.91E-03	2.29E-05	1.02E-05	2.18E-05	7.05E-05	4.77E-06	2.17E-07	7.95E-07	1.65E-06	2.89E-07	1.04E-06	5.71E-06	5.06E-06	1.45E-05	7.25E-06	1.90E-05	1.04E-04	2.32E-05
Thorium	7440-29-1					6.23E-06	4.90E-05	2.99E-04	1.75E-06	2.08E-06	1.63E-05	9.97E-05	5.83E-07	1.85E-07	3.96E-07	2.53E-06	1.68E-07	4.36E-09	1.60E-08	3.31E-08	5.81E-09	2.64E-08	1.46E-07	1.64E-07	4.42E-07	2.11E-07	5.41E-07	2.69E-06	6.10E-07
Quartz (in PM10)	14808-60-7					1.32E-01	6.34E+00	3.71E-02	4.40E-02	4.60E-01	2.11E+00	1.24E-02	1.25E-02	6.21E-03	1.33E-02	1.22E-01	8.16E-03	2.97E-05	1.06E-04	2.29E-04	3.96E-05	1.01E-03	5.54E-03	1.64E-03	4.41E-03	2.72E-03	1.31E-01	3.32E-02	
Pyrite	12068-85-8					2.97E-06	2.33E-05	1.43E-04	8.34E-07	9.90E-07	7.78E-06	4.75E-05	2.78E-07	7.44E-08	1.59E-07	1.60E-06	1.06E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-08	6.95E-08	1.14E-07	3.07E-07	8.70E-08	2.29E-07	1.71E-06	4.13E-07
Biotite	1302-27-8					2.08E-01	1.27E+00	7.42E-03	8.80E-03	6.92E-02	4.23E-01	2.47E-03	6.35E-04	1.36E-03	9.31E-03	6.21E-04	3.13E-05	1.15E-04	2.38E-04	4.17E-05	1.12E-04	6.18E-04	6.60E-04	1.78E-03	7.78E-04	2.09E-03	1.02E-02	2.44E-03	
Magnetite	1309-38-2					5.17E-02	4.06E-01	2.48E+00	1.45E-02	1.80E-02	1.35E-01	8.27E-01	4.84E-03	1.12E-02	2.40E-02	9.94E-02	6.63E-03	2.20E-05	8.05E-05	1.67E-04	2.93E-05	2.19E-04	1.21E-03	1.18E-03	3.16E-03	1.44E-03	3.52E-03	1.04E-02	3.32E-03	
Hematite	1317-60-8					3.27E-03	2.57E-02	1.57E-01	9.18E-04	1.09E-03	8.56E-03	5.23E-02	3.06E-04	8.18E-05	1.75E-04	1.75E-03	1.17E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-05	7.64E-05	1.25E-04	3.38E-04	9.57E-05	2.52E-04	1.88E-03	4.54E-04
Chlorite	1318-59-8					1.38E-01	1.08E+00	6.61E-03	2.34E-03	1.84E-02	1.12E+00	7.06E-02	4.10E-04	1.48E-02	3.17E-02	1.29E-01	8.60E-03	7.18E-04	2.63E-03	5.25E-03	9.57E-04	1.39E-03	1.02E-02	5.94E-03	1.57E-02	1.74E-02	4.46E-02	1.40E-01	2.53E-02
Muscovite	1318-94-1					2.10E-01	1.61E+00	5.90E-02	7.01E-02	5.51E-01	3.37E+00	1.97E-02	5.18E-03	1.11E-02	9.48E-02	6.32E-03	1.04E-04	3.81E-04	7.89E-04	1.38E-04	8.92E-04	4.92E-03	6.75E-03	1.82E-02	6.17E-03	1.64E-02	1.02E-01	2.46E-02	
Talc (fibrous)	14807-96-6					1.49E-02	1.17E-01	7.13E-01	4.17E-03	4.95E-03	3.89E-02	2.38E-01	1.39E-03	3.72E-04	7.97E-04	7.98E-03	5.32E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.30E-05	3.47E-04	5.70E-04	1.53E-03	4.35E-04	1.14E-03	8.55E-03	2.07E-03
Phosphorus	7723-14-0					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00					0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>					3.67E-04	3.86E-03	1.76E-02	1.03E-04	1.22E-04	1.29E-03	5.88E-03	3.44E-05	1.12E-04	2.39E-04	9.68E-04	6.45E-05	4.80E-07	1.76E-06	3.65E-06	6.40E-07	2.80E-06	1.54E-05	5.05E-06	1.36E-05	1.15E-04	2.57E-04	9.77E-04	7.88E-05
Uranium (in PM10)	<<U_PM10>>					2.66E-06	1.21E-05	7.05E-08	8.40E-08	8.85E-07	4.04E-06	2.36E-08	2.04E-08	4.37E-08	2.91E-07	1.94E-08	8.05E-11	2.95E-10	6.12E-10	1.07E-10	1.92E-09	1.96E-08	1.54E-08	4.15E-08	2.24E-08	5.46E-08	3.07E-07	6.10E-08	
Chrysotile Asbestos	132001-53-2					5.70E-03	4.48E-02	2.74E-01	1.60E-03	1.90E-03	9.12E-02	5.34E-04	1.49E-03	1.44E-03	3.20E-03	1.28E-02	8.52E-04	1.58E-08	5.80E-08	1.21E-07	2.13E-08	2.42E-05	1.33E-04	1.52E-03	3.80E-03	9.77E-05	1.43E-04	1.29E-02	9.90E-04	
Manganese (in PM10)	<<Mn_PM10>>					1.28E-03	1.35E-02	6.16E-02	3.60E-04	4.28E-04	4.50E-03	2.05E-02	1.20E-04	9.51E-05	2.04E-04	8.64E-04	5.76E-05	2.12E-06	7.77E-06	1.61E-05	2.83E-06	9.78E-06	5.39E-05	3.26E-05	8.77E-05	1.07E-04	2.65E-04	9.13E-04	1.48E-04	
Manganese (in PM2.5)	<<Mn_PM2.5>>					1.28E-04	1.35E-03	6.16E-03	3.60E-05	4.28E-05	4.50E-04	2.05E-03	1.20E-05	1.44E-05	3.06E-05	1.31E-04	8.72E-06	1.88E-07	6.90E-07	1.43E-06	2.51E-07	2.01E-11	1.11E-10	3.47E-11	9.35E-11	2.19E-10	5.37E-10	1.45E-09	1.88E-10	
Chromium VI (in PM10)	<<Cr6_PM10>>					2.63E-09	2.77E-08	1.26E-07	7.40E-10	8.78E-10	9.23E-09	4.22E-08	2.47E-10	1.99E-10	4.26E-10	1.42E-09	9.44E-11												
0.00	-					-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	-	-	-	-	-	-	-	-	-	-
1,3-butadiene	106-99-0	3.47E-04	4.47E-04	7.14E-04	4.86E-04																					3.47E-04	4.47E-04	7.14E-04	4.86E-04
Acenaphthene	83-32-9	2.28E-05	2.94E-05	4.69E-05	3.20E-05																					2.28E-05	2.94E-05	4.69E-05	3.20E-05
Acenaphthylene	208-96-8	3.70E-05	4.77E-05	7.61E-05	5.18E-05																					3.70E-05	4.77E-05	7.61E-05	5.18E-05
Acetaldehyde	75-07-0	3.01E-02	3.87E-02	6.19E-02	4.21E-02																					3.01E-02	3.87E-02	6.19E-02	4.21E-02
Acrolein	107-02-8	4.35E-03	5.58E-03	8.92E-03	6.07E-03																					4.35E-03	5.58E-03	8.92E-03	6.07E-03
Anthracene	120-12-7	1.44E-05	1.94E-05	3.10E-05	2.07E-05																					1.44E-05	1.94E-05	3.10E-05	2.07E-05
Benzene	71-43-2	5.60E-03	7.21E-03	1.15E-02	7.85E-03																					5.60E-03	7.21E-03	1.15E-02	7.85E-03
Benzo(a)anthracene	56-55-3	1.68E-07	2.40E-07	3.85E-07	2.51E-07																					1.68E-07	2.40E-07	3.85E-07	2.51E-07
Benzo(a)pyrene	50-32-8	1.56E-07	3.00E-07	4.83E-07	2.82E-07																					1.56E-07	3.00E-07	4.83E-07	2.82E-07
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1.32E-07	2.54E-07	4.09E-07	2.39E-07																					1.32E-07	2.54E-07	4.09E-07	2.39E-07
Benzo(g,h,i)perylene	191-24-2	9.62E-08	1.30E-07	2.08E-07	1.39E-07																					9.62E-08	1.30E-07	2.08E-07	1.39E-07

Source : Blasting in pit (P6)

Description:
Blasting is used to loosen ore and waste rock. These emissions are intermittent and non-continuous. In the model, this is a separate source from the continuously emitting pit source since blasting occurs 5 times per week. It is assumed the emulsion explosives use ANFO as the main explosive

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NOx, SO_2 and CO are emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for blasting calculated using Equation (1) in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate emissions from blasting.
Explosives Detonation factors derived from US EPA AP-42 document Chapter 13.3 (Explosive Detonation). Assumed ANFO explosives

$E = 0.00022(A)^{1.5}$
where;
E=Emissions of TSP (kg/blast) (<=30um)
A=horizontal area (m^2)

	Year -1		Year 7		Reference	
	Mz	EZ1	Mz	EZ2		
Weight of Explosives used (kg/blast)	106,573		470,085		Blasting data provided CNC and increased by 35% for a worst case daily blast (one blast per week)	
Percentage of Explosive usage per pit	8%	92%	66%	34%		
Weight of Explosives used (kg/blasts per pit)	8,246	98,327	310,568	159,517		
Pioneer Blasts						
Number of discrete areas blasted at once	1			1		
Individual Area (m2)	1,743			2,969		
7.5m Bench						
Number of discrete areas blasted at once		2		2		
Individual Area (m2)		10,391		17,934		
15-m Bench						
Number of discrete areas blasted at once			5			
Individual Area (m2)			7,562			
Method Control	30%	30%	30%	30%	Included to account for particulate emissions being controlled by optimizing each blast through modernized techniques (e.g., type, timing sequence, and blast patterns). The US EPA blasting data is outdated and primarily based on measurements of blasting coal, with current blasting practices and technologies being significantly improved. The emulsion will not migrate into cracked ground and significantly reduces fly rock/PM emissions.	

Blasting emission factor:	Year -1		Year 7		Reference
Contaminant	**Blasting emission rate (g/blast)**		**Blasting emission rate (g/blast)**		
	Mz	**EZ1**	**Mz**	**EZ2**	
TSP	11,205	326,223	506,302	764,668	Emission factor for blasting calculated using Equation (1) in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate emissions from blasting.
PM10	5,826	169,636	263,277	397,627	
PM2.5	336	9,787	15,189	22,940	
Contaminant	**Emission Factor (kg/ Mg)**	**Emission Factor (kg/ Mg)**	**Emission Factor (kg/ Mg)**	**Emission Factor (kg/ Mg)**	
CO	2.30	2.30	2.30	2.30	
NOx	0.20	0.20	0.20	0.20	Explosives Detonation factors derived from Australia NPI Emission estimation technique manual for Explosives detonation and firing ranges (Aug 2016) for emulsion explosives. CO emission factor for large bore (>150mm) used as hole diameters will be >229 mm. Rating =D/U
SO_2	0.06	0.06	0.06	0.06	Explosives Detonation factors derived from Australia NPI Emission estimation technique manual for Explosives detonation and firing ranges (Aug 2016): ANFO on-site mix emission factor is used as no factor provided for emulsion explosives. Rating =D

Blasting Emissions

CoPC	CAS	Metal Speciation Factor for Waste Rock		Year -1				Year 7			
				MZ		EZ1		MZ		EZ2	
		Year -1	Year 7	Emission rate in 1 hour (g/s)	Emission rate in 24 hour (g/s)	Emission rate in 1 hour (g/s)	Emission rate in 24 hour (g/s)	Emission rate in 1 hour (g/s)	Emission rate in 24 hour (g/s)	Emission rate in 1 hour (g/s)	Emission rate in 24 hour (g/s)
PM	<<PM>>	N/A	N/A	3.11	0.13	90.62	3.78	140.64	5.86	212.41	8.85
PM_{10}	<<PM10>>	N/A	N/A	1.62	0.07	47.12	1.96	73.13	3.05	110.45	4.60
$PM_{2.5}$	<<PM2.5>>	N/A	N/A	0.09	3.89E-03	2.72	0.11	4.22	0.18	6.37	0.27
CO	630-08-0	N/A	N/A	5.27	0.22	62.82	2.62	198.42	8.27	101.91	4.25
NOx	10102-44-0	N/A	N/A	0.46	0.02	5.46	0.23	17.25	0.72	8.86	0.37
SO_2	7446-09-5	N/A	N/A	0.14	0.01	1.64	0.07	5.18	0.22	2.66	0.11
Fluoride	7664-39-3	2.16E-07	2.10E-07	6.73E-07	2.80E-08	1.96E-05	8.16E-07	2.96E-05	1.23E-06	4.47E-05	1.86E-06
Chromium VI	18540-29-9	1.99E-09	8.89E-10	6.20E-09	2.58E-10	1.80E-07	7.52E-09	1.25E-07	5.21E-09	1.89E-07	7.86E-09
Mercury	7439-97-6	3.00E-11	3.00E-11	9.34E-11	3.89E-12	2.72E-09	1.13E-10	4.22E-09	1.76E-10	6.37E-09	2.66E-10
Aluminum	7429-90-5	6.66E-02	7.57E-02	2.07E-01	8.64E-03	6.03E+00	2.51E-01	1.07E+01	4.44E-01	1.61E+01	6.70E-01
Silver	7440-22-4	2.50E-07	2.50E-07	7.78E-07	3.24E-08	2.27E-05	9.44E-07	3.52E-05	1.46E-06	5.31E-05	2.21E-06
Arsenic	7440-38-2	3.77E-06	6.14E-06	1.17E-05	4.88E-07	3.41E-04	1.42E-05	8.63E-04	3.60E-05	1.30E-03	5.43E-05
Barium	7440-39-3	1.40E-04	2.27E-04	4.36E-04	1.81E-05	1.27E-02	5.28E-04	3.19E-02	1.33E-03	4.82E-02	2.01E-03
Beryllium	7440-41-7	2.91E-07	5.83E-07	9.07E-07	3.78E-08	2.64E-05	1.10E-06	8.20E-05	3.42E-06	1.24E-04	5.16E-06
Boron	7440-42-8	1.73E-05	2.61E-05	5.37E-05	2.24E-06	1.56E-03	6.51E-05	3.67E-03	1.53E-04	5.54E-03	2.31E-04
Bismuth	7440-69-9	9.70E-08	1.65E-07	3.02E-07	1.26E-08	8.79E-06	3.66E-07	3.32E-05	9.65E-07	3.50E-05	1.46E-06
Calcium	7440-70-2	6.24E-02	3.92E-02	1.94E-01	8.09E-03	5.66E+00	2.36E-01	5.51E+00	2.30E-01	8.33E+00	3.47E-01
Cadmium	7440-43-9	7.66E-08	1.10E-07	2.38E-07	9.93E-09	6.94E-06	2.89E-07	1.56E-05	6.44E-07	2.33E-05	9.73E-07
Cobalt	7440-48-4	4.68E-05	2.89E-05	1.46E-04	6.07E-06	4.24E-03	1.77E-04	4.07E-03	1.69E-04	6.14E-03	2.56E-04
Chromium	7440-47-3	5.55E-04	1.95E-04	1.73E-03	7.19E-05	5.03E-02	2.09E-03	2.75E-02	1.15E-03	4.15E-02	1.73E-03
Copper	7440-50-8	8.70E-05	5.84E-05	2.71E-04	1.13E-05	7.88E-03	3.29E-04	8.21E-03	3.42E-04	1.24E-02	5.16E-04
Iron	7439-89-6	5.05E-02	4.76E-02	1.57E-01	6.55E-03	4.57E+00	1.91E-01	6.69E+00	2.79E-01	1.01E+01	4.21E-01
Potassium	7440-09-7	4.84E-03	8.51E-03	1.51E-02	6.28E-04	4.39E-01	1.83E-02	1.25E+00	4.99E-02	1.81E+00	7.53E-02
Lithium	7439-93-2	1.13E-05	1.18E-05	3.51E-05	1.46E-06	1.02E-03	4.25E-05	1.66E-03	6.93E-05	2.51E-03	1.05E-04
Magnesium	7439-95-4	6.45E-02	2.73E-02	2.01E-01	8.36E-03	5.84E+00	2.43E-01	3.84E+00	1.60E-01	5.80E+00	2.42E-01
Manganese	7439-96-5	9.70E-04	8.34E-04	3.02E-03	1.26E-04	8.79E-02	3.66E-03	1.17E-01	4.88E-03	1.77E-01	7.38E-03
Molybdenum	7439-98-7	6.46E-07	9.27E-07	2.01E-06	8.37E-08	5.85E-05	2.44E-06	1.30E-04	5.43E-06	1.97E-04	8.20E-06
Silicon	7440-21-3	8.13E-03	1.12E-02	2.53E-02	1.05E-03	7.36E-01	3.07E-02	1.57E+00	6.56E-02	2.38E+00	9.91E-02
Sodium	7440-23-5	1.46E-02	2.58E-02	4.53E-02	1.89E-03	1.32E+00	5.50E-02	3.63E+00	1.51E-01	5.48E+00	2.28E-01
Nickel	7440-02-0	2.78E-04	1.29E-04	8.64E-04	3.60E-05	2.52E-02	1.05E-03	1.82E-02	7.57E-04	2.74E-02	1.14E-03
Lead	7439-92-1	1.73E-06	3.42E-06	5.38E-06	2.25E-07	1.57E-04	6.54E-06	4.81E-04	2.00E-05	7.26E-04	3.02E-05
Antimony	7440-36-0	4.35E-07	4.32E-07	1.35E-06	5.64E-08	3.94E-05	1.64E-06	6.07E-05	2.53E-06	9.17E-05	3.82E-06
Selenium	7782-49-2	2.98E-07	3.04E-07	9.26E-07	3.87E-08	2.70E-05	1.13E-06	4.28E-05	1.78E-06	6.46E-05	2.69E-06
Tin	7440-31-5	3.26E-06	3.40E-06	1.01E-05	4.22E-07	2.95E-04	1.23E-05	4.79E-04	2.00E-05	7.23E-04	3.01E-05
Strontium	7440-24-6	1.21E-04	1.51E-04	3.76E-04	1.57E-05	1.10E-02	4.59E-04	2.13E-02	8.86E-04	3.21E-02	1.34E-03
Titanium	7440-32-6	1.94E-03	3.01E-03	6.05E-03	2.52E-04	1.76E-01	7.34E-03	4.24E-01	1.76E-02	6.40E-01	2.67E-02
Thallium	7440-28-0	4.56E-08	7.51E-08	1.42E-07	5.91E-09	4.13E-06	1.72E-07	1.06E-05	4.40E-07	1.59E-05	6.65E-07
Uranium	7440-61-1	1.91E-07	3.94E-07	5.94E-07	2.48E-08	1.73E-05	7.21E-07	5.55E-05	2.31E-06	8.37E-05	3.49E-06
Vanadium	7440-62-2	1.10E-04	1.14E-04	3.43E-04	1.43E-05	9.98E-03	4.16E-04	1.61E-02	6.69E-04	2.42E-02	1.01E-03
Tungsten	7440-33-7	3.65E-07	5.67E-07	1.14E-06	4.74E-08	3.31E-05	1.38E-06	7.97E-05	3.32E-06	1.20E-04	5.02E-06
Yttrium	7440-65-5	8.06E-06	1.30E-05	2.51E-05	1.04E-06	7.30E-04	3.04E-05	1.83E-03	7.64E-05	2.77E-03	1.15E-04
Zinc	7440-66-6	5.35E-05	7.42E-05	1.67E-04	6.94E-06	4.85E-03	2.02E-04	1.04E-02	4.35E-04	1.58E-02	6.57E-04
Thorium	7440-29-1	1.36E-06	2.18E-06	4.25E-06	1.77E-07	1.24E-04	5.15E-06	3.07E-04	1.28E-05	4.64E-04	1.93E-05
Quartz (in PM10)	14808-60-7	9.98E-02	2.29E-01	1.62E-01	6.73E-03	4.70E+00	1.96E-01	1.67E+01	6.98E-01	2.53E+01	1.05E+00
Pyrite	12068-85-8	6.50E-07	1.52E-06	2.02E-06	8.44E-08	5.89E-05	2.46E-06	2.13E-04	8.88E-06	3.22E-04	1.34E-05
Biotite	1302-27-8	5.78E-03	8.78E-03	1.80E-02	7.50E-04	5.24E-01	2.18E-02	1.23E+00	5.14E-02	1.86E+00	7.77E-02
Magnetite	1309-38-2	1.13E-02	8.22E-03	3.52E-02	1.47E-03	1.03E+00	4.27E-02	1.16E+00	4.82E-02	1.75E+00	7.28E-02
Hematite	1317-60-8	7.16E-04	1.67E-03	2.22E-03	9.28E-05	6.48E-02	2.70E-03	2.35E-01	9.77E-03	3.54E-01	1.48E-02
Chlorite	1318-59-8	9.58E-02	7.77E-02	2.98E-01	1.24E-02	8.68E+00	3.62E-01	1.09E+01	4.55E-01	1.65E+01	6.88E-01
Muscovite	1318-94-1	4.60E-02	8.98E-02	1.43E-01	5.97E-03	4.17E+00	1.74E-01	1.26E+01	5.26E-01	1.91E+01	7.94E-01
Talc (fibrous)	14807-96-6	3.25E-03	7.58E-03	1.01E-02	4.22E-04	2.95E-01	1.23E-02	1.07E+00	4.44E-02	1.61E+00	6.71E-02
Phosphorus	7723-14-0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.78E-04	1.29E-04	4.49E-04	1.87E-05	1.31E-02	5.45E-04	9.45E-03	3.94E-04	1.43E-02	5.95E-04
Uranium (in PM10)	<<U_PM10>>	1.91E-07	3.94E-07	3.09E-07	1.29E-08	9.00E-06	3.75E-07	2.88E-05	1.20E-06	4.35E-05	1.81E-06
Chrysotile Asbestos	132207-32-0	1.25E-03	4.83E-04	3.88E-03	1.62E-04	1.13E-01	4.71E-03	6.79E-02	2.83E-03	1.03E-01	4.27E-03
Manganese (in PM10)	<<Mn_PM10>>	9.70E-04	8.34E-04	3.02E-03	1.26E-04	8.79E-02	3.66E-03	1.90E-03	6.10E-02	2.54E-03	9.21E-02
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.70E-04	8.34E-04	9.06E-05	3.77E-06	2.64E-03	1.10E-04	3.52E-03	1.47E-04	5.31E-03	2.21E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	1.99E-09	8.89E-10	3.22E-09	1.34E-10	9.38E-08	3.91E-09	6.50E-08	2.71E-09	9.82E-08	4.09E-09

Sample Calculation PM emissions:
Emissions/blast = (0.00022 x 1743^1.5) x 1000 x 30% x 1 = 4,802 g/blast
Emissions = 4,802 g/blast * 1hr/3600s = 1.334 g/s

Data Quality: Average, Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MEIOP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on blasting occurring at the scheduled rate

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from Water Management Excavation Activities including:
1) Truck Loading (WMEX1)
2) Mobile Emissions (WMEX2)

Source : Loading excavated material onto haul trucks (WMEX1)

Description:
There will be dust emissions when excavators transfer overburden into haul trucks. Since these emissions are dependent on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, and metal emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table WMEX-1: Water Management Excavation Loading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Material handling rate	7,825,623	0	tonnes/year	It is assumed that overburden will be excavated.
Overburden Moisture Content	20	20	%	Average of 375 Overburden Samples - Table 6.1, Crawford
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	No controls assumed
Calculated PM Emission Factor	8.24E-05	8.24E-05	kg/tonne	
Calculated PM_{10} Emission Factor	3.90E-05	3.90E-05	kg/tonne	
Calculated $PM_{2.5}$ Emission Factor	5.90E-06	5.90E-06	kg/tonne	
Calculated PM Hourly Emissions	8.59E-02	0.00E+00	kg/hr	
Calculated PM_{10} Hourly Emissions	4.06E-02	0.00E+00	kg/hr	
Calculated $PM_{2.5}$ Hourly Emissions	6.15E-03	0.00E+00	kg/hr	
Calculated PM Short-term Emissions	2.39E-02	0.00E+00	g/s	
Calculated PM_{10} Short-term Emissions	1.13E-02	0.00E+00	g/s	
Calculated $PM_{2.5}$ Short-term Emissions	1.71E-03	0.00E+00	g/s	

Emissions - Wind Speed Dependent Factors to Use in Modelling for Drop Emissions

Wind Speed (m/s)	Emission Factor (kg/tonne)	Wind Speed Dependent Factor for Dispersion Modelling
1.54	3.07E-05	0.37
3.09	7.60E-05	0.92
5.14	1.47E-04	1.79
8.23	2.71E-04	3.29
10.80	3.86E-04	4.69
12.40	4.62E-04	5.61
Average Wind Speed used in Calculations Above		
3.29	8.24E-05	1.00

Table WMEX-2: Water Management Excavation Loading Emissions (24-Hour)

CoPC	CAS	Material Speciation Factor for Overburden	Year -1	Year 7
				-
PM	<<PM>>	-	2.39E-02	-
PM_{10}	<<PM10>>	-	1.13E-02	-
$PM_{2.5}$	<<PM2.5>>	-	1.71E-03	-
Fluoride	7664-39-3	2.40E-06	5.72E-08	-
Chromium VI	18540-29-9	6.20E-09	1.48E-10	-
Mercury	7439-97-6	4.20E-11	1.00E-12	-
Aluminum	7429-90-5	4.55E-02	1.09E-03	-
Silver	7440-22-4	2.50E-07	5.96E-09	-
Arsenic	7440-38-2	2.32E-06	5.53E-08	-
Barium	7440-39-3	3.57E-04	8.51E-06	-
Beryllium	7440-41-7	8.44E-07	2.01E-08	-
Boron	7440-42-8	0.00E+00	0.00E+00	-
Bismuth	7440-69-9	1.64E-07	3.91E-09	-
Calcium	7440-70-2	8.43E-02	2.01E-03	-
Cadmium	7440-43-9	1.24E-07	2.97E-09	-
Cobalt	7440-48-4	7.70E-06	1.84E-07	-
Chromium	7440-47-3	4.66E-05	1.11E-06	-
Copper	7440-50-8	2.00E-05	4.76E-07	-
Iron	7439-89-6	2.00E-02	4.78E-04	-
Potassium	7440-09-7	1.50E-02	3.57E-04	-
Lithium	7439-93-2	2.18E-05	5.19E-07	-
Magnesium	7439-95-4	2.33E-02	5.55E-04	-
Manganese	7439-96-5	3.91E-04	9.33E-06	-
Molybdenum	7439-98-7	6.00E-07	1.43E-08	-
Silicon	7440-21-3	0.00E+00	0.00E+00	-
Sodium	7440-23-5	0.00E+00	0.00E+00	-
Nickel	7440-02-0	2.11E-05	5.03E-07	-
Lead	7439-92-1	9.87E-06	2.35E-07	-
Antimony	7440-36-0	4.00E-07	9.54E-09	-
Selenium	7782-49-2	4.80E-07	1.14E-08	-
Tin	7440-31-5	4.90E-06	1.17E-07	-
Strontium	7440-24-6	2.09E-04	4.98E-06	-
Titanium	7440-32-6	1.80E-03	4.29E-05	-
Thallium	7440-28-0	2.68E-07	6.39E-09	-
Uranium	7440-61-1	1.36E-06	3.26E-08	-
Vanadium	7440-62-2	4.67E-05	1.11E-06	-
Tungsten	7440-33-7	0.00E+00	0.00E+00	-
Yttrium	7440-65-5	1.00E-05	2.39E-07	-
Zinc	7440-66-6	3.81E-05	9.08E-07	-
Thorium	7440-29-1	0.00E+00	0.00E+00	-
Quartz (in PM10)	14808-60-7	9.98E-02	1.13E-03	-
Pyrite	12068-85-8	6.50E-07	1.55E-08	-
Biotite	1302-27-8	5.78E-03	1.38E-04	-
Magnetite	1309-38-2	1.13E-02	2.70E-04	-
Hematite	1317-60-8	7.16E-04	1.71E-05	-
Chlorite	1318-59-8	9.58E-02	2.29E-03	-
Muscovite	1318-94-1	4.60E-02	1.10E-03	-
Talc (fibrous)	14807-96-6	3.25E-03	7.76E-05	-
Phosphorus	7723-14-0	0.00E+00	0.00E+00	-
Platinum	7440-06-4	0.00E+00	0.00E+00	-
Palladium	7440-05-3	0.00E+00	0.00E+00	-
Nickel (in PM10)	<<Ni_PM10>>	2.11E-05	2.38E-07	-
Uranium (in PM10)	<<U_PM10>>	1.36E-06	1.54E-08	-
Chrysotile Asbestos	132207-32-0	1.25E-03	2.98E-05	-
Manganese (in PM10)	<<Mn_PM10>>	3.91E-04	4.41E-06	-
Manganese (in PM2.5)	<<Mn_PM2.5>>	3.91E-04	6.68E-07	-
Chromium VI (in PM10)	<<Cr6_PM10>>	6.20E-09	6.99E-11	-

Sample Calculation PM emissions: Year -1
Overburden PM Emission factor - uncontrolled (kg/tonne) = 0.74 x 0.0016 x $(3.29/2.2)^{1.3}$ / $(5/2)^{1.4}$ = 8.24E-05 kg/tonne
PM hourly emissions - with controls (kg/hr) = 1.17 x 7,825,623 tonne/year x 5.54E-04 kg/tonne x 1yr/365 day x 1 day/24hour x (1-0%) = 0.086 kg/hr
PM short-term emission rate - with controls (g/s) = 0.577 kg/hr x 1000 g/kg / 3600 s/hr = 2.39E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the annual production rate. The calculated emission rate should be conservative.

Source : Mobile Emissions (WMEX2)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table WMEX-3: 1-Hour and 24-Hour Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	3.04E-03	3.47E-04	-	-
PM_{10}	<<PM10>>	3.04E-03	3.47E-04	-	-
$PM_{2.5}$	<<PM2.5>>	3.04E-03	3.47E-04	-	-
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	3.04E-03	3.47E-04	-	-
Elemental Carbon (from diesel exhaust)	7440-44-0	3.04E-03	3.47E-04	-	-
CO	630-08-0	5.32E-01	6.08E-02	-	-
SO_2	7446-09-5	8.56E-04	9.77E-05	-	-
Non-methane hydrocarbons	<<NMHC>>	2.89E-02	3.30E-03	-	-
NOx	10102-44-0	6.08E-02	6.94E-03	-	-
1,3-butadiene	106-99-0	2.97E-05	3.39E-06	-	-
Acenaphthene	83-32-9	1.95E-06	2.23E-07	-	-
Acenaphthylene	208-96-8	3.17E-06	3.62E-07	-	-
Acetaldehyde	75-07-0	2.57E-03	2.94E-04	-	-
Acrolein	107-02-8	3.71E-04	4.23E-05	-	-
Anthracene	120-12-7	1.21E-06	1.38E-07	-	-
Benzene	71-43-2	4.79E-04	5.47E-05	-	-
Benzo(a)anthracene	56-55-3	1.36E-08	1.55E-09	-	-
Benzo(a)pyrene	50-32-8	1.00E-08	1.15E-09	-	-
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	8.52E-09	9.72E-10	-	-
Benzo(g,h,i)perylene	191-24-2	8.03E-09	9.17E-10	-	-
Chrysene	218-01-9	2.62E-08	2.99E-09	-	-
Fluoranthene	206-44-0	1.84E-06	2.11E-07	-	-
Fluorene	86-73-7	7.44E-06	8.49E-07	-	-
Formaldehyde	50-00-0	8.07E-03	9.22E-04	-	-
Phenanthrene	85-01-8	3.29E-05	3.76E-06	-	-
Pyrene	129-00-0	1.55E-06	1.77E-07	-	-
Dibenz(a,h)anthracene	53-70-3	3.04E-09	3.47E-10	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	1.52E-09	1.74E-10	-	-
Napthalene	91-20-3	6.05E-04	6.91E-05	-	-

Table WMEX-4: Emission Summary (24-Hour Average)

CoPC	CAS	Units	WMEX1 Material Loading		WMEX2 - Mobile Emissions	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	2.39E-02	-	3.47E-04	-
PM_{10}	<<PM10>>	g/s	1.13E-02	-	3.47E-04	-
$PM_{2.5}$	<<PM2.5>>	g/s	1.71E-03	-	3.47E-04	-
Fluoride	7664-39-3	g/s	5.72E-08	-	-	-
Chromium VI	18540-29-9	g/s	1.48E-10	-	-	-
Mercury	7439-97-6	g/s	1.00E-12	-	-	-
Aluminum	7429-90-5	g/s	1.09E-03	-	-	-
Silver	7440-22-4	g/s	5.96E-09	-	-	-
Arsenic	7440-38-2	g/s	5.53E-08	-	-	-
Barium	7440-39-3	g/s	8.51E-06	-	-	-
Beryllium	7440-41-7	g/s	2.01E-08	-	-	-
Boron	7440-42-8	g/s	0.00E+00	-	-	-
Bismuth	7440-69-9	g/s	3.91E-09	-	-	-
Calcium	7440-70-2	g/s	2.01E-03	-	-	-
Cadmium	7440-43-9	g/s	2.97E-09	-	-	-
Cobalt	7440-48-4	g/s	1.84E-07	-	-	-
Chromium	7440-47-3	g/s	1.11E-06	-	-	-
Copper	7440-50-8	g/s	4.76E-07	-	-	-
Iron	7439-89-6	g/s	4.78E-04	-	-	-
Potassium	7440-09-7	g/s	3.57E-04	-	-	-
Lithium	7439-93-2	g/s	5.19E-07	-	-	-
Magnesium	7439-95-4	g/s	5.55E-04	-	-	-
Manganese	7439-96-5	g/s	9.33E-06	-	-	-
Molybdenum	7439-98-7	g/s	1.43E-08	-	-	-
Silicon	7440-21-3	g/s	0.00E+00	-	-	-
Sodium	7440-23-5	g/s	0.00E+00	-	-	-
Nickel	7440-02-0	g/s	5.03E-07	-	-	-
Lead	7439-92-1	g/s	2.35E-07	-	-	-
Antimony	7440-36-0	g/s	9.54E-09	-	-	-
Selenium	7782-49-2	g/s	1.14E-08	-	-	-
Tin	7440-31-5	g/s	1.17E-07	-	-	-
Strontium	7440-24-6	g/s	4.98E-06	-	-	-
Titanium	7440-32-6	g/s	4.29E-05	-	-	-
Thallium	7440-28-0	g/s	6.39E-09	-	-	-
Uranium	7440-61-1	g/s	3.26E-08	-	-	-
Vanadium	7440-62-2	g/s	1.11E-06	-	-	-
Tungsten	7440-33-7	g/s	0.00E+00	-	-	-
Yttrium	7440-65-5	g/s	2.39E-07	-	-	-
Zinc	7440-66-6	g/s	9.08E-07	-	-	-
Thorium	7440-29-1	g/s	0.00E+00	-	-	-
Quartz (in PM10)	14808-60-7	g/s	1.13E-03	-	-	-
Pyrite	12068-85-8	g/s	1.55E-08	-	-	-
Biotite	1302-27-8	g/s	1.38E-04	-	-	-
Magnetite	1309-38-2	g/s	2.70E-04	-	-	-
Hematite	1317-60-8	g/s	1.71E-05	-	-	-
Chlorite	1318-59-8	g/s	2.29E-03	-	-	-
Muscovite	1318-94-1	g/s	1.10E-03	-	-	-
Talc (fibrous)	14807-96-6	g/s	7.76E-05	-	-	-
Phosphorus	7723-14-0	g/s	0.00E+00	-	-	-
Platinum	7440-06-4	g/s	0.00E+00	-	-	-
Palladium	7440-05-3	g/s	0.00E+00	-	-	-
Nickel (in PM10)	<<Ni_PM10>>	g/s	2.38E-07	-	-	-
Uranium (in PM10)	<<U_PM10>>	g/s	1.54E-08	-	-	-
Chrysotile Asbestos	132207-32-0	g/s	2.98E-05	-	-	-
Manganese (in PM10)	<<Mn_PM10>>	g/s	4.41E-06	-	-	-
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	6.68E-07	-	-	-
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	6.99E-11	-	-	-
0	--	g/s	-	-	-	-
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	3.47E-04	-
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	3.47E-04	-
CO	630-08-0	g/s	-	-	6.08E-02	-
SO_2	7446-09-5	g/s	-	-	9.77E-05	-
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	3.30E-03	-
NOx	10102-44-0	g/s	-	-	6.94E-03	-
1,3-butadiene	106-99-0	g/s	-	-	3.39E-06	-
Acenaphthene	83-32-9	g/s	-	-	2.23E-07	-
Acenaphthylene	208-96-8	g/s	-	-	3.62E-07	-
Acetaldehyde	75-07-0	g/s	-	-	2.94E-04	-
Acrolein	107-02-8	g/s	-	-	4.23E-05	-
Anthracene	120-12-7	g/s	-	-	1.38E-07	-
Benzene	71-43-2	g/s	-	-	5.47E-05	-
Benzo(a)anthracene	56-55-3	g/s	-	-	1.55E-09	-
Benzo(a)pyrene	50-32-8	g/s	-	-	1.15E-09	-
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	9.72E-10	-
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	9.17E-10	-
Chrysene	218-01-9	g/s	-	-	2.99E-09	-
Fluoranthene	206-44-0	g/s	-	-	2.11E-07	-
Fluorene	86-73-7	g/s	-	-	8.49E-07	-
Formaldehyde	50-00-0	g/s	-	-	9.22E-04	-
Phenanthrene	85-01-8	g/s	-	-	3.76E-06	-
Pyrene	129-00-0	g/s	-	-	1.77E-07	-
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	3.47E-10	-
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	1.74E-10	-
Napthalene	91-20-3	g/s	-	-	6.91E-05	-

Table WMEX-5: Emission Summary (1-Hour Average)

CoPC	CAS	Units	WMEX1 Material Loading		WMEX2 - Mobile Emissions	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	3.04E-03	-
PM_{10}	<<PM10>>	g/s	-	-	3.04E-03	-
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	3.04E-03	-
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	-	-	3.04E-03	-
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	3.04E-03	-
CO	630-08-0	g/s	-	-	5.32E-01	-
SO_2	7446-09-5	g/s	-	-	8.56E-04	-
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.89E-02	-
NOx	10102-44-0	g/s	-	-	6.08E-02	-
1,3-butadiene	106-99-0	g/s	-	-	2.97E-05	-
Acenaphthene	83-32-9	g/s	-	-	1.95E-06	-
Acenaphthylene	208-96-8	g/s	-	-	3.17E-06	-
Acetaldehyde	75-07-0	g/s	-	-	2.57E-03	-
Acrolein	107-02-8	g/s	-	-	3.71E-04	-
Anthracene	120-12-7	g/s	-	-	1.21E-06	-
Benzene	71-43-2	g/s	-	-	4.79E-04	-
Benzo(a)anthracene	56-55-3	g/s	-	-	1.36E-08	-
Benzo(a)pyrene	50-32-8	g/s	-	-	1.00E-08	-
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	8.52E-09	-
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	8.03E-09	-
Chrysene	218-01-9	g/s	-	-	2.62E-08	-
Fluoranthene	206-44-0	g/s	-	-	1.84E-06	-
Fluorene	86-73-7	g/s	-	-	7.44E-06	-
Formaldehyde	50-00-0	g/s	-	-	8.07E-03	-
Phenanthrene	85-01-8	g/s	-	-	3.29E-05	-
Pyrene	129-00-0	g/s	-	-	1.55E-06	-
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	3.04E-09	-
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	1.52E-09	-
Napthalene	91-20-3	g/s	-	-	6.05E-04	-

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from Tailings Management Facility Excavation Activities including:
1) Truck Loading (TMFEX1)
2) Mobile Emissions from the utility excavator is accounted for in the TMF - Tailings tab.

Source : Loading excavated material onto haul trucks (TMFEX1)

Description:
There will be dust emissions when excavators transfer overburden onto haul trucks. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, and metal emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table TMFEX-1: TMF Excavation Loading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Material handling rate	1,113,268	0	tonnes/year	It is assumed that overburden will be excavated.
Overburden Moisture Content	19.5	19.5	%	Average of 375 Overburden Samples - Table 6.1, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	No controls assumed
Calculated PM Emission Factor	8.24E-05	8.24E-05	kg/tonne	
Calculated PM_{10} Emission Factor	3.90E-05	3.90E-05	kg/tonne	
Calculated $PM_{2.5}$ Emission Factor	5.90E-06	5.90E-06	kg/tonne	
Calculated PM Hourly Emissions	1.22E-02	0.00E+00	kg/hr	
Calculated PM_{10} Hourly Emissions	5.78E-03	0.00E+00	kg/hr	
Calculated $PM_{2.5}$ Hourly Emissions	8.75E-04	0.00E+00	kg/hr	
Calculated PM Short-term Emissions	3.39E-03	0.00E+00	g/s	
Calculated PM_{10} Short-term Emissions	1.60E-03	0.00E+00	g/s	
Calculated $PM_{2.5}$ Short-term Emissions	2.43E-04	0.00E+00	g/s	

Table TMFEX-2: TMF Excavation Loading Emissions (24-Hour)

CoPC	CAS	Material Speciation Factor for Overburden	Year -1	Year 7
				-
PM	<<PM>>	-	3.39E-03	-
PM_{10}	<<PM10>>	-	1.60E-03	-
$PM_{2.5}$	<<PM2.5>>	-	2.43E-04	-
Fluoride	7664-39-3	2.40E-06	8.14E-09	-
Chromium VI	18540-29-9	6.20E-09	2.10E-11	-
Mercury	7439-97-6	4.20E-11	1.43E-13	-
Aluminum	7429-90-5	4.55E-02	1.54E-04	-
Silver	7440-22-4	2.50E-07	8.48E-10	-
Arsenic	7440-38-2	2.32E-06	7.86E-09	-
Barium	7440-39-3	3.57E-04	1.21E-06	-
Beryllium	7440-41-7	8.44E-07	2.86E-09	-
Boron	7440-42-8	0.00E+00	0.00E+00	-
Bismuth	7440-69-9	1.64E-07	5.57E-10	-
Calcium	7440-70-2	8.43E-02	2.86E-04	-
Cadmium	7440-43-9	1.24E-07	4.22E-10	-
Cobalt	7440-48-4	7.70E-06	2.61E-08	-
Chromium	7440-47-3	4.66E-05	1.58E-07	-
Copper	7440-50-8	2.00E-05	6.77E-08	-
Iron	7439-89-6	2.00E-02	6.80E-05	-
Potassium	7440-09-7	1.50E-02	5.07E-05	-
Lithium	7439-93-2	2.18E-05	7.39E-08	-
Magnesium	7439-95-4	2.33E-02	7.90E-05	-
Manganese	7439-96-5	3.91E-04	1.33E-06	-
Molybdenum	7439-98-7	6.00E-07	2.04E-09	-
Silicon	7440-21-3	0.00E+00	0.00E+00	-
Sodium	7440-23-5	0.00E+00	0.00E+00	-
Nickel	7440-02-0	2.11E-05	7.15E-08	-
Lead	7439-92-1	9.87E-06	3.35E-08	-
Antimony	7440-36-0	4.00E-07	1.36E-09	-
Selenium	7782-49-2	4.80E-07	1.63E-09	-
Tin	7440-31-5	4.90E-06	1.66E-08	-
Strontium	7440-24-6	2.09E-04	7.08E-07	-
Titanium	7440-32-6	1.80E-03	6.10E-06	-
Thallium	7440-28-0	2.68E-07	9.09E-10	-
Uranium	7440-61-1	1.36E-06	4.63E-09	-
Vanadium	7440-62-2	4.67E-05	1.59E-07	-
Tungsten	7440-33-7	0.00E+00	0.00E+00	-
Yttrium	7440-65-5	1.00E-05	3.39E-08	-
Zinc	7440-66-6	3.81E-05	1.29E-07	-
Thorium	7440-29-1	0.00E+00	0.00E+00	-
Quartz (in PM10)	14808-60-7	9.98E-02	1.60E-04	-
Pyrite	12068-85-8	6.50E-07	2.21E-09	-
Biotite	1302-27-8	5.78E-03	1.96E-05	-
Magnetite	1309-38-2	1.13E-02	3.84E-05	-
Hematite	1317-60-8	7.16E-04	2.43E-06	-
Chlorite	1318-59-8	9.58E-02	3.25E-04	-
Muscovite	1318-94-1	4.60E-02	1.56E-04	-
Talc (fibrous)	14807-96-6	3.25E-03	1.10E-05	-
Phosphorus	7723-14-0	0.00E+00	0.00E+00	-
Platinum	7440-06-4	0.00E+00	0.00E+00	-
Palladium	7440-05-3	0.00E+00	0.00E+00	-
Nickel (in PM10)	<<Ni_PM10>>	2.11E-05	3.38E-08	-
Uranium (in PM10)	<<U_PM10>>	1.36E-06	2.19E-09	-
Chrysotile Asbestos	132207-32-0	1.25E-03	4.24E-06	-
Manganese (in PM10)	<<Mn_PM10>>	3.91E-04	6.27E-07	-
Manganese (in PM2.5)	<<Mn_PM2.5>>	3.91E-04	9.50E-08	-
Chromium VI (in PM10)	<<Cr6_PM10>>	6.20E-09	9.95E-12	-

Sample Calculation PM emissions: Year -1
Overburden PM Emission factor - uncontrolled (kg/tonne) = 0.74 x 0.0016 x $(3.29/2.2)^{1.3}$ / $(5/2)^{1.4}$ = 8.24E-05 kg/tonne
PM hourly emissions - with controls (kg/hr) = 1.17 x 1,113,268 tonne/year x 5.54E-04 kg/tonne x 1yr/365 day x 1 day/24hour x (1-0%) = 0.012 kg/hr
PM short-term emission rate - with controls (g/s) = 0.082 kg/hr x 1000 g/kg / 3600 s/hr = 3.39E-03 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the annual production rate. The calculated emission rate should be conservative.

Source : Mobile Emissions (TMFEX2)

Description:
Mobile Emissions from the utility excavator is accounted for in the TMF - Tailings tab.

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Waste rock will be dumped and handled at the Waste Rock Impounding Area. Emissions include:
1) Waste rock/overburden unloading dust emissions (WR1)
2) Emissions from Mucking (bulldozing/front end loaders) (WR2A)
3) Grading (WR2B)
4) Mobile Emissions (WR2C)

Source : Waste Rock/Reclaim unloading dust emissions (WR1A/B)

Description:
Haul trucks will transport waste rock from the pit to the waste rock impounding area. While unloading this waste rock/ overburden, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table WR-1A: Waste Rock Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Waste Rock Unloaded	1,328,128	134,756,183	tonnes/year	
Waste Rock Moisture Content	3	3	%	
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	4.81E+00	4.29E+02	kg/day	
Calculated PM_{10} Emissions	2.27E+00	2.03E+02	kg/day	
Calculated $PM_{2.5}$ Emissions	3.44E-01	3.08E+01	kg/day	
Calculated PM Emissions	5.56E-02	4.97E+00	g/s	
Calculated PM_{10} Emissions	2.63E-02	2.35E+00	g/s	
Calculated $PM_{2.5}$ Emissions	3.98E-03	3.56E-01	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 1 x 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.53E-03 kg/tonne
PM hourly emissions (with control) (kg/hr) = 1629 tonne/hr x 1.42E-03 kg/tonne x (1-0%) = 0.27 kg/hr
PM short-term emission rate (g/s) = 2.32 kg/hr x 0.74 x 1000 g/kg / 3600 s/hr = 5.56E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Table WR-1B: Reclaim Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Reclaim Unloaded	0	1,584,333	tonnes/year	Assume no reclaim to WR in Year -1, 50% of total in Year 7
Overburden Moisture Content	19.5	19.5	%	Average of 375 Overburden Samples - Table 6.1, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Mean wind speed (U)	3.29	3.29	m/s	
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	0.00E+00	3.67E-01	kg/day	
Calculated PM_{10} Emissions	0.00E+00	1.74E-01	kg/day	
Calculated $PM_{2.5}$ Emissions	0.00E+00	2.63E-02	kg/day	
Calculated PM Emissions	0.00E+00	4.25E-03	g/s	
Calculated PM_{10} Emissions	0.00E+00	2.01E-03	g/s	
Calculated $PM_{2.5}$ Emissions	0.00E+00	3.05E-04	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 1 x 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.11E-04 kg/tonne
PM hourly emissions (with control) (kg/hr) = 1,584,333 tonne/yr x 7.49E-04 kg/tonne x (1-0%) x 1 yr/8760 hr = 0.02 kg/hr
PM short-term emission rate (g/s) = 0.14 kg/hr x 0.74 x 1000 g/kg / 3600 s/hr = 0.00 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (WR2A)

Description:
Waste rock is moved with bulldozers or fornt end loaders

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation equation in the table
$E = 2.6 \times s^{1.2} / M^{1.3}$ **$E\ (PM15) = 0.45 \times s^{1.5} / M^{1.4}$**
where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table WR-2: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	3	3	%	Assumed same as ore - NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Material silt content (s)	2.0	2.0	%	CNC - Effectively 0 - 2% used for conservatism
Calculated emission factor (E)	1.432	1.432	kg/hour	-
Number of bulldozers/loaders	2	4	dozers	Equipment Summary
Operating Hours per Day	14	14		
Calculated PM Emissions (short-term)	0.454	0.908	g/s	-
PM10 emission	0.065	0.130	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
PM2.5 emission	0.048	0.095	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x (2.0^1.2) / (3^1.3) = 1.432 kg/hr
Emission Rate (g/s) = 1.432 kg/hr x 1/3600 hr/s x 1000 g/kg x 2 dozers x (1-0%) x 14hr/24hr = 0.454 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (WR2B)

Description:
A grader maintains the truck route on the pile for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um)

where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table WR-3: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route within Impoundment that requires grading	1.4	3.6	km	
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	11.5	28.7	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	8.21E-02	2.05E-01	g/s	Calculated
PM_{10} Emission rate (g/s)	2.87E-02	7.15E-02	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
$PM_{2.5}$ Emission rate (g/s)	2.54E-03	6.34E-03	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x 8^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 2.9 km/day x 1000 g/kg x 1 day/3600s x (1-0%) x 1 graders = 8.21E-02 g/s

Data Quality: Average and Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (WR2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment. Emissions from mobile equipment are split equally between the waste rock, sand & till and clay impoundment areas.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table WR-4: 1-Hour and 24-Hour Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
PM_{10}	<<PM10>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
$PM_{2.5}$	<<PM2.5>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	1.14E-02	5.65E-03	1.30E-02	6.08E-03
CO	630-08-0	1.08E+00	5.33E-01	1.35E+00	6.10E-01
SO_2	7446-09-5	1.73E-03	8.57E-04	2.18E-03	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	5.85E-02	2.90E-02	7.35E-02	3.31E-02
NOx	10102-44-0	9.32E-01	4.64E-01	9.63E-01	4.72E-01
1,3-butadiene	106-99-0	6.02E-05	2.98E-05	7.55E-05	3.40E-05
Acenaphthene	83-32-9	3.96E-06	1.96E-06	4.97E-06	2.24E-06
Acenaphthylene	208-96-8	6.41E-06	3.17E-06	8.05E-06	3.63E-06
Acetaldehyde	75-07-0	5.21E-03	2.58E-03	6.55E-03	2.95E-03
Acrolein	107-02-8	7.51E-04	3.72E-04	9.43E-04	4.25E-04
Anthracene	120-12-7	2.59E-06	1.28E-06	3.21E-06	1.45E-06
Benzene	71-43-2	9.71E-04	4.80E-04	1.22E-03	5.49E-04
Benzo(a)anthracene	56-55-3	3.17E-08	1.57E-08	3.87E-08	1.76E-08
Benzo(a)pyrene	50-32-8	3.75E-08	1.86E-08	4.27E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	3.19E-08	1.58E-08	3.63E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	1.73E-08	8.57E-09	2.15E-08	9.72E-09
Chrysene	218-01-9	6.60E-08	3.27E-08	7.96E-08	3.65E-08
Fluoranthene	206-44-0	3.99E-06	1.98E-06	4.95E-06	2.24E-06
Fluorene	86-73-7	1.53E-05	7.60E-06	1.92E-05	8.66E-06
Formaldehyde	50-00-0	1.63E-02	8.09E-03	2.05E-02	9.25E-03
Phenanthrene	85-01-8	6.89E-05	3.41E-05	8.59E-05	3.88E-05
Pyrene	129-00-0	3.38E-06	1.67E-06	4.18E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	1.14E-08	5.65E-09	1.30E-08	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	5.69E-09	2.82E-09	6.48E-09	3.04E-09
Napthalene	91-20-3	1.23E-03	6.07E-04	1.54E-03	6.93E-04

Table WR-5: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	WR1 Material Unloading [1,2]		WR2 Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	5.56E-02	4.97E+00	5.42E-01	1.12E+00
PM_{10}	<<PM10>>	g/s	2.63E-02	2.35E+00	9.93E-02	2.08E-01
$PM_{2.5}$	<<PM2.5>>	g/s	3.98E-03	3.56E-01	5.59E-02	1.08E-01
Fluoride	7664-39-3	g/s	1.20E-08	1.05E-06	1.17E-07	2.35E-07
Chromium VI	18540-29-9	g/s	1.11E-10	4.42E-09	1.08E-09	9.94E-10
Mercury	7439-97-6	g/s	1.67E-12	1.49E-10	1.63E-11	3.36E-11
Aluminum	7429-90-5	g/s	3.71E-03	3.77E-01	3.61E-02	8.48E-02
Silver	7440-22-4	g/s	1.39E-08	1.24E-06	1.35E-07	2.80E-07
Arsenic	7440-38-2	g/s	2.10E-07	3.05E-05	2.04E-06	6.87E-06
Barium	7440-39-3	g/s	7.79E-06	1.13E-03	7.58E-05	2.54E-04
Beryllium	7440-41-7	g/s	1.62E-08	2.90E-06	1.58E-07	6.53E-07
Boron	7440-42-8	g/s	9.60E-07	1.30E-04	9.35E-06	2.92E-05
Bismuth	7440-69-9	g/s	5.40E-09	8.19E-07	5.26E-08	1.84E-07
Calcium	7440-70-2	g/s	3.47E-03	1.95E-01	3.38E-02	4.39E-02
Cadmium	7440-43-9	g/s	4.26E-09	5.47E-07	4.15E-08	1.23E-07
Cobalt	7440-48-4	g/s	2.61E-06	1.44E-04	2.54E-05	3.24E-05
Chromium	7440-47-3	g/s	3.09E-05	9.72E-04	3.01E-04	2.19E-04
Copper	7440-50-8	g/s	4.84E-06	2.90E-04	4.71E-05	6.53E-05
Iron	7439-89-6	g/s	2.81E-03	2.37E-01	2.74E-02	5.32E-02
Potassium	7440-09-7	g/s	2.69E-04	4.23E-02	2.62E-03	9.52E-03
Lithium	7439-93-2	g/s	6.27E-07	5.88E-05	6.10E-06	1.32E-05
Magnesium	7439-95-4	g/s	3.59E-03	1.36E-01	3.49E-02	3.06E-02
Manganese	7439-96-5	g/s	5.40E-05	4.15E-03	5.26E-04	9.33E-04
Molybdenum	7439-98-7	g/s	3.59E-08	4.61E-06	3.50E-07	1.04E-06
Silicon	7440-21-3	g/s	4.52E-04	5.57E-02	4.40E-03	1.25E-02
Sodium	7440-23-5	g/s	8.10E-04	1.28E-01	7.89E-03	2.89E-02
Nickel	7440-02-0	g/s	1.55E-05	6.43E-04	1.50E-04	1.45E-04
Lead	7439-92-1	g/s	9.64E-08	1.70E-05	9.39E-07	3.82E-06
Antimony	7440-36-0	g/s	2.42E-08	2.15E-06	2.36E-07	4.83E-07
Selenium	7782-49-2	g/s	1.66E-08	1.51E-06	1.62E-07	3.40E-07
Tin	7440-31-5	g/s	1.81E-07	1.69E-05	1.76E-06	3.81E-06
Strontium	7440-24-6	g/s	6.76E-06	7.52E-04	6.58E-05	1.69E-04
Titanium	7440-32-6	g/s	1.08E-04	1.50E-02	1.05E-03	3.37E-03
Thallium	7440-28-0	g/s	2.53E-09	3.74E-07	2.47E-08	8.40E-08
Uranium	7440-61-1	g/s	1.06E-08	1.96E-06	1.03E-07	4.41E-07
Vanadium	7440-62-2	g/s	6.13E-06	5.68E-04	5.97E-05	1.28E-04
Tungsten	7440-33-7	g/s	2.03E-08	2.82E-06	1.98E-07	6.34E-07
Yttrium	7440-65-5	g/s	4.48E-07	6.49E-05	4.36E-06	1.46E-05
Zinc	7440-66-6	g/s	2.98E-06	3.69E-04	2.90E-05	8.30E-05
Thorium	7440-29-1	g/s	7.59E-08	1.09E-05	7.39E-07	2.44E-06
Quartz (in PM10)	14808-60-7	g/s	2.63E-03	5.39E-01	9.92E-03	4.75E-02
Pyrite	12068-85-8	g/s	3.62E-08	7.54E-06	3.52E-07	1.70E-06
Biotite	1302-27-8	g/s	3.22E-04	4.37E-02	3.13E-03	9.82E-03
Magnetite	1309-38-2	g/s	6.30E-04	4.09E-02	6.13E-03	9.20E-03
Hematite	1317-60-8	g/s	3.98E-05	8.30E-03	3.88E-04	1.87E-03
Chlorite	1318-59-8	g/s	5.33E-03	3.87E-01	5.19E-02	8.70E-02
Muscovite	1318-94-1	g/s	2.56E-03	4.47E-01	2.49E-02	1.00E-01
Talc (fibrous)	14807-96-6	g/s	1.81E-04	3.77E-02	1.76E-03	8.48E-03
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	7.31E-06	3.04E-04	2.76E-05	2.68E-05
Uranium (in PM10)	<<U_PM10>>	g/s	5.03E-09	9.28E-07	1.90E-08	8.19E-08
Chrysotile Asbestos	132207-32-0	g/s	6.94E-05	2.40E-03	6.76E-04	5.40E-04
Manganese (in PM10)	<<Mn_PM10>>	g/s	2.55E-05	1.96E-03	9.64E-05	1.73E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	3.87E-06	2.97E-04	5.42E-05	8.98E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	5.24E-11	2.09E-09	1.98E-10	1.84E-10
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	-	-	5.65E-03	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	5.65E-03	6.08E-03
CO	630-08-0	g/s	-	-	5.33E-01	6.10E-01
SO_2	7446-09-5	g/s	-	-	8.57E-04	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.90E-02	3.31E-02
NOx	10102-44-0	g/s	-	-	4.64E-01	4.72E-01
1,3-butadiene	106-99-0	g/s	-	-	2.98E-05	3.40E-05
Acenaphthene	83-32-9	g/s	-	-	1.96E-06	2.24E-06
Acenaphthylene	208-96-8	g/s	-	-	3.17E-06	3.63E-06
Acetaldehyde	75-07-0	g/s	-	-	2.58E-03	2.95E-03
Acrolein	107-02-8	g/s	-	-	3.72E-04	4.25E-04
Anthracene	120-12-7	g/s	-	-	1.28E-06	1.45E-06
Benzene	71-43-2	g/s	-	-	4.80E-04	5.49E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.57E-08	1.76E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	1.86E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	1.58E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	8.57E-09	9.72E-09
Chrysene	218-01-9	g/s	-	-	3.27E-08	3.65E-08
Fluoranthene	206-44-0	g/s	-	-	1.98E-06	2.24E-06
Fluorene	86-73-7	g/s	-	-	7.60E-06	8.66E-06
Formaldehyde	50-00-0	g/s	-	-	8.09E-03	9.25E-03
Phenanthrene	85-01-8	g/s	-	-	3.41E-05	3.88E-05
Pyrene	129-00-0	g/s	-	-	1.67E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	5.65E-09	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	2.82E-09	3.04E-09
Napthalene	91-20-3	g/s	-	-	6.07E-04	6.93E-04

Notes:
(1) Metal speciation based on waste rock.
(2) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table WR-6: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	WR -1 Material Unloading		WR - 2 Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	1.14E-02	1.30E-02
PM_{10}	<<PM10>>	g/s	-	-	1.14E-02	1.30E-02
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	1.14E-02	1.30E-02
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	1.14E-02	1.30E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	1.14E-02	1.30E-02
CO	630-08-0	g/s	-	-	1.08E+00	1.35E+00
SO_2	7446-09-5	g/s	-	-	1.73E-03	2.18E-03
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	5.85E-02	7.35E-02
NOx	10102-44-0	g/s	-	-	9.32E-01	9.63E-01
1,3-butadiene	106-99-0	g/s	-	-	6.02E-05	7.55E-05
Acenaphthene	83-32-9	g/s	-	-	3.96E-06	4.97E-06
Acenaphthylene	208-96-8	g/s	-	-	6.41E-06	8.05E-06
Acetaldehyde	75-07-0	g/s	-	-	5.21E-03	6.55E-03
Acrolein	107-02-8	g/s	-	-	7.51E-04	9.43E-04
Anthracene	120-12-7	g/s	-	-	2.59E-06	3.21E-06
Benzene	71-43-2	g/s	-	-	9.71E-04	1.22E-03
Benzo(a)anthracene	56-55-3	g/s	-	-	3.17E-08	3.87E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	3.75E-08	4.27E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	3.19E-08	3.63E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	1.73E-08	2.15E-08
Chrysene	218-01-9	g/s	-	-	6.60E-08	7.96E-08
Fluoranthene	206-44-0	g/s	-	-	3.99E-06	4.95E-06
Fluorene	86-73-7	g/s	-	-	1.53E-05	1.92E-05
Formaldehyde	50-00-0	g/s	-	-	1.63E-02	2.05E-02
Phenanthrene	85-01-8	g/s	-	-	6.89E-05	8.59E-05
Pyrene	129-00-0	g/s	-	-	3.38E-06	4.18E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	1.14E-08	1.30E-08
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	5.69E-09	6.48E-09
Napthalene	91-20-3	g/s	-	-	1.23E-03	1.54E-03

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Clay will be dumped and handled at the Clay Impounding Area. Emissions include:
1) Clay/Reclaim unloading dust emissions (CL1A/B)
2) Emissions from Mucking (bulldozing/front end loaders) (CL2A)
3) Grading (CL2B)
4) Mobile Emissions (CL2C)

Source : Clay/Reclaim Unloading Emissions (CL1A/B)

Description:
Haul trucks will transport caly from the pit to the caly impounding area. While unloading this clay/ overburdenmaterial, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Non Road - Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table CL-1: Clay Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Clay Unloaded	23,158,388	13,770,278	tonnes/year	
Clay Moisture Content	28	28	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	3.68E+00	1.92E+00	kg/day	
Calculated PM_{10} Emissions	1.74E+00	9.10E-01	kg/day	
Calculated $PM_{2.5}$ Emissions	2.63E-01	1.38E-01	kg/day	
Calculated PM Emissions	4.25E-02	2.23E-02	g/s	
Calculated PM_{10} Emissions	2.01E-02	1.05E-02	g/s	
Calculated $PM_{2.5}$ Emissions	3.05E-03	1.60E-03	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 0.0016 x (3.29/2.2)^1.3 / (28/2)^1.4 = 6.71E-05 kg/tonne
PM hourly emissions (with control) (kg/hr) = 23,158,388 tonne/yr x 7.27E-05 kg/tonne x 1yr/8670hr x (1-0%) = 0.21 kg/hr
PM short-term emission rate (g/s) = 2.32 kg/hr x 0.74 x 1000 g/kg / 3600 s/hr = 4.25E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Table CL-2: Reclaim Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Reclaim Unloaded	2,317,840	792,167	tonnes/year	50% in Year -1, 25% of total in Year 7
Overburden Moisture Content	20	20	%	Average of 375 Overburden Samples - Table 6.1, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Mean wind speed (U)	3.29	3.29	m/s	
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	6.10E-01	1.84E-01	kg/day	
Calculated PM_{10} Emissions	2.89E-01	8.69E-02	kg/day	
Calculated $PM_{2.5}$ Emissions	4.37E-02	1.32E-02	kg/day	
Calculated PM Emissions	7.07E-03	2.13E-03	g/s	
Calculated PM_{10} Emissions	3.34E-03	1.01E-03	g/s	
Calculated $PM_{2.5}$ Emissions	5.06E-04	1.52E-04	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 0.0016 x (3.29/2.2)^1.3 / (5/2)^1.4 = 1.11E-04 kg/tonne
PM hourly emissions (with control) (kg/hr) = 2,317,840 tonne/yr x 7.49E-04 kg/tonne x 1yr/8760 hr x (1-0%) = 0.03 kg/hr
PM short-term emission rate (g/s) = 0.20 kg/hr x 0.74 x 1.17 x 1000 g/kg / 3600 s/hr = 7.07E-03 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (CL2A)

Description:
Clay is moved with bulldozers or front end loaders

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation equation in the

$$E = 2.6 \times s^{1.2} / M^{1.3} \qquad E\ (PM15) = 0.45 \times s^{1.5} / M^{1.4}$$

where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table CL-3: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	28	28	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Material silt content (s)	76.4	76.4	%	Clay Content multiplied by the ratio of average Silt to Clay contents in Overburden (rat
Calculated emission factor (E)	6.214	6.214	kg/hour	-
Number of bulldozers/loaders	2	3	dozers	Equipment Summary
Operating Hours per Day	14	14		Provided by CNC
Calculated PM Emissions (short-term)	1.970	2.956	g/s	-
PM_{10} emission	0.673	1.010	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
$PM_{2.5}$ emission	0.207	0.310	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x 40^1.2 / 28^1.3 = 6.214 kg/hr
Emission Rate (g/s) = 2.859 kg/hr x 1/3600 hr/s x 1000 g/kg x 2 dozers x (1-0%) x 14hr/24hr = 1.970 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (CL2B)

Description:
A grader maintains the truck route on the pile for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um) **$E\ (PM_{15}) = 0.0056(S)^{2.0}$**

where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table CL-4: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
PM Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
PM15 Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route within Impoundment that requires grading	9.1	9.7	km	
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	73.0	77.9	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	5.20E-01	5.55E-01	g/s	Calculated
PM10 Emission rate (g/s)	1.82E-01	1.94E-01	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
PM2.5 Emission rate (g/s)	1.61E-02	1.72E-02	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x (8)^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 18.3 km/day x 1000 g/kg x (1-0%) x 1 graders x 1day/24hr x 1hr/3600s = 5.20E-01 g/s

Data Quality: Average and Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (CL2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment. Emissions from mobile equipment are split equally between the waste rock, sand & till and clay impoundment areas.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table CL-5: Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
PM_{10}	<<PM10>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
$PM_{2.5}$	<<PM2.5>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	1.14E-02	5.65E-03	1.30E-02	6.08E-03
CO	630-08-0	1.08E+00	5.33E-01	1.35E+00	6.10E-01
SO_2	7446-09-5	1.73E-03	8.57E-04	2.18E-03	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	5.85E-02	2.90E-02	7.35E-02	3.31E-02
NOx	10102-44-0	9.32E-01	4.64E-01	9.63E-01	4.72E-01
1,3-butadiene	106-99-0	6.02E-05	2.98E-05	7.55E-05	3.40E-05
Acenaphthene	83-32-9	3.96E-06	1.96E-06	4.97E-06	2.24E-06
Acenaphthylene	208-96-8	6.41E-06	3.17E-06	8.05E-06	3.63E-06
Acetaldehyde	75-07-0	5.21E-03	2.58E-03	6.55E-03	2.95E-03
Acrolein	107-02-8	7.51E-04	3.72E-04	9.43E-04	4.25E-04
Anthracene	120-12-7	2.59E-06	1.28E-06	3.21E-06	1.45E-06
Benzene	71-43-2	9.71E-04	4.80E-04	1.22E-03	5.49E-04
Benzo(a)anthracene	56-55-3	3.17E-08	1.57E-08	3.87E-08	1.76E-08
Benzo(a)pyrene	50-32-8	3.75E-08	1.86E-08	4.27E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	3.19E-08	1.58E-08	3.63E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	1.73E-08	8.57E-09	2.15E-08	9.72E-09
Chrysene	218-01-9	6.60E-08	3.27E-08	7.96E-08	3.65E-08
Fluoranthene	206-44-0	3.99E-06	1.98E-06	4.95E-06	2.24E-06
Fluorene	86-73-7	1.53E-05	7.60E-06	1.92E-05	8.66E-06
Formaldehyde	50-00-0	1.63E-02	8.09E-03	2.05E-02	9.25E-03
Phenanthrene	85-01-8	6.89E-05	3.41E-05	8.59E-05	3.88E-05
Pyrene	129-00-0	3.38E-06	1.67E-06	4.18E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	1.14E-08	5.65E-09	1.30E-08	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	5.69E-09	2.82E-09	6.48E-09	3.04E-09
Napthalene	91-20-3	1.23E-03	6.07E-04	1.54E-03	6.93E-04

Table CL-6: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	CL1 - Material Unloading [1,2]		CL2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	4.96E-02	2.44E-02	2.50E+00	3.52E+00
PM_{10}	<<PM10>>	g/s	2.35E-02	1.15E-02	8.61E-01	1.21E+00
$PM_{2.5}$	<<PM2.5>>	g/s	3.55E-03	1.75E-03	2.29E-01	3.34E-01
Fluoride	7664-39-3	g/s	1.19E-07	5.86E-08	5.99E-06	8.44E-06
Chromium VI	18540-29-9	g/s	3.08E-10	1.51E-10	1.55E-08	2.18E-08
Mercury	7439-97-6	g/s	2.08E-12	1.02E-12	1.05E-10	1.48E-10
Aluminum	7429-90-5	g/s	2.26E-03	1.11E-03	1.14E-01	1.60E-01
Silver	7440-22-4	g/s	1.24E-08	6.10E-09	6.24E-07	8.79E-07
Arsenic	7440-38-2	g/s	1.15E-07	5.65E-08	5.78E-06	8.15E-06
Barium	7440-39-3	g/s	1.77E-05	8.71E-06	8.91E-04	1.26E-03
Beryllium	7440-41-7	g/s	4.19E-08	2.06E-08	2.11E-06	2.97E-06
Boron	7440-42-8	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bismuth	7440-69-9	g/s	8.13E-09	4.00E-09	4.09E-07	5.77E-07
Calcium	7440-70-2	g/s	4.18E-03	2.06E-03	2.10E-01	2.96E-01
Cadmium	7440-43-9	g/s	6.17E-09	3.03E-09	3.10E-07	4.37E-07
Cobalt	7440-48-4	g/s	3.82E-07	1.88E-07	1.92E-05	2.71E-05
Chromium	7440-47-3	g/s	2.31E-06	1.14E-06	1.16E-04	1.64E-04
Copper	7440-50-8	g/s	9.90E-07	4.87E-07	4.98E-05	7.02E-05
Iron	7439-89-6	g/s	9.94E-04	4.89E-04	5.00E-02	7.05E-02
Potassium	7440-09-7	g/s	7.42E-04	3.65E-04	3.73E-02	5.26E-02
Lithium	7439-93-2	g/s	1.08E-06	5.31E-07	5.43E-05	7.65E-05
Magnesium	7439-95-4	g/s	1.15E-03	5.68E-04	5.81E-02	8.19E-02
Manganese	7439-96-5	g/s	1.94E-05	9.54E-06	9.76E-04	1.37E-03
Molybdenum	7439-98-7	g/s	2.98E-08	1.46E-08	1.50E-06	2.11E-06
Silicon	7440-21-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	7440-23-5	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	7440-02-0	g/s	1.05E-06	5.14E-07	5.26E-05	7.41E-05
Lead	7439-92-1	g/s	4.89E-07	2.41E-07	2.46E-05	3.47E-05
Antimony	7440-36-0	g/s	1.98E-08	9.76E-09	9.99E-07	1.41E-06
Selenium	7782-49-2	g/s	2.38E-08	1.17E-08	1.20E-06	1.69E-06
Tin	7440-31-5	g/s	2.43E-07	1.19E-07	1.22E-05	1.72E-05
Strontium	7440-24-6	g/s	1.04E-05	5.09E-06	5.21E-04	7.34E-04
Titanium	7440-32-6	g/s	8.91E-05	4.38E-05	4.49E-03	6.32E-03
Thallium	7440-28-0	g/s	1.33E-08	6.54E-09	6.69E-07	9.42E-07
Uranium	7440-61-1	g/s	6.77E-08	3.33E-08	3.41E-06	4.80E-06
Vanadium	7440-62-2	g/s	2.32E-06	1.14E-06	1.17E-04	1.64E-04
Tungsten	7440-33-7	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yttrium	7440-65-5	g/s	4.96E-07	2.44E-07	2.50E-05	3.52E-05
Zinc	7440-66-6	g/s	1.89E-06	9.29E-07	9.50E-05	1.34E-04
Thorium	7440-29-1	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Quartz (in PM10)	14808-60-7	g/s	2.34E-03	1.15E-03	8.59E-02	1.21E-01
Pyrite	12068-85-8	g/s	3.23E-08	1.59E-08	1.62E-06	2.29E-06
Biotite	1302-27-8	g/s	2.87E-04	1.41E-04	1.44E-02	2.03E-02
Magnetite	1309-38-2	g/s	5.61E-04	2.76E-04	2.83E-02	3.98E-02
Hematite	1317-60-8	g/s	3.55E-05	1.75E-05	1.79E-03	2.52E-03
Chlorite	1318-59-8	g/s	4.75E-03	2.34E-03	2.39E-01	3.37E-01
Muscovite	1318-94-1	g/s	2.28E-03	1.12E-03	1.15E-01	1.62E-01
Talc (fibrous)	14807-96-6	g/s	1.61E-04	7.94E-05	8.12E-03	1.14E-02
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	4.95E-07	2.43E-07	1.81E-05	2.55E-05
Uranium (in PM10)	<<U_PM10>>	g/s	3.20E-08	1.57E-08	1.17E-06	1.65E-06
Chrysotile Asbestos	132207-32-0	g/s	6.19E-05	1.18E-05	3.12E-03	1.70E-03
Manganese (in PM10)	<<Mn_PM10>>	g/s	9.17E-06	4.51E-06	3.36E-04	4.73E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	1.39E-06	6.83E-07	8.94E-05	1.30E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	1.45E-10	7.15E-11	5.34E-09	7.50E-09
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	5.65E-03	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	5.65E-03	6.08E-03
CO	630-08-0	g/s	-	-	5.33E-01	6.10E-01
SO_2	7446-09-5	g/s	-	-	8.57E-04	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.90E-02	3.31E-02
NOx	10102-44-0	g/s	-	-	4.64E-01	4.72E-01
1,3-butadiene	106-99-0	g/s	-	-	2.98E-05	3.40E-05
Acenaphthene	83-32-9	g/s	-	-	1.96E-06	2.24E-06
Acenaphthylene	208-96-8	g/s	-	-	3.17E-06	3.63E-06
Acetaldehyde	75-07-0	g/s	-	-	2.58E-03	2.95E-03
Acrolein	107-02-8	g/s	-	-	3.72E-04	4.25E-04
Anthracene	120-12-7	g/s	-	-	1.28E-06	1.45E-06
Benzene	71-43-2	g/s	-	-	4.80E-04	5.49E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.57E-08	1.76E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	1.86E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	1.58E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	8.57E-09	9.72E-09
Chrysene	218-01-9	g/s	-	-	3.27E-08	3.65E-08
Fluoranthene	206-44-0	g/s	-	-	1.98E-06	2.24E-06
Fluorene	86-73-7	g/s	-	-	7.60E-06	8.66E-06
Formaldehyde	50-00-0	g/s	-	-	8.09E-03	9.25E-03
Phenanthrene	85-01-8	g/s	-	-	3.41E-05	3.88E-05
Pyrene	129-00-0	g/s	-	-	1.67E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	5.65E-09	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	2.82E-09	3.04E-09
Napthalene	91-20-3	g/s	-	-	6.07E-04	6.93E-04

Notes:
(1) Metal speciation based on overburden.
(2) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table CL-7: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	CL -1 Material Unloading		CL - 2 Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	1.14E-02	1.30E-02
PM_{10}	<<PM10>>	g/s	-	-	1.14E-02	1.30E-02
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	1.14E-02	1.30E-02
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	1.14E-02	1.30E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	1.14E-02	1.30E-02
CO	630-08-0	g/s	-	-	1.08E+00	1.35E+00
SO_2	7446-09-5	g/s	-	-	1.73E-03	2.18E-03
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	5.85E-02	7.35E-02
NOx	10102-44-0	g/s	-	-	9.32E-01	9.63E-01
1,3-butadiene	106-99-0	g/s	-	-	6.02E-05	7.55E-05
Acenaphthene	83-32-9	g/s	-	-	3.96E-06	4.97E-06
Acenaphthylene	208-96-8	g/s	-	-	6.41E-06	8.05E-06
Acetaldehyde	75-07-0	g/s	-	-	5.21E-03	6.55E-03
Acrolein	107-02-8	g/s	-	-	7.51E-04	9.43E-04
Anthracene	120-12-7	g/s	-	-	2.59E-06	3.21E-06
Benzene	71-43-2	g/s	-	-	9.71E-04	1.22E-03
Benzo(a)anthracene	56-55-3	g/s	-	-	3.17E-08	3.87E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	3.75E-08	4.27E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	3.19E-08	3.63E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	1.73E-08	2.15E-08
Chrysene	218-01-9	g/s	-	-	6.60E-08	7.96E-08
Fluoranthene	206-44-0	g/s	-	-	3.99E-06	4.95E-06
Fluorene	86-73-7	g/s	-	-	1.53E-05	1.92E-05
Formaldehyde	50-00-0	g/s	-	-	1.63E-02	2.05E-02
Phenanthrene	85-01-8	g/s	-	-	6.89E-05	8.59E-05
Pyrene	129-00-0	g/s	-	-	3.38E-06	4.18E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	1.14E-08	1.30E-08
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	5.69E-09	6.48E-09
Napthalene	91-20-3	g/s	-	-	1.23E-03	1.54E-03

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Sand and Till will be dumped and handled at the S&T Impounding Area. Emissions include:
1) S&T/Reclaim unloading dust emissions (ST1A/B)
2) Emissions from Mucking (bulldozing/front end loaders) (ST2A)
3) Grading (ST2B)
4) Mobile Emissions (ST2C)

Source : S&T/Reclaim Unloading Emissions (ST1A/B)

Description:
Haul trucks will transport S&T from the pit to the S&T impounding area. While unloading this S&T / overburdenmaterial, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.5}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table ST-1: S&T Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
S&T Unloaded	7,535,841	19,361,139	tonnes/year	
S&T Moisture Content	14	14	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	3.16E+00	7.14E+00	kg/day	
Calculated PM_{10} Emissions	1.49E+00	3.38E+00	kg/day	
Calculated $PM_{2.5}$ Emissions	2.26E-01	5.11E-01	kg/day	
Calculated PM Emissions	3.65E-02	8.26E-02	g/s	
Calculated PM_{10} Emissions	1.73E-02	3.91E-02	g/s	
Calculated $PM_{2.5}$ Emissions	2.62E-03	5.92E-03	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 0.0016 x (3.29/2.2)^1.3 / (14/2)^1.4 = 1.77E-04 kg/tonne
PM hourly emissions (with control) (kg/hr) = 7,535,847 tonne/yr x 1.77E-04 kg/tonne x 1 yr/8760 hr x (1-0%) = 0.15 kg/hr
PM short-term emission rate (g/s) = 0.15 kg/hr x 0.74 x 1000 g/kg /3600 s/hr x 1.17 = 3.65E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Table ST-2: Reclaim Unloading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Reclaim Unloaded	2,317,840	792,167	tonnes/year	50% in Year -1, 25% of total in Year 7
Overburden Moisture Content	19.5	19.5	%	Average of 375 Overburden Samples - Table 6.1, Crawford Overburden Geotechincal Investigation Factual Report, SRK Consulting, March 2023.
Mean wind speed (U)	3.29	3.29	m/s	
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	6.10E-01	1.84E-01	kg/day	
Calculated PM_{10} Emissions	2.89E-01	8.69E-02	kg/day	
Calculated $PM_{2.5}$ Emissions	4.37E-02	1.32E-02	kg/day	
Calculated PM Emissions	7.07E-03	2.13E-03	g/s	
Calculated PM_{10} Emissions	3.34E-03	1.01E-03	g/s	
Calculated $PM_{2.5}$ Emissions	5.06E-04	1.52E-04	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 1 x 0.0016 x (3.29/2.2)^1.3 / (5/2)^1.4 = 1.11E-04 kg/tonne
PM hourly emissions (with control) (kg/hr) = 2,317,840 tonne/yr x 7.49E-04 kg/tonne x (1-0%) x 1yr/8760hr = 0.03 kg/hr
PM short-term emission rate (g/s) = 0.20 kg/hr x 0.74 x 1.17 x 1000 g/kg / 3600 s/hr = 7.07E-03 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (ST2A)

Description:
Sand and Till is moved with bulldozers or front end loaders

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation
$E = 2.6 \times s^{1.2} / M^{1.3}$ **$E\ (PM15) = 0.45 \times s^{1.5} / M^{1.4}$**
where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table ST-3: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	14	14	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Material silt content (s)	51.6	51.6	%	Clay Content multiplied by the ratio of average Silt to Clay contents in Overburden
Calculated emission factor (E)	9.547	9.547	kg/hour	-
Number of bulldozers/loaders	3	3	dozers	Equipment Summary
Operating Hours per Day	14	14		Provided by CNC
Calculated PM Emissions (short-term)	4.541	4.541	g/s	-
PM_{10} emission	1.478	1.478	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
$PM_{2.5}$ emission	0.477	0.477	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x (20^1.2)/ (14^1.3) = 9.547 kg/hr
Emission Rate (g/s) = 3.064 kg/hr x 1/3600 hr/s x 1000 g/kg x 3 dozers x (1-0%) x 14hr/24hr = 4.541 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (ST2B)

Description:
A grader maintains the truck route on the pile for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um) **$E\ (PM_{15}) = 0.0056(S)^{2.0}$**

where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table ST-4: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
PM Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
PM_{15} Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route within Impoundment that requires grading	2.6	3.4	km	Road Data - travel path length on pile
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	20.5	26.9	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	1.46E-01	1.91E-01	g/s	Calculated
PM_{10} Emission rate (g/s)	5.10E-02	6.68E-02	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
$PM_{2.5}$ Emission rate (g/s)	4.52E-03	5.93E-03	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x (8)^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 5.1 km/day x 1000 g/kg x (1-0%) x 1 graders x 1 day/24hr x 1hr/3600 s = 1.46E-01 g/s

Data Quality: Average & Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (ST2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment. Emissions from mobile equipment are split equally between the waste rock, sand & till and clay impoundment areas.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Non Road - Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table ST-5: Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
PM_{10}	<<PM10>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
$PM_{2.5}$	<<PM2.5>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	1.14E-02	5.65E-03	1.30E-02	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	1.14E-02	5.65E-03	1.30E-02	6.08E-03
CO	630-08-0	1.08E+00	5.33E-01	1.35E+00	6.10E-01
SO_2	7446-09-5	1.73E-03	8.57E-04	2.18E-03	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	5.85E-02	2.90E-02	7.35E-02	3.31E-02
NOx	10102-44-0	9.32E-01	4.64E-01	9.63E-01	4.72E-01
1,3-butadiene	106-99-0	6.02E-05	2.98E-05	7.55E-05	3.40E-05
Acenaphthene	83-32-9	3.96E-06	1.96E-06	4.97E-06	2.24E-06
Acenaphthylene	208-96-8	6.41E-06	3.17E-06	8.05E-06	3.63E-06
Acetaldehyde	75-07-0	5.21E-03	2.58E-03	6.55E-03	2.95E-03
Acrolein	107-02-8	7.51E-04	3.72E-04	9.43E-04	4.25E-04
Anthracene	120-12-7	2.59E-06	1.28E-06	3.21E-06	1.45E-06
Benzene	71-43-2	9.71E-04	4.80E-04	1.22E-03	5.49E-04
Benzo(a)anthracene	56-55-3	3.17E-08	1.57E-08	3.87E-08	1.76E-08
Benzo(a)pyrene	50-32-8	3.75E-08	1.86E-08	4.27E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	3.19E-08	1.58E-08	3.63E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	1.73E-08	8.57E-09	2.15E-08	9.72E-09
Chrysene	218-01-9	6.60E-08	3.27E-08	7.96E-08	3.65E-08
Fluoranthene	206-44-0	3.99E-06	1.98E-06	4.95E-06	2.24E-06
Fluorene	86-73-7	1.53E-05	7.60E-06	1.92E-05	8.66E-06
Formaldehyde	50-00-0	1.63E-02	8.09E-03	2.05E-02	9.25E-03
Phenanthrene	85-01-8	6.89E-05	3.41E-05	8.59E-05	3.88E-05
Pyrene	129-00-0	3.38E-06	1.67E-06	4.18E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	1.14E-08	5.65E-09	1.30E-08	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	5.69E-09	2.82E-09	6.48E-09	3.04E-09
Napthalene	91-20-3	1.23E-03	6.07E-04	1.54E-03	6.93E-04

Table ST-6: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	ST1 - Material Unloading [1,2]		ST2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	4.36E-02	8.48E-02	4.69E+00	4.74E+00
PM_{10}	<<PM10>>	g/s	2.06E-02	4.01E-02	1.53E+00	1.55E+00
$PM_{2.5}$	<<PM2.5>>	g/s	3.12E-03	6.07E-03	4.87E-01	4.89E-01
Fluoride	7664-39-3	g/s	1.05E-07	2.03E-07	1.13E-05	1.14E-05
Chromium VI	18540-29-9	g/s	2.70E-10	5.26E-10	2.91E-08	2.94E-08
Mercury	7439-97-6	g/s	1.83E-12	3.56E-12	1.97E-10	1.99E-10
Aluminum	7429-90-5	g/s	1.98E-03	3.86E-03	2.14E-01	2.16E-01
Silver	7440-22-4	g/s	1.09E-08	2.12E-08	1.17E-06	1.18E-06
Arsenic	7440-38-2	g/s	1.01E-07	1.96E-07	1.09E-05	1.10E-05
Barium	7440-39-3	g/s	1.56E-05	3.03E-05	1.68E-03	1.69E-03
Beryllium	7440-41-7	g/s	3.68E-08	7.15E-08	3.96E-06	4.00E-06
Boron	7440-42-8	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bismuth	7440-69-9	g/s	7.15E-09	1.39E-08	7.70E-07	7.77E-07
Calcium	7440-70-2	g/s	3.67E-03	7.15E-03	3.96E-01	3.99E-01
Cadmium	7440-43-9	g/s	5.42E-09	1.05E-08	5.83E-07	5.89E-07
Cobalt	7440-48-4	g/s	3.35E-07	6.52E-07	3.61E-05	3.65E-05
Chromium	7440-47-3	g/s	2.03E-06	3.95E-06	2.19E-04	2.21E-04
Copper	7440-50-8	g/s	8.70E-07	1.69E-06	9.37E-05	9.46E-05
Iron	7439-89-6	g/s	8.74E-04	1.70E-03	9.41E-02	9.50E-02
Potassium	7440-09-7	g/s	6.52E-04	1.27E-03	7.02E-02	7.08E-02
Lithium	7439-93-2	g/s	9.49E-07	1.85E-06	1.02E-04	1.03E-04
Magnesium	7439-95-4	g/s	1.02E-03	1.97E-03	1.09E-01	1.10E-01
Manganese	7439-96-5	g/s	1.70E-05	3.31E-05	1.83E-03	1.85E-03
Molybdenum	7439-98-7	g/s	2.62E-08	5.09E-08	2.82E-06	2.84E-06
Silicon	7440-21-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sodium	7440-23-5	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel	7440-02-0	g/s	9.19E-07	1.79E-06	9.89E-05	9.99E-05
Lead	7439-92-1	g/s	4.30E-07	8.36E-07	4.63E-05	4.68E-05
Antimony	7440-36-0	g/s	1.74E-08	3.39E-08	1.88E-06	1.90E-06
Selenium	7782-49-2	g/s	2.09E-08	4.07E-08	2.25E-06	2.27E-06
Tin	7440-31-5	g/s	2.13E-07	4.15E-07	2.30E-05	2.32E-05
Strontium	7440-24-6	g/s	9.10E-06	1.77E-05	9.79E-04	9.89E-04
Titanium	7440-32-6	g/s	7.83E-05	1.52E-04	8.43E-03	8.51E-03
Thallium	7440-28-0	g/s	1.17E-08	2.27E-08	1.26E-06	1.27E-06
Uranium	7440-61-1	g/s	5.95E-08	1.16E-07	6.40E-06	6.47E-06
Vanadium	7440-62-2	g/s	2.04E-06	3.96E-06	2.19E-04	2.21E-04
Tungsten	7440-33-7	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yttrium	7440-65-5	g/s	4.36E-07	8.48E-07	4.69E-05	4.74E-05
Zinc	7440-66-6	g/s	1.66E-06	3.23E-06	1.79E-04	1.80E-04
Thorium	7440-29-1	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Quartz (in PM10)	14808-60-7	g/s	2.06E-03	4.00E-03	1.53E-01	1.55E-01
Pyrite	12068-85-8	g/s	2.84E-08	5.51E-08	3.05E-06	3.08E-06
Biotite	1302-27-8	g/s	2.52E-04	4.90E-04	2.71E-02	2.74E-02
Magnetite	1309-38-2	g/s	4.93E-04	9.59E-04	5.31E-02	5.36E-02
Hematite	1317-60-8	g/s	3.12E-05	6.07E-05	3.36E-03	3.39E-03
Chlorite	1318-59-8	g/s	4.18E-03	8.12E-03	4.50E-01	4.54E-01
Muscovite	1318-94-1	g/s	2.01E-03	3.90E-03	2.16E-01	2.18E-01
Talc (fibrous)	14807-96-6	g/s	1.42E-04	2.76E-04	1.53E-02	1.54E-02
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	4.35E-07	8.45E-07	3.23E-05	3.27E-05
Uranium (in PM10)	<<U_PM10>>	g/s	2.81E-08	5.47E-08	2.09E-06	2.12E-06
Chrysotile Asbestos	132207-32-0	g/s	5.44E-05	4.09E-05	5.86E-03	2.29E-03
Manganese (in PM10)	<<Mn_PM10>>	g/s	8.06E-06	1.57E-05	6.00E-04	6.06E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	1.22E-06	2.37E-06	1.90E-04	1.91E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	1.28E-10	2.49E-10	9.51E-09	9.61E-09
0	--	g/s	-	-	-	-
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	-	-	5.65E-03	6.08E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	5.65E-03	6.08E-03
CO	630-08-0	g/s	-	-	5.33E-01	6.10E-01
SO_2	7446-09-5	g/s	-	-	8.57E-04	9.80E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.90E-02	3.31E-02
NOx	10102-44-0	g/s	-	-	4.64E-01	4.72E-01
1,3-butadiene	106-99-0	g/s	-	-	2.98E-05	3.40E-05
Acenaphthene	83-32-9	g/s	-	-	1.96E-06	2.24E-06
Acenaphthylene	208-96-8	g/s	-	-	3.17E-06	3.63E-06
Acetaldehyde	75-07-0	g/s	-	-	2.58E-03	2.95E-03
Acrolein	107-02-8	g/s	-	-	3.72E-04	4.25E-04
Anthracene	120-12-7	g/s	-	-	1.28E-06	1.45E-06
Benzene	71-43-2	g/s	-	-	4.80E-04	5.49E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.57E-08	1.76E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	1.86E-08	2.01E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	1.58E-08	1.70E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	8.57E-09	9.72E-09
Chrysene	218-01-9	g/s	-	-	3.27E-08	3.65E-08
Fluoranthene	206-44-0	g/s	-	-	1.98E-06	2.24E-06
Fluorene	86-73-7	g/s	-	-	7.60E-06	8.66E-06
Formaldehyde	50-00-0	g/s	-	-	8.09E-03	9.25E-03
Phenanthrene	85-01-8	g/s	-	-	3.41E-05	3.88E-05
Pyrene	129-00-0	g/s	-	-	1.67E-06	1.90E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	5.65E-09	6.08E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	2.82E-09	3.04E-09
Napthalene	91-20-3	g/s	-	-	6.07E-04	6.93E-04

Notes:
(1) Metal speciation based on overburden.
(2) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table ST-7: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	ST1 - Material Unloading		ST2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	1.14E-02	1.30E-02
PM_{10}	<<PM10>>	g/s	-	-	1.14E-02	1.30E-02
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	1.14E-02	1.30E-02
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	1.14E-02	1.30E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	1.14E-02	1.30E-02
CO	630-08-0	g/s	-	-	1.08E+00	1.35E+00
SO_2	7446-09-5	g/s	-	-	1.73E-03	2.18E-03
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	5.85E-02	7.35E-02
NOx	10102-44-0	g/s	-	-	9.32E-01	9.63E-01
1,3-butadiene	106-99-0	g/s	-	-	6.02E-05	7.55E-05
Acenaphthene	83-32-9	g/s	-	-	3.96E-06	4.97E-06
Acenaphthylene	208-96-8	g/s	-	-	6.41E-06	8.05E-06
Acetaldehyde	75-07-0	g/s	-	-	5.21E-03	6.55E-03
Acrolein	107-02-8	g/s	-	-	7.51E-04	9.43E-04
Anthracene	120-12-7	g/s	-	-	2.59E-06	3.21E-06
Benzene	71-43-2	g/s	-	-	9.71E-04	1.22E-03
Benzo(a)anthracene	56-55-3	g/s	-	-	3.17E-08	3.87E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	3.75E-08	4.27E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	3.19E-08	3.63E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	1.73E-08	2.15E-08
Chrysene	218-01-9	g/s	-	-	6.60E-08	7.96E-08
Fluoranthene	206-44-0	g/s	-	-	3.99E-06	4.95E-06
Fluorene	86-73-7	g/s	-	-	1.53E-05	1.92E-05
Formaldehyde	50-00-0	g/s	-	-	1.63E-02	2.05E-02
Phenanthrene	85-01-8	g/s	-	-	6.89E-05	8.59E-05
Pyrene	129-00-0	g/s	-	-	3.38E-06	4.18E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	1.14E-08	1.30E-08
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	5.69E-09	6.48E-09
Napthalene	91-20-3	g/s	-	-	1.23E-03	1.54E-03

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Ore will be dumped and handled at the Low Grade Ore -East Stockpile Emissions include:
1) Ore Unloading/Loading dust emissions (LGE1)
2) Emissions from Mucking (bulldozing/front end loaders) (LGE2A)
3) Grading (LGE2B)
4) Mobile Emissions (LGE2C)

Source : Ore Unloading/Loading Emissions (LGE1)

Description:
Haul trucks will transport Ore from the pit to the Low Grade Ore (East) Stockpile and from the LGE to the crushers. While unloading/loading the ore, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table LGE-1: Ore Unloading/Loading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Ore Loaded/Unloaded	13,264,521	11,358,351	tonnes/year	
Ore Moisture Content	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	4.80E+01	3.62E+01	kg/day	
Calculated PM_{10} Emissions	2.27E+01	1.71E+01	kg/day	
Calculated $PM_{2.5}$ Emissions	3.44E+00	2.59E+00	kg/day	
Calculated PM Emissions	5.56E-01	4.19E-01	g/s	
Calculated PM_{10} Emissions	2.63E-01	1.98E-01	g/s	
Calculated $PM_{2.5}$ Emissions	3.98E-02	3.00E-02	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 1 x 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.53E-03 kg/tonne
PM hourly emissions (with control) (kg/hr) = 13,264,521 tonne/yr x 1.53E-03 kg/tonne x (1-0%) x 1yr/8760 hr = 2.32 kg/hr
PM short-term emission rate (g/s) = 2.32 kg/hr x 0.74 x 1.17 x 1000 g/kg / 3600 s/hr = 5.56E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (LGE2A)

Description:
Ore is moved with bulldozers or front end loaders

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation
$E = 2.6 \times s^{1.2} / M^{1.3}$ **$E\ (PM15) = 0.45 \times s^{1.5} / M^{1.4}$**
where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table LGE-2: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Material silt content (s)	2.0	2.0	%	CNC - Effectively 0 - 2% used for conservatism
Calculated emission factor (E)	1.432	1.432	kg/hour	-
Number of bulldozers/loaders	1	1	dozers	Equipment Summary
Operating Hours per Day	8	8	hours	Provided by CNC
Calculated PM Emissions (short-term)	0.136	0.136	g/s	-
PM_{10} emission	0.020	0.020	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
$PM_{2.5}$ emission	0.014	0.014	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x(2^1.2) / (3^1.3) = 1.432 kg/hr
Emission Rate (g/s) = 1.432 kg/hr x 1/3600 hr/s x 1000 g/kg x 1 dozers x (1-0%) x 8hr/24hr = 0.136 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (LGE2B)

Description:
A grader maintains the truck route on the pile for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11.9 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um) **$E\ (PM15) = 0.0056(S)^{2.0}$**

where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table LGE-3: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
PM Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
PM_{15} Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route on stockpile that requires grading	1.2	1.6	km	Road Data - travel path length on pile
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	9.5	13.0	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	6.79E-02	9.24E-02	g/s	Calculated
PM10 Emission rate (g/s)	2.37E-02	3.23E-02	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
PM2.5 Emission rate (g/s)	2.11E-03	2.87E-03	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x 8^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 2.4 vkt/day x 1000 g/kg x (1-0%)/24hr/3600s x 1 graders = 6.79E-02 g/s

Data Quality: Average and Marginal
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (LGE2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table LGE-4: Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
PM_{10}	<<PM10>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
$PM_{2.5}$	<<PM2.5>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	5.55E-03	1.90E-03	5.55E-03	1.90E-03
CO	630-08-0	4.86E-01	1.66E-01	4.86E-01	1.66E-01
SO_2	7446-09-5	7.81E-04	2.68E-04	7.81E-04	2.68E-04
Non-methane hydrocarbons	<<NMHC>>	2.64E-02	9.04E-03	2.64E-02	9.04E-03
NOx	10102-44-0	4.86E-01	1.66E-01	4.86E-01	1.66E-01
1,3-butadiene	106-99-0	2.71E-05	9.29E-06	2.71E-05	9.29E-06
Acenaphthene	83-32-9	1.78E-06	6.11E-07	1.78E-06	6.11E-07
Acenaphthylene	208-96-8	2.89E-06	9.90E-07	2.89E-06	9.90E-07
Acetaldehyde	75-07-0	2.35E-03	8.05E-04	2.35E-03	8.05E-04
Acrolein	107-02-8	3.39E-04	1.16E-04	3.39E-04	1.16E-04
Anthracene	120-12-7	1.18E-06	4.03E-07	1.18E-06	4.03E-07
Benzene	71-43-2	4.38E-04	1.50E-04	4.38E-04	1.50E-04
Benzo(a)anthracene	56-55-3	1.46E-08	5.01E-09	1.46E-08	5.01E-09
Benzo(a)pyrene	50-32-8	1.83E-08	6.28E-09	1.83E-08	6.28E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1.56E-08	5.33E-09	1.56E-08	5.33E-09
Benzo(g,h,i)perylene	191-24-2	7.89E-09	2.70E-09	7.89E-09	2.70E-09
Chrysene	218-01-9	3.08E-08	1.06E-08	3.08E-08	1.06E-08
Fluoranthene	206-44-0	1.82E-06	6.23E-07	1.82E-06	6.23E-07
Fluorene	86-73-7	6.94E-06	2.38E-06	6.94E-06	2.38E-06
Formaldehyde	50-00-0	7.37E-03	2.52E-03	7.37E-03	2.52E-03
Phenanthrene	85-01-8	3.12E-05	1.07E-05	3.12E-05	1.07E-05
Pyrene	129-00-0	1.54E-06	5.29E-07	1.54E-06	5.29E-07
Dibenz(a,h)anthracene	53-70-3	5.55E-09	1.90E-09	5.55E-09	1.90E-09
Indeno(1,2,3-cd)pyrene	193-39-5	2.78E-09	9.51E-10	2.78E-09	9.51E-10
Napthalene	91-20-3	5.53E-04	1.89E-04	5.53E-04	1.89E-04

Table LGE-5: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	LGE1 - Material Loading & Unloading [1,2]		LGE2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	1.11	8.38E-01	2.06E-01	2.31E-01
PM_{10}	<<PM10>>	g/s	5.26E-01	3.96E-01	4.51E-02	5.37E-02
$PM_{2.5}$	<<PM2.5>>	g/s	7.96E-02	6.00E-02	1.83E-02	1.91E-02
Fluoride	7664-39-3	g/s	2.00E-07	1.51E-07	3.71E-08	4.15E-08
Chromium VI	18540-29-9	g/s	1.44E-09	1.07E-09	2.66E-10	2.95E-10
Mercury	7439-97-6	g/s	3.96E-11	2.95E-11	7.34E-12	8.10E-12
Aluminum	7429-90-5	g/s	8.85E-03	8.24E-03	1.64E-03	2.27E-03
Silver	7440-22-4	g/s	2.78E-07	2.09E-07	5.15E-08	5.76E-08
Arsenic	7440-38-2	g/s	4.80E-06	5.15E-06	8.90E-07	1.42E-06
Barium	7440-39-3	g/s	3.27E-05	3.59E-05	6.06E-06	9.89E-06
Beryllium	7440-41-7	g/s	6.16E-08	6.01E-08	1.14E-08	1.65E-08
Boron	7440-42-8	g/s	2.21E-05	1.59E-05	4.11E-06	4.38E-06
Bismuth	7440-69-9	g/s	5.00E-08	3.77E-08	9.27E-09	1.04E-08
Calcium	7440-70-2	g/s	1.48E-02	1.35E-02	2.75E-03	3.73E-03
Cadmium	7440-43-9	g/s	3.01E-08	2.54E-08	5.59E-09	6.99E-09
Cobalt	7440-48-4	g/s	1.34E-04	9.96E-05	2.49E-05	2.74E-05
Chromium	7440-47-3	g/s	1.49E-03	1.11E-03	2.77E-04	3.05E-04
Copper	7440-50-8	g/s	4.75E-05	3.72E-05	8.81E-06	1.02E-05
Iron	7439-89-6	g/s	7.36E-02	5.59E-02	1.37E-02	1.54E-02
Potassium	7440-09-7	g/s	5.33E-04	4.81E-04	9.89E-05	1.32E-04
Lithium	7439-93-2	g/s	3.81E-06	3.85E-06	7.07E-07	1.06E-06
Magnesium	7439-95-4	g/s	2.36E-01	1.73E-01	4.38E-02	4.77E-02
Manganese	7439-96-5	g/s	1.12E-03	8.63E-04	2.08E-04	2.38E-04
Molybdenum	7439-98-7	g/s	1.95E-07	1.72E-07	3.61E-08	4.75E-08
Silicon	7440-21-3	g/s	3.47E-03	2.54E-03	6.44E-04	7.00E-04
Sodium	7440-23-5	g/s	1.24E-04	9.49E-05	2.31E-05	2.61E-05
Nickel	7440-02-0	g/s	2.36E-03	1.70E-03	4.37E-04	4.67E-04
Lead	7439-92-1	g/s	4.94E-07	4.08E-07	9.16E-08	1.12E-07
Antimony	7440-36-0	g/s	4.53E-07	3.44E-07	8.40E-08	9.45E-08
Selenium	7782-49-2	g/s	3.11E-07	2.32E-07	5.77E-08	6.38E-08
Tin	7440-31-5	g/s	3.63E-06	2.73E-06	6.74E-07	7.51E-07
Strontium	7440-24-6	g/s	3.31E-05	2.92E-05	6.14E-06	8.03E-06
Titanium	7440-32-6	g/s	4.93E-04	4.52E-04	9.15E-05	1.24E-04
Thallium	7440-28-0	g/s	2.44E-08	1.96E-08	4.53E-09	5.40E-09
Uranium	7440-61-1	g/s	3.27E-08	3.08E-08	6.07E-09	8.47E-09
Vanadium	7440-62-2	g/s	3.14E-05	2.75E-05	5.81E-06	7.56E-06
Tungsten	7440-33-7	g/s	9.58E-08	7.21E-08	1.78E-08	1.98E-08
Yttrium	7440-65-5	g/s	1.94E-06	1.72E-06	3.60E-07	4.74E-07
Zinc	7440-66-6	g/s	4.85E-05	3.79E-05	9.00E-06	1.04E-05
Thorium	7440-29-1	g/s	5.69E-07	4.03E-07	1.05E-07	1.11E-07
Quartz (in PM10)	14808-60-7	g/s	9.32E-03	1.07E-02	8.00E-04	1.45E-03
Pyrite	12068-85-8	g/s	1.17E-07	1.39E-07	2.18E-08	3.82E-08
Biotite	1302-27-8	g/s	7.42E-04	8.68E-04	1.38E-04	2.39E-04
Magnetite	1309-38-2	g/s	1.14E-01	8.09E-02	2.11E-02	2.23E-02
Hematite	1317-60-8	g/s	1.29E-04	1.53E-04	2.39E-05	4.20E-05
Chlorite	1318-59-8	g/s	6.08E-02	4.88E-02	1.13E-02	1.34E-02
Muscovite	1318-94-1	g/s	7.28E-03	8.51E-03	1.35E-03	2.34E-03
Talc (fibrous)	14807-96-6	g/s	5.87E-04	6.95E-04	1.09E-04	1.91E-04
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	1.11E-03	8.03E-04	9.57E-05	1.09E-04
Uranium (in PM10)	<<U_PM10>>	g/s	1.55E-08	1.46E-08	1.33E-09	1.97E-09
Chrysotile Asbestos	132207-32-0	g/s	1.53E-02	1.08E-02	2.83E-03	2.98E-03
Manganese (in PM10)	<<Mn_PM10>>	g/s	5.31E-04	4.08E-04	4.56E-05	5.53E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	8.05E-05	6.18E-05	1.85E-05	1.96E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	6.80E-10	5.06E-10	5.84E-11	6.86E-11
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	1.90E-03	1.90E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	1.90E-03	1.90E-03
CO	630-08-0	g/s	-	-	1.66E-01	1.66E-01
SO_2	7446-09-5	g/s	-	-	2.68E-04	2.68E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	9.04E-03	9.04E-03
NOx	10102-44-0	g/s	-	-	1.66E-01	1.66E-01
1,3-butadiene	106-99-0	g/s	-	-	9.29E-06	9.29E-06
Acenaphthene	83-32-9	g/s	-	-	6.11E-07	6.11E-07
Acenaphthylene	208-96-8	g/s	-	-	9.90E-07	9.90E-07
Acetaldehyde	75-07-0	g/s	-	-	8.05E-04	8.05E-04
Acrolein	107-02-8	g/s	-	-	1.16E-04	1.16E-04
Anthracene	120-12-7	g/s	-	-	4.03E-07	4.03E-07
Benzene	71-43-2	g/s	-	-	1.50E-04	1.50E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	5.01E-09	5.01E-09
Benzo(a)pyrene	50-32-8	g/s	-	-	6.28E-09	6.28E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	5.33E-09	5.33E-09
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	2.70E-09	2.70E-09
Chrysene	218-01-9	g/s	-	-	1.06E-08	1.06E-08
Fluoranthene	206-44-0	g/s	-	-	6.23E-07	6.23E-07
Fluorene	86-73-7	g/s	-	-	2.38E-06	2.38E-06
Formaldehyde	50-00-0	g/s	-	-	2.52E-03	2.52E-03
Phenanthrene	85-01-8	g/s	-	-	1.07E-05	1.07E-05
Pyrene	129-00-0	g/s	-	-	5.29E-07	5.29E-07
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	1.90E-09	1.90E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	9.51E-10	9.51E-10
Napthalene	91-20-3	g/s	-	-	1.89E-04	1.89E-04

Notes:
(1) Metal speciation based on ore. PM emissions are multiplied by 2 to account for both loading and unloading.
(2) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table LGE-6: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	LGE1 - Material Unloading [2]		LGE2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	5.55E-03	5.55E-03
PM_{10}	<<PM10>>	g/s	-	-	5.55E-03	5.55E-03
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	5.55E-03	5.55E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	5.55E-03	5.55E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	5.55E-03	5.55E-03
CO	630-08-0	g/s	-	-	4.86E-01	4.86E-01
SO_2	7446-09-5	g/s	-	-	7.81E-04	7.81E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.64E-02	2.64E-02
NOx	10102-44-0	g/s	-	-	4.86E-01	4.86E-01
1,3-butadiene	106-99-0	g/s	-	-	2.71E-05	2.71E-05
Acenaphthene	83-32-9	g/s	-	-	1.78E-06	1.78E-06
Acenaphthylene	208-96-8	g/s	-	-	2.89E-06	2.89E-06
Acetaldehyde	75-07-0	g/s	-	-	2.35E-03	2.35E-03
Acrolein	107-02-8	g/s	-	-	3.39E-04	3.39E-04
Anthracene	120-12-7	g/s	-	-	1.18E-06	1.18E-06
Benzene	71-43-2	g/s	-	-	4.38E-04	4.38E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.46E-08	1.46E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	1.83E-08	1.83E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	1.56E-08	1.56E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	7.89E-09	7.89E-09
Chrysene	218-01-9	g/s	-	-	3.08E-08	3.08E-08
Fluoranthene	206-44-0	g/s	-	-	1.82E-06	1.82E-06
Fluorene	86-73-7	g/s	-	-	6.94E-06	6.94E-06
Formaldehyde	50-00-0	g/s	-	-	7.37E-03	7.37E-03
Phenanthrene	85-01-8	g/s	-	-	3.12E-05	3.12E-05
Pyrene	129-00-0	g/s	-	-	1.54E-06	1.54E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	5.55E-09	5.55E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	2.78E-09	2.78E-09
Napthalene	91-20-3	g/s	-	-	5.53E-04	5.53E-04

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Ore will be dumped and handled at the Low Grade Ore - West Stockpile Emissions include:
1) Ore Unloading/Loading dust emissions (LGW1)
2) Emissions from Mucking (bulldozing/front end loaders) (LGW2A)
3) Grading (LGW2B)
4) Mobile Emissions (LGW2C)

Source : Ore Unloading/Loading Emissions (LGW1)

Description:
Haul trucks will transport Ore from the pit to the Low Grade Ore (West) Stockpile and from the LGW to the crushers. While unloading/loading the ore, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources on these piles. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table LGW-1: Ore Unloading/Loading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
Ore Loaded/Unloaded	0	8,086,600	tonnes/year	
Ore Moisture Content	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions	0.00E+00	2.58E+01	kg/day	
Calculated PM10 Emissions	0.00E+00	1.22E+01	kg/day	
Calculated PM2.5 Emissions	0.00E+00	1.85E+00	kg/day	
Calculated PM Emissions	0.00E+00	2.98E-01	g/s	
Calculated PM10 Emissions	0.00E+00	1.41E-01	g/s	
Calculated PM2.5 Emissions	0.00E+00	2.14E-02	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.53E-03 kg/tonne
PM hourly emissions (with control) (kg/hr) = 8,086,600 tonne/year x 1.53E-03 kg/tonne x (1-0%)x 1yr/8760 hr = 1.41 kg/hr
PM short-term emission rate (g/s) = 1.41 kg/hr x 0.74 x 1.03 x 1000 g/kg / 3600 s/hr = 2.98E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (LGW2A)

Description:
Ore is moved with bulldozers or front end loaders

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material (overburden) other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation equation in the table is:

$E = 2.6 \times s^{1.2} / M^{1.3}$ (TSP<=30um)
$E = 0.45 \times s^{1.5} / M^{1.4}$ (TSP<=15um)
where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table LGW-2: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Material silt content (s)	2.0	2.0	%	CNC - Effectively 0 - 2% used for conservatism
Calculated emission factor (E)	1.432	1.432	kg/hour	-
Number of bulldozers/loaders	1	1	dozers	Equipment Summary
Operating Hours per Day	8	8	hours	Provided by CNC
Calculated PM Emissions (short-term)	0.136	0.136	g/s	-
PM10 emission	0.020	0.020	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
PM2.5 emission	0.014	0.014	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x (2^1.2)/(3^1.3) = 1.432 kg/hr
Emission Rate (g/s) = 1.432 kg/hr x 1/3600 hr/s x 1000 g/kg x 1 dozers x (1-0%) x 8hr/24hr = 0.136 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (LGW2B)

Description:
A grader maintains the truck route on the pile for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_x, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um) **$E\ (PM15) = 0.0056(S)^{2.0}$**

where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table LGW-3: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route on stockpile that requires grading	0.0	2.1	km	Road Data - travel path length on pile
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	0.0	17.1	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	0.00E+00	1.22E-01	g/s	Calculated
PM10 Emission rate (g/s)	0.00E+00	4.26E-02	g/s	Scaling factor applied to <=15um equation found in Table 11.9-2
PM2.5 Emission rate (g/s)	0.00E+00	3.78E-03	g/s	Scaling factor applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x 8^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 4.3vkt/day x 1000 g/kg x (1-0%)/24hr x 1 graders = 1.22E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (LGW2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table LGW-4: Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
PM_{10}	<<PM10>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
$PM_{2.5}$	<<PM2.5>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	5.55E-03	1.90E-03	5.55E-03	1.90E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	5.55E-03	1.90E-03	5.55E-03	1.90E-03
CO	630-08-0	4.86E-01	1.66E-01	4.86E-01	1.66E-01
SO_2	7446-09-5	7.81E-04	2.68E-04	7.81E-04	2.68E-04
Non-methane hydrocarbons	<<NMHC>>	2.64E-02	9.04E-03	2.64E-02	9.04E-03
NOx	10102-44-0	4.86E-01	1.66E-01	4.86E-01	1.66E-01
1,3-butadiene	106-99-0	2.71E-05	9.29E-06	2.71E-05	9.29E-06
Acenaphthene	83-32-9	1.78E-06	6.11E-07	1.78E-06	6.11E-07
Acenaphthylene	208-96-8	2.89E-06	9.90E-07	2.89E-06	9.90E-07
Acetaldehyde	75-07-0	2.35E-03	8.05E-04	2.35E-03	8.05E-04
Acrolein	107-02-8	3.39E-04	1.16E-04	3.39E-04	1.16E-04
Anthracene	120-12-7	1.18E-06	4.03E-07	1.18E-06	4.03E-07
Benzene	71-43-2	4.38E-04	1.50E-04	4.38E-04	1.50E-04
Benzo(a)anthracene	56-55-3	1.46E-08	5.01E-09	1.46E-08	5.01E-09
Benzo(a)pyrene	50-32-8	1.83E-08	6.28E-09	1.83E-08	6.28E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1.56E-08	5.33E-09	1.56E-08	5.33E-09
Benzo(g,h,i)perylene	191-24-2	7.89E-09	2.70E-09	7.89E-09	2.70E-09
Chrysene	218-01-9	3.08E-08	1.06E-08	3.08E-08	1.06E-08
Fluoranthene	206-44-0	1.82E-06	6.23E-07	1.82E-06	6.23E-07
Fluorene	86-73-7	6.94E-06	2.38E-06	6.94E-06	2.38E-06
Formaldehyde	50-00-0	7.37E-03	2.52E-03	7.37E-03	2.52E-03
Phenanthrene	85-01-8	3.12E-05	1.07E-05	3.12E-05	1.07E-05
Pyrene	129-00-0	1.54E-06	5.29E-07	1.54E-06	5.29E-07
Dibenz(a,h)anthracene	53-70-3	5.55E-09	1.90E-09	5.55E-09	1.90E-09
Indeno(1,2,3-cd)pyrene	193-39-5	2.78E-09	9.51E-10	2.78E-09	9.51E-10
Napthalene	91-20-3	5.53E-04	1.89E-04	5.53E-04	1.89E-04

Table LGW-5: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	LGW1 -Material Unloading [1,2]		LGW2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	0.00E+00	5.97E-01	1.38E-01	2.60E-01
PM_{10}	<<PM10>>	g/s	0.00E+00	2.82E-01	2.14E-02	6.41E-02
$PM_{2.5}$	<<PM2.5>>	g/s	0.00E+00	4.27E-02	1.62E-02	2.00E-02
Fluoride	7664-39-3	g/s	0.00E+00	1.07E-07	2.49E-08	4.68E-08
Chromium VI	18540-29-9	g/s	0.00E+00	7.62E-10	1.79E-10	3.32E-10
Mercury	7439-97-6	g/s	0.00E+00	2.10E-11	4.92E-12	9.15E-12
Aluminum	7429-90-5	g/s	0.00E+00	5.87E-03	1.10E-03	2.56E-03
Silver	7440-22-4	g/s	0.00E+00	1.49E-07	3.45E-08	6.50E-08
Arsenic	7440-38-2	g/s	0.00E+00	3.67E-06	5.97E-07	1.60E-06
Barium	7440-39-3	g/s	0.00E+00	2.56E-05	4.06E-06	1.12E-05
Beryllium	7440-41-7	g/s	0.00E+00	4.28E-08	7.66E-09	1.87E-08
Boron	7440-42-8	g/s	0.00E+00	1.13E-05	2.75E-06	4.94E-06
Bismuth	7440-69-9	g/s	0.00E+00	2.68E-08	6.22E-09	1.17E-08
Calcium	7440-70-2	g/s	0.00E+00	9.64E-03	1.84E-03	4.20E-03
Cadmium	7440-43-9	g/s	0.00E+00	1.81E-08	3.75E-09	7.88E-09
Cobalt	7440-48-4	g/s	0.00E+00	7.09E-05	1.67E-05	3.09E-05
Chromium	7440-47-3	g/s	0.00E+00	7.89E-04	1.85E-04	3.44E-04
Copper	7440-50-8	g/s	0.00E+00	2.65E-05	5.90E-06	1.16E-05
Iron	7439-89-6	g/s	0.00E+00	3.98E-02	9.15E-03	1.73E-02
Potassium	7440-09-7	g/s	0.00E+00	3.42E-04	6.63E-05	1.49E-04
Lithium	7439-93-2	g/s	0.00E+00	2.74E-06	4.74E-07	1.19E-06
Magnesium	7439-95-4	g/s	0.00E+00	1.23E-01	2.93E-02	5.38E-02
Manganese	7439-96-5	g/s	0.00E+00	6.15E-04	1.40E-04	2.68E-04
Molybdenum	7439-98-7	g/s	0.00E+00	1.23E-07	2.42E-08	5.36E-08
Silicon	7440-21-3	g/s	0.00E+00	1.81E-03	4.32E-04	7.90E-04
Sodium	7440-23-5	g/s	0.00E+00	6.76E-05	1.55E-05	2.95E-05
Nickel	7440-02-0	g/s	0.00E+00	1.21E-03	2.93E-04	5.27E-04
Lead	7439-92-1	g/s	0.00E+00	2.91E-07	6.14E-08	1.27E-07
Antimony	7440-36-0	g/s	0.00E+00	2.45E-07	5.63E-08	1.07E-07
Selenium	7782-49-2	g/s	0.00E+00	1.65E-07	3.86E-08	7.19E-08
Tin	7440-31-5	g/s	0.00E+00	1.94E-06	4.51E-07	8.47E-07
Strontium	7440-24-6	g/s	0.00E+00	2.08E-05	4.12E-06	9.06E-06
Titanium	7440-32-6	g/s	0.00E+00	3.22E-04	6.13E-05	1.40E-04
Thallium	7440-28-0	g/s	0.00E+00	1.40E-08	3.03E-09	6.09E-09
Uranium	7440-61-1	g/s	0.00E+00	2.19E-08	4.07E-09	9.55E-09
Vanadium	7440-62-2	g/s	0.00E+00	1.96E-05	3.90E-06	8.53E-06
Tungsten	7440-33-7	g/s	0.00E+00	5.13E-08	1.19E-08	2.24E-08
Yttrium	7440-65-5	g/s	0.00E+00	1.23E-06	2.41E-07	5.35E-07
Zinc	7440-66-6	g/s	0.00E+00	2.70E-05	6.03E-06	1.18E-05
Thorium	7440-29-1	g/s	0.00E+00	2.87E-07	7.07E-08	1.25E-07
Quartz (in PM10)	14808-60-7	g/s	0.00E+00	7.61E-03	3.80E-04	1.73E-03
Pyrite	12068-85-8	g/s	0.00E+00	9.89E-08	1.46E-08	4.31E-08
Biotite	1302-27-8	g/s	0.00E+00	6.18E-04	9.22E-05	2.70E-04
Magnetite	1309-38-2	g/s	0.00E+00	5.76E-02	1.41E-02	2.51E-02
Hematite	1317-60-8	g/s	0.00E+00	1.09E-04	1.60E-05	4.74E-05
Chlorite	1318-59-8	g/s	0.00E+00	3.48E-02	7.56E-03	1.52E-02
Muscovite	1318-94-1	g/s	0.00E+00	6.06E-03	9.05E-04	2.64E-03
Talc (fibrous)	14807-96-6	g/s	0.00E+00	4.94E-04	7.29E-05	2.16E-04
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	0.00E+00	5.72E-04	4.54E-05	1.30E-04
Uranium (in PM10)	<<U_PM10>>	g/s	0.00E+00	1.04E-08	6.31E-10	2.35E-09
Chrysotile Asbestos	132207-32-0	g/s	0.00E+00	7.70E-03	1.90E-03	3.36E-03
Manganese (in PM10)	<<Mn_PM10>>	g/s	0.00E+00	2.91E-04	2.16E-05	6.60E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	0.00E+00	4.40E-05	1.64E-05	2.06E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	0.00E+00	3.61E-10	2.77E-11	8.18E-11
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	-	-	1.90E-03	1.90E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	1.90E-03	1.90E-03
CO	630-08-0	g/s	-	-	1.66E-01	1.66E-01
SO_2	7446-09-5	g/s	-	-	2.68E-04	2.68E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	9.04E-03	9.04E-03
NOx	10102-44-0	g/s	-	-	1.66E-01	1.66E-01
1,3-butadiene	106-99-0	g/s	-	-	9.29E-06	9.29E-06
Acenaphthene	83-32-9	g/s	-	-	6.11E-07	6.11E-07
Acenaphthylene	208-96-8	g/s	-	-	9.90E-07	9.90E-07
Acetaldehyde	75-07-0	g/s	-	-	8.05E-04	8.05E-04
Acrolein	107-02-8	g/s	-	-	1.16E-04	1.16E-04
Anthracene	120-12-7	g/s	-	-	4.03E-07	4.03E-07
Benzene	71-43-2	g/s	-	-	1.50E-04	1.50E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	5.01E-09	5.01E-09
Benzo(a)pyrene	50-32-8	g/s	-	-	6.28E-09	6.28E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	5.33E-09	5.33E-09
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	2.70E-09	2.70E-09
Chrysene	218-01-9	g/s	-	-	1.06E-08	1.06E-08
Fluoranthene	206-44-0	g/s	-	-	6.23E-07	6.23E-07
Fluorene	86-73-7	g/s	-	-	2.38E-06	2.38E-06
Formaldehyde	50-00-0	g/s	-	-	2.52E-03	2.52E-03
Phenanthrene	85-01-8	g/s	-	-	1.07E-05	1.07E-05
Pyrene	129-00-0	g/s	-	-	5.29E-07	5.29E-07
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	1.90E-09	1.90E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	9.51E-10	9.51E-10
Napthalene	91-20-3	g/s	-	-	1.89E-04	1.89E-04

Notes:
(1) Metal speciation based on ore. PM emissions are multiplied by 2 to account for both loading and unloading.
(2) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table LGW-6: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	LGW1 - Material Unloading [2]		LGW2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	5.55E-03	5.55E-03
PM_{10}	<<PM10>>	g/s	-	-	5.55E-03	5.55E-03
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	5.55E-03	5.55E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	5.55E-03	5.55E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	5.55E-03	5.55E-03
CO	630-08-0	g/s	-	-	4.86E-01	4.86E-01
SO_2	7446-09-5	g/s	-	-	7.81E-04	7.81E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.64E-02	2.64E-02
NOx	10102-44-0	g/s	-	-	4.86E-01	4.86E-01
1,3-butadiene	106-99-0	g/s	-	-	2.71E-05	2.71E-05
Acenaphthene	83-32-9	g/s	-	-	1.78E-06	1.78E-06
Acenaphthylene	208-96-8	g/s	-	-	2.89E-06	2.89E-06
Acetaldehyde	75-07-0	g/s	-	-	2.35E-03	2.35E-03
Acrolein	107-02-8	g/s	-	-	3.39E-04	3.39E-04
Anthracene	120-12-7	g/s	-	-	1.18E-06	1.18E-06
Benzene	71-43-2	g/s	-	-	4.38E-04	4.38E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.46E-08	1.46E-08
Benzo(a)pyrene	50-32-8	g/s	-	-	1.83E-08	1.83E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	1.56E-08	1.56E-08
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	7.89E-09	7.89E-09
Chrysene	218-01-9	g/s	-	-	3.08E-08	3.08E-08
Fluoranthene	206-44-0	g/s	-	-	1.82E-06	1.82E-06
Fluorene	86-73-7	g/s	-	-	6.94E-06	6.94E-06
Formaldehyde	50-00-0	g/s	-	-	7.37E-03	7.37E-03
Phenanthrene	85-01-8	g/s	-	-	3.12E-05	3.12E-05
Pyrene	129-00-0	g/s	-	-	1.54E-06	1.54E-06
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	5.55E-09	5.55E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	2.78E-09	2.78E-09
Napthalene	91-20-3	g/s	-	-	5.53E-04	5.53E-04

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Material will be dumped and handled at the Tailings Management Facility and will include:
1) Material Unloading dust emissions (TMF1)
2) Emissions from Mucking (bulldozing/front end loaders) (TMF2A)
3) Grading (TMF2B)
4) Mobile Emissions (TMF2C)

Source : WR/S&T/Clay Unloading Emissions (TMF1)

Description:
Haul trucks will transport material from the pits to the TMF for TMF construction. While unloading the material, dust emissions are expected and are calculated here. Since these emissions are dependant on wind speed, unloading emissions are applied to a separate source from other emissions sources in the TMF. An average wind speed is assumed here for calculations - in the model setup, the emissions scale with the wind speeds encountered during each hour using the meteorological data provided by the MECP.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016) \frac{\left(\frac{U}{2.2}\right)^{1.5}}{\left(\frac{M}{2}\right)^{1.4}} \text{ (kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table TMF-1: Material Unloading/Loading Input Parameters

Parameter	Year -1	Year 7	Unit	Reference
Max 24 Hour Production Factor	1.17	1.03		
WR Unloaded	1,612,833	5,933,971	tonnes/year	
S&T Unloaded	0	1,407,626	tonnes/year	
Clay Unloaded	0	394,468	tonnes/year	
WR Moisture Content	3	3	%	Assumed same as ore
S&T Moisture Content	14	14	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-2
Clay Moisture Content	28	28	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	hours/year	
	365	365	day/year	
Hours of Operation per day	24	24	hours	
Control Efficiency	0%	0%	%	
Calculated PM Emissions - WR	5.84E+00	1.89E+01	kg/day	
Calculated PM Emissions - S&T	0.00E+00	5.19E-01	kg/day	
Calculated PM Emissions - Clay	0.00E+00	5.51E-02	kg/day	
Calculated PM_{10} Emissions	2.76E+00	9.22E+00	kg/day	
Calculated $PM_{2.5}$ Emissions	4.18E-01	1.40E+00	kg/day	
Calculated Total PM Emissions	6.76E-02	2.26E-01	g/s	
Calculated Total PM_{10} Emissions	3.20E-02	1.07E-01	g/s	
Calculated Total $PM_{2.5}$ Emissions	4.84E-03	1.62E-02	g/s	

Sample Calculation - PM emissions:
Emission factor (uncontrolled) (kg/tonne) = 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.53E-03 kg/tonne
PM hourly emissions (with control) (kg/hr) = 1,612,833 tonne/yr x 1.53E-03 kg/tonne x (1-0%) x 1yr/8760 hr = 0.28 kg/hr
PM short-term emission rate (g/s) = 0.28 kg/hr x 0.74 x 1.03 x 1000 g/kg / 3600 s/hr = 6.76E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Source: Mucking (TMF2A)

Description:
Material is moved with bulldozers or front end loaders for TMF construction

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_X, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for bulldozing of material other than coal in the US EPA AP-42 document Chapter 11.9 (Western Surface Coal Mining) Table 11.9-2 was used to estimate the dust emissions. The emission calculation
$E = 2.6 \times s^{1.2} / M^{1.3}$ **$E\ (PM15) = 0.45 \times s^{1.5} / M^{1.4}$**
where:
E = emission factor (kg/h)
s = material silt content (%)
M = material moisture content (%)
The emission calculation is listed in the following table.

Table TMF-2: Mucking Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Material Moisture content (M)	3	3	%	Assumed same as ore
Material silt content (s)	2.0	2.0	%	CNC - Effectively 0 - 2% used for conservatism
Calculated emission factor (E)	1.432	1.432	kg/hour	-
Number of bulldozers/loaders	2	1	dozers	Equipment Summary
Operating Hours per Day	8	8	hours	Provided by CNC
Calculated PM Emissions (short-term)	0.272	0.136	g/s	-
PM_{10} emission	0.057	0.057	g/s	Scaling Factor of 0.75 of the PM15 equation from Table 11.9-2
$PM_{2.5}$ emission	0.029	0.014	g/s	Scaling Factor of 0.105 of the TSP equation from Table 11.9-2
Control Efficiency	0	0	%	Assumed uncontrolled

Sample Calculation:
Emission factor (uncontrolled) (kg/hr) = 2.6 x 2.0^1.2 / 3^1.3 = 1.432 kg/hr
Emission Rate (g/s) = 1.432 kg/hr x 1/3600 hr/s x 1000 g/kg x 2 dozers x (1-0%) x 8hr/24hr = 0.272 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum capacity. The calculated emission rate should be conservative.

Source: Grading (TMF2B)

Description:
A grader maintains the truck route around the TMF for efficient operation of haul trucks

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_x, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for grading operations are found in the US EPA AP42 document Chapter 11 in Table 11.9-2

$E=0.0034(S)^{2.5}$ (TSP<=30um)
$E=0.0056(S)^{2.5}$ (TSP<=15um)
where:
S = mean vehicle speed (km/hr)
E = emission factor (kg/VKT)

Table TMF-3: Grading Input Parameters

Parameter	Year -1	Year 7	Units	Reference
Grader Speed	8	8	km/hr	US EPA - Gravel Roads - Maintenance and Design Manual. Max speed for road grading = 5 mph (8 km/hr). https://www.epa.gov/sites/production/files/2015-10/documents/2003_07_24_nps_gravelroads_sec1_1.pdf
Emission factor (uncontrolled)	0.62	0.62	kg/vkt	TSP calculated
Emission factor (uncontrolled)	0.36	0.36	kg/vkt	TSP <15µm calculated
Control Efficiency	0%	0%	%	assumed
Length of route on stockpile that requires grading	12.8	14.9	km	Road Data - travel path length on pile
Frequency of grading	4	4	times/ day	Assumed the route is graded 4 times/ day
Total length of route graded per day	102.6	119.6	vkt/day	Road Data - travel path length on pile
PM Emission rate (g/s)	7.31E-01	8.52E-01	g/s	Calculated
PM_{10} Emission rate (g/s)	2.55E-01	2.98E-01	g/s	Scaling factor of 0.6 applied to <=15um equation found in Table 11.9-2
$PM_{2.5}$ Emission rate (g/s)	2.27E-02	2.64E-02	g/s	Scaling factor of 0.031 applied to TSP emission rate found in Table 11.9-2

Sample Calculation - PM emissions:
Emission factor - uncontrolled (kg/vkt) = 0.0034 x 8^2.5 = 0.62 kg/vkt
TSP Emission rate - with control (g/s) = 0.62 kg/vkt x 0.002 km/s x 1000 g/kg x (1-0%) x 4 times/day = 7.31E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "C" and "D" based on the AP-42 chapter. This gives a MECP data quality of "Average Data Quality" and "Marginal Data Quality"

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating at full speed. The calculated emission rate should be conservative.

Source : Mobile Emissions (TMF2C)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

Table TMF-4: Tailpipe Emissions

COPC	CAS	Equipment Tailpipe Emissions (g/s)			
		Year -1		Year 7	
		1-Hour	24-Hour	1-Hour	24-Hour
PM	<<PM>>	3.04E-03	3.47E-04	1.52E-03	1.74E-04
PM_{10}	<<PM10>>	3.04E-03	3.47E-04	1.52E-03	1.74E-04
$PM_{2.5}$	<<PM2.5>>	3.04E-03	3.47E-04	1.52E-03	1.74E-04
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	3.04E-03	3.47E-04	1.52E-03	1.74E-04
Elemental Carbon (from diesel exhaust)	7440-44-0	3.04E-03	3.47E-04	1.52E-03	1.74E-04
CO	630-08-0	5.32E-01	6.08E-02	2.66E-01	3.04E-02
SO_2	7446-09-5	8.56E-04	9.77E-05	4.28E-04	4.88E-05
Non-methane hydrocarbons	<<NMHC>>	2.89E-02	3.30E-03	1.44E-02	1.65E-03
NOx	10102-44-0	6.08E-02	6.94E-03	3.04E-02	3.47E-03
1,3-butadiene	106-99-0	2.97E-05	3.39E-06	1.49E-05	1.70E-06
Acenaphthene	83-32-9	1.95E-06	2.23E-07	9.76E-07	1.11E-07
Acenaphthylene	208-96-8	3.17E-06	3.62E-07	1.58E-06	1.81E-07
Acetaldehyde	75-07-0	2.57E-03	2.94E-04	1.29E-03	1.47E-04
Acrolein	107-02-8	3.71E-04	4.23E-05	1.85E-04	2.12E-05
Anthracene	120-12-7	1.21E-06	1.38E-07	6.05E-07	6.90E-08
Benzene	71-43-2	4.79E-04	5.47E-05	2.40E-04	2.74E-05
Benzo(a)anthracene	56-55-3	1.36E-08	1.55E-09	6.79E-09	7.75E-10
Benzo(a)pyrene	50-32-8	1.00E-08	1.15E-09	5.02E-09	5.73E-10
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	8.52E-09	9.72E-10	4.26E-09	4.86E-10
Benzo(g,h,i)perylene	191-24-2	8.03E-09	9.17E-10	4.02E-09	4.59E-10
Chrysene	218-01-9	2.62E-08	2.99E-09	1.31E-08	1.49E-09
Fluoranthene	206-44-0	1.84E-06	2.11E-07	9.22E-07	1.05E-07
Fluorene	86-73-7	7.44E-06	8.49E-07	3.72E-06	4.25E-07
Formaldehyde	50-00-0	8.07E-03	9.22E-04	4.04E-03	4.61E-04
Phenanthrene	85-01-8	3.29E-05	3.76E-06	1.65E-05	1.88E-06
Pyrene	129-00-0	1.55E-06	1.77E-07	7.75E-07	8.84E-08
Dibenz(a,h)anthracene	53-70-3	3.04E-09	3.47E-10	1.52E-09	1.74E-10
Indeno(1,2,3-cd)pyrene	193-39-5	1.52E-09	1.74E-10	7.60E-10	8.68E-11
Napthalene	91-20-3	6.05E-04	6.91E-05	3.03E-04	3.45E-05

Table TMF-5: Emissions Summary (24-Hour Average)

CoPC	CAS	Units	TMF1 - Material Unloading		TMF2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	6.76E-02	2.26E-01	1.00E+00	9.88E-01
PM_{10}	<<PM10>>	g/s	3.20E-02	1.07E-01	3.13E-01	3.55E-01
$PM_{2.5}$	<<PM2.5>>	g/s	4.84E-03	1.62E-02	5.16E-02	4.09E-02
Fluoride	7664-39-3	g/s	1.22E-08	4.06E-08	1.81E-07	1.78E-07
Chromium VI	18540-29-9	g/s	8.73E-11	2.88E-10	1.30E-09	1.26E-09
Mercury	7439-97-6	g/s	2.41E-12	7.93E-12	3.58E-11	3.47E-11
Aluminum	7429-90-5	g/s	5.38E-04	2.22E-03	8.00E-03	9.72E-03
Silver	7440-22-4	g/s	1.69E-08	5.64E-08	2.51E-07	2.47E-07
Arsenic	7440-38-2	g/s	2.92E-07	1.39E-06	4.34E-06	6.08E-06
Barium	7440-39-3	g/s	1.99E-06	9.68E-06	2.95E-05	4.24E-05
Beryllium	7440-41-7	g/s	3.75E-09	1.62E-08	5.57E-08	7.09E-08
Boron	7440-42-8	g/s	1.35E-06	4.28E-06	2.00E-05	1.88E-05
Bismuth	7440-69-9	g/s	3.04E-09	1.01E-08	4.52E-08	4.45E-08
Calcium	7440-70-2	g/s	9.00E-04	3.64E-03	1.34E-02	1.60E-02
Cadmium	7440-43-9	g/s	1.83E-09	6.83E-09	2.72E-08	2.99E-08
Cobalt	7440-48-4	g/s	8.18E-06	2.68E-05	1.21E-04	1.17E-04
Chromium	7440-47-3	g/s	9.07E-05	2.98E-04	1.35E-03	1.31E-03
Copper	7440-50-8	g/s	2.89E-06	1.00E-05	4.29E-05	4.39E-05
Iron	7439-89-6	g/s	4.48E-03	1.50E-02	6.65E-02	6.59E-02
Potassium	7440-09-7	g/s	3.24E-05	1.29E-04	4.82E-04	5.67E-04
Lithium	7439-93-2	g/s	2.32E-07	1.04E-06	3.44E-06	4.54E-06
Magnesium	7439-95-4	g/s	1.44E-02	4.66E-02	2.13E-01	2.04E-01
Manganese	7439-96-5	g/s	6.83E-05	2.32E-04	1.01E-03	1.02E-03
Molybdenum	7439-98-7	g/s	1.19E-08	4.64E-08	1.76E-07	2.03E-07
Silicon	7440-21-3	g/s	2.11E-04	6.85E-04	3.14E-03	3.00E-03
Sodium	7440-23-5	g/s	7.56E-06	2.55E-05	1.12E-04	1.12E-04
Nickel	7440-02-0	g/s	1.43E-04	4.57E-04	2.13E-03	2.00E-03
Lead	7439-92-1	g/s	3.00E-08	1.10E-07	4.46E-07	4.81E-07
Antimony	7440-36-0	g/s	2.76E-08	9.25E-08	4.09E-07	4.05E-07
Selenium	7782-49-2	g/s	1.89E-08	6.24E-08	2.81E-07	2.73E-07
Tin	7440-31-5	g/s	2.21E-07	7.35E-07	3.28E-06	3.22E-06
Strontium	7440-24-6	g/s	2.01E-06	7.85E-06	2.99E-05	3.44E-05
Titanium	7440-32-6	g/s	3.00E-05	1.22E-04	4.46E-04	5.33E-04
Thallium	7440-28-0	g/s	1.48E-09	5.28E-09	2.20E-08	2.31E-08
Uranium	7440-61-1	g/s	1.99E-09	8.28E-09	2.96E-08	3.63E-08
Vanadium	7440-62-2	g/s	1.91E-06	7.40E-06	2.83E-05	3.24E-05
Tungsten	7440-33-7	g/s	5.82E-09	1.94E-08	8.65E-08	8.50E-08
Yttrium	7440-65-5	g/s	1.18E-07	4.64E-07	1.75E-06	2.03E-06
Zinc	7440-66-6	g/s	2.95E-06	1.02E-05	4.38E-05	4.47E-05
Thorium	7440-29-1	g/s	3.46E-08	1.08E-07	5.14E-07	4.75E-07
Quartz (in PM10)	14808-60-7	g/s	5.67E-04	2.88E-03	5.55E-03	9.57E-03
Pyrite	12068-85-8	g/s	7.13E-09	3.74E-08	1.06E-07	1.64E-07
Biotite	1302-27-8	g/s	4.51E-05	2.34E-04	6.70E-04	1.02E-03
Magnetite	1309-38-2	g/s	6.91E-03	2.18E-02	1.03E-01	9.54E-02
Hematite	1317-60-8	g/s	7.85E-06	4.11E-05	1.17E-04	1.80E-04
Chlorite	1318-59-8	g/s	3.70E-03	1.31E-02	5.49E-02	5.76E-02
Muscovite	1318-94-1	g/s	4.43E-04	2.29E-03	6.58E-03	1.00E-02
Talc (fibrous)	14807-96-6	g/s	3.57E-05	1.87E-04	5.30E-04	8.19E-04
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	6.77E-05	2.16E-04	6.63E-04	7.19E-04
Uranium (in PM10)	<<U_PM10>>	g/s	9.41E-10	3.92E-09	9.21E-09	1.30E-08
Chrysotile Asbestos	132207-32-0	g/s	9.28E-04	2.91E-03	1.38E-02	1.28E-02
Manganese (in PM10)	<<Mn_PM10>>	g/s	3.23E-05	1.10E-04	3.16E-04	3.65E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	4.89E-06	1.66E-05	5.22E-05	4.21E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	4.13E-11	1.36E-10	4.04E-10	4.53E-10
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	-	-	3.47E-04	1.74E-04
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	3.47E-04	1.74E-04
CO	630-08-0	g/s	-	-	6.08E-02	3.04E-02
SO_2	7446-09-5	g/s	-	-	9.77E-05	4.88E-05
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	3.30E-03	1.65E-03
NOx	10102-44-0	g/s	-	-	6.94E-03	3.47E-03
1,3-butadiene	106-99-0	g/s	-	-	3.39E-06	1.70E-06
Acenaphthene	83-32-9	g/s	-	-	2.23E-07	1.11E-07
Acenaphthylene	208-96-8	g/s	-	-	3.62E-07	1.81E-07
Acetaldehyde	75-07-0	g/s	-	-	2.94E-04	1.47E-04
Acrolein	107-02-8	g/s	-	-	4.23E-05	2.12E-05
Anthracene	120-12-7	g/s	-	-	1.38E-07	6.90E-08
Benzene	71-43-2	g/s	-	-	5.47E-05	2.74E-05
Benzo(a)anthracene	56-55-3	g/s	-	-	1.55E-09	7.75E-10
Benzo(a)pyrene	50-32-8	g/s	-	-	1.15E-09	5.73E-10
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	9.72E-10	4.86E-10
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	9.17E-10	4.59E-10
Chrysene	218-01-9	g/s	-	-	2.99E-09	1.49E-09
Fluoranthene	206-44-0	g/s	-	-	2.11E-07	1.05E-07
Fluorene	86-73-7	g/s	-	-	8.49E-07	4.25E-07
Formaldehyde	50-00-0	g/s	-	-	9.22E-04	4.61E-04
Phenanthrene	85-01-8	g/s	-	-	3.76E-06	1.88E-06
Pyrene	129-00-0	g/s	-	-	1.77E-07	8.84E-08
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	3.47E-10	1.74E-10
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	1.74E-10	8.68E-11
Napthalene	91-20-3	g/s	-	-	6.91E-05	3.45E-05

Notes:
(1) In the model, these emissions will be applied as a separate source that scales dependant on wind speed. Emissions presented here use an average wind speed of 3.29m/s.

Table TMF-6: Emissions Summary (1-Hour Average)

CoPC	CAS	Units	TMF1 - Material Unloading [2]		TMF2 - Material Handling (Bulldozing, Grading and Tailpipe)	
			Year -1	Year 7	Year -1	Year 7
PM	<<PM>>	g/s	-	-	3.04E-03	1.52E-03
PM_{10}	<<PM10>>	g/s	-	-	3.04E-03	1.52E-03
$PM_{2.5}$	<<PM2.5>>	g/s	-	-	3.04E-03	1.52E-03
Diesel Particulate Matter ($PM_{2.5}$ from Diesel Combustion)	<<DPM>>	g/s	-	-	3.04E-03	1.52E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	-	-	3.04E-03	1.52E-03
CO	630-08-0	g/s	-	-	5.32E-01	2.66E-01
SO_2	7446-09-5	g/s	-	-	8.56E-04	4.28E-04
Non-methane hydrocarbons	<<NMHC>>	g/s	-	-	2.89E-02	1.44E-02
NOx	10102-44-0	g/s	-	-	6.08E-02	3.04E-02
1,3-butadiene	106-99-0	g/s	-	-	2.97E-05	1.49E-05
Acenaphthene	83-32-9	g/s	-	-	1.95E-06	9.76E-07
Acenaphthylene	208-96-8	g/s	-	-	3.17E-06	1.58E-06
Acetaldehyde	75-07-0	g/s	-	-	2.57E-03	1.29E-03
Acrolein	107-02-8	g/s	-	-	3.71E-04	1.85E-04
Anthracene	120-12-7	g/s	-	-	1.21E-06	6.05E-07
Benzene	71-43-2	g/s	-	-	4.79E-04	2.40E-04
Benzo(a)anthracene	56-55-3	g/s	-	-	1.36E-08	6.79E-09
Benzo(a)pyrene	50-32-8	g/s	-	-	1.00E-08	5.02E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	-	-	8.52E-09	4.26E-09
Benzo(g,h,i)perylene	191-24-2	g/s	-	-	8.03E-09	4.02E-09
Chrysene	218-01-9	g/s	-	-	2.62E-08	1.31E-08
Fluoranthene	206-44-0	g/s	-	-	1.84E-06	9.22E-07
Fluorene	86-73-7	g/s	-	-	7.44E-06	3.72E-06
Formaldehyde	50-00-0	g/s	-	-	8.07E-03	4.04E-03
Phenanthrene	85-01-8	g/s	-	-	3.29E-05	1.65E-05
Pyrene	129-00-0	g/s	-	-	1.55E-06	7.75E-07
Dibenz(a,h)anthracene	53-70-3	g/s	-	-	3.04E-09	1.52E-09
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	-	-	1.52E-09	7.60E-10
Napthalene	91-20-3	g/s	-	-	6.05E-04	3.03E-04

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Wind Erosion from Stockpiles and TMF
1) Waste Rock Impoundment (WR3)
2) Sand and Till Impoundment (ST3)
3) Clay Impoundment (CL3)
4) Low Grade Ore Stockpile - East (LGE3)
5) Low Grade Ore Stockpile - West (LGW3)
6) Tailing Management Facility (TMF3)
7) Road Stone Crusher Piles (RDSC4)

Source: Storage Piles and the TMF will be subject to winds which can erode storage piles causing dust emissions (WR3, ST3, CL3, LGE3, LGW3, TMF3, RDSC4)

Description:
Storage piles and the TMF can be eroded by high winds. Some areas of the TMF may be dry and inactive , it is conservatively assumed that these portions of the TMF are occasionally disturbed and subject to some wind erosion.

Contaminant(s) of Concern:
Particulate and metals.

Methodology: Emission Factor (EF)
The calculation is based on emission estimation methodology and related emission factors in Chapter 13.2.5 of US EPA AP-42 entitled "Industrial Wind Erosion".
The following emission estimation equations are used:
The emission factor for wind-generated particulate emissions from mixtures of erodible and nonerodable surface material subject to disturbance may be expressed in units of grams per square meter (g/m2) per year as follows:

$$\text{Emission factor} = k \sum_{i=1}^{N} P_i \qquad \text{eqn (2)}$$

where:
k = particle size multiplier
N = number of disturbances per year
P_i = erosion potential corresponding to the observed (or probable fastest mile of wind for the ith period between disturbances, g/m^2

The particle size multiplier (k) for Equation 2 varies with aerodynamic particle size, listed as follows:

	K for Equation 2		
	30 µm	<10 µm	<2.5 µm
Chapter 13.2.5	1	0.5	0.075
Various Particle Size Analyses as provided by Stantec Geochemical team (SGS Ref. No 14117-001)	1	0.26	0.10

The erosion potential function for a dry, exposed surface is:

$$P = 58\ (u^* - u_t^*)^2 + 25\ (u^* - u_t^*) \qquad \text{eqn (3)}$$

$$P = 0 \text{ for } u^* \leq u_t^*$$

where:
u* = friction velocity (m/s)
u_t = threshold friction velocity (m/s)

The following equation is used to convert the fastest mile of wind (u+) from a reference anemometer height of 10 m to the equivalent friction velocity (u*). This equation is applied to large relatively flat piles or exposed areas with little penetration into the surface wind layer.

$$u^* = 0.053\ u_{10}^{+} \qquad \text{eqn (4)}$$

where:
u* = friction velocity (m/s)
u^*_{10} = fastest mile of reference anemometer for period between disturbances (m/s)

Active Surface Area Calculation - WR3, ST3, LGE3, LGW3

Daily active area of each pile determined by assuming that each truck load dumped on a pile disturbs a 100 m2 area and multiplying by the number of truck loads per day. The disturbed area on the pile due to truck travel is conservatively calculated as the maximum distance a truck could travel on the pile multiplied by a 10 m wide (1-lane) pathway as determined by the Haul Road Calculator.

Pile	Yr-1			Year 7		
	Maximum Travel Distance on Pile (m)	Daily Truck Loads	Disturbed Area (m^2)	Maximum Travel Distance on Pile (m)	Daily Truck Loads	Distributed Area (m^2)
Waste Rock Impoundment (WR3)	730	13	8,600	2334	1272	150,540
Sand and Till Impoundment (ST3)	2322	231	46,320	3122	594	90,620
Low Grade Ore Stockpile - East (LGE3)	1004	126	22,640	1418	59	20,080
Low Grade Ore Stockpile - West (LGW3)	0	0	0	1893	59	24,830

Active Surface Area Calculation - Clay Impoundment (CL3)

Parameter	Year - 1	Year 7	Units	Comments
Daily Clay Tonnage	63448	37727	tonnes/day	Tonnage dumped per day
Lift Depth	2.5	2.5	m	Depth of the clay lift
Clay Density	1.71	1.71	tonne/m3	From CNC
Disturbed Area	14,842	8,825	m^2	tonnage/density/lift depth x 2 (assumed previous day also active)

Active Surface Area Calculation - Roadstone Crusher Pile (RDSC4)

Parameter	Year - 1	Year 7	Units	Comments
Total Roadstone Production	2,788,404	3,462,242	tonnes/year	
Operating time	365	365	days/year	
Daily Roadstone Production	7,639	9,486	tonnes/day	
Density of WR	2,830	2,830	kg/m3	Water has a density of 1000 kg/m3
Assumed height of storage pile	3	3	m	
Disturbed Area	900	1,117	m^2	

Parameter	Source	ID	Year -1	Year 7	Units	Reference
Active Area	WR3	Active Area_WR3	8,600	150,540	m^2	
Active Area	ST3	Active Area_ST3	46,320	90,620	m^2	
Active Area	CL3	Active Area_CL3	14,842	8,825	m^2	
Active Area	LGE3	Active Area_LGE3	22,640	20,080	m^2	
Active Area	LGW3	Active Area_LGW3	0	24,830	m^2	
Active Area	TMF3	Active Area_TMF3	0	23,000,000	m^2	Ausenco
Active Area	RDSC4	Active Area_RDSC4	900	1,117	m^2	
Height	WR3	Height _WR3	5	10	m	
Height	ST3	Height _ST3	2.5	20	m	
Height	CL3	Height _CL3	5	5	m	
Height	LGE3	Height _LGE3	5	30	m	
Height	LGW3	Height _LGW3	0	5	m	Height of Lift 1 (dumping operations are occuring
Height	TMF3	Height _TMF3	0	20	m	CNC - Max height of TMF in Year 7 approx 40-m. Average height of 20-m used in assessment.
Height	RDSC4	Height _RDSC4	3	3	m	
TFV	WR3	TFV_WR3	1.02	1.02	m/s	Table 13.2.5 of US EPA AP-42 (overburden data was used).
TFV	ST3	_ST3	1.02	1.02	m/s	
TFV	CL3	_CL3	0.55	0.55	m/s	Table 13.2.5 of US EPA AP-42 (ground coal data was assumed equivalent to clay).
TFV	LGE3	_LGE3	1.02	1.02	m/s	Table 13.2.5 of US EPA AP-42 (overburden data was used).
TFV	LGW3	_LGW3	1.02	1.02	m/s	
TFV	TMF3	_TMF3	0.742	0.742	m/s	Calculated
TFV	RDSC4	_RDSC4	1.02	1.02	m/s	Table 13.2.5 of US EPA AP-42 (overburden data was used).
TWV	WR3	TWV_WR3	19	19	m/s	Calculated - Threshold Wind Velocity
TWV	ST3	_ST3	19	19	m/s	
TWV	CL3	_CL3	10	10	m/s	
TWV	LGE3	_LGE3	19	19	m/s	
TWV	LGW3	_LGW3	19	19	m/s	
TWV	TMF3	_TMF3	14	14	m/s	Measured 10-m wind at which samples of Dumont mine tailings showed erosion (Mine Tailing Study, RWDI # 1302313-REV2, September 24, 2013)
TWV	RDSC4	_RDSC4	19	19	m/s	Calculated - Threshold Wind Velocity

Waste Rock Impoundment WR3

Wind Speed Category	Threshold Wind Velocity (m/s) @10m	Threshold Friction Velocity (m/s)	Will cause erosion?[1]	N[2]	3-second wind gust factor[3]	V_{3s} (3-second gust) (m/s)	V_{fm} (fastest mile)[4] (m/s)	Friction Velocity - U* (m/s)	Dust Control Efficiency (%)	Emissions (kg/day)			Estimated Emission Rate[3] (g/s)		
										PM	PM-10	PM-2.5	PM	PM-10	PM-2.5
0-1.54	19.2	1.02	No	1	1.53	2.4	1.62	0.09	0%	0.00	0	0	0	0	0
1.54-3.09			No			4.7	3.31	0.175		0.00	0	0	0	0	0
3.09-5.14			No			7.9	5.65	0.30		0.00	0	0	0	0	0
5.14-8.23			No			12.6	9.30	0.49		0.00	0	0	0	0	0
8.23-10.8			No			16.5	12.42	0.66		0.00	0	0	0	0	0
10.8-			Yes			26.0	20.40	1.08		15.03	8	1	**0.174**	**0.087**	**0.007**

Clay Impoundment, CL3

Wind Speed Category	Threshold Wind Velocity (m/s) @10m	Threshold Friction Velocity (m/s)	Will cause erosion?[5]	N[6]	3-second wind gust factor[7]	V_{3s} (3-second gust) (m/s)	V_{fm} (fastest mile)[8] (m/s)	Friction Velocity - U* (m/s)	Dust Control Efficiency (%)	Emissions (kg/day)			Estimated Emission Rate[7] (g/s)		
										PM	PM-10	PM-2.5	PM	PM-10	PM-2.5
0-1.54	10	0.55	No	1	1.53	2.4	1.62	0.09	0%	0.00	0	0	0	0	0
1.54-3.09			No			4.7	3.31	0.175		0.00	0	0	0	0	0
3.09-5.14			No			7.9	5.65	0.30		0.00	0	0	0	0	0
5.14-8.23			No			12.6	9.30	0.49		0.00	0	0	0	0	0
8.23-10.8			Yes			16.5	12.42	0.66		50	25	4	**0.58**	**0.29**	**0.04**
10.8-			Yes			26.0	20.40	1.08		440	220	33	**5.09**	**2.55**	**0.38**

Stockpile emissions summary (wind speed category >10.8 m/s)

Pile Location	Parameter	Quantity		Units
		Year -1	Year 7	
WR3	PM	15.03	263	kg/day
ST3	PM	81	158	
CL3	PM	440	262	
LGE3	PM	40	35	
LGW3	PM	0	43	
TMF3	PM	0	348,526	
RDSC4	PM	1.57	1.95	
WR3	PM	1.74E-01	3.04	g/s
	PM_{10}	8.70E-02	1.52	
	$PM_{2.5}$	1.30E-02	2.28E-01	
ST3	PM	9.37E-01	1.83	
	PM_{10}	4.68E-01	9.16E-01	
	$PM_{2.5}$	7.03E-02	1.37E-01	
CL3	PM	5.09	3.03	
	PM_{10}	2.55	1.51	
	$PM_{2.5}$	0.38	0.23	
LGE3	PM	4.58E-01	4.06E-01	
	PM_{10}	2.29E-01	2.03E-01	
	$PM_{2.5}$	3.43E-02	3.05E-02	
LGW3	PM	0	5.02E-01	
	PM_{10}	0	2.51E-01	
	$PM_{2.5}$	0	3.77E-02	
TMF3	PM	0	4033.86	
	PM_{10}	0	2016.93	
	$PM_{2.5}$	0	302.54	
RDSC4	PM	1.82E-02	2.26E-02	
	PM_{10}	9.10E-03	1.13E-02	
	$PM_{2.5}$	1.36E-03	1.69E-03	

Notes:
1. For these calculations, only wind speeds over 10.8 m/s will cause erosion. Since the other stockpiles are subject to the same criteria, subsequent calculations for other stockpiles will only show emissions for this wind speed category
2. N - Number of disturbances. The calculations presented are for 1 disturbance event. The AERMOD model will use variable emissions to account for the number of times the threshold friction velocity is met.
3. Used to convert the upper end of each wind speed category into the highest sustained gust over a 3-second period within 1 hour. Figure C6-4 from ASCE7-05. *Minimum Design Loads for Buildings and Other Structures.* For wind speed category >10.8m/s, a wind speed of 17m/s was selected to have a friction velocity greater than the threshold friction velocity.
4. Fastest mile calculated from the upper end hourly mean wind speed in each range using the Durst Curve provided in ASCE 7-05.

Stockpile emissions summary (wind speed category 8.23 - 10.8 m/s)

Pile Location	Parameter	Quantity		Units
		Year -1	Year 7	
CL3	PM	50.26	29.88	kg/day
	PM_{10}	25.13	14.94	
	$PM_{2.5}$	3.77	2.24	
CL3	PM	5.82E-01	3.46E-01	g/s
	PM_{10}	2.91E-01	1.73E-01	
	$PM_{2.5}$	4.36E-02	2.59E-02	

Notes

1. For these calculations, only wind speeds between 8.23m/s and 10.8m/s and over 10.8 m/s will cause erosion on the Clay impoundment stockpile only due to the lower threshold friction velocity
2. N - Number of disturbances. The calculations presented are for 1 disturbance event. The AERMOD model will use variable emissions to account for the number of times the threshold friction velocity is met.
3. Used to convert the upper end of each wind speed category into the highest sustained gust over a 3-second period within 1 hour. Figure C6-4 from ASCE7-05. *Minimum Design Loads for Buildings and Other Structures.*
4. Fastest mile calculated from the upper end hourly mean wind speed in each range using the Durst Curve provided in ASCE 7-05.

Sample Calculation PM emissions (WR3):

Erosion Potential= 58(1.08 - 1.02)^2 + 25 (1.08 - 1.02) = 1.75 g/m^2

Emission Factor = 1.75 g/m^2 x 8,600 m^2 x 1/1000 kg/g= 15.03 kg/day

PM Emission Rate (g/s) = 15.03 kg/day * 1/3600 hr/s * 1/24 Day/Hours * 1000g/kg 1.74E-01 g/s

Data Quality: Marginal

The data quality of the emission calculation is assumed to be "Marginal".

Operating Condition, Individual Maximum Rates of Production:

The emission rate calculation for this source is based on the trucks operating continuously at its maximum production rate. The calculated emission rate should be conservative.

Summary of Storage Pile and TMF Wind Erosion Emissions

CoPC	CAS	Units	Year -1							Year 7						
			WR3	ST3	CL3	LGE3	LGW3	TMF3	RDSC4	WR3	ST3	CL3	LGE3	LGW3	TMF3	RDSC4
PM	<<PM>>	g/s	1.74E-01	9.37E-01	5.09	4.58E-01	0	0	1.82E-02	3.04	1.83	3.03	4.06E-01	5.02E-01	4033.86	2.26E-02
PM_{10}	<<PM10>>	g/s	8.70E-02	4.68E-01	2.55	2.29E-01	0	0	9.10E-03	1.52	0.92	1.51	2.03E-01	2.51E-01	2016.93	1.13E-02
$PM_{2.5}$	<<PM2.5>>	g/s	1.30E-02	7.03E-02	0.38	3.43E-02	0	0	1.36E-03	0.23	0.14	0.23	3.05E-02	3.77E-02	302.54	1.69E-03
Fluoride	7664-39-3	g/s	3.76E-08	2.25E-06	1.22E-05	8.24E-08	0.00E+00	0.00E+00	3.93E-09	6.40E-07	4.40E-06	7.27E-06	7.31E-08	9.04E-08	0.00E+00	4.75E-09
Chromium VI	18540-29-9	g/s	3.46E-10	5.81E-09	3.16E-08	5.92E-10	0.00E+00	0.00E+00	3.62E-11	2.71E-09	1.14E-08	1.88E-08	5.19E-10	6.42E-10	0.00E+00	2.01E-11
Mercury	7439-97-6	g/s	5.22E-12	3.93E-11	2.14E-10	1.63E-11	0.00E+00	0.00E+00	5.46E-13	9.13E-11	7.70E-11	1.27E-10	1.43E-11	1.77E-11	1.01E-04	6.78E-13
Aluminum	7429-90-5	g/s	1.16E-02	4.26E-02	2.32E-01	3.65E-03	0.00E+00	0.00E+00	1.21E-03	2.31E-01	8.34E-02	1.38E-01	3.99E-03	4.94E-03	1.17E+01	1.71E-03
Silver	7440-22-4	g/s	4.35E-08	2.34E-07	1.27E-06	1.14E-07	0.00E+00	0.00E+00	4.55E-09	7.61E-07	4.58E-07	7.57E-07	1.02E-07	1.26E-07	2.02E-03	5.65E-09
Arsenic	7440-38-2	g/s	6.55E-07	2.17E-06	1.18E-05	1.98E-06	0.00E+00	0.00E+00	6.85E-08	1.87E-05	4.25E-06	7.02E-06	2.50E-06	3.09E-06	1.01E-03	1.39E-07
Barium	7440-39-3	g/s	2.43E-05	3.34E-04	1.82E-03	1.35E-05	0.00E+00	0.00E+00	2.55E-06	6.91E-04	6.54E-04	1.08E-03	1.74E-05	2.15E-05	3.27E-03	5.13E-06
Beryllium	7440-41-7	g/s	5.07E-08	7.91E-07	4.30E-06	2.54E-08	0.00E+00	0.00E+00	5.30E-09	1.76E-06	1.55E-06	2.56E-06	2.91E-08	3.60E-08	7.87E-05	1.32E-08
Boron	7440-42-8	g/s	3.00E-06	0.00E+00	0.00E+00	9.12E-06	0.00E+00	-	3.14E-07	7.93E-05	0.00E+00	0.00E+00	7.71E-06	9.53E-06	-	5.89E-07
Bismuth	7440-69-9	g/s	1.69E-08	1.54E-07	8.35E-07	2.06E-08	0.00E+00	0.00E+00	1.77E-09	5.01E-07	3.01E-07	4.97E-07	1.83E-08	2.26E-08	1.82E-04	3.72E-09
Calcium	7440-70-2	g/s	1.09E-02	7.90E-02	4.29E-01	6.10E-03	0.00E+00	0.00E+00	1.14E-03	1.19E-01	1.54E-01	2.55E-01	6.56E-03	8.11E-03	8.55E+00	8.86E-04
Cadmium	7440-43-9	g/s	1.33E-08	1.16E-07	6.33E-07	1.24E-08	0.00E+00	0.00E+00	1.39E-09	3.35E-07	2.28E-07	3.76E-07	1.23E-08	1.52E-08	4.03E-05	2.48E-09
Cobalt	7440-48-4	g/s	8.14E-06	7.21E-06	3.92E-05	5.54E-05	0.00E+00	0.00E+00	8.52E-07	8.80E-05	1.41E-05	2.33E-05	4.83E-05	5.97E-05	2.79E-01	6.53E-07
Chromium	7440-47-3	g/s	9.65E-05	4.36E-05	2.37E-04	6.15E-04	0.00E+00	0.00E+00	1.01E-05	5.95E-04	8.53E-05	1.41E-04	5.37E-04	6.64E-04	7.06E+00	4.42E-06
Copper	7440-50-8	g/s	1.51E-05	1.87E-05	1.02E-04	1.96E-05	0.00E+00	0.00E+00	1.58E-06	1.78E-04	3.66E-05	6.04E-05	1.80E-05	2.23E-05	1.84E-01	1.32E-06
Iron	7439-89-6	g/s	8.78E-03	1.88E-02	1.02E-01	3.03E-02	0.00E+00	0.00E+00	9.19E-04	1.45E-01	3.67E-02	6.07E-02	2.71E-02	3.35E-02	1.37E+02	1.07E-03
Potassium	7440-09-7	g/s	8.42E-04	1.40E-02	7.61E-02	2.20E-04	0.00E+00	0.00E+00	8.81E-05	2.59E-02	2.74E-02	4.53E-02	2.33E-04	2.88E-04	1.73E-01	1.92E-04
Lithium	7439-93-2	g/s	1.96E-06	2.04E-05	1.11E-04	1.57E-06	0.00E+00	0.00E+00	2.05E-07	3.60E-05	3.99E-05	6.59E-05	1.86E-06	2.30E-06	4.03E-03	2.67E-07
Magnesium	7439-95-4	g/s	1.12E-02	2.18E-02	1.19E-01	9.73E-02	0.00E+00	0.00E+00	1.17E-03	8.31E-02	4.27E-02	7.05E-02	8.40E-02	1.04E-01	9.68E+02	6.17E-04
Manganese	7439-96-5	g/s	1.69E-04	3.66E-04	1.99E-03	4.63E-04	0.00E+00	0.00E+00	1.77E-05	2.54E-03	7.16E-04	1.18E-03	4.18E-04	5.17E-04	3.06E+00	1.88E-05
Molybdenum	7439-98-7	g/s	1.12E-07	5.62E-07	3.06E-06	8.03E-08	0.00E+00	0.00E+00	1.17E-08	2.82E-06	1.10E-06	1.82E-06	8.36E-08	1.03E-07	2.92E-03	2.09E-08
Silicon	7440-21-3	g/s	1.41E-03	0.00E+00	0.00E+00	1.43E-03	0.00E+00	-	1.48E-04	3.41E-02	0.00E+00	0.00E+00	1.23E-03	1.52E-03	-	2.53E-04
Sodium	7440-23-5	g/s	2.53E-03	0.00E+00	0.00E+00	5.12E-05	0.00E+00	0.00E+00	2.65E-04	7.85E-02	0.00E+00	0.00E+00	4.60E-05	5.69E-05	2.46E-01	5.83E-04
Nickel	7440-02-0	g/s	4.83E-05	1.97E-05	1.07E-04	9.70E-04	0.00E+00	0.00E+00	5.05E-06	3.93E-04	3.86E-05	6.38E-05	8.23E-04	1.02E-03	4.94E+00	2.92E-06
Lead	7439-92-1	g/s	3.01E-07	9.24E-06	5.02E-05	2.04E-07	0.00E+00	0.00E+00	3.15E-08	1.04E-05	1.81E-05	2.99E-05	1.98E-07	2.45E-07	1.56E-03	7.72E-08
Antimony	7440-36-0	g/s	7.57E-08	3.75E-07	2.04E-06	1.87E-07	0.00E+00	0.00E+00	7.92E-09	1.31E-06	7.33E-07	1.21E-06	1.67E-07	2.06E-07	1.21E-02	9.76E-09
Selenium	7782-49-2	g/s	5.19E-08	4.50E-07	2.44E-06	1.28E-07	0.00E+00	0.00E+00	5.43E-09	9.26E-07	8.80E-07	1.45E-06	1.12E-07	1.39E-07	1.41E-03	6.87E-09
Tin	7440-31-5	g/s	5.66E-07	4.59E-06	2.49E-05	1.50E-06	0.00E+00	0.00E+00	5.93E-08	1.04E-05	8.97E-06	1.48E-05	1.32E-06	1.64E-06	1.01E-03	7.69E-08
Strontium	7440-24-6	g/s	2.11E-05	1.95E-04	1.06E-03	1.36E-05	0.00E+00	0.00E+00	2.21E-06	4.60E-04	3.82E-04	6.32E-04	1.41E-05	1.75E-05	6.45E-03	3.42E-06
Titanium	7440-32-6	g/s	3.38E-04	1.68E-03	9.15E-03	2.03E-04	0.00E+00	0.00E+00	3.54E-05	9.17E-03	3.29E-03	5.44E-03	2.19E-04	2.71E-04	4.68E-01	6.80E-05
Thallium	7440-28-0	g/s	7.92E-09	2.51E-07	1.36E-06	1.01E-08	0.00E+00	0.00E+00	8.29E-10	2.29E-07	4.91E-07	8.12E-07	9.51E-09	1.18E-08	4.03E-05	1.70E-09
Uranium	7440-61-1	g/s	3.32E-08	1.28E-06	6.95E-06	1.35E-08	0.00E+00	0.00E+00	3.48E-09	1.20E-06	2.50E-06	4.13E-06	1.49E-08	1.84E-08	3.73E-05	8.91E-09
Vanadium	7440-62-2	g/s	1.92E-05	4.38E-05	2.38E-04	1.29E-05	0.00E+00	0.00E+00	2.00E-06	3.48E-04	8.56E-05	1.41E-04	1.33E-05	1.65E-05	6.35E-02	2.58E-06
Tungsten	7440-33-7	g/s	6.35E-08	0.00E+00	0.00E+00	3.95E-08	0.00E+00	-	6.65E-09	1.73E-06	0.00E+00	0.00E+00	3.49E-08	4.32E-08	-	1.28E-08
Yttrium	7440-65-5	g/s	1.40E-06	9.37E-06	5.09E-05	7.99E-07	0.00E+00	0.00E+00	1.47E-07	3.97E-05	1.83E-05	3.03E-05	8.35E-07	1.03E-06	3.66E-03	2.95E-07
Zinc	7440-66-6	g/s	9.31E-06	3.57E-05	1.94E-04	2.00E-05	0.00E+00	0.00E+00	9.74E-07	2.26E-04	6.98E-05	1.15E-04	1.84E-05	2.27E-05	6.96E-02	1.68E-06
Thorium	7440-29-1	g/s	2.37E-07	0.00E+00	0.00E+00	2.34E-07	0.00E+00	-	2.48E-08	6.64E-06	0.00E+00	0.00E+00	1.95E-07	2.41E-07	-	4.93E-08
Quartz (in PM10)	14808-60-7	g/s	8.68E-03	4.68E-02	2.54E-01	4.06E-03	0.00E+00	0.00E+00	9.08E-04	3.49E-01	9.15E-02	1.51E-01	5.48E-03	6.77E-03	2.54E-01	2.59E-03
Pyrite	12068-85-8	g/s	1.13E-07	6.09E-07	3.31E-06	4.83E-08	0.00E+00	0.00E+00	1.18E-08	4.62E-06	1.19E-06	1.97E-06	6.73E-08	8.32E-08	3.11E-02	3.43E-08
Biotite	1302-27-8	g/s	1.01E-03	5.42E-03	2.95E-02	3.06E-04	0.00E+00	-	1.05E-04	2.67E-02	1.06E-02	1.75E-02	4.21E-04	5.20E-04	-	1.98E-04
Magnetite	1309-38-2	g/s	1.97E-03	1.06E-02	5.76E-02	4.68E-02	0.00E+00	0.00E+00	2.06E-04	2.50E-02	2.07E-02	3.43E-02	3.92E-02	4.85E-02	9.91E+01	1.86E-04
Hematite	1317-60-8	g/s	1.24E-04	6.70E-04	3.64E-03	5.32E-05	0.00E+00	-	1.30E-05	5.08E-03	1.31E-03	2.17E-03	7.40E-05	9.16E-05	-	3.77E-05
Chlorite	1318-59-8	g/s	1.67E-02	8.97E-02	4.88E-01	2.51E-02	0.00E+00	0.00E+00	1.74E-03	2.37E-01	1.76E-01	2.90E-01	2.37E-02	2.93E-02	2.98E+01	1.76E-03
Muscovite	1318-94-1	g/s	8.01E-03	4.31E-02	2.34E-01	3.00E-03	0.00E+00	-	8.38E-04	2.73E-01	8.44E-02	1.39E-01	4.12E-03	5.10E-03	-	2.03E-03
Talc (fibrous)	14807-96-6	g/s	5.66E-04	3.05E-03	1.66E-02	2.42E-04	0.00E+00	0.00E+00	5.92E-05	2.31E-02	5.96E-03	9.85E-03	3.37E-04	4.16E-04	5.21E-01	1.71E-04
Phosphorus	7723-14-0	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	2.42E-05	9.87E-06	5.37E-05	4.85E-04	0.00E+00	0.00E+00	2.53E-06	1.97E-04	1.93E-05	3.19E-05	4.11E-04	5.09E-04	2.47E+00	1.46E-06
Uranium (in PM10)	<<U_PM10>>	g/s	1.66E-08	6.39E-07	3.47E-06	6.74E-09	0.00E+00	0.00E+00	1.74E-09	6.00E-07	1.25E-06	2.07E-06	7.45E-09	9.22E-09	1.87E-05	4.45E-09
Chrysotile Asbestos	132207-32-0	g/s	2.17E-04	1.17E-03	6.36E-03	6.29E-03	0.00E+00	0.00E+00	2.27E-05	1.47E-03	8.85E-04	1.46E-03	5.24E-03	6.48E-03	5.21E+01	1.09E-05
Manganese (in PM10)	<<Mn_PM10>>	g/s	8.44E-05	1.83E-04	9.96E-04	2.31E-04	0.00E+00	0.00E+00	8.83E-06	1.27E-03	3.58E-04	5.92E-04	2.09E-04	2.59E-04	1.53E+00	9.42E-06
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	1.27E-05	2.75E-05	1.49E-04	3.47E-05	0.00E+00	0.00E+00	1.32E-06	1.90E-04	5.37E-05	8.88E-05	3.14E-05	3.88E-05	2.29E-01	1.41E-06
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	1.73E-10	2.90E-09	1.58E-08	2.96E-10	0.00E+00	0.00E+00	1.81E-11	1.35E-09	5.68E-09	9.39E-09	2.59E-10	3.21E-10	0.00E+00	1.00E-11

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from the roadstone crushing process include the following:
1) Emissions from truck dump to roadstone crusher (RDSC1A), material drop to finished stockpile (RDSC1B) and loading finished product to truck (RDSC1C) - assumes RDSC1A occurs outside of primary crusher building
2) Primary crushing (jaw crusher) (RDSC2)
3) Secondary crushing (cone crusher) and screening (RDSC3)

Source : Truck Unloading/Loading and Material Transfers (RDSC1A, RDSC1B and RDSC1C)

Description:
Truck unloading rock to roadstone crusher, conveyor loading to intermediate storage pile and then re-loading crushed stone to haul truck

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NO_x, VOCs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table RC-1: RC Unloading Input Parameters

Parameter	Year -1			Year 7			Unit	Reference
	Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C	Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C		
Max 24 Hour Production Factor	1.17	1.17	1.17	1.03	1.03	1.03		assuming similar factor to comeup with a worst case day
Material Handling Rate	2,788,404	2,788,404	2,788,404	3,462,242	3,462,242	3,462,242	tonnes/year	
Waste Rock Moisture Content	3	3	3	3	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 16.2, Table 16-1
Mean wind speed (U)	3.29	3.29	3.29	3.29	3.29	3.29	m/s	5-year average wind speed from the site specific meteorological dataset
Operating time	8760	8760	8760	8760	8760	8760	hours/year	
	365	365	365	365	365	365	day/year	
Hours of Operation per day	24	24	24	24	24	24	hours	
Control Efficiency	50%	50%	50%	50%	50%	50%	%	Assumed partially enclosed/drop heights minimized
Calculated PM Emissions	5.05E+00	5.05E+00	5.05E+00	5.52E+00	5.52E+00	5.52E+00	kg/day	
Calculated PM_{10} Emissions	2.39E+00	2.39E+00	2.39E+00	2.61E+00	2.61E+00	2.61E+00	kg/day	
Calculated $PM_{2.5}$ Emissions	3.61E-01	3.61E-01	3.61E-01	3.95E-01	3.95E-01	3.95E-01	kg/day	
Calculated PM Emissions	5.84E-02	5.84E-02	5.84E-02	6.39E-02	6.39E-02	6.39E-02	g/s	
Calculated PM_{10} Emissions	2.76E-02	2.76E-02	2.76E-02	3.02E-02	3.02E-02	3.02E-02	g/s	
Calculated $PM_{2.5}$ Emissions	4.18E-03	4.18E-03	4.18E-03	4.57E-03	4.57E-03	4.57E-03	g/s	

Notes:
1. Conservatively assumed uncontrolled and operating for 24hr/day for a worst-case scenario
2. Total Emissions include truck unloading to the portable crusher and conveyor loading to stock pile and loading to haul truck .
3. Emission factor for speciated metals are based on waste rock composition data.

Sample Calculation - PM emissions:
Emission factor (kg/tonne) = 1 x 0.0016 x (3.29/2.2)^1.3 / (3/2)^1.4 = 1.53E-03 kg/tonne
E/k (kg/hr) = 2,788,404 tonne/yr x 1.53E-03 kg/tonne x 1 yr/8760 hrs x (1-0.5) = 0.2436 kg/hr
PM short-term emission rate (g/s) = 0.244 kg/hr x 0.74 x 1.17 x 1000 g/kg / 3600 s/hr = 5.84E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the typical daily maximum production rate. The calculated emission rate should be conservative.

Table RC-2: Summary of Emissions from Truck Unloading and Material Transfers at Roadstone Crusher:

CoPC	CAS	Material Speciation Factor for Haul Roads	Year - 1			Year 7		
			Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C	Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C
			(g/s)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
PM	<<PM>>	-	5.84E-02	5.84E-02	5.84E-02	6.39E-02	6.39E-02	6.39E-02
PM_{10}	<<PM10>>	-	2.76E-02	2.76E-02	2.76E-02	3.02E-02	3.02E-02	3.02E-02
$PM_{2.5}$	<<PM2.5>>	-	4.18E-03	4.18E-03	4.18E-03	4.57E-03	4.57E-03	4.57E-03
Fluoride	7664-39-3		-	-	-	-	-	-
Chromium VI	18540-29-9		-	-	-	-	-	-
Mercury	7439-97-6		-	-	-	-	-	-
Aluminum	7429-90-5	7.41E-02	4.33E-03	4.33E-03	4.33E-03	4.73E-03	4.73E-03	4.73E-03
Silver	7440-22-4	2.50E-07	1.46E-08	1.46E-08	1.46E-08	1.60E-08	1.60E-08	1.60E-08
Arsenic	7440-38-2	2.28E-06	1.33E-07	1.33E-07	1.33E-07	1.46E-07	1.46E-07	1.46E-07
Barium	7440-39-3	9.66E-05	5.64E-06	5.64E-06	5.64E-06	6.17E-06	6.17E-06	6.17E-06
Beryllium	7440-41-7	6.74E-08	3.94E-09	3.94E-09	3.94E-09	4.31E-09	4.31E-09	4.31E-09
Boron	7440-42-8	7.76E-06	4.53E-07	4.53E-07	4.53E-07	4.95E-07	4.95E-07	4.95E-07
Bismuth	7440-69-9	4.66E-08	2.72E-09	2.72E-09	2.72E-09	2.98E-09	2.98E-09	2.98E-09
Calcium	7440-70-2	9.07E-02	5.30E-03	5.30E-03	5.30E-03	5.79E-03	5.79E-03	5.79E-03
Cadmium	7440-43-9	5.13E-08	3.00E-09	3.00E-09	3.00E-09	3.28E-09	3.28E-09	3.28E-09
Cobalt	7440-48-4	4.49E-05	2.62E-06	2.62E-06	2.62E-06	2.87E-06	2.87E-06	2.87E-06
Chromium	7440-47-3	5.19E-04	3.03E-05	3.03E-05	3.03E-05	3.31E-05	3.31E-05	3.31E-05
Copper	7440-50-8	1.03E-04	6.04E-06	6.04E-06	6.04E-06	6.60E-06	6.60E-06	6.60E-06
Iron	7439-89-6	4.35E-02	2.54E-03	2.54E-03	2.54E-03	2.78E-03	2.78E-03	2.78E-03
Potassium	7440-09-7	2.68E-03	1.57E-04	1.57E-04	1.57E-04	1.71E-04	1.71E-04	1.71E-04
Lithium	7439-93-2	1.24E-05	7.21E-07	7.21E-07	7.21E-07	7.89E-07	7.89E-07	7.89E-07
Magnesium	7439-95-4	7.02E-02	4.10E-03	4.10E-03	4.10E-03	4.49E-03	4.49E-03	4.49E-03
Manganese	7439-96-5	9.47E-04	5.53E-05	5.53E-05	5.53E-05	6.04E-05	6.04E-05	6.04E-05
Molybdenum	7439-98-7	5.30E-07	3.10E-08	3.10E-08	3.10E-08	3.39E-08	3.39E-08	3.39E-08
Silicon	7440-21-3	5.02E-03	2.93E-04	2.93E-04	2.93E-04	3.21E-04	3.21E-04	3.21E-04
Sodium	7440-23-5	8.00E-03	4.67E-04	4.67E-04	4.67E-04	5.11E-04	5.11E-04	5.11E-04
Nickel	7440-02-0	2.14E-04	1.25E-05	1.25E-05	1.25E-05	1.37E-05	1.37E-05	1.37E-05
Lead	7439-92-1	4.55E-07	2.66E-08	2.66E-08	2.66E-08	2.91E-08	2.91E-08	2.91E-08
Antimony	7440-36-0	4.18E-07	2.44E-08	2.44E-08	2.44E-08	2.67E-08	2.67E-08	2.67E-08
Selenium	7782-49-2	2.87E-07	1.68E-08	1.68E-08	1.68E-08	1.83E-08	1.83E-08	1.83E-08
Tin	7440-31-5	3.13E-06	1.83E-07	1.83E-07	1.83E-07	2.00E-07	2.00E-07	2.00E-07
Strontium	7440-24-6	1.28E-04	7.48E-06	7.48E-06	7.48E-06	8.18E-06	8.18E-06	8.18E-06
Titanium	7440-32-6	1.17E-03	6.81E-05	6.81E-05	6.81E-05	7.44E-05	7.44E-05	7.44E-05
Thallium	7440-28-0	2.46E-08	1.44E-09	1.44E-09	1.44E-09	1.57E-09	1.57E-09	1.57E-09
Uranium	7440-61-1	3.59E-08	2.10E-09	2.10E-09	2.10E-09	2.29E-09	2.29E-09	2.29E-09
Vanadium	7440-62-2	1.14E-04	6.65E-06	6.65E-06	6.65E-06	7.27E-06	7.27E-06	7.27E-06
Tungsten	7440-33-7	1.21E-07	7.07E-09	7.07E-09	7.07E-09	7.73E-09	7.73E-09	7.73E-09
Yttrium	7440-65-5	4.48E-06	2.62E-07	2.62E-07	2.62E-07	2.86E-07	2.86E-07	2.86E-07
Zinc	7440-66-6	3.38E-05	1.98E-06	1.98E-06	1.98E-06	2.16E-06	2.16E-06	2.16E-06
Thorium	7440-29-1	6.80E-07	3.97E-08	3.97E-08	3.97E-08	4.34E-08	4.34E-08	4.34E-08
Quartz (in PM10)	14808-60-7	1.33E-03	3.66E-05	3.66E-05	3.66E-05	4.00E-05	4.00E-05	4.00E-05
Pyrite	12068-85-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biotite	1302-27-8	4.88E-03	2.85E-04	2.85E-04	2.85E-04	3.11E-04	3.11E-04	3.11E-04
Magnetite	1309-38-2	3.43E-03	2.00E-04	2.00E-04	2.00E-04	2.19E-04	2.19E-04	2.19E-04
Hematite	1317-60-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorite	1318-59-8	1.12E-01	6.54E-03	6.54E-03	6.54E-03	7.15E-03	7.15E-03	7.15E-03
Muscovite	1318-94-1	1.62E-02	9.46E-04	9.46E-04	9.46E-04	1.03E-03	1.03E-03	1.03E-03
Talc (fibrous)	14807-96-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0		-	-	-	-	-	-
Platinum	7440-06-4		-	-	-	-	-	-
Palladium	7440-05-3		-	-	-	-	-	-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04	5.92E-06	5.92E-06	5.92E-06	6.47E-06	6.47E-06	6.47E-06
Uranium (in PM10)	<<U_PM10>>	3.59E-08	9.92E-10	9.92E-10	9.92E-10	1.09E-09	1.09E-09	1.09E-09
Chrysotile Asbestos	132207-32-0	2.49E-06	1.45E-07	1.45E-07	1.45E-07	1.59E-07	1.59E-07	1.59E-07
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04	2.61E-05	2.61E-05	2.61E-05	2.86E-05	2.86E-05	2.86E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04	3.96E-06	3.96E-06	3.96E-06	4.33E-06	4.33E-06	4.33E-06
Chromium VI (in PM10)	<<Cr6_PM10>>		-	-	-	-	-	-

Source : Primary crushing (jaw crusher) (RDSC2)

Description:
Primary crushing of waste rock using a jaw crusher

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and speciated metal emissions.

Methodology: Emission Factor (EF)
Emission factors for primary crushing were based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing

Table RC3: Summary of Primary Crushing at Road Stone Crusher:

CoPC	CAS	Emission Factor Kg/tonne [1]	Control Efficiency (%) [2]	Year -1		Year 7	
				Material Handled tonne/year	Total Emissions g/s	Material Handled tonne/year	Total Emissions g/s
PM	<<PM>>	0.2	90%	2,788,404	1.77	3,462,242	2.20
PM_{10}	<<PM10>>	0.02	90%	2,788,404	0.18	3,462,242	0.22
$PM_{2.5}$	<<PM2.5>>	0.015	90%	2,788,404	0.13	3,462,242	0.16
Speciated Metals	**CAS**	**Material Speciation Factor for Haul Roads**			**Year -1 Total Emissions g/s**		**Year 7 Total Emissions g/s**
Fluoride	7664-39-3				-		-
Chromium VI	18540-29-9				-		-
Mercury	7439-97-6				-		-
Aluminum	7429-90-5	7.41E-02			1.31E-01		1.63E-01
Silver	7440-22-4	2.50E-07			4.42E-07		5.49E-07
Arsenic	7440-38-2	2.28E-06			4.03E-06		5.00E-06
Barium	7440-39-3	9.66E-05			1.71E-04		2.12E-04
Beryllium	7440-41-7	6.74E-08			1.19E-07		1.48E-07
Boron	7440-42-8	7.76E-06			1.37E-05		1.70E-05
Bismuth	7440-69-9	4.66E-08			8.25E-08		1.02E-07
Calcium	7440-70-2	9.07E-02			1.60E-01		1.99E-01
Cadmium	7440-43-9	5.13E-08			9.08E-08		1.13E-07
Cobalt	7440-48-4	4.49E-05			7.94E-05		9.86E-05
Chromium	7440-47-3	5.19E-04			9.18E-04		1.14E-03
Copper	7440-50-8	1.03E-04			1.83E-04		2.27E-04
Iron	7439-89-6	4.35E-02			7.70E-02		9.56E-02
Potassium	7440-09-7	2.68E-03			4.74E-03		5.88E-03
Lithium	7439-93-2	1.24E-05			2.18E-05		2.71E-05
Magnesium	7439-95-4	7.02E-02			1.24E-01		1.54E-01
Manganese	7439-96-5	9.47E-04			1.67E-03		2.08E-03
Molybdenum	7439-98-7	5.30E-07			9.38E-07		1.16E-06
Silicon	7440-21-3	5.02E-03			8.88E-03		1.10E-02
Sodium	7440-23-5	8.00E-03			1.41E-02		1.76E-02
Nickel	7440-02-0	2.14E-04			3.79E-04		4.71E-04
Lead	7439-92-1	4.55E-07			8.05E-07		1.00E-06
Antimony	7440-36-0	4.18E-07			7.40E-07		9.18E-07
Selenium	7782-49-2	2.87E-07			5.08E-07		6.31E-07
Tin	7440-31-5	3.13E-06			5.54E-06		6.87E-06
Strontium	7440-24-6	1.28E-04			2.27E-04		2.81E-04
Titanium	7440-32-6	1.17E-03			2.06E-03		2.56E-03
Thallium	7440-28-0	2.46E-08			4.36E-08		5.41E-08
Uranium	7440-61-1	3.59E-08			6.35E-08		7.89E-08
Vanadium	7440-62-2	1.14E-04			2.01E-04		2.50E-04
Tungsten	7440-33-7	1.21E-07			2.14E-07		2.66E-07
Yttrium	7440-65-5	4.48E-06			7.92E-06		9.83E-06
Zinc	7440-66-6	3.38E-05			5.98E-05		7.43E-05
Thorium	7440-29-1	6.80E-07			1.20E-06		1.49E-06
Quartz (in PM10)	14808-60-7	1.33E-03			2.34E-04		2.91E-04
Pyrite	12068-85-8	0.00E+00			0.00E+00		0.00E+00
Biotite	1302-27-8	4.88E-03			8.62E-03		1.07E-02
Magnetite	1309-38-2	3.43E-03			6.06E-03		7.52E-03
Hematite	1317-60-8	0.00E+00			0.00E+00		0.00E+00
Chlorite	1318-59-8	1.12E-01			1.98E-01		2.46E-01
Muscovite	1318-94-1	1.62E-02			2.86E-02		3.56E-02
Talc (fibrous)	14807-96-6	0.00E+00			0.00E+00		0.00E+00
Phosphorus	7723-14-0				-		-
Platinum	7440-06-4				-		-
Palladium	7440-05-3				-		-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04			3.79E-05		4.71E-05
Uranium (in PM10)	<<U_PM10>>	3.59E-08			6.35E-09		7.89E-09
Chrysotile Asbestos	132207-32-0	2.49E-06			4.40E-06		5.46E-06
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04			1.67E-04		2.08E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04			1.26E-04		1.56E-04
Chromium VI (in PM10)	<<Cr6_PM10>>				-		-

Notes:
1. Emission factors are from US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing for a low moisture content (<4%) ore. $PM_{2.5}$ emission factors are not provided in Table 11.24-1. The particle size multiplier for $PM_{2.5}$ in AP42 Chap 13.2.5 Industrial Wind Erosion chapter is conservatively assumed as PM2.5 emission factor.

2. Emission control due to enclosure of unit

Sample Calculation - PM emissions:
PM emissions (kg/hr) = EF (kg/tonne) x Material Handled (tonnes/yr) x 1yr/8760hours x (1-0) 6.3662 kg/hr
PM short-term emission rate (g/s) = 63.66 kg/hr x 1000 g/kg / 3600 s/hr = 1.77 g/s

Data Quality: Average
The emission factor calculation methodology has a US EPA data rating of "C" based on the AP-42 Chapter 11.24. This gives a MECP data quality of "Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the typical daily maximum production rate. The calculated emission rate should be conservative.

Source : Secondary crushing (cone crusher) and screening (RDSC3)

Description:
Secondary crushing of waste rock using a cone crusher

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and speciated metal emissions.

Methodology: Emission Factor (EF)
Emission factors for primary crushing were based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing

Table RC4: Summary of Secondary Crushing at Road Stone Crusher:

CoPC	CAS	Emission Factor for Secondary Crushing kg/tonne [1]	Emission Factor for Screening kg/tonne [2]	Control Efficiency (%) [3]	Year -1		Year 7	
					Material Handled tonne/year	Total Emissions	Material Handled tonne/year	Total Emissions
PM	<<PM>>	0.6	0.0011	90%	2,788,404	5.31	3,462,242	6.60
PM_{10}	<<PM10>>	0.06	0.00037	90%	2,788,404	0.53	3,462,242	0.66
$PM_{2.5}$	<<PM2.5>>	0.045	0.000025	90%	2,788,404	0.40	3,462,242	0.49
Speciated Metals	**CAS**	**Material Speciation Factor for Haul Roads**				**Year -1 Total Emissions**		**Year 7 Total Emissions**
Fluoride	7664-39-3					-		-
Chromium VI	18540-29-9					-		-
Mercury	7439-97-6					-		-
Aluminum	7429-90-5	7.41E-02				3.94E-01		4.89E-01
Silver	7440-22-4	2.50E-07				1.33E-06		1.65E-06
Arsenic	7440-38-2	2.28E-06				1.21E-05		1.50E-05
Barium	7440-39-3	9.66E-05				5.14E-04		6.38E-04
Beryllium	7440-41-7	6.74E-08				3.58E-07		4.45E-07
Boron	7440-42-8	7.76E-06				4.12E-05		5.12E-05
Bismuth	7440-69-9	4.66E-08				2.48E-07		3.08E-07
Calcium	7440-70-2	9.07E-02				4.82E-01		5.99E-01
Cadmium	7440-43-9	5.13E-08				2.73E-07		3.39E-07
Cobalt	7440-48-4	4.49E-05				2.39E-04		2.96E-04
Chromium	7440-47-3	5.19E-04				2.76E-03		3.42E-03
Copper	7440-50-8	1.03E-04				5.50E-04		6.83E-04
Iron	7439-89-6	4.35E-02				2.31E-01		2.87E-01
Potassium	7440-09-7	2.68E-03				1.42E-02		1.77E-02
Lithium	7439-93-2	1.24E-05				6.56E-05		8.15E-05
Magnesium	7439-95-4	7.02E-02				3.73E-01		4.64E-01
Manganese	7439-96-5	9.47E-04				5.03E-03		6.25E-03
Molybdenum	7439-98-7	5.30E-07				2.82E-06		3.50E-06
Silicon	7440-21-3	5.02E-03				2.67E-02		3.32E-02
Sodium	7440-23-5	8.00E-03				4.25E-02		5.28E-02
Nickel	7440-02-0	2.14E-04				1.14E-03		1.41E-03
Lead	7439-92-1	4.55E-07				2.42E-06		3.01E-06
Antimony	7440-36-0	4.18E-07				2.22E-06		2.76E-06
Selenium	7782-49-2	2.87E-07				1.53E-06		1.90E-06
Tin	7440-31-5	3.13E-06				1.66E-05		2.07E-05
Strontium	7440-24-6	1.28E-04				6.81E-04		8.45E-04
Titanium	7440-32-6	1.17E-03				6.20E-03		7.69E-03
Thallium	7440-28-0	2.46E-08				1.31E-07		1.63E-07
Uranium	7440-61-1	3.59E-08				1.91E-07		2.37E-07
Vanadium	7440-62-2	1.14E-04				6.06E-04		7.52E-04
Tungsten	7440-33-7	1.21E-07				6.44E-07		7.99E-07
Yttrium	7440-65-5	4.48E-06				2.38E-05		2.96E-05
Zinc	7440-66-6	3.38E-05				1.80E-04		2.23E-04
Thorium	7440-29-1	6.80E-07				3.61E-06		4.49E-06
Quartz (in PM10)	14808-60-7	1.33E-03				7.07E-04		8.78E-04
Pyrite	12068-85-8	0.00E+00				0.00E+00		0.00E+00
Biotite	1302-27-8	4.88E-03				2.59E-02		3.22E-02
Magnetite	1309-38-2	3.43E-03				1.82E-02		2.26E-02
Hematite	1317-60-8	0.00E+00				0.00E+00		0.00E+00
Chlorite	1318-59-8	1.12E-01				5.95E-01		7.39E-01
Muscovite	1318-94-1	1.62E-02				8.61E-02		1.07E-01
Talc (fibrous)	14807-96-6	0.00E+00				0.00E+00		0.00E+00
Phosphorus	7723-14-0					-		-
Platinum	7440-06-4					-		-
Palladium	7440-05-3					-		-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04				1.14E-04		1.42E-04
Uranium (in PM10)	<<U_PM10>>	3.59E-08				1.92E-08		2.38E-08
Chrysotile Asbestos	132207-32-0	2.49E-06				1.32E-05		1.64E-05
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04				5.05E-04		6.27E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04				3.77E-04		4.68E-04
Chromium VI (in PM10)	<<Cr6_PM10>>					-		-

Notes:
1. Emission factors are from US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing for a low moisture content (<4%) ore. There is no data for PM10 emissions for low moisture ore for secondary crushing. Ratio of PM10/TSP for Primary Crushing of low moistrue ore is 0.1 - this ratio was used for secondary crushing. The ratio approach is consisent with that for high moisture ore primary/secondary crushing where both PC and SC have ratios about 0.4. PM2.5 emission factors are not provided in this section. The particle size multiplier for PM2.5 in AP42 Chap 13.2.5 Industrial Wind Erosion chapter is conservatively assumed as PM2.5 emission factor.
2. Emission factors are from US EPA AP-42 document Chapter 11.19.2 (Crushed Stone Processing and Pulverized Mineral Processing), Table 11.19.2-1 - Emission Factors for controlled Screening
3. Emission control due to enclosure of unit

Sample Calculation - PM emissions:
PM emissions (kg/hr) = EF (kg/tonne) x Material Handled (tonnes/yr) x 1yr/8760hours x (1-0) 19.0987 kg/hr
PM short-term emission rate (g/s) = 63.66 kg/hr x 1000 g/kg / 3600 s/hr = 5.31 g/s

Data Quality: Marginal
The emission factor calculation methodology has a US EPA data rating of "D" based on the AP-42 Chapter 11.24. This gives a MECP data quality of "Marginal Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the typical daily maximum production rate. The calculated emission rate should be conservative.

Table RC5: Summary of 24-hour Roadstone Crusher Emissions

CoPC	CAS	Units	Year -1					Year 7				
			Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C	Primary Crushing RDSC2	Secondary Crushing & Screening RSDC3	Truck Unloading RDSC1A	Material Transfer RDSC1B	Truck Loading RDSC1C	Primary Crushing RDSC2	Secondary Crushing & Screening RSDC3
PM	<<PM>>	g/s	5.84E-02	5.84E-02	5.84E-02	1.77	5.31	6.39E-02	6.39E-02	6.39E-02	2.20	6.60
PM_{10}	<<PM10>>	g/s	2.76E-02	2.76E-02	2.76E-02	1.77E-01	5.34E-01	3.02E-02	3.02E-02	3.02E-02	2.20E-01	6.63E-01
$PM_{2.5}$	<<PM2.5>>	g/s	4.18E-03	4.18E-03	4.18E-03	1.33E-01	3.98E-01	4.57E-03	4.57E-03	4.57E-03	1.65E-01	4.94E-01
Fluoride	7664-39-3	g/s	-	-	-	-	-	-	-	-	-	-
Chromium VI	18540-29-9	g/s	-	-	-	-	-	-	-	-	-	-
Mercury	7439-97-6	g/s	-	-	-	-	-	-	-	-	-	-
Aluminum	7429-90-5	g/s	4.33E-03	4.33E-03	4.33E-03	1.31E-01	3.94E-01	4.73E-03	4.73E-03	4.73E-03	1.63E-01	4.89E-01
Silver	7440-22-4	g/s	1.46E-08	1.46E-08	1.46E-08	4.42E-07	1.33E-06	1.60E-08	1.60E-08	1.60E-08	5.49E-07	1.65E-06
Arsenic	7440-38-2	g/s	1.33E-07	1.33E-07	1.33E-07	4.03E-06	1.21E-05	1.46E-07	1.46E-07	1.46E-07	5.00E-06	1.50E-05
Barium	7440-39-3	g/s	5.64E-06	5.64E-06	5.64E-06	1.71E-04	5.14E-04	6.17E-06	6.17E-06	6.17E-06	2.12E-04	6.38E-04
Beryllium	7440-41-7	g/s	3.94E-09	3.94E-09	3.94E-09	1.19E-07	3.58E-07	4.31E-09	4.31E-09	4.31E-09	1.48E-07	4.45E-07
Boron	7440-42-8	g/s	4.53E-07	4.53E-07	4.53E-07	1.37E-05	4.12E-05	4.95E-07	4.95E-07	4.95E-07	1.70E-05	5.12E-05
Bismuth	7440-69-9	g/s	2.72E-09	2.72E-09	2.72E-09	8.25E-08	2.48E-07	2.98E-09	2.98E-09	2.98E-09	1.02E-07	3.08E-07
Calcium	7440-70-2	g/s	5.30E-03	5.30E-03	5.30E-03	1.60E-01	4.82E-01	5.79E-03	5.79E-03	5.79E-03	1.99E-01	5.99E-01
Cadmium	7440-43-9	g/s	3.00E-09	3.00E-09	3.00E-09	9.08E-08	2.73E-07	3.28E-09	3.28E-09	3.28E-09	1.13E-07	3.39E-07
Cobalt	7440-48-4	g/s	2.62E-06	2.62E-06	2.62E-06	7.94E-05	2.39E-04	2.87E-06	2.87E-06	2.87E-06	9.86E-05	2.96E-04
Chromium	7440-47-3	g/s	3.03E-05	3.03E-05	3.03E-05	9.18E-04	2.76E-03	3.31E-05	3.31E-05	3.31E-05	1.14E-03	3.42E-03
Copper	7440-50-8	g/s	6.04E-06	6.04E-06	6.04E-06	1.83E-04	5.50E-04	6.60E-06	6.60E-06	6.60E-06	2.27E-04	6.83E-04
Iron	7439-89-6	g/s	2.54E-03	2.54E-03	2.54E-03	7.70E-02	2.31E-01	2.78E-03	2.78E-03	2.78E-03	9.56E-02	2.87E-01
Potassium	7440-09-7	g/s	1.57E-04	1.57E-04	1.57E-04	4.74E-03	1.42E-02	1.71E-04	1.71E-04	1.71E-04	5.88E-03	1.77E-02
Lithium	7439-93-2	g/s	7.21E-07	7.21E-07	7.21E-07	2.18E-05	6.56E-05	7.89E-07	7.89E-07	7.89E-07	2.71E-05	8.15E-05
Magnesium	7439-95-4	g/s	4.10E-03	4.10E-03	4.10E-03	1.24E-01	3.73E-01	4.49E-03	4.49E-03	4.49E-03	1.54E-01	4.64E-01
Manganese	7439-96-5	g/s	5.53E-05	5.53E-05	5.53E-05	1.67E-03	5.03E-03	6.04E-05	6.04E-05	6.04E-05	2.08E-03	6.25E-03
Molybdenum	7439-98-7	g/s	3.10E-08	3.10E-08	3.10E-08	9.38E-07	2.82E-06	3.39E-08	3.39E-08	3.39E-08	1.16E-06	3.50E-06
Silicon	7440-21-3	g/s	2.93E-04	2.93E-04	2.93E-04	8.88E-03	2.67E-02	3.21E-04	3.21E-04	3.21E-04	1.10E-02	3.32E-02
Sodium	7440-23-5	g/s	4.67E-04	4.67E-04	4.67E-04	1.41E-02	4.25E-02	5.11E-04	5.11E-04	5.11E-04	1.76E-02	5.28E-02
Nickel	7440-02-0	g/s	1.25E-05	1.25E-05	1.25E-05	3.79E-04	1.14E-03	1.37E-05	1.37E-05	1.37E-05	4.71E-04	1.41E-03
Lead	7439-92-1	g/s	2.66E-08	2.66E-08	2.66E-08	8.05E-07	2.42E-06	2.91E-08	2.91E-08	2.91E-08	1.00E-06	3.01E-06
Antimony	7440-36-0	g/s	2.44E-08	2.44E-08	2.44E-08	7.40E-07	2.22E-06	2.67E-08	2.67E-08	2.67E-08	9.18E-07	2.76E-06
Selenium	7782-49-2	g/s	1.68E-08	1.68E-08	1.68E-08	5.08E-07	1.53E-06	1.83E-08	1.83E-08	1.83E-08	6.31E-07	1.90E-06
Tin	7440-31-5	g/s	1.83E-07	1.83E-07	1.83E-07	5.54E-06	1.66E-05	2.00E-07	2.00E-07	2.00E-07	6.87E-06	2.07E-05
Strontium	7440-24-6	g/s	7.48E-06	7.48E-06	7.48E-06	2.27E-04	6.81E-04	8.18E-06	8.18E-06	8.18E-06	2.81E-04	8.45E-04
Titanium	7440-32-6	g/s	6.81E-05	6.81E-05	6.81E-05	2.06E-03	6.20E-03	7.44E-05	7.44E-05	7.44E-05	2.56E-03	7.69E-03
Thallium	7440-28-0	g/s	1.44E-09	1.44E-09	1.44E-09	4.36E-08	1.31E-07	1.57E-09	1.57E-09	1.57E-09	5.41E-08	1.63E-07
Uranium	7440-61-1	g/s	2.10E-09	2.10E-09	2.10E-09	6.35E-08	1.91E-07	2.29E-09	2.29E-09	2.29E-09	7.89E-08	2.37E-07
Vanadium	7440-62-2	g/s	6.65E-06	6.65E-06	6.65E-06	2.01E-04	6.06E-04	7.27E-06	7.27E-06	7.27E-06	2.50E-04	7.52E-04
Tungsten	7440-33-7	g/s	7.07E-09	7.07E-09	7.07E-09	2.14E-07	6.44E-07	7.73E-09	7.73E-09	7.73E-09	2.66E-07	7.99E-07
Yttrium	7440-65-5	g/s	2.62E-07	2.62E-07	2.62E-07	7.92E-06	2.38E-05	2.86E-07	2.86E-07	2.86E-07	9.83E-06	2.96E-05
Zinc	7440-66-6	g/s	1.98E-06	1.98E-06	1.98E-06	5.98E-05	1.80E-04	2.16E-06	2.16E-06	2.16E-06	7.43E-05	2.23E-04
Thorium	7440-29-1	g/s	3.97E-08	3.97E-08	3.97E-08	1.20E-06	3.61E-06	4.34E-08	4.34E-08	4.34E-08	1.49E-06	4.49E-06
Quartz (in PM10)	14808-60-7	g/s	3.66E-05	3.66E-05	3.66E-05	2.34E-04	7.07E-04	4.00E-05	4.00E-05	4.00E-05	2.91E-04	8.78E-04
Pyrite	12068-85-8	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biotite	1302-27-8	g/s	2.85E-04	2.85E-04	2.85E-04	8.62E-03	2.59E-02	3.11E-04	3.11E-04	3.11E-04	1.07E-02	3.22E-02
Magnetite	1309-38-2	g/s	2.00E-04	2.00E-04	2.00E-04	6.06E-03	1.82E-02	2.19E-04	2.19E-04	2.19E-04	7.52E-03	2.26E-02
Hematite	1317-60-8	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorite	1318-59-8	g/s	6.54E-03	6.54E-03	6.54E-03	1.98E-01	5.95E-01	7.15E-03	7.15E-03	7.15E-03	2.46E-01	7.39E-01
Muscovite	1318-94-1	g/s	9.46E-04	9.46E-04	9.46E-04	2.86E-02	8.61E-02	1.03E-03	1.03E-03	1.03E-03	3.56E-02	1.07E-01
Talc (fibrous)	14807-96-6	g/s	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0	g/s	-	-	-	-	-	-	-	-	-	-
Platinum	7440-06-4	g/s	-	-	-	-	-	-	-	-	-	-
Palladium	7440-05-3	g/s	-	-	-	-	-	-	-	-	-	-
Nickel (in PM10)	<<Ni_PM10>>	g/s	5.92E-06	5.92E-06	5.92E-06	3.79E-05	1.14E-04	6.47E-06	6.47E-06	6.47E-06	4.71E-05	1.42E-04
Uranium (in PM10)	<<U_PM10>>	g/s	9.92E-10	9.92E-10	9.92E-10	6.35E-09	1.92E-08	1.09E-09	1.09E-09	1.09E-09	7.89E-09	2.38E-08
Chrysotile Asbestos	132207-32-0	g/s	1.45E-07	1.45E-07	1.45E-07	0.00	1.32E-05	1.59E-07	1.59E-07	1.59E-07	5.46E-06	1.64E-05
Manganese (in PM10)	<<Mn_PM10>>	g/s	2.61E-05	2.61E-05	2.61E-05	0.00	5.05E-04	2.86E-05	2.86E-05	2.86E-05	2.08E-04	6.27E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	3.96E-06	3.96E-06	3.96E-06	0.00	3.77E-04	4.33E-06	4.33E-06	4.33E-06	1.56E-04	4.68E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	-	-	-	-	-	-	-	-	-	-

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from Main Plant Crushing Activities:
1) Truck unloading to hopper above primary crusher at Processing Plant 1 (P1A) and Processing Plant 2 (P2A) - assumes dump occurs inside primary crusher building
2) Primary crushing (gyratory crusher) and conveying at Processing Plant 1 (P1B) and Processing Plant 2 (P2B)
3) Secondary screening and crushing and conveying at Processing Plant 1 (P1C) and Processing Plant 2 (P2C)
4) Crushed ore stockpiling at Processing Plant 1 (P1D) and Processing Plant 2 (P2D)

Source : Truck unloading to hopper above primary crusher at Processing Plant 1 (P1A) and Processing Plant 2 (P2A)

Description:
Truck unloading ore to primary crusher.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, and metal emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table PC-1: Truck Unloading Input Parameters

Parameter	Year -1		Year 7		Unit	Reference
	Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper	Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper		
	P1A	P2A	P1A	P2A		
Material Handling Rate	-	-	60,000	60,000	tonnes/day	Plant design capacity
Ore Moisture Content	-	-	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Mean wind speed (U)	-	-	1	1	m/s	Enclosed area, assumed 1m/s as per MECP Procedure Document Table C-2
PM Emission Factor	-	-	2.41E-04	2.41E-04	kg/tonne	
PM_{10} Emission Factor	-	-	1.14E-04	1.14E-04	kg/tonne	
$PM_{2.5}$ Emission Factor	-	-	1.72E-05	1.72E-05	kg/tonne	
Hours of Operation per day	-	-	24	24	hours	DP/CNC
Control Efficiency	-	-	99%	99%	%	Partial enclosure plus dust collector - TCEQ Cheer Workshop Report.
PM Emissions	-	-	1.67E-03	1.67E-03	g/s	
PM_{10} Emissions	-	-	7.91E-04	7.91E-04	g/s	
$PM_{2.5}$ Emissions	-	-	1.20E-04	1.20E-04	g/s	

Sample Calculation - PM emissions:
Emission factor (kg/tonne) = 0.74 x 0.0016 x $(3.29/2.2)^{1.3}$ / $(3/2)^{1.4}$ = 2.41E-04 kg/tonne
PM short-term emission rate (g/s) = 60,000 tonne/day x 1.13E-03 kg/tonne x 1000 g/kg x 1day/24hr x 1hr/3600s x (1-0) = 1.67E-01 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the plant design capacity. The calculated emission rate should be conservative.

Table PC-2: Summary of Truck Unloading Emissions

CoPC	CAS	Material Speciation Factor for Ore Year 7	Emission Rate (g/s)			
			Year -1		Year 7	
			Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper	Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper
			P1A	P2A	P1A	P2A
PM	<<PM>>	-	-	-	1.67E-03	1.67E-03
PM_{10}	<<PM10>>	-	-	-	7.91E-04	7.91E-04
$PM_{2.5}$	<<PM2.5>>	-	-	-	1.20E-04	1.20E-04
Fluoride	7664-39-3	1.8E-07	-	-	3.01E-10	3.01E-10
Chromium VI	18540-29-9	1.3E-09	-	-	2.14E-12	2.14E-12
Mercury	7439-97-6	3.5E-11	-	-	5.88E-14	5.88E-14
Aluminum	7429-90-5	9.8E-03	-	-	1.64E-05	1.64E-05
Silver	7440-22-4	2.5E-07	-	-	4.18E-10	4.18E-10
Arsenic	7440-38-2	6.2E-06	-	-	1.03E-08	1.03E-08
Barium	7440-39-3	4.3E-05	-	-	7.17E-08	7.17E-08
Beryllium	7440-41-7	7.2E-08	-	-	1.20E-10	1.20E-10
Boron	7440-42-8	1.9E-05	-	-	3.18E-08	3.18E-08
Bismuth	7440-69-9	4.5E-08	-	-	7.53E-11	7.53E-11
Calcium	7440-70-2	1.6E-02	-	-	2.70E-05	2.70E-05
Cadmium	7440-43-9	3.0E-08	-	-	5.07E-11	5.07E-11
Cobalt	7440-48-4	1.2E-04	-	-	1.99E-07	1.99E-07
Chromium	7440-47-3	1.3E-03	-	-	2.21E-06	2.21E-06
Copper	7440-50-8	4.4E-05	-	-	7.43E-08	7.43E-08
Iron	7439-89-6	6.7E-02	-	-	1.12E-04	1.12E-04
Potassium	7440-09-7	5.7E-04	-	-	9.59E-07	9.59E-07
Lithium	7439-93-2	4.6E-06	-	-	7.68E-09	7.68E-09
Magnesium	7439-95-4	2.1E-01	-	-	3.46E-04	3.46E-04
Manganese	7439-96-5	1.0E-03	-	-	1.72E-06	1.72E-06
Molybdenum	7439-98-7	2.1E-07	-	-	3.44E-10	3.44E-10
Silicon	7440-21-3	3.0E-03	-	-	5.08E-06	5.08E-06
Sodium	7440-23-5	1.1E-04	-	-	1.89E-07	1.89E-07
Nickel	7440-02-0	2.0E-03	-	-	3.39E-06	3.39E-06
Lead	7439-92-1	4.9E-07	-	-	8.15E-10	8.15E-10
Antimony	7440-36-0	4.1E-07	-	-	6.86E-10	6.86E-10
Selenium	7782-49-2	2.8E-07	-	-	4.62E-10	4.62E-10
Tin	7440-31-5	3.3E-06	-	-	5.45E-09	5.45E-09
Strontium	7440-24-6	3.5E-05	-	-	5.82E-08	5.82E-08
Titanium	7440-32-6	5.4E-04	-	-	9.02E-07	9.02E-07
Thallium	7440-28-0	2.3E-08	-	-	3.92E-11	3.92E-11
Uranium	7440-61-1	3.7E-08	-	-	6.14E-11	6.14E-11
Vanadium	7440-62-2	3.3E-05	-	-	5.48E-08	5.48E-08
Tungsten	7440-33-7	8.6E-08	-	-	1.44E-10	1.44E-10
Yttrium	7440-65-5	2.1E-06	-	-	3.44E-09	3.44E-09
Zinc	7440-66-6	4.5E-05	-	-	7.56E-08	7.56E-08
Thorium	7440-29-1	4.8E-07	-	-	8.03E-10	8.03E-10
Quartz (in PM10)	14808-60-7	2.7E-02	-	-	2.13E-05	2.13E-05
Pyrite	12068-85-8	1.7E-07	-	-	2.77E-10	2.77E-10
Biotite	1302-27-8	1.0E-03	-	-	1.73E-06	1.73E-06
Magnetite	1309-38-2	9.7E-02	-	-	1.62E-04	1.62E-04
Hematite	1317-60-8	1.8E-04	-	-	3.05E-07	3.05E-07
Chlorite	1318-59-8	5.8E-02	-	-	9.75E-05	9.75E-05
Muscovite	1318-94-1	1.0E-02	-	-	1.70E-05	1.70E-05
Talc (fibrous)	14807-96-6	8.3E-04	-	-	1.39E-06	1.39E-06
Phosphorus	7723-14-0	0.0E+00	-	-	0.00E+00	0.00E+00
Platinum	7440-06-4	0.0E+00	-	-	0.00E+00	0.00E+00
Palladium	7440-05-3	0.0E+00	-	-	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.0E-03	-	-	1.60E-06	1.60E-06
Uranium (in PM10)	<<U_PM10>>	3.7E-08	-	-	2.90E-11	2.90E-11
Chrysotile Asbestos	132207-32-0	1.3E-02	-	-	2.16E-05	2.16E-05
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	-	-	8.15E-07	8.15E-07
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	-	-	1.23E-07	1.23E-07
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	-	-	1.01E-12	1.01E-12

Source: Primary crushing (gyratory crusher) and conveying at Processing Plant 1 (P1B) and Processing Plant 2 (P2B)

Description:
Primary crushing of ore and conveying material to secondary screening and crushing.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and speciated metal emissions.

Methodology: Emission Factor (EF)
Emission factors for primary crushing were based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing for a low moisture content (<4%) ore.

Table PC-3: Summary of Primary Crushing at Main Processing Plants:

CoPC	CAS	Emission Factor Kg/tonne [1]	Control Efficiency (%) [2]	Year -1				Year 7			
				Material Handled (tonne/day)		Emission Rate (g/s)		Material Handled (tonne/day)		Emission Rate (g/s)	
				Procesing Plant 1 Primary Crushing	Procesing Plant 2 Primary Crushing	Procesing Plant 1 Primary Crushing	Procesing Plant 2 Primary Crushing	Procesing Plant 1 Primary Crushing	Procesing Plant 2 Primary Crushing	Procesing Plant 1 Primary Crushing	Procesing Plant 2 Primary Crushing
				P1B	P2B	P1B	P2B	P1B	P2B	P1B	P2B
PM	<<PM>>	0.2	99%	-	-	-	-	60,000	60,000	1.39	1.39
PM_{10}	<<PM10>>	0.02	99%	-	-	-	-	60,000	60,000	0.14	0.14
$PM_{2.5}$	<<PM2.5>>	0.015	99%	-	-	-	-	60,000	60,000	0.10	0.10

CoPC	CAS	Material Speciation Factor for Ore Year 7	Emission Rate (g/s)	
			Procesing Plant 1 Primary Crushing	Procesing Plant 2 Primary Crushing
			P1B	P2B
Fluoride	7664-39-3	1.8E-07	2.50E-07	2.50E-07
Chromium VI	18540-29-9	1.3E-09	1.77E-09	1.77E-09
Mercury	7439-97-6	3.5E-11	4.88E-11	4.88E-11
Aluminum	7429-90-5	9.8E-03	1.37E-02	1.37E-02
Silver	7440-22-4	2.5E-07	3.47E-07	3.47E-07
Arsenic	7440-38-2	6.2E-06	8.54E-06	8.54E-06
Barium	7440-39-3	4.3E-05	5.96E-05	5.96E-05
Beryllium	7440-41-7	7.2E-08	9.96E-08	9.96E-08
Boron	7440-42-8	1.9E-05	2.64E-05	2.64E-05
Bismuth	7440-69-9	4.5E-08	6.25E-08	6.25E-08
Calcium	7440-70-2	1.6E-02	2.24E-02	2.24E-02
Cadmium	7440-43-9	3.0E-08	4.21E-08	4.21E-08
Cobalt	7440-48-4	1.2E-04	1.65E-04	1.65E-04
Chromium	7440-47-3	1.3E-03	1.84E-03	1.84E-03
Copper	7440-50-8	4.4E-05	6.17E-05	6.17E-05
Iron	7439-89-6	6.7E-02	9.26E-02	9.26E-02
Potassium	7440-09-7	5.7E-04	7.97E-04	7.97E-04
Lithium	7439-93-2	4.6E-06	6.38E-06	6.38E-06
Magnesium	7439-95-4	2.1E-01	2.87E-01	2.87E-01
Manganese	7439-96-5	1.0E-03	1.43E-03	1.43E-03
Molybdenum	7439-98-7	2.1E-07	2.86E-07	2.86E-07
Silicon	7440-21-3	3.0E-03	4.22E-03	4.22E-03
Sodium	7440-23-5	1.1E-04	1.57E-04	1.57E-04
Nickel	7440-02-0	2.0E-03	2.81E-03	2.81E-03
Lead	7439-92-1	4.9E-07	6.77E-07	6.77E-07
Antimony	7440-36-0	4.1E-07	5.69E-07	5.69E-07
Selenium	7782-49-2	2.8E-07	3.84E-07	3.84E-07
Tin	7440-31-5	3.3E-06	4.52E-06	4.52E-06
Strontium	7440-24-6	3.5E-05	4.84E-05	4.84E-05
Titanium	7440-32-6	5.4E-04	7.49E-04	7.49E-04
Thallium	7440-28-0	2.3E-08	3.25E-08	3.25E-08
Uranium	7440-61-1	3.7E-08	5.10E-08	5.10E-08
Vanadium	7440-62-2	3.3E-05	4.55E-05	4.55E-05
Tungsten	7440-33-7	8.6E-08	1.19E-07	1.19E-07
Yttrium	7440-65-5	2.1E-06	2.86E-06	2.86E-06
Zinc	7440-66-6	4.5E-05	6.28E-05	6.28E-05
Thorium	7440-29-1	4.8E-07	6.67E-07	6.67E-07
Quartz (in PM10)	14808-60-7	2.7E-02	3.75E-03	3.75E-03
Pyrite	12068-85-8	1.7E-07	2.30E-07	2.30E-07
Biotite	1302-27-8	1.0E-03	1.44E-03	1.44E-03
Magnetite	1309-38-2	9.7E-02	1.34E-01	1.34E-01
Hematite	1317-60-8	1.8E-04	2.53E-04	2.53E-04
Chlorite	1318-59-8	5.8E-02	8.09E-02	8.09E-02
Muscovite	1318-94-1	1.0E-02	1.41E-02	1.41E-02
Talc (fibrous)	14807-96-6	8.3E-04	1.15E-03	1.15E-03
Phosphorus	7723-14-0	0.0E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	0.0E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	0.0E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.0E-03	2.81E-04	2.81E-04
Uranium (in PM10)	<<U_PM10>>	3.7E-08	5.10E-09	5.10E-09
Chrysotile Asbestos	132207-32-0	1.3E-02	1.79E-02	1.79E-02
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	1.43E-04	1.43E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	1.07E-04	1.07E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	1.77E-10	1.77E-10

Notes:
1. $PM_{2.5}$ emission factors are not provided in Table 11.24-1. The particle size multiplier for $PM_{2.5}$ in AP42 Chap 13.2.5 Industrial Wind Erosion chapter is conservatively assumed as $PM_{2.5}$ emission factor.
2. Partial enclosure plus dust collector - TCEQ Cheer Workshop Report.

Sample Calculation - PM emissions:
PM short-term emission rate (g/s) = 60,000 tonne/day x 0.2 kg/tonne x 1000 g/kg x 1day/24hr x 1hr/3600s x (1-0.99) = 1.39 g/s

Data Quality: Average
The emission factor calculation methodology has a US EPA data rating of "C" based on the AP-42 Chapter 11.24. This gives a MECP data quality of "Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the plant design capacity. The calculated emission rate should be conservative.

Source: Secondary screening and crushing and conveying at Processing Plant 1 (P1C) and Processing Plant 2 (P2C)

Description:
Secondary screening and crushing (cone crushers) of ore and conveying material to the crushed ore stockpiles.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and speciated metal emissions.

Methodology: Emission Factor (EF)
Emission factors for primary crushing were based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing for a low moisture content (<4%) ore.

Table PC-4: Secondary Screening and Crushing Inputs and Emissions at Main Processing Plants:

CoPC	CAS	Emission Factor kg/tonne [1]	Control Efficiency (%) [2]	Year -1				Year 7			
				Material Handled (tonne/year)		Emission Rate (g/s)		Material Handled (tonne/year)		Emission Rate (g/s)	
				Procesing Plant 1 Secondary Screening and Crushing	Procesing Plant 2 Secondary Screening and Crushing	Procesing Plant 1 Secondary Screening and Crushing	Procesing Plant 2 Secondary Screening and Crushing	Procesing Plant 1 Secondary Screening and Crushing	Procesing Plant 2 Secondary Screening and Crushing	Procesing Plant 1 Secondary Screening and Crushing	Procesing Plant 2 Secondary Screening and Crushing
				P1C	P2C	P1C	P2C	P1C	P2C	P1C	P2C
PM	<<PM>>	0.6	99%	-	-	-	-	60,000	60,000	4.17	4.17
PM_{10}	<<PM10>>	0.06	99%	-	-	-	-	60,000	60,000	0.42	0.42
$PM_{2.5}$	<<PM2.5>>	0.045	99%	-	-	-	-	60,000	60,000	0.31	0.31

CoPC	CAS	Material Speciation Factor for Ore	Emission Rate (g/s)	
			Procesing Plant 1 Secondary Screening and Crushing	Procesing Plant 2 Secondary Screening and Crushing
			P1C	P2C
Fluoride	7664-39-3	1.8E-07	7.50E-07	7.50E-07
Chromium VI	18540-29-9	1.3E-09	5.32E-09	5.32E-09
Mercury	7439-97-6	3.5E-11	1.46E-10	1.46E-10
Aluminum	7429-90-5	9.8E-03	4.10E-02	4.10E-02
Silver	7440-22-4	2.5E-07	1.04E-06	1.04E-06
Arsenic	7440-38-2	6.2E-06	2.56E-05	2.56E-05
Barium	7440-39-3	4.3E-05	1.79E-04	1.79E-04
Beryllium	7440-41-7	7.2E-08	2.99E-07	2.99E-07
Boron	7440-42-8	1.9E-05	7.91E-05	7.91E-05
Bismuth	7440-69-9	4.5E-08	1.88E-07	1.88E-07
Calcium	7440-70-2	1.6E-02	6.73E-02	6.73E-02
Cadmium	7440-43-9	3.0E-08	1.26E-07	1.26E-07
Cobalt	7440-48-4	1.2E-04	4.95E-04	4.95E-04
Chromium	7440-47-3	1.3E-03	5.51E-03	5.51E-03
Copper	7440-50-8	4.4E-05	1.85E-04	1.85E-04
Iron	7439-89-6	6.7E-02	2.78E-01	2.78E-01
Potassium	7440-09-7	5.7E-04	2.39E-03	2.39E-03
Lithium	7439-93-2	4.6E-06	1.91E-05	1.91E-05
Magnesium	7439-95-4	2.1E-01	8.62E-01	8.62E-01
Manganese	7439-96-5	1.0E-03	4.29E-03	4.29E-03
Molybdenum	7439-98-7	2.1E-07	8.58E-07	8.58E-07
Silicon	7440-21-3	3.0E-03	1.26E-02	1.26E-02
Sodium	7440-23-5	1.1E-04	4.72E-04	4.72E-04
Nickel	7440-02-0	2.0E-03	8.44E-03	8.44E-03
Lead	7439-92-1	4.9E-07	2.03E-06	2.03E-06
Antimony	7440-36-0	4.1E-07	1.71E-06	1.71E-06
Selenium	7782-49-2	2.8E-07	1.15E-06	1.15E-06
Tin	7440-31-5	3.3E-06	1.36E-05	1.36E-05
Strontium	7440-24-6	3.5E-05	1.45E-04	1.45E-04
Titanium	7440-32-6	5.4E-04	2.25E-03	2.25E-03
Thallium	7440-28-0	2.3E-08	9.76E-08	9.76E-08
Uranium	7440-61-1	3.7E-08	1.53E-07	1.53E-07
Vanadium	7440-62-2	3.3E-05	1.37E-04	1.37E-04
Tungsten	7440-33-7	8.6E-08	3.58E-07	3.58E-07
Yttrium	7440-65-5	2.1E-06	8.57E-06	8.57E-06
Zinc	7440-66-6	4.5E-05	1.88E-04	1.88E-04
Thorium	7440-29-1	4.8E-07	2.00E-06	2.00E-06
Quartz (in PM10)	14808-60-7	2.7E-02	1.12E-02	1.12E-02
Pyrite	12068-85-8	1.7E-07	6.91E-07	6.91E-07
Biotite	1302-27-8	1.0E-03	4.32E-03	4.32E-03
Magnetite	1309-38-2	9.7E-02	4.02E-01	4.02E-01
Hematite	1317-60-8	1.8E-04	7.60E-04	7.60E-04
Chlorite	1318-59-8	5.8E-02	2.43E-01	2.43E-01
Muscovite	1318-94-1	1.0E-02	4.23E-02	4.23E-02
Talc (fibrous)	14807-96-6	8.3E-04	3.45E-03	3.45E-03
Phosphorus	7723-14-0	0.0E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	0.0E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	0.0E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.0E-03	8.44E-04	8.44E-04
Uranium (in PM10)	<<U_PM10>>	3.7E-08	1.53E-08	1.53E-08
Chrysotile Asbestos	132207-32-0	1.3E-02	5.38E-02	5.38E-02
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	4.29E-04	4.29E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	3.22E-04	3.22E-04
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	5.32E-10	5.32E-10

Notes:
1. Ratio of PM10/TSP for Primary Crushing of low moistrue ore is 0.1. Same ratio used for secondary crushing.
$PM_{2.5}$ emission factors are not provided in Table 11.24-1. The particle size multiplier for $PM_{2.5}$ in AP42 Chap 13.2.5 Industrial Wind Erosion chapter is conservatively assumed as $PM_{2.5}$ emission factor.
2. Partial enclosure plus dust collector - TCEQ Cheer Workshop Report.

Sample Calculation - PM emissions:
PM short-term emission rate (g/s) = 60,000 tonne/day x 0.6 kg/tonne x 1000 g/kg x 1day/24hr x 1hr/3600s x (1-0.99) = 4.17 g/s

Data Quality: Marginal
The emission factor calculation methodology has a US EPA data rating of "D" based on the AP-42 Chapter 11.24. This gives a MECP data quality of "Marginal Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the plant design capacity. The calculated emission rate should be conservative.

Source : Crushed ore stockpiling at Processing Plant 1 (P1D) and Processing Plant 2 (P2D)

Description:
Crushed ore is dropped to a covered stockpile.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, and metal emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table PC-5: Crushed Ore Stockpiling Input Parameters

Parameter	Year -1		Year 7		Unit	Reference
	Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile	Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile		
	P1D	P2D	P1D	P2D		
Material Handling Rate	-	-	60,000	60,000	tonnes/day	Plant design capacity
Ore Moisture Content	-	-	3	3	%	NI 43-101 Technical Report and Feasibility Study, Section 17.3, Table 17-1
Mean wind speed (U)	-	-	1	1	m/s	Enclosed area, assumed 1m/s as per MECP Procedure Document Table C-2
PM Emission Factor	-	-	2.41E-04	2.41E-04	kg/tonne	
PM10 Emission Factor	-	-	1.14E-04	1.14E-04	kg/tonne	
PM2.5 Emission Factor	-	-	1.72E-05	1.72E-05	kg/tonne	
Hours of Operation per day	-	-	24	24	hours	DP/CNC
Control Efficiency	-	-	99%	99%	%	Partial enclosure plus dust collector - TCEQ Cheer Workshop Report.
PM Emissions	-	-	1.67E-03	1.67E-03	g/s	
PM10 Emissions	-	-	7.91E-04	7.91E-04	g/s	
PM2.5 Emissions	-	-	1.20E-04	1.20E-04	g/s	

Sample Calculation - PM emissions:
Emission factor (kg/tonne) = 0.74 x 0.0016 x $(1/2.2)^{1.3}$ / $(3/2)^{1.4}$ = 2.41E-04 kg/tonne
PM short-term emission rate (g/s) = 60,000 tonne/day x 1.13E-03 kg/tonne x 1000 g/kg x 1day/24hr x 1hr/3600s x (1-0.99) = 1.67E-03 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the plant design capacity. The calculated emission rate should be conservative.

Table PC-6: Summary of Crushed Ore Stockpiling Emissions

CoPC	CAS	Material Speciation Factor for Ore Year 7	Emission Rate (g/s)			
			Year -1		Year 7	
			Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile	Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile
			P1D	P2D	P1D	P2D
PM	<<PM>>	-	-	-	1.67E-03	1.67E-03
PM_{10}	<<PM10>>	-	-	-	7.91E-04	7.91E-04
$PM_{2.5}$	<<PM2.5>>	-	-	-	1.20E-04	1.20E-04
Fluoride	7664-39-3	1.8E-07	-	-	3.01E-10	3.01E-10
Chromium VI	18540-29-9	1.3E-09	-	-	2.14E-12	2.14E-12
Mercury	7439-97-6	3.5E-11	-	-	5.88E-14	5.88E-14
Aluminum	7429-90-5	9.8E-03	-	-	1.64E-05	1.64E-05
Silver	7440-22-4	2.5E-07	-	-	4.18E-10	4.18E-10
Arsenic	7440-38-2	6.2E-06	-	-	1.03E-08	1.03E-08
Barium	7440-39-3	4.3E-05	-	-	7.17E-08	7.17E-08
Beryllium	7440-41-7	7.2E-08	-	-	1.20E-10	1.20E-10
Boron	7440-42-8	1.9E-05	-	-	3.18E-08	3.18E-08
Bismuth	7440-69-9	4.5E-08	-	-	7.53E-11	7.53E-11
Calcium	7440-70-2	1.6E-02	-	-	2.70E-05	2.70E-05
Cadmium	7440-43-9	3.0E-08	-	-	5.07E-11	5.07E-11
Cobalt	7440-48-4	1.2E-04	-	-	1.99E-07	1.99E-07
Chromium	7440-47-3	1.3E-03	-	-	2.21E-06	2.21E-06
Copper	7440-50-8	4.4E-05	-	-	7.43E-08	7.43E-08
Iron	7439-89-6	6.7E-02	-	-	1.12E-04	1.12E-04
Potassium	7440-09-7	5.7E-04	-	-	9.59E-07	9.59E-07
Lithium	7439-93-2	4.6E-06	-	-	7.68E-09	7.68E-09
Magnesium	7439-95-4	2.1E-01	-	-	3.46E-04	3.46E-04
Manganese	7439-96-5	1.0E-03	-	-	1.72E-06	1.72E-06
Molybdenum	7439-98-7	2.1E-07	-	-	3.44E-10	3.44E-10
Silicon	7440-21-3	3.0E-03	-	-	5.08E-06	5.08E-06
Sodium	7440-23-5	1.1E-04	-	-	1.89E-07	1.89E-07
Nickel	7440-02-0	2.0E-03	-	-	3.39E-06	3.39E-06
Lead	7439-92-1	4.9E-07	-	-	8.15E-10	8.15E-10
Antimony	7440-36-0	4.1E-07	-	-	6.86E-10	6.86E-10
Selenium	7782-49-2	2.8E-07	-	-	4.62E-10	4.62E-10
Tin	7440-31-5	3.3E-06	-	-	5.45E-09	5.45E-09
Strontium	7440-24-6	3.5E-05	-	-	5.82E-08	5.82E-08
Titanium	7440-32-6	5.4E-04	-	-	9.02E-07	9.02E-07
Thallium	7440-28-0	2.3E-08	-	-	3.92E-11	3.92E-11
Uranium	7440-61-1	3.7E-08	-	-	6.14E-11	6.14E-11
Vanadium	7440-62-2	3.3E-05	-	-	5.48E-08	5.48E-08
Tungsten	7440-33-7	8.6E-08	-	-	1.44E-10	1.44E-10
Yttrium	7440-65-5	2.1E-06	-	-	3.44E-09	3.44E-09
Zinc	7440-66-6	4.5E-05	-	-	7.56E-08	7.56E-08
Thorium	7440-29-1	4.8E-07	-	-	8.03E-10	8.03E-10
Quartz (in PM10)	14808-60-7	2.7E-02	-	-	2.13E-05	2.13E-05
Pyrite	12068-85-8	1.7E-07	-	-	2.77E-10	2.77E-10
Biotite	1302-27-8	1.0E-03	-	-	1.73E-06	1.73E-06
Magnetite	1309-38-2	9.7E-02	-	-	1.62E-04	1.62E-04
Hematite	1317-60-8	1.8E-04	-	-	3.05E-07	3.05E-07
Chlorite	1318-59-8	5.8E-02	-	-	9.75E-05	9.75E-05
Muscovite	1318-94-1	1.0E-02	-	-	1.70E-05	1.70E-05
Talc (fibrous)	14807-96-6	8.3E-04	-	-	1.39E-06	1.39E-06
Phosphorus	7723-14-0	0.0E+00	-	-	0.00E+00	0.00E+00
Platinum	7440-06-4	0.0E+00	-	-	0.00E+00	0.00E+00
Palladium	7440-05-3	0.0E+00	-	-	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.0E-03	-	-	1.60E-06	1.60E-06
Uranium (in PM10)	<<U_PM10>>	3.7E-08	-	-	2.90E-11	2.90E-11
Chrysotile Asbestos	132207-32-0	1.3E-02	-	-	2.16E-05	2.16E-05
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	-	-	8.15E-07	8.15E-07
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	-	-	1.23E-07	1.23E-07
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	-	-	1.01E-12	1.01E-12

Table PC-7: Summary of 24-Hour Average Emissions from Main Processing Plant Crushing Activities:

CoPC	CAS	Emission Rate (g/s)															
		Year -1								Year 7							
		Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper	Processing Plant 1 Primary Crushing	Processing Plant 2 Primary Crushing	Processing Plant 1 Secondary Screening and Crushing	Processing Plant 2 Secondary Screening and Crushing	Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile	Processing Plant 1 Truck Unloading to hopper	Processing Plant 2 Truck Unloading to hopper	Processing Plant 1 Primary Crushing	Processing Plant 2 Primary Crushing	Processing Plant 1 Secondary Screening and Crushing	Processing Plant 2 Secondary Screening and Crushing	Processing Plant 1 Crushed Ore Stockpile	Processing Plant 2 Crushed Ore Stockpile
		P1A	P2A	P1B	P2B	P1C	P2C	P1D	P2D	P1A	P2A	P1B	P2B	P1C	P2C	P1D	P2D
PM	<<PM>>	-	-	-	-	-	-	-	-	1.67E-03	1.67E-03	1.39E+00	1.39E+00	4.17E+00	4.17E+00	1.67E-03	1.67E-03
PM_{10}	<<PM10>>	-	-	-	-	-	-	-	-	7.91E-04	7.91E-04	1.39E-01	1.39E-01	4.17E-01	4.17E-01	7.91E-04	7.91E-04
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	-	-	-	-	1.20E-04	1.20E-04	1.04E-01	1.04E-01	3.13E-01	3.13E-01	1.20E-04	1.20E-04
Fluoride	7664-39-3	-	-	-	-	-	-	-	-	3.01E-10	3.01E-10	2.50E-07	2.50E-07	7.50E-07	7.50E-07	3.01E-10	3.01E-10
Chromium VI	18540-29-9	-	-	-	-	-	-	-	-	2.14E-12	2.14E-12	1.77E-09	1.77E-09	5.32E-09	5.32E-09	2.14E-12	2.14E-12
Mercury	7439-97-6	-	-	-	-	-	-	-	-	5.88E-14	5.88E-14	4.88E-11	4.88E-11	1.46E-10	1.46E-10	5.88E-14	5.88E-14
Aluminum	7429-90-5	-	-	-	-	-	-	-	-	1.64E-05	1.64E-05	1.37E-02	1.37E-02	4.10E-02	4.10E-02	1.64E-05	1.64E-05
Silver	7440-22-4	-	-	-	-	-	-	-	-	4.18E-10	4.18E-10	3.47E-07	3.47E-07	1.04E-06	1.04E-06	4.18E-10	4.18E-10
Arsenic	7440-38-2	-	-	-	-	-	-	-	-	1.03E-08	1.03E-08	8.54E-06	8.54E-06	2.56E-05	2.56E-05	1.03E-08	1.03E-08
Barium	7440-39-3	-	-	-	-	-	-	-	-	7.17E-08	7.17E-08	5.96E-05	5.96E-05	1.79E-04	1.79E-04	7.17E-08	7.17E-08
Beryllium	7440-41-7	-	-	-	-	-	-	-	-	1.20E-10	1.20E-10	9.96E-08	9.96E-08	2.99E-07	2.99E-07	1.20E-10	1.20E-10
Boron	7440-42-8	-	-	-	-	-	-	-	-	3.18E-08	3.18E-08	2.64E-05	2.64E-05	7.91E-05	7.91E-05	3.18E-08	3.18E-08
Bismuth	7440-69-9	-	-	-	-	-	-	-	-	7.53E-11	7.53E-11	6.25E-08	6.25E-08	1.88E-07	1.88E-07	7.53E-11	7.53E-11
Calcium	7440-70-2	-	-	-	-	-	-	-	-	2.70E-05	2.70E-05	2.24E-02	2.24E-02	6.73E-02	6.73E-02	2.70E-05	2.70E-05
Cadmium	7440-43-9	-	-	-	-	-	-	-	-	5.07E-11	5.07E-11	4.21E-08	4.21E-08	1.26E-07	1.26E-07	5.07E-11	5.07E-11
Cobalt	7440-48-4	-	-	-	-	-	-	-	-	1.99E-07	1.99E-07	1.65E-04	1.65E-04	4.95E-04	4.95E-04	1.99E-07	1.99E-07
Chromium	7440-47-3	-	-	-	-	-	-	-	-	2.21E-06	2.21E-06	1.84E-03	1.84E-03	5.51E-03	5.51E-03	2.21E-06	2.21E-06
Copper	7440-50-8	-	-	-	-	-	-	-	-	7.43E-08	7.43E-08	6.17E-05	6.17E-05	1.85E-04	1.85E-04	7.43E-08	7.43E-08
Iron	7439-89-6	-	-	-	-	-	-	-	-	1.12E-04	1.12E-04	9.26E-02	9.26E-02	2.78E-01	2.78E-01	1.12E-04	1.12E-04
Potassium	7440-09-7	-	-	-	-	-	-	-	-	9.59E-07	9.59E-07	7.97E-04	7.97E-04	2.39E-03	2.39E-03	9.59E-07	9.59E-07
Lithium	7439-93-2	-	-	-	-	-	-	-	-	7.68E-09	7.68E-09	6.38E-06	6.38E-06	1.91E-05	1.91E-05	7.68E-09	7.68E-09
Magnesium	7439-95-4	-	-	-	-	-	-	-	-	3.46E-04	3.46E-04	2.87E-01	2.87E-01	8.62E-01	8.62E-01	3.46E-04	3.46E-04
Manganese	7439-96-5	-	-	-	-	-	-	-	-	1.72E-06	1.72E-06	1.43E-03	1.43E-03	4.29E-03	4.29E-03	1.72E-06	1.72E-06
Molybdenum	7439-98-7	-	-	-	-	-	-	-	-	3.44E-10	3.44E-10	2.86E-07	2.86E-07	8.58E-07	8.58E-07	3.44E-10	3.44E-10
Silicon	7440-21-3	-	-	-	-	-	-	-	-	5.08E-06	5.08E-06	4.22E-03	4.22E-03	1.26E-02	1.26E-02	5.08E-06	5.08E-06
Sodium	7440-23-5	-	-	-	-	-	-	-	-	1.89E-07	1.89E-07	1.57E-04	1.57E-04	4.72E-04	4.72E-04	1.89E-07	1.89E-07
Nickel	7440-02-0	-	-	-	-	-	-	-	-	3.39E-06	3.39E-06	2.81E-03	2.81E-03	8.44E-03	8.44E-03	3.39E-06	3.39E-06
Lead	7439-92-1	-	-	-	-	-	-	-	-	8.15E-10	8.15E-10	6.77E-07	6.77E-07	2.03E-06	2.03E-06	8.15E-10	8.15E-10
Antimony	7440-36-0	-	-	-	-	-	-	-	-	6.86E-10	6.86E-10	5.69E-07	5.69E-07	1.71E-06	1.71E-06	6.86E-10	6.86E-10
Selenium	7782-49-2	-	-	-	-	-	-	-	-	4.62E-10	4.62E-10	3.84E-07	3.84E-07	1.15E-06	1.15E-06	4.62E-10	4.62E-10
Tin	7440-31-5	-	-	-	-	-	-	-	-	5.45E-09	5.45E-09	4.52E-06	4.52E-06	1.36E-05	1.36E-05	5.45E-09	5.45E-09
Strontium	7440-24-6	-	-	-	-	-	-	-	-	5.82E-08	5.82E-08	4.84E-05	4.84E-05	1.45E-04	1.45E-04	5.82E-08	5.82E-08
Titanium	7440-32-6	-	-	-	-	-	-	-	-	9.02E-07	9.02E-07	7.49E-04	7.49E-04	2.25E-03	2.25E-03	9.02E-07	9.02E-07
Thallium	7440-28-0	-	-	-	-	-	-	-	-	3.92E-11	3.92E-11	3.25E-08	3.25E-08	9.76E-08	9.76E-08	3.92E-11	3.92E-11
Uranium	7440-61-1	-	-	-	-	-	-	-	-	6.14E-11	6.14E-11	5.10E-08	5.10E-08	1.53E-07	1.53E-07	6.14E-11	6.14E-11
Vanadium	7440-62-2	-	-	-	-	-	-	-	-	5.48E-08	5.48E-08	4.55E-05	4.55E-05	1.37E-04	1.37E-04	5.48E-08	5.48E-08
Tungsten	7440-33-7	-	-	-	-	-	-	-	-	1.44E-10	1.44E-10	1.19E-07	1.19E-07	3.58E-07	3.58E-07	1.44E-10	1.44E-10
Yttrium	7440-65-5	-	-	-	-	-	-	-	-	3.44E-09	3.44E-09	2.86E-06	2.86E-06	8.57E-06	8.57E-06	3.44E-09	3.44E-09
Zinc	7440-66-6	-	-	-	-	-	-	-	-	7.56E-08	7.56E-08	6.28E-05	6.28E-05	1.88E-04	1.88E-04	7.56E-08	7.56E-08
Thorium	7440-29-1	-	-	-	-	-	-	-	-	8.03E-10	8.03E-10	6.67E-07	6.67E-07	2.00E-06	2.00E-06	8.03E-10	8.03E-10
Quartz (in PM10)	14808-60-7	-	-	-	-	-	-	-	-	2.13E-05	2.13E-05	3.75E-03	3.75E-03	1.12E-02	1.12E-02	2.13E-05	2.13E-05
Pyrite	12068-85-8	-	-	-	-	-	-	-	-	2.77E-10	2.77E-10	2.30E-07	2.30E-07	6.91E-07	6.91E-07	2.77E-10	2.77E-10
Biotite	1302-27-8	-	-	-	-	-	-	-	-	1.73E-06	1.73E-06	1.44E-03	1.44E-03	4.32E-03	4.32E-03	1.73E-06	1.73E-06
Magnetite	1309-38-2	-	-	-	-	-	-	-	-	1.62E-04	1.62E-04	1.34E-01	1.34E-01	4.02E-01	4.02E-01	1.62E-04	1.62E-04
Hematite	1317-60-8	-	-	-	-	-	-	-	-	3.05E-07	3.05E-07	2.53E-04	2.53E-04	7.60E-04	7.60E-04	3.05E-07	3.05E-07
Chlorite	1318-59-8	-	-	-	-	-	-	-	-	9.75E-05	9.75E-05	8.09E-02	8.09E-02	2.43E-01	2.43E-01	9.75E-05	9.75E-05
Muscovite	1318-94-1	-	-	-	-	-	-	-	-	1.70E-05	1.70E-05	1.41E-02	1.41E-02	4.23E-02	4.23E-02	1.70E-05	1.70E-05
Talc (fibrous)	14807-96-6	-	-	-	-	-	-	-	-	1.39E-06	1.39E-06	1.15E-03	1.15E-03	3.45E-03	3.45E-03	1.39E-06	1.39E-06
Phosphorus	7723-14-0	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	-	-	-	-	-	-	-	-	1.60E-06	1.60E-06	2.81E-04	2.81E-04	8.44E-04	8.44E-04	1.60E-06	1.60E-06
Uranium (in PM10)	<<U_PM10>>	-	-	-	-	-	-	-	-	2.90E-11	2.90E-11	5.10E-09	5.10E-09	1.53E-08	1.53E-08	2.90E-11	2.90E-11
Chrysotile Asbestos	132207-32-0	-	-	-	-	-	-	-	-	2.16E-05	2.16E-05	1.79E-02	1.79E-02	5.38E-02	5.38E-02	2.16E-05	2.16E-05
Manganese (in PM10)	<<Mn_PM10>>	-	-	-	-	-	-	-	-	8.15E-07	8.15E-07	1.43E-04	1.43E-04	4.29E-04	4.29E-04	8.15E-07	8.15E-07
Manganese (in PM2.5)	<<Mn_PM2.5>>	-	-	-	-	-	-	-	-	1.23E-07	1.23E-07	1.07E-04	1.07E-04	3.22E-04	3.22E-04	1.23E-07	1.23E-07
Chromium VI (in PM10)	<<Cr6_PM10>>	-	-	-	-	-	-	-	-	1.01E-12	1.01E-12	1.77E-10	1.77E-10	5.32E-10	5.32E-10	1.01E-12	1.01E-12

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Dust Collector Emissions from Main Plant Crushing Activities:

Dust collector emissions from:
a) Primary crushing at Processing Plant 1 (P1DC1) and Processing Plant 2 (P2DC1)
b) Secondary screening and crushing and conveying at Processing Plant 1 (P1DC2) and Processing Plant 2 (P2DC2)
c) Crushed ore stockpiling at Processing Plant 1 (P1DC3 and P1DC4) and Processing Plant 2 (P2DC3 and P2DC4)

Description:
Dust collectors controlling emissions from the primary crusher, secondary screening and crushing and conveying, and crushed ore stockpile.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and metal emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission are estimated based on the MECP recommended emission factor of 20 mg/m^3 for the most significant baghouse and 10 mg/m^3 for other units.

Table DC-1: Dust Collector Input Parameters

Parameters	Processing Plant 1 Primary Crusher Dust Collector 1	Processing Plant 2 Primary Crusher Dust Collector 1	Processing Plant 1 Secondary Screening and Crushing Dust Collector 2	Processing Plant 2 Secondary Screening and Crushing Dust Collector 2	Processing Plant 1 Crushed Ore Stockpile Dust Collector 3	Processing Plant 2 Crushed Ore Stockpile Dust Collector 3	Processing Plant 1 Crushed Ore Stockpile Dust Collector 4	Processing Plant 2 Crushed Ore Stockpile Dust Collector 4
	P1DC1	P2DC1	P1DC2	P2DC2	P1DC3	P2DC3	P1DC4	P2DC4
Maximum Flow Rate (m^3/hr)	64,000	64,000	10,000	10,000	25,000	25,000	25,000	25,000
Outlet Loading (mg/m^3)	20	10	10	10	10	10	10	10
PM_{10} Speciation Factor [1]	0.48							
$PM_{2.5}$ Speciation Factor [1]	0.10							
[1] - AP-42, App B-1, Section 11.xx (fluorspar ore drum dryer with fabric filter)								

Table DC-2: Summary of 24-Hour Average Dust Collector Emissions from the Main Processing Plant Crushing Activities:

CoPC	CAS	Material Speciation Factor for Ore Year 7	Emission Rate (g/s)															
			Year-1								Year 7							
			Processing Plant 1 Primary Crusher Dust Collector 1	Processing Plant 2 Primary Crusher Dust Collector 1	Processing Plant 1 Secondary Screening and Crushing Dust Collector 2	Processing Plant 2 Secondary Screening and Crushing Dust Collector 2	Processing Plant 1 Crushed Ore Stockpile Dust Collector 3	Processing Plant 2 Crushed Ore Stockpile Dust Collector 3	Processing Plant 1 Crushed Ore Stockpile Dust Collector 4	Processing Plant 2 Crushed Ore Stockpile Dust Collector 4	Processing Plant 1 Primary Crusher Dust Collector 1	Processing Plant 2 Primary Crusher Dust Collector 1	Processing Plant 1 Secondary Screening and Crushing Dust Collector 2	Processing Plant 2 Secondary Screening and Crushing Dust Collector 2	Processing Plant 1 Crushed Ore Stockpile Dust Collector 3	Processing Plant 2 Crushed Ore Stockpile Dust Collector 3	Processing Plant 1 Crushed Ore Stockpile Dust Collector 4	Processing Plant 2 Crushed Ore Stockpile Dust Collector 4
			P1DC1	P2DC1	P1DC2	P2DC2	P1DC3	P2DC3	P1DC4	P2DC4	P1DC1	P2DC1	P1DC2	P2DC2	P1DC3	P2DC3	P1DC4	P2DC4
PM	<<PM>>	-	-	-	-	-	-	-	-	-	0.356	0.178	0.028	0.028	0.069	0.069	0.069	0.069
PM_{10}	<<PM10>>	-	-	-	-	-	-	-	-	-	0.171	0.085	0.013	0.013	0.033	0.033	0.033	0.033
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	-	-	-	-	-	0.036	0.018	0.003	0.003	0.007	0.007	0.007	0.007
Fluoride	7664-39-3	1.8E-07	-	-	-	-	-	-	-	-	6.4E-08	3.2E-08	5.0E-09	5.0E-09	1.3E-08	1.3E-08	1.3E-08	1.3E-08
Chromium VI	18540-29-9	1.3E-09	-	-	-	-	-	-	-	-	4.5E-10	2.3E-10	3.5E-11	3.5E-11	8.9E-11	8.9E-11	8.9E-11	8.9E-11
Mercury	7439-97-6	3.5E-11	-	-	-	-	-	-	-	-	1.2E-11	6.2E-12	9.8E-13	9.8E-13	2.4E-12	2.4E-12	2.4E-12	2.4E-12
Aluminum	7429-90-5	9.8E-03	-	-	-	-	-	-	-	-	3.5E-03	1.7E-03	2.7E-04	2.7E-04	6.8E-04	6.8E-04	6.8E-04	6.8E-04
Silver	7440-22-4	2.5E-07	-	-	-	-	-	-	-	-	8.9E-08	4.4E-08	6.9E-09	6.9E-09	1.7E-08	1.7E-08	1.7E-08	1.7E-08
Arsenic	7440-38-2	6.2E-06	-	-	-	-	-	-	-	-	2.2E-06	1.1E-06	1.7E-07	1.7E-07	4.3E-07	4.3E-07	4.3E-07	4.3E-07
Barium	7440-39-3	4.3E-05	-	-	-	-	-	-	-	-	1.5E-05	7.6E-06	1.2E-06	1.2E-06	3.0E-06	3.0E-06	3.0E-06	3.0E-06
Beryllium	7440-41-7	7.2E-08	-	-	-	-	-	-	-	-	2.6E-08	1.3E-08	2.0E-09	2.0E-09	5.0E-09	5.0E-09	5.0E-09	5.0E-09
Boron	7440-42-8	1.9E-05	-	-	-	-	-	-	-	-	6.8E-06	3.4E-06	5.3E-07	5.3E-07	1.3E-06	1.3E-06	1.3E-06	1.3E-06
Bismuth	7440-69-9	4.5E-08	-	-	-	-	-	-	-	-	1.6E-08	8.0E-09	1.3E-09	1.3E-09	3.1E-09	3.1E-09	3.1E-09	3.1E-09
Calcium	7440-70-2	1.6E-02	-	-	-	-	-	-	-	-	5.7E-03	2.9E-03	4.5E-04	4.5E-04	1.1E-03	1.1E-03	1.1E-03	1.1E-03
Cadmium	7440-43-9	3.0E-08	-	-	-	-	-	-	-	-	1.1E-08	5.4E-09	8.4E-10	8.4E-10	2.1E-09	2.1E-09	2.1E-09	2.1E-09
Cobalt	7440-48-4	1.2E-04	-	-	-	-	-	-	-	-	4.2E-05	2.1E-05	3.3E-06	3.3E-06	8.3E-06	8.3E-06	8.3E-06	8.3E-06
Chromium	7440-47-3	1.3E-03	-	-	-	-	-	-	-	-	4.7E-04	2.3E-04	3.7E-05	3.7E-05	9.2E-05	9.2E-05	9.2E-05	9.2E-05
Copper	7440-50-8	4.4E-05	-	-	-	-	-	-	-	-	1.6E-05	7.9E-06	1.2E-06	1.2E-06	3.1E-06	3.1E-06	3.1E-06	3.1E-06
Iron	7439-89-6	6.7E-02	-	-	-	-	-	-	-	-	2.4E-02	1.2E-02	1.9E-03	1.9E-03	4.6E-03	4.6E-03	4.6E-03	4.6E-03
Potassium	7440-09-7	5.7E-04	-	-	-	-	-	-	-	-	2.0E-04	1.0E-04	1.6E-05	1.6E-05	4.0E-05	4.0E-05	4.0E-05	4.0E-05
Lithium	7439-93-2	4.6E-06	-	-	-	-	-	-	-	-	1.6E-06	8.2E-07	1.3E-07	1.3E-07	3.2E-07	3.2E-07	3.2E-07	3.2E-07
Magnesium	7439-95-4	2.1E-01	-	-	-	-	-	-	-	-	7.4E-02	3.7E-02	5.7E-03	5.7E-03	1.4E-02	1.4E-02	1.4E-02	1.4E-02
Manganese	7439-96-5	1.0E-03	-	-	-	-	-	-	-	-	3.7E-04	1.8E-04	2.9E-05	2.9E-05	7.2E-05	7.2E-05	7.2E-05	7.2E-05
Molybdenum	7439-98-7	2.1E-07	-	-	-	-	-	-	-	-	7.3E-08	3.7E-08	5.7E-09	5.7E-09	1.4E-08	1.4E-08	1.4E-08	1.4E-08
Silicon	7440-21-3	3.0E-03	-	-	-	-	-	-	-	-	1.1E-03	5.4E-04	8.4E-05	8.4E-05	2.1E-04	2.1E-04	2.1E-04	2.1E-04
Sodium	7440-23-5	1.1E-04	-	-	-	-	-	-	-	-	4.0E-05	2.0E-05	3.1E-06	3.1E-06	7.9E-06	7.9E-06	7.9E-06	7.9E-06
Nickel	7440-02-0	2.0E-03	-	-	-	-	-	-	-	-	7.2E-04	3.6E-04	5.6E-05	5.6E-05	1.4E-04	1.4E-04	1.4E-04	1.4E-04
Lead	7439-92-1	4.9E-07	-	-	-	-	-	-	-	-	1.7E-07	8.7E-08	1.4E-08	1.4E-08	3.4E-08	3.4E-08	3.4E-08	3.4E-08
Antimony	7440-36-0	4.1E-07	-	-	-	-	-	-	-	-	1.5E-07	7.3E-08	1.1E-08	1.1E-08	2.8E-08	2.8E-08	2.8E-08	2.8E-08
Selenium	7782-49-2	2.8E-07	-	-	-	-	-	-	-	-	9.8E-08	4.9E-08	7.7E-09	7.7E-09	1.9E-08	1.9E-08	1.9E-08	1.9E-08
Tin	7440-31-5	3.3E-06	-	-	-	-	-	-	-	-	1.2E-06	5.8E-07	9.0E-08	9.0E-08	2.3E-07	2.3E-07	2.3E-07	2.3E-07
Strontium	7440-24-6	3.5E-05	-	-	-	-	-	-	-	-	1.2E-05	6.2E-06	9.7E-07	9.7E-07	2.4E-06	2.4E-06	2.4E-06	2.4E-06
Titanium	7440-32-6	5.4E-04	-	-	-	-	-	-	-	-	1.9E-04	9.6E-05	1.5E-05	1.5E-05	3.7E-05	3.7E-05	3.7E-05	3.7E-05
Thallium	7440-28-0	2.3E-08	-	-	-	-	-	-	-	-	8.3E-09	4.2E-09	6.5E-10	6.5E-10	1.6E-09	1.6E-09	1.6E-09	1.6E-09
Uranium	7440-61-1	3.7E-08	-	-	-	-	-	-	-	-	1.3E-08	6.5E-09	1.0E-09	1.0E-09	2.5E-09	2.5E-09	2.5E-09	2.5E-09
Vanadium	7440-62-2	3.3E-05	-	-	-	-	-	-	-	-	1.2E-05	5.8E-06	9.1E-07	9.1E-07	2.3E-06	2.3E-06	2.3E-06	2.3E-06
Tungsten	7440-33-7	8.6E-08	-	-	-	-	-	-	-	-	3.1E-08	1.5E-08	2.4E-09	2.4E-09	6.0E-09	6.0E-09	6.0E-09	6.0E-09
Yttrium	7440-65-5	2.1E-06	-	-	-	-	-	-	-	-	7.3E-07	3.7E-07	5.7E-08	5.7E-08	1.4E-07	1.4E-07	1.4E-07	1.4E-07
Zinc	7440-66-6	4.5E-05	-	-	-	-	-	-	-	-	1.6E-05	8.0E-06	1.3E-06	1.3E-06	3.1E-06	3.1E-06	3.1E-06	3.1E-06
Thorium	7440-29-1	4.8E-07	-	-	-	-	-	-	-	-	1.7E-07	8.5E-08	1.3E-08	1.3E-08	3.3E-08	3.3E-08	3.3E-08	3.3E-08
Quartz (in PM10)	14808-60-7	2.7E-02	-	-	-	-	-	-	-	-	4.6E-03	2.3E-03	3.6E-04	3.6E-04	9.0E-04	9.0E-04	9.0E-04	9.0E-04
Pyrite	12068-85-8	1.7E-07	-	-	-	-	-	-	-	-	5.9E-08	2.9E-08	4.6E-09	4.6E-09	1.2E-08	1.2E-08	1.2E-08	1.2E-08
Biotite	1302-27-8	1.0E-03	-	-	-	-	-	-	-	-	3.7E-04	1.8E-04	2.9E-05	2.9E-05	7.2E-05	7.2E-05	7.2E-05	7.2E-05
Magnetite	1309-38-2	9.7E-02	-	-	-	-	-	-	-	-	3.4E-02	1.7E-02	2.7E-03	2.7E-03	6.7E-03	6.7E-03	6.7E-03	6.7E-03
Hematite	1317-60-8	1.8E-04	-	-	-	-	-	-	-	-	6.5E-05	3.2E-05	5.1E-06	5.1E-06	1.3E-05	1.3E-05	1.3E-05	1.3E-05
Chlorite	1318-59-8	5.8E-02	-	-	-	-	-	-	-	-	2.1E-02	1.0E-02	1.6E-03	1.6E-03	4.0E-03	4.0E-03	4.0E-03	4.0E-03
Muscovite	1318-94-1	1.0E-02	-	-	-	-	-	-	-	-	3.6E-03	1.8E-03	2.8E-04	2.8E-04	7.0E-04	7.0E-04	7.0E-04	7.0E-04
Talc (fibrous)	14807-96-6	8.3E-04	-	-	-	-	-	-	-	-	2.9E-04	1.5E-04	2.3E-05	2.3E-05	5.8E-05	5.8E-05	5.8E-05	5.8E-05
Phosphorus	7723-14-0	0.0E+00	-	-	-	-	-	-	-	-	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Platinum	7440-06-4	0.0E+00	-	-	-	-	-	-	-	-	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Palladium	7440-05-3	0.0E+00	-	-	-	-	-	-	-	-	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Nickel (in PM10)	<<Ni_PM10>>	2.0E-03	-	-	-	-	-	-	-	-	3.5E-04	1.7E-04	2.7E-05	2.7E-05	6.8E-05	6.8E-05	6.8E-05	6.8E-05
Uranium (in PM10)	<<U_PM10>>	3.7E-08	-	-	-	-	-	-	-	-	6.3E-09	3.1E-09	4.9E-10	4.9E-10	1.2E-09	1.2E-09	1.2E-09	1.2E-09
Chrysotile Asbestos	132207-32-0	1.3E-02	-	-	-	-	-	-	-	-	4.6E-03	2.3E-03	3.6E-04	3.6E-04	9.0E-04	9.0E-04	9.0E-04	9.0E-04
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	-	-	-	-	-	-	-	-	1.8E-04	8.8E-05	1.4E-05	1.4E-05	3.4E-05	3.4E-05	3.4E-05	3.4E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	-	-	-	-	-	-	-	-	3.7E-05	1.8E-05	2.9E-06	2.9E-06	7.2E-06	7.2E-06	7.2E-06	7.2E-06
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	-	-	-	-	-	-	-	-	2.2E-10	1.1E-10	1.7E-11	1.7E-11	4.3E-11	4.3E-11	4.3E-11	4.3E-11

Sample Calculation - PM emissions:
PM emissions (g/s) = Maximum Flow Rate (m3/hr) x Outlet Loading (mg/m3) x 1/1000 g/mg x 1 hour/3600 seconds
= 64000 (m3/hr) x 20 (mg/m3) x 1/1000 g/mg x 1 hour/3600 seconds
= 0.356 g/s

Data Quality: Above Average
The engineering estimation methodology used has a MECP data quality of "Above Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the baghouse flow rate and is independent of the production rate. The calculated emission rate should be conservative.

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from Main Processing Plant Grinding Activities including:

1) Material transfer points inside Processing Plant 1 (P1E) and Processing Plant 2 (P2E) from crushed ore stockpile to SAG Mill
2) SAG milling inside Processing Plant 1 (P1F) and Processing Plant 2 (P2F)
3) Ball milling inside Processing Plant 1 (P1G) and Processing Plant 2 (P2G)

Source : Material transfer points inside Processing Plant 1 (P1E) and Processing Point 2 (P2E) to SAG Mill

Description:
From the crushed ore stockpiles, a series of conveyors are used to feed the semi-autogenous grinding (SAG) mills for primary grinding.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table M-1: Material transfer Input Parameters

Parameter	Year -1		Year -7		Unit	Reference
	Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer	Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer		
	P1E	P2E	P1E	P2E		
Material Handling Rate	-	-	60,000	60,000	tonnes/day	Plant design capacity
Ore Moisture Content (M)	-	-	3	3	%	DP/CNC
Mean wind speed (U)	-	-	1	1	m/s	Enclosed area, assumed 1m/s as per MECP Procedure Document Table C-2
PM Emission Factor	-	-	2.41E-04	2.41E-04	kg/tonne	
PM10 Emission Factor	-	-	1.14E-04	1.14E-04	kg/tonne	
PM2.5 Emission Factor	-	-	1.72E-05	1.72E-05	kg/tonne	
Operating time	-	-	8760	8760	hours/year	
Hours of Operation per day	-	-	365	365	day/year	
Control Efficiency	-	-	24	24	hours/day	
	-	-	90%	90%	%	Partial enclosure - TCEQ Cheer Workshop Report
PM Emissions	-	-	1.67E-02	1.67E-02	g/s	for a single drop point
PM10 Emissions	-	-	7.91E-03	7.91E-03	g/s	for a single drop point
PM2.5 Emissions	-	-	1.20E-03	1.20E-03	g/s	for a single drop point
Number of conveyor drop points to SAG mill	-	-	3	3	drops	

Sample Calculation - PM emissions:
Emission factor (kg/tonne) = 0.74 x 0.0016 x $(1/2.2)^{1.3}$ / $(3/2)^{1.4}$ = 2.41E-04 kg/tonne
PM short-term emission rate (g/s) = 60,000 tonne/day x 2.41E-04 kg/tonne x 1000 g/kg x 1day/24hr x 1hr/3600s x (1-0.9) = 1.67E-02 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the plant design capacity. The calculated emission rate should be conservative.

Table M-2: Summary of Material Transfer Emissions

CoPC	CAS	Material Speciation Factor for Ore		Emission Rate (g/s)			
				Year -1		Year 7	
		Year -1	Year 7	Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer	Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer
				P1E	P2E	P1E	P2E
PM	<<PM>>	-	-	-	-	5.02E-02	5.02E-02
PM_{10}	<<PM10>>	-	-	-	-	2.37E-02	2.37E-02
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	3.59E-03	3.59E-03
Fluoride	7664-39-3	1.8E-07	1.80E-07	-	-	9.03E-09	9.03E-09
Chromium VI	18540-29-9	1.3E-09	1.28E-09	-	-	6.41E-11	6.41E-11
Mercury	7439-97-6	3.6E-11	3.52E-11	-	-	1.76E-12	1.76E-12
Aluminum	7429-90-5	8.0E-03	9.83E-03	-	-	4.93E-04	4.93E-04
Silver	7440-22-4	2.5E-07	2.50E-07	-	-	1.25E-08	1.25E-08
Arsenic	7440-38-2	4.3E-06	6.15E-06	-	-	3.09E-07	3.09E-07
Barium	7440-39-3	2.9E-05	4.29E-05	-	-	2.15E-06	2.15E-06
Beryllium	7440-41-7	5.5E-08	7.17E-08	-	-	3.60E-09	3.60E-09
Boron	7440-42-8	2.0E-05	1.90E-05	-	-	9.53E-07	9.53E-07
Bismuth	7440-69-9	4.5E-08	4.50E-08	-	-	2.26E-09	2.26E-09
Calcium	7440-70-2	1.3E-02	1.62E-02	-	-	8.11E-04	8.11E-04
Cadmium	7440-43-9	2.7E-08	3.03E-08	-	-	1.52E-09	1.52E-09
Cobalt	7440-48-4	1.2E-04	1.19E-04	-	-	5.96E-06	5.96E-06
Chromium	7440-47-3	1.3E-03	1.32E-03	-	-	6.63E-05	6.63E-05
Copper	7440-50-8	4.3E-05	4.44E-05	-	-	2.23E-06	2.23E-06
Iron	7439-89-6	6.6E-02	6.67E-02	-	-	3.35E-03	3.35E-03
Potassium	7440-09-7	4.8E-04	5.74E-04	-	-	2.88E-05	2.88E-05
Lithium	7439-93-2	3.4E-06	4.59E-06	-	-	2.30E-07	2.30E-07
Magnesium	7439-95-4	2.1E-01	2.07E-01	-	-	1.04E-02	1.04E-02
Manganese	7439-96-5	1.0E-03	1.03E-03	-	-	5.17E-05	5.17E-05
Molybdenum	7439-98-7	1.8E-07	2.06E-07	-	-	1.03E-08	1.03E-08
Silicon	7440-21-3	3.1E-03	3.04E-03	-	-	1.52E-04	1.52E-04
Sodium	7440-23-5	1.1E-04	1.13E-04	-	-	5.68E-06	5.68E-06
Nickel	7440-02-0	2.1E-03	2.03E-03	-	-	1.02E-04	1.02E-04
Lead	7439-92-1	4.4E-07	4.87E-07	-	-	2.44E-08	2.44E-08
Antimony	7440-36-0	4.1E-07	4.10E-07	-	-	2.06E-08	2.06E-08
Selenium	7782-49-2	2.8E-07	2.76E-07	-	-	1.39E-08	1.39E-08
Tin	7440-31-5	3.3E-06	3.26E-06	-	-	1.63E-07	1.63E-07
Strontium	7440-24-6	3.0E-05	3.48E-05	-	-	1.75E-06	1.75E-06
Titanium	7440-32-6	4.4E-04	5.40E-04	-	-	2.71E-05	2.71E-05
Thallium	7440-28-0	2.2E-08	2.34E-08	-	-	1.17E-09	1.17E-09
Uranium	7440-61-1	2.9E-08	3.67E-08	-	-	1.84E-09	1.84E-09
Vanadium	7440-62-2	2.8E-05	3.28E-05	-	-	1.65E-06	1.65E-06
Tungsten	7440-33-7	8.6E-08	8.60E-08	-	-	4.32E-09	4.32E-09
Yttrium	7440-65-5	1.7E-06	2.06E-06	-	-	1.03E-07	1.03E-07
Zinc	7440-66-6	4.4E-05	4.52E-05	-	-	2.27E-06	2.27E-06
Thorium	7440-29-1	5.1E-07	4.80E-07	-	-	2.41E-08	2.41E-08
Quartz (in PM10)	14808-60-7	1.8E-02	2.70E-02	-	-	6.40E-04	6.40E-04
Pyrite	12068-85-8	1.1E-07	1.66E-07	-	-	8.32E-09	8.32E-09
Biotite	1302-27-8	6.7E-04	1.04E-03	-	-	5.20E-05	5.20E-05
Magnetite	1309-38-2	1.0E-01	9.66E-02	-	-	4.85E-03	4.85E-03
Hematite	1317-60-8	1.2E-04	1.82E-04	-	-	9.15E-06	9.15E-06
Chlorite	1318-59-8	5.5E-02	5.83E-02	-	-	2.92E-03	2.92E-03
Muscovite	1318-94-1	6.6E-03	1.02E-02	-	-	5.09E-04	5.09E-04
Talc (fibrous)	14807-96-6	5.3E-04	8.29E-04	-	-	4.16E-05	4.16E-05
Phosphorus	7723-14-0	0.0E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Platinum	7440-06-4	0.0E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Palladium	7440-05-3	0.0E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.1E-03	2.03E-03	-	-	4.81E-05	4.81E-05
Uranium (in PM10)	<<U_PM10>>	2.9E-08	3.67E-08	-	-	8.71E-10	8.71E-10
Chrysotile Asbestos	132207-32-0	1.4E-02	1.29E-02	-	-	6.48E-04	6.48E-04
Manganese (in PM10)	<<Mn_PM10>>	1.0E-03	1.03E-03	-	-	2.44E-05	2.44E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.0E-03	1.03E-03	-	-	3.70E-06	3.70E-06
Chromium VI (in PM10)	<<Cr6_PM10>>	1.3E-09	1.28E-09	-	-	3.03E-11	3.03E-11

Emissions from Main Processing Plant Grinding Activities including:

1) Material transfer points inside Processing Plant 1 (P1E) and Processing Plant 2 (P2E) from crushed ore stockpile to SAG Mill

Source: SAG milling inside Processing Plant 1 (P1F) and Processing Plant 2 (P2F)

Description:
First stage of grinding ore.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$ and speciated metal emissions.

Methodology: Emission Factor (EF)
Emissions are assumed to be negligible (based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing) for wet grinding as the slurry maintained at 65% w/w.

Source : Ball milling inside Processing Plant 1 (P1G) and Processing Plant 2 (P2G)

Description:
Grinding of ore using primary and secondary ball mills. Ball mill grinding is a wet grinding process. Emissions are assumed to be negligible (based on US EPA AP-42 document Chapter 11.24 (Metallic Minerals Processing) Table 11.24-1 Emission Factors for Metallic Minerals Processing).

Table M-4: Summary of 24-Hour Average Dust Emissions from Main Processing Plant Grinding Activities:

CoPC	CAS	Emission Rate (g/s)							
		Year -1				Year 7			
		Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer	Processing Plant 1 SAG Milling	Processing Plant 2 SAG Milling	Processing Plant 1 Material Transfer	Processing Plant 2 Material Transfer	Processing Plant 1 SAG Milling	Processing Plant 2 SAG Milling
		P1E	P2E	P1F	P2F	P1E	P2E	P1F	P2F
PM	<<PM>>	-	-	-	-	5.02E-02	5.02E-02	0.00E+00	0.00E+00
PM_{10}	<<PM10>>	-	-	-	-	2.37E-02	2.37E-02	0.00E+00	0.00E+00
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	3.59E-03	3.59E-03	0.00E+00	0.00E+00
Fluoride	7664-39-3	-	-	-	-	9.03E-09	9.03E-09	0.00E+00	0.00E+00
Chromium VI	18540-29-9	-	-	-	-	6.41E-11	6.41E-11	0.00E+00	0.00E+00
Mercury	7439-97-6	-	-	-	-	1.76E-12	1.76E-12	0.00E+00	0.00E+00
Aluminum	7429-90-5	-	-	-	-	4.93E-04	4.93E-04	0.00E+00	0.00E+00
Silver	7440-22-4	-	-	-	-	1.25E-08	1.25E-08	0.00E+00	0.00E+00
Arsenic	7440-38-2	-	-	-	-	3.09E-07	3.09E-07	0.00E+00	0.00E+00
Barium	7440-39-3	-	-	-	-	2.15E-06	2.15E-06	0.00E+00	0.00E+00
Beryllium	7440-41-7	-	-	-	-	3.60E-09	3.60E-09	0.00E+00	0.00E+00
Boron	7440-42-8	-	-	-	-	9.53E-07	9.53E-07	0.00E+00	0.00E+00
Bismuth	7440-69-9	-	-	-	-	2.26E-09	2.26E-09	0.00E+00	0.00E+00
Calcium	7440-70-2	-	-	-	-	8.11E-04	8.11E-04	0.00E+00	0.00E+00
Cadmium	7440-43-9	-	-	-	-	1.52E-09	1.52E-09	0.00E+00	0.00E+00
Cobalt	7440-48-4	-	-	-	-	5.96E-06	5.96E-06	0.00E+00	0.00E+00
Chromium	7440-47-3	-	-	-	-	6.63E-05	6.63E-05	0.00E+00	0.00E+00
Copper	7440-50-8	-	-	-	-	2.23E-06	2.23E-06	0.00E+00	0.00E+00
Iron	7439-89-6	-	-	-	-	3.35E-03	3.35E-03	0.00E+00	0.00E+00
Potassium	7440-09-7	-	-	-	-	2.88E-05	2.88E-05	0.00E+00	0.00E+00
Lithium	7439-93-2	-	-	-	-	2.30E-07	2.30E-07	0.00E+00	0.00E+00
Magnesium	7439-95-4	-	-	-	-	1.04E-02	1.04E-02	0.00E+00	0.00E+00
Manganese	7439-96-5	-	-	-	-	5.17E-05	5.17E-05	0.00E+00	0.00E+00
Molybdenum	7439-98-7	-	-	-	-	1.03E-08	1.03E-08	0.00E+00	0.00E+00
Silicon	7440-21-3	-	-	-	-	1.52E-04	1.52E-04	0.00E+00	0.00E+00
Sodium	7440-23-5	-	-	-	-	5.68E-06	5.68E-06	0.00E+00	0.00E+00
Nickel	7440-02-0	-	-	-	-	1.02E-04	1.02E-04	0.00E+00	0.00E+00
Lead	7439-92-1	-	-	-	-	2.44E-08	2.44E-08	0.00E+00	0.00E+00
Antimony	7440-36-0	-	-	-	-	2.06E-08	2.06E-08	0.00E+00	0.00E+00
Selenium	7782-49-2	-	-	-	-	1.39E-08	1.39E-08	0.00E+00	0.00E+00
Tin	7440-31-5	-	-	-	-	1.63E-07	1.63E-07	0.00E+00	0.00E+00
Strontium	7440-24-6	-	-	-	-	1.75E-06	1.75E-06	0.00E+00	0.00E+00
Titanium	7440-32-6	-	-	-	-	2.71E-05	2.71E-05	0.00E+00	0.00E+00
Thallium	7440-28-0	-	-	-	-	1.17E-09	1.17E-09	0.00E+00	0.00E+00
Uranium	7440-61-1	-	-	-	-	1.84E-09	1.84E-09	0.00E+00	0.00E+00
Vanadium	7440-62-2	-	-	-	-	1.65E-06	1.65E-06	0.00E+00	0.00E+00
Tungsten	7440-33-7	-	-	-	-	4.32E-09	4.32E-09	0.00E+00	0.00E+00
Yttrium	7440-65-5	-	-	-	-	1.03E-07	1.03E-07	0.00E+00	0.00E+00
Zinc	7440-66-6	-	-	-	-	2.27E-06	2.27E-06	0.00E+00	0.00E+00
Thorium	7440-29-1	-	-	-	-	2.41E-08	2.41E-08	0.00E+00	0.00E+00
Quartz (in PM10)	14808-60-7	-	-	-	-	6.40E-04	6.40E-04	0.00E+00	0.00E+00
Pyrite	12068-85-8	-	-	-	-	8.32E-09	8.32E-09	0.00E+00	0.00E+00
Biotite	1302-27-8	-	-	-	-	5.20E-05	5.20E-05	0.00E+00	0.00E+00
Magnetite	1309-38-2	-	-	-	-	4.85E-03	4.85E-03	0.00E+00	0.00E+00
Hematite	1317-60-8	-	-	-	-	9.15E-06	9.15E-06	0.00E+00	0.00E+00
Chlorite	1318-59-8	-	-	-	-	2.92E-03	2.92E-03	0.00E+00	0.00E+00
Muscovite	1318-94-1	-	-	-	-	5.09E-04	5.09E-04	0.00E+00	0.00E+00
Talc (fibrous)	14807-96-6	-	-	-	-	4.16E-05	4.16E-05	0.00E+00	0.00E+00
Phosphorus	7723-14-0	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Platinum	7440-06-4	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Palladium	7440-05-3	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	-	-	-	-	4.81E-05	4.81E-05	0.00E+00	0.00E+00
Uranium (in PM10)	<<U_PM10>>	-	-	-	-	8.71E-10	8.71E-10	0.00E+00	0.00E+00
Chrysotile Asbestos	132207-32-0	-	-	-	-	6.48E-04	6.48E-04	0.00E+00	0.00E+00
Manganese (in PM10)	<<Mn_PM10>>	-	-	-	-	2.44E-05	2.44E-05	0.00E+00	0.00E+00
Manganese (in PM2.5)	<<Mn_PM2.5>>	-	-	-	-	3.70E-06	3.70E-06	0.00E+00	0.00E+00
Chromium VI (in PM10)	<<Cr6_PM10>>	-	-	-	-	3.03E-11	3.03E-11	0.00E+00	0.00E+00

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from Reagents include:
1) Unloading of solid reagents received in bags (R1)
2) Evaporation of liquid reagents stored in storage tanks/mix tanks (R2)

Table R1: Reagents used onsite in the processing plant

Process	Reagent	State	Contaminant(s) of Concern [1]	Consumption Rate (g/feed)		Annual Usage (tonnes/yr)	
				Yr - 1	Yr 7	Yr - 1	Yr 7
Collector	Potassium amyl xanthate (PAX)	Solid	Potassium amyl xanthate	-	184	0	8,059
Frothers	Methyl isobutyl carbinol (MIBC)	Liquid	2-Pentanol, 4-methyl-	-	36	0	1,577
	Cytec 65	Liquid	Contains no reportable hazards	-	4	0	175
Depressants	Calgon (sodium hexametaphosphate)	Solid	Sodium hexametaphosphate	-	300	0	13,140
	Carboxy methyl cellulose (CMC)	Solid	Contains no reportable hazards	-	21	0	920
pH Modifier	Sulphuric acid (H_2SO_4)	Liquid	Sulphuric Acid	-	1,000	0	43,800
Flocculant	VANFLOC FC 20	Solid	Contains no reportable hazards	-	19	0	811

Notes:
1) Contaminant(s) of Concern were obtained from supplier Safety Data Sheets

Source: Unloading of Solids Reagents Received in Bags (R1)

Description:
Solids reagents will be received in bags and transferred to holding/storage/mix tanks were they are diluted to form solutions. Emissions from the unloading of these bags are calculated here.

Contaminant(s) of Concern:
The contaminants of concern include Particulate Matter (PM, PM_{10} and $PM_{2.5}$) and the various components of the reagents used at the process plant.

Methodology: Emission Factor (EF)
The dust emissions from the unloading of the reagents are estimated using emission factor approach based on the total quantitiy of material to be used

Table R2: Ore Processing Inputs

Parameter	Yr - 1	Year 7	units	Comment
Ore Feed Rate	0	120,000	tonne/year	NI 43-101 Technical Report and Feasibility Study, Section 17.1
Operating Time	365	365	days/year	
	24	24	hours/day	

Table R3: Emissions from Unloading Solid Reagents

Contaminant	CAS	Annual Usage (tonne/year) [2]	Usage (g/tonne)	Material Handling Emission Factor[3] (kg/Mg)	Emission Control Efficiency[4]	Total Emissions (kg/year)	Typical Maximum Daily Ore Processing Rate (tonne/day)	Average Daily Emission Rate[5] (g/s)
PM	<<PM>>	22930	524	1.1	90%	2,522	120,000	8.01E-02
PM_{10} [1]	<<PM10>>	22930	524			2,522		8.01E-02
$PM_{2.5}$ [1]	<<PM2.5>>	22930	524			2,522		8.01E-02
Potassium amyl xanthate	2720-73-2	8059	184			887		2.81E-02
Sodium hexametaphosphate	10124-56-8	13140	300			1,445		4.58E-02

Notes:
1) It is conservatively assumed that PM_{10} and $PM_{2.5}$ are the same as PM
2) Annual usage provided by CNC
3) Emission factor from US EPA AP-42 Chap 11.17 (Lime Manufacturing) for product loading and transferring are used.
4) Control efficiency is 90% as it is assumed that all unloading activities will be occurring inside of a building
5) The average daily emission rates are estimated based on the facility operating time and daily processing rate.

Sample Calculation - PM emissions:
PM emission rate (g/s) = 120,000 tonne/day x 524/10^6 (tonne/tonne) x 1.1 kg/tonne x 1000 g/1 kg x 1day/24 hr x 1 hr/3600 s 8.01E-02 g/s

Data Quality: Marginal
The emission factor calculation methodology for PM substances is based on the US EPA emission factor. It is considered having a data quality of "Marginal".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum production rate. The calculated emission rate should be conservative.

Source: Emissions from the evaporation of Reagents stored in Storage/Mix tanks

Description:
Reagents will be added to the process to modify mineral particle surfaces and enhance the effectiveness of a unit process

Contaminant(s) of Concern:
The contaminants of concern include the various components of the reagents used at the process plant.

Methodology: Emission Factor (EF)
Emissions from the significant reagents used are calculated using the evapouration equation as per the MECP document "Procedure for Preparing an ESDM Report" Table C-2.

$$Q = (8.5 \times 10^{-10}) \times A_P \times P^* \times M \times (u)^{0.78}$$

where;
Q = evapouration rate, kg/s
Ap = pool area, m2
P* = partial vapour pressure, Pa
M = molecular weight
u = wind speed, m/s

Table R4: Collector Consumables:

Reagent	Contaminant Name	CAS #	Percent by weight	Vapour Pressure	Description	Emission Rate (g/s)	Assumption
Potassium amyl xanthate (PAX)	Potassium amyl xanthate (PAX)	2720-73-2	90 - 100	N/A	Solid	0	Insignificant. Solid material, no VOC risk.

Table R5: Frother Consumables:

Reagent	Contaminant Name	CAS #	Percent by weight	Vapour Pressure	Description	Emission Rate (g/s)	Assumption
Methyl isobutyl carbinol (MIBC)	2-Pentanol, 4-methyl-	108-11-2	>95%	0.7 kPa	Liquid	0	Insignificant. Solution vapour pressure less than 1 kPa.
Cytec 65	Contains no reportable hazards	N/A	N/A	N/A	N/A	N/A	Insignificant. SDS information did not identify any VOC risk in the aqueous state.

Table R6: Depressant Consumables:

Reagent	Contaminant Name	CAS #	Percent by weight	Vapour Pressure	Description	Emission Rate (g/s)	Assumption
Calgon (sodium hexametaphosphate)	Sodium hexametaphosphate	10124-56-8	100	N/A	Solid	0	Insignificant. Solid material, no VOC risk.
Carboxy methyl cellulose (CMC)	Contains no reportable hazards	N/A	N/A	N/A	N/A	0	Insignificant. SDS information did not identify any VOC risk in the aqueous state.

Table R7: pH Modifier Consumables:

Reagent	Contaminant Name	CAS #	Percent by weight	Vapour Pressure	Description	Emission Rate (g/s)	Assumption
Sulphuric acid (H_2SO_4)	Sulphuric Acid	7664-93-9	77 - 100	0.07 kPa	Liquid	0	Insignificant. Solution vapour pressure less than 1 kPa.

Table R8: Flocculant Consumables:

Reagent	Contaminant Name	CAS #	Percent by weight	Vapour Pressure	Description	Emission Rate (g/s)	Assumption
VANFLOC FC 20	Contains no reportable hazards	N/A	N/A	N/A	N/A	0	Insignificant. SDS information did not identify any VOC risk in the aqueous state.

Table R9: Summary of 24-hour Emissions from the Unloading and Use of Reagents

Contaminant	CAS	Year -1		Year 7		
		R1 - Unloading (g/s)	R2 - Evaporation (g/s)	R1 - Unloading (g/s)	R2 - Evaporation (g/s)	Total (g/s)
PM	<<PM>>	-	-	8.01E-02	0	8.01E-02
PM_{10}	<<PM10>>	-	-	8.01E-02	0	8.01E-02
$PM_{2.5}$	<<PM2.5>>	-	-	8.01E-02	0	8.01E-02
Potassium amyl xanthate	2720-73-2	-	-	2.81E-02	0	2.81E-02
2-Pentanol, 4-methyl-	108-11-2	-	-	-	0	0.00E+00
Sodium hexametaphosphate	10124-56-8	-	-	4.58E-02	0	4.58E-02
Sulphuric Acid	7664-93-9	-	-	-	0	0.00E+00

Note:
R1 and R2 emissions are split evenly between processing plant 1 and processing plant 2 and are modelled as P1R1 and P2R1.

Dust Emissions from Main Processing Plant Concentrate Loadout Activities:

1) Concentrate dust emissions from loading stockpiles inside Processing Plant 1 (P1CL1, P1CL2) and Processing Plant 2 (P2CL1, P2CL2)
2) Mobile Emissions from inside Processing Plant 1 and Processing Plant 2 are captured in source PLANT_OP. See Non Road - Mobile Emissions tab.

Source : Concentrate dust emissions from loading stockpiles and railcars inside Processing Plant 1 (P1CL1, P1CL2) and Processing Plant 2 (P2CL1, P2CL2)

Description:
Dust emissions are expected from loading nickel and iron concentrate onto indoor stockpiles and then trasferring the concentrate from the stockpiles into the railcars via a front end loader.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for material unloading/dropping was calculated using Equation (1) in the US EPA AP-42 document Chapter 13.2.4 (Aggregate Handling and Storage Piles). The equation is:

$$E = k(0.0016)\ \frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}\ \text{(kg/megagram [Mg])}$$

where:
E = emission factor
k = particle size multiplier (dimensionless)
U = mean wind speed, meters per second (m/s)
M = material moisture content (%)
The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1 (US EPA AP-42 document Chapter 13.2.4)	< 30 µm	0.74	Note: It is assumed that k=0.74 for total particulate matter (<30 µm) consistent with the assumption in U.S. EPA AP-42 Chapter 13.2.2
	< 10 µm	0.35	
	< 2.5 µm	0.053	

Table CL-1: Concentrate Unloading Input Parameters

Parameter	Year -1				Year 7				Unit	Reference
	Plant 1 Drop to Pile	Plant 2 Drop to Pile	Plant 1 Drop to Railcar	Plant 2 Drop to Railcar	Plant 1 Drop to Pile	Plant 2 Drop to Pile	Plant 1 Drop to Railcar	Plant 2 Drop to Railcar		
	P1CL1	P2CL1	P1CL2	P2CL2	P1CL1	P2CL1	P1CL2	P2CL2		
Max 24 Hour Production Factor	-	-	-	-	1.03	1.03	1.03	1.03		
Nickel Concentrate Unloaded per Processing Plant	-	-	-	-	52,526	52,526	52,526	52,526	tonnes/year	Total concentrate per year / 2
Iron Concentrate Unloaded per Processing Plant	-	-	-	-	1,437,705	1,437,705	1,437,705	1,437,705	tonnes/year	Total concentrate per year / 2
Concentrate Moisture Content (M)	-	-	-	-	11	11	11	11	%	DP/CNC
Mean wind speed (U)	-	-	-	-	1	1	1	1	m/s	Enclosed area, assumed 1m/s as per MECP Procedure Document Table C-2
PM Emission Factor	-	-	-	-	3.91E-05	3.91E-05	3.91E-05	3.91E-05	kg/tonne	
PM10 Emission Factor	-	-	-	-	1.85E-05	1.85E-05	1.85E-05	1.85E-05	kg/tonne	
PM2.5 Emission Factor	-	-	-	-	2.80E-06	2.80E-06	2.80E-06	2.80E-06	kg/tonne	
Operating time	-	-	-	-	8760	8760	8760	8760	hours/year	
Hours of Operation per day	-	-	-	-	365	365	365	365	day/year	
Control Efficiency	-	-	-	-	24	24	24	24	hours/day	
	-	-	-	-	90%	90%	90%	90%	%	Partial enclosure - TCEQ Cheer Workshop Report

Sample Calculation - PM emissions from Plant 1 Drop to Pile (P1CL1A) for Nickel Concentrate:
Emission factor (kg/tonne) = 0.74 x 0.0016 x $(1/2.2)^{1.3}$ / $(11/2)^{1.4}$ = 3.91E-05 kg/tonne
PM short-term emission rate (g/s) = 1.03 x 52,526 tonne/year x 3.91E-05 kg/tonne x 1000 g/kg x 1year/8760hr x 1hr/3600s x (1-0.9) = 6.68E-06 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum production rate. The calculated emission rate should be conservative.

Table CL-2: Summary of 24-Hour Average Emissions from Concentrate Loadout Activities

CoPC	CAS	Material Speciation Factor		Emission Rate (g/s)													
				Year -1								Year 7					
				Plant 1 Drop to Pile		Plant 2 Drop to Pile		Plant 1 Drop to Railcar		Plant 2 Drop to Railcar		Plant 1 Drop to Pile		Plant 2 Drop to Pile		Plant 1 Drop to Railcar		Plant 2 Drop to Railcar	
				P1CL1		P2CL1		P1CL2		P2CL2		P1CL1		P2CL1		P1CL2		P2CL2	
		Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate	Nickel Concentrate	Iron Concentrate
PM	<<PM>>	-	-	-	-	-	-	-	-	-	-	6.68E-06	1.83E-04	6.68E-06	1.83E-04	6.68E-06	1.83E-04	6.68E-06	1.83E-04
PM_{10}	<<PM10>>	-	-	-	-	-	-	-	-	-	-	3.16E-06	8.65E-05	3.16E-06	8.65E-05	3.16E-06	8.65E-05	3.16E-06	8.65E-05
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	-	-	-	-	-	-	4.79E-07	1.31E-05	4.79E-07	1.31E-05	4.79E-07	1.31E-05	4.79E-07	1.31E-05
Fluoride	7664-39-3	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chromium VI	18540-29-9	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mercury	7439-97-6	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Aluminum	7429-90-5	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver	7440-22-4	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	7440-38-2	1.5E-04	2.5E-05	-	-	-	-	-	-	-	-	1.00E-09	4.57E-09	1.00E-09	4.57E-09	1.00E-09	4.57E-09	1.00E-09	4.57E-09
Barium	7440-39-3	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beryllium	7440-41-7	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Boron	7440-42-8	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Bismuth	7440-69-9	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Calcium	7440-70-2	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	7440-43-9	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	7440-48-4	6.5E-03	3.0E-08	-	-	-	-	-	-	-	-	4.34E-08	5.49E-12	4.34E-08	5.49E-12	4.34E-08	5.49E-12	4.34E-08	5.49E-12
Chromium	7440-47-3	3.0E-03	2.6E-02	-	-	-	-	-	-	-	-	2.00E-08	4.76E-06	2.00E-08	4.76E-06	2.00E-08	4.76E-06	2.00E-08	4.76E-06
Copper	7440-50-8	2.1E-03	5.0E-03	-	-	-	-	-	-	-	-	1.40E-08	9.14E-07	1.40E-08	9.14E-07	1.40E-08	9.14E-07	1.40E-08	9.14E-07
Iron	7439-89-6	1.7E-01	5.5E-01	-	-	-	-	-	-	-	-	1.14E-06	1.01E-04	1.14E-06	1.01E-04	1.14E-06	1.01E-04	1.14E-06	1.01E-04
Potassium	7440-09-7	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lithium	7439-93-2	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnesium	7439-95-4	0.0E+00	7.0E-02	-	-	-	-	-	-	-	-	0.00E+00	1.28E-05	0.00E+00	1.28E-05	0.00E+00	1.28E-05	0.00E+00	1.28E-05
Manganese	7439-96-5	5.0E-04	2.6E-03	-	-	-	-	-	-	-	-	3.34E-09	4.76E-07	3.34E-09	4.76E-07	3.34E-09	4.76E-07	3.34E-09	4.76E-07
Molybdenum	7439-98-7	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silicon	7440-21-3	0.0E+00	1.0E-01	-	-	-	-	-	-	-	-	0.00E+00	1.83E-05	0.00E+00	1.83E-05	0.00E+00	1.83E-05	0.00E+00	1.83E-05
Sodium	7440-23-5	0.0E+00	1.0E-04	-	-	-	-	-	-	-	-	0.00E+00	1.83E-08	0.00E+00	1.83E-08	0.00E+00	1.83E-08	0.00E+00	1.83E-08
Nickel	7440-02-0	3.4E-01	2.7E-07	-	-	-	-	-	-	-	-	2.27E-06	4.94E-11	2.27E-06	4.94E-11	2.27E-06	4.94E-11	2.27E-06	4.94E-11
Lead	7439-92-1	1.0E-04	0.0E+00	-	-	-	-	-	-	-	-	6.68E-10	0.00E+00	6.68E-10	0.00E+00	6.68E-10	0.00E+00	6.68E-10	0.00E+00
Antimony	7440-36-0	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium	7782-49-2	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tin	7440-31-5	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Strontium	7440-24-6	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Titanium	7440-32-6	0.0E+00	5.0E-04	-	-	-	-	-	-	-	-	0.00E+00	9.14E-08	0.00E+00	9.14E-08	0.00E+00	9.14E-08	0.00E+00	9.14E-08
Thallium	7440-28-0	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Uranium	7440-61-1	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vanadium	7440-62-2	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tungsten	7440-33-7	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Yttrium	7440-65-5	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	7440-66-6	5.0E-04	2.0E-04	-	-	-	-	-	-	-	-	3.34E-09	3.66E-08	3.34E-09	3.66E-08	3.34E-09	3.66E-08	3.34E-09	3.66E-08
Thorium	7440-29-1	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Quartz (in PM10)	14808-60-7	1.1E-01	7.4E-02	-	-	-	-	-	-	-	-	3.48E-07	6.40E-06	3.48E-07	6.40E-06	3.48E-07	6.40E-06	3.48E-07	6.40E-06
Pyrite	12068-85-8	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biotite	1302-27-8	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Magnetite	1309-38-2	2.5E-02	0.0E+00	-	-	-	-	-	-	-	-	1.67E-07	0.00E+00	1.67E-07	0.00E+00	1.67E-07	0.00E+00	1.67E-07	0.00E+00
Hematite	1317-60-8	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorite	1318-59-8	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Muscovite	1318-94-1	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Talc (fibrous)	14807-96-6	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0	3.0E-04	1.0E-04	-	-	-	-	-	-	-	-	2.00E-09	1.83E-08	2.00E-09	1.83E-08	2.00E-09	1.83E-08	2.00E-09	1.83E-08
Platinum	7440-06-4	9.0E-07	0.0E+00	-	-	-	-	-	-	-	-	6.01E-12	0.00E+00	6.01E-12	0.00E+00	6.01E-12	0.00E+00	6.01E-12	0.00E+00
Palladium	7440-05-3	3.1E-06	0.0E+00	-	-	-	-	-	-	-	-	2.07E-11	0.00E+00	2.07E-11	0.00E+00	2.07E-11	0.00E+00	2.07E-11	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	3.4E-01	2.7E-07	-	-	-	-	-	-	-	-	1.07E-06	2.34E-11	1.07E-06	2.34E-11	1.07E-06	2.34E-11	1.07E-06	2.34E-11
Uranium (in PM10)	<<U_PM10>>	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chrysotile Asbestos	132207-32-0	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Manganese (in PM10)	<<Mn_PM10>>	5.0E-04	2.6E-03	-	-	-	-	-	-	-	-	1.58E-09	2.25E-07	1.58E-09	2.25E-07	1.58E-09	2.25E-07	1.58E-09	2.25E-07
Manganese (in PM2.5)	<<Mn_PM2.5>>	5.0E-04	2.6E-03	-	-	-	-	-	-	-	-	2.39E-10	3.41E-08	2.39E-10	3.41E-08	2.39E-10	3.41E-08	2.39E-10	3.41E-08
Chromium VI (in PM10)	<<Cr6_PM10>>	0.0E+00	0.0E+00	-	-	-	-	-	-	-	-	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from vehicles using the Access Road include the following:
1) Emissions from Unpaved Road (ACCESSAB1)
2) Tailpipe Emissions (ACCESSAB2)

Table AR-1: Access Road Information

Access Road Specifications					
Parameter	**Value**	**Units**	**Value**	**Units**	**Comments**
Length	5470	m	3.40	miles	
Number of passes	2	-	2	-	
Total Length of road (per round trip)	10940	m	6.80	miles	
Width	15	m	0.01	miles	
Speed Limit	20	km/hr	12.4	mph	conservative assumption that speed limit on the access road will be limited to 20-30 km/hr
Paved/Unpaved	Unpaved				assumption

Vehicle Information					
Vehicle Type	**Vehicle Type (MOVES classification)**	**Vehicle Counts/day**		**Vehicle Distribution**	
		Yr -1	**Yr 7**	**Yr -1**	**Yr 7**
Car	Passenger Car	88	218	74%	77%
Bus	Bus	31	55	26%	19%
Grinding Media	Heavy Truck	0	1	0%	4%
Collector (PAX)		0	1		
Frother 1 (MIBC)		0	1		
Sulphuric Acid		0	4		
Frother 2 (Cytec)		0	1		
Depressant 1 (CMC)		0	1		
Depressant 2 (Calgon)		0	1		
Flocculant		0	1		

Other assumptions:
1. Road type is restricted access

Source: Emissions from Unpaved Roads (ACCESSAB1)

Description:
Particulate emissions from vehicles driving on unpaved roads causing the resuspension of loose particulate matter on the road surface.

Contaminant(s) of Concern:
PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
Emission factor for unpaved roads was calculated using Equation (1a) in the US EPA AP-42 document Chapter 13.2.2 (Unpaved Roads). The equation is:

$$E = k\,(s/12)^a (W/3)^b$$

Where:
E = emission factor
s = surface material silt content (%)
W = mean vehicle weight
k, a, and b = empirical constants

Table AR-2: Vehicle Information

Parameter		Value		Unit	Reference
		Year -1	**Year 7**		
Access road from Highway 655 to Processing Plant	Length	5.47	5.47	km	Length taken from AERMOD
Class 8 Heavy Duty Truck (all trucks excluding sulphuric acid truck)	Power rating	335	335	kW	Power rating assumed for Heavy duty truck (450 HP)
	Engine Efficiency	45%	45%	%	"Just the basics: Diesel Energy". US department of energy.
	Gross Weight	40.8	40.8	tonnes	Average gross vehicle weight of Class 8 truck
	Traffic count	0	7	Vehicles/ day	
	Fuel Used	Diesel	Diesel		
Class 8 Heavy Duty Truck (sulphuric acid truck only)	Power rating	335	335	kW	Power rating assumed for Heavy duty truck (450 HP)
	Engine Efficiency	45%	45%	%	"Just the basics: Diesel Energy". US department of energy.
	Gross Weight	36	36	tonnes	Average gross vehicle weight of Class 8 truck
	Traffic count	0	4	Vehicles/ day	
	Fuel Used	Diesel	Diesel		
Worker Vehicle - passenger car/light truck	Gross Weight	2.5	2.5	tonnes	2023 Ford F-150® XL Truck | Model Details & Specs
	Number of vehicles/day (7-day shift)	88	218	Vehicles/ day	
	Fuel Used	Gasoline	Gasoline		
Worker Vehicle - bus	Gross Weight	17.75	17.75	tonnes	Proterra-Catalyst-Vehicle-Specs.pdf
	Number of vehicles/day (7-day shift)	31	55	Vehicles/ day	
	Fuel Used	Gasoline	Gasoline		
Diesel	Fuel sulphur content	15	15	ppm (mass)	Sulphur in Diesel Regulations
	Fuel density	861	861	g/L	Diesel MSDS
	Lower Heating Value (BTU/gal)	132,680	132,680	BTU/gal	Based on "Alternative Fuels Data Center – Fuel Properties Comparison " from the US Department of Energy
Gasoline	Fuel sulphur content	30	30	ppm (mass)	Sulphur in Gasoline Regulations
	Fuel density	740	740	g/L	Unleaded gasoline MSDS
Dust Control Method Control Efficiency	Dust control during non-precipitation days in summer	85%	85%	%	Assumed a combination of water, chemical suppressant, wind shielding from vegetation, stockpiles or wind breaks and limiting vehicle speeds
	Winter months natural mitigation efficiency	95%	95%	%	Based on "Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada", Golder Associates. Assumed average control efficiency.

Table AR-3: Vehicle Weight and Travel Distance Calculation:

	Year -1								Year 7							
Vehicle[1]	**Number of Vehicles/day**	**Mean Vehicle Weight**		**Round Trip Travel Distance Each Vehicle**	**Days travelled Per year**	**Annual Travel Distance**	**Rated Mean Vehicle Weight[2]**	**Mean Weight x Annual Distance[3]**	**Number of Vehicles/day**	**Mean Vehicle Weight**		**Round Trip Travel Distance Each Vehicle**	**Days travelled Per year**	**Annual Travel Distance**	**Rated Mean Vehicle Weight[2]**	**Mean Weight x Annual Distance[3]**
		Tonnes	**Ton**	**km/day**	**days/year**	**VKT/year**	**Ton**	**ton.VKT/year**		**Tonnes**	**Ton**	**km/day**	**days/year**	**VKT/year**	**Ton**	**ton.VKT/year**
Class 8 Heavy Duty Truck (all trucks excluding sulphuric acid truck)	0	40.8	45.0	10.94	365	0	7.2	0	7	40.8	45.0	10.94	365	27,952	7.6	1,257,826
Class 8 Heavy Duty Truck (sulphuric acid truck only)	0	36	39.7	10.94	365	0		0	4	36	39.7	10.94	365	15,972		633,836
Worker Vehicle - passenger car/light truck	88	2.5	2.8	10.94	365	351,393		968,360	218	2.5	2.8	10.94	365	870,496		2,398,893
Worker Vehicle - bus	31	17.75	19.6	10.94	365	124,585		2,437,627	55	17.75	19.6	10.94	365	220,419		4,312,725
					Total	**475,976**	**Total**	**3,405,988**					**Total**	**1,134,839**	**Total**	**8,603,280**

Notes:
1. Various vehicles travelling on the access road.
2. Since there are different vehicles running on different schedules and the estimation methodology suggested by US. EPA is intended for a "fleet" average weight of all vehicles travelling on the road, a weighted (based on weight of each vehicle and travelled distance) vehicle mass is used for emissions estimation.
3. Factor used to calculate rated mean weight.

Table AR-4: Unpaved Road Dust Emission Calculations

CoPC	CAS	Emission Constants [1]			Silt Content, s [2]	Year - 1						Year 7					
						Average Vehicle Weight	SUMMER MONTHS [3]			WINTER MONTHS [3]		Average Vehicle Weight	SUMMER MONTHS [3]			WINTER MONTHS [3]	
							Emission Factor [4]		Total Emissions	Emission Factor [4]			Emission Factor [4]		Total Emissions	Emission Factor [4]		Total Emissions
		k (lb./VMT)	a	b	(%)	(Tons)	(lb./VMT)	(g/VKT)	(g/s)	(lb./VMT)	(g/VKT)	(g/s)	(Tons)	(lb./VMT)	(g/VKT)	(g/s)	(lb./VMT)	(g/VKT)	(g/s)
PM	<<PM>>	4.9	0.7	0.45	9.1	7.2	0.90	252	3.81	0.30	84	1.27	7.6	0.92	259	9.32	0.31	86	3.11
PM_{10}	<<PM10>>	1.5	0.9	0.45	9.1	7.2	0.26	73	1.10	0.09	24	0.37	7.6	0.27	75	2.70	0.09	25	0.90
$PM_{2.5}$	<<PM2.5>>	0.15	0.9	0.45	9.1	7.2	0.03	7	0.11	0.009	2	0.04	7.6	0.03	8	0.27	0.01	3	0.09
Speciated Metals	**CAS**	**Metal Speciation Factor for Haul Roads**							**Summer Emission Rate (g/s)**			**Winter Emission Rate (g/s)**				**Summer Emission Rate (g/s)**			**Winter Emission Rate (g/s)**
Fluoride	7664-39-3								-			-				-			-
Chromium VI	18540-29-9								-			-				-			-
Mercury	7439-97-6								-			-				-			-
Aluminum	7429-90-5	7.41E-02							2.82E-01			9.41E-02				6.91E-01			2.30E-01
Silver	7440-22-4	2.50E-07							9.53E-07			3.18E-07				2.33E-06			7.77E-07
Arsenic	7440-38-2	2.29E-06							8.68E-06			2.89E-06				2.13E-05			7.08E-06
Barium	7440-39-3	9.66E-05							3.68E-04			1.23E-04				9.01E-04			3.00E-04
Beryllium	7440-41-7	6.74E-08							2.57E-07			8.57E-08				6.29E-07			2.10E-07
Boron	7440-42-8	7.76E-06							2.96E-05			9.85E-06				7.23E-05			2.41E-05
Bismuth	7440-69-9	4.66E-08							1.78E-07			5.92E-08				4.35E-07			1.45E-07
Calcium	7440-70-2	9.07E-02							3.46E-01			1.15E-01				8.46E-01			2.82E-01
Cadmium	7440-43-9	5.13E-08							1.96E-07			6.52E-08				4.79E-07			1.60E-07
Cobalt	7440-48-4	4.49E-05							1.71E-04			5.71E-05				4.19E-04			1.40E-04
Chromium	7440-47-3	5.19E-04							1.98E-03			6.59E-04				4.84E-03			1.61E-03
Copper	7440-50-8	1.03E-04							3.94E-04			1.31E-04				9.64E-04			3.21E-04
Iron	7439-89-6	4.35E-02							1.66E-01			5.53E-02				4.06E-01			1.35E-01
Potassium	7440-09-7	2.68E-03							1.02E-02			3.40E-03				2.50E-02			8.33E-03
Lithium	7439-93-2	1.24E-05							4.71E-05			1.57E-05				1.15E-04			3.84E-05
Magnesium	7439-95-4	7.02E-02							2.68E-01			8.92E-02				6.55E-01			2.18E-01
Manganese	7439-96-5	9.47E-04							3.61E-03			1.20E-03				8.83E-03			2.94E-03
Molybdenum	7439-98-7	5.30E-07							2.02E-06			6.74E-07				4.95E-06			1.65E-06
Silicon	7440-21-3	5.02E-03							1.91E-02			6.38E-03				4.68E-02			1.56E-02
Sodium	7440-23-5	8.00E-03							3.05E-02			1.02E-02				7.46E-02			2.49E-02
Nickel	7440-02-0	2.14E-04							8.17E-04			2.72E-04				2.00E-03			6.66E-04
Lead	7439-92-1	4.55E-07							1.74E-06			5.79E-07				4.25E-06			1.42E-06
Antimony	7440-36-0	4.18E-07							1.59E-06			5.31E-07				3.90E-06			1.30E-06
Selenium	7782-49-2	2.87E-07							1.09E-06			3.65E-07				2.68E-06			8.93E-07
Tin	7440-31-5	3.13E-06							1.19E-05			3.98E-06				2.92E-05			9.73E-06
Strontium	7440-24-6	1.28E-04							4.88E-04			1.63E-04				1.19E-03			3.98E-04
Titanium	7440-32-6	1.17E-03							4.44E-03			1.48E-03				1.09E-02			3.62E-03
Thallium	7440-28-0	2.46E-08							9.39E-08			3.13E-08				2.30E-07			7.66E-08
Uranium	7440-61-1	3.59E-08							1.37E-07			4.56E-08				3.35E-07			1.12E-07
Vanadium	7440-62-2	1.14E-04							4.34E-04			1.45E-04				1.06E-03			3.54E-04
Tungsten	7440-33-7	1.21E-07							4.61E-07			1.54E-07				1.13E-06			3.76E-07
Yttrium	7440-65-5	4.48E-06							1.71E-05			5.69E-06				4.18E-05			1.39E-05
Zinc	7440-66-6	3.38E-05							1.29E-04			4.30E-05				3.15E-04			1.05E-04
Thorium	7440-29-1	6.80E-07							2.59E-06			8.64E-07				6.34E-06			2.11E-06
Quartz (in PM10)	14808-60-7	1.33E-03							1.46E-03			4.87E-04				3.58E-03			1.19E-03
Pyrite	12068-85-8	0.00E+00							0.00E+00			0.00E+00				0.00E+00			0.00E+00
Biotite	1302-27-8	4.88E-03							1.86E-02			6.19E-03				4.55E-02			1.52E-02
Magnetite	1309-38-2	3.43E-03							1.31E-02			4.35E-03				3.19E-02			1.06E-02
Hematite	1317-60-8	0.00E+00							0.00E+00			0.00E+00				0.00E+00			0.00E+00
Chlorite	1318-59-8	1.12E-01							4.27E-01			1.42E-01				1.04E+00			3.48E-01
Muscovite	1318-94-1	1.62E-02							6.17E-02			2.06E-02				1.51E-01			5.03E-02
Talc (fibrous)	14807-96-6	0.00E+00							0.00E+00			0.00E+00				0.00E+00			0.00E+00
Phosphorus	7723-14-0								-			-				-			-
Platinum	7440-06-4								-			-				-			-
Palladium	7440-05-3								-			-				-			-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04							2.37E-04			7.89E-05				5.79E-04			1.93E-04
Uranium (in PM10)	<<U_PM10>>	3.59E-08							3.96E-08			1.32E-08				9.70E-08			3.23E-08
Chrysotile Asbestos	132207-32-0	2.49E-06							9.48E-06			3.16E-06				2.32E-05			7.73E-06
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04							1.04E-03			3.48E-04				2.56E-03			8.52E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04							1.04E-04			3.48E-05				2.56E-04			8.52E-05
Chromium VI (in PM10)	<<Cr6_PM10>>								-			-				-			-
0	--																		
0	--																		
0	--																		
0	--																		
0	--																		

Notes:
1. Reference: US EPA AP-42 Table 13.2.2-2
2. Mean silt content (%) for unpaved roads at Ontario mining sites from Table 2, Centre for Excellence in Mining Innovation (CEMI), Literature Review of Current Fugitive Dust Control Practices within the Mining.
3. Natural mitigation efficiency due to snow/ice cover on ground is assumed for dust emissions during winter months (November to March). During summer months (April to October), roads are watered on non-precipitation days.
4. Emissions calculated using Equation (1a) in the US EPA AP-42 document Chapter 13.2.2. (Unpaved Road), and considering the control efficiencies from dust control mitigation used on site as follows:
For dust control mitigation used on site, emission factors are multiplied by (1- Control Efficiency %).

Sample Calculation - PM emissions: Summer Months

Emission factor (g/VKT) = 4.9 x (8.1/12)^0.7 / (7.2/3)^0.45 x (1-0.9) x 281.9 g/VKT =	252	g/VKT
PM short-term emission rate (g/s) = 168 g/VKT x 169.992 VKT/year x 1year/ 365 days x 1day /24hr x 1hr/3600 s =	3.81	g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "A" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum daily vehicle trips. The calculated emission rate should be conservative.

Source: Tailpipe (ACCESSAB2)

Description:
Tailpipe emissions from vehicles driving on unpaved roads.

Contaminant(s) of Concern:
Tailpipe emissions such as PM, PM_{10}, $PM_{2.5}$, NO_X, VOCs, CO, PAHs, and SO_2 emissions are the contaminants of concern.

Methodology: Emission Factor (EF)
On-Road emission factors for vehicles travelling on the unpaved access road were obtained from MOVES3.

Table AR-5: Traffic Data

Road Source ID	Description	Link Type	Modelled Road Length (m) [1]	Average Speed [2] (km/h)	Year -1					Year 7				
					Traffic Volume [3]		ADT Distribution - Cars [5]	ADT Distribution - Heavy Trucks [5]	ADT Distribution - Bus [5]	Traffic Volume [3]		ADT Distribution - Cars [5]	ADT Distribution - Heavy Trucks [5]	ADT Distribution - Bus [5]
					ADT	Peak Hourly [4]	74%	0%	26%	ADT	Peak Hourly [4]	77%	4%	19%
1	ACCESS ROAD	Cruise	10.940	20	119	60	88	0	31	284	137	218	11	55

Notes:
(1) Source length in AERMOD.
(2) Assumed a speed limit of 20km/hr.
(3) Average Daily Traffic (ADT) provided by CNC, Peak Hourly Traffic assumed to be 50% of the total cars and buses for Year -1 and Year 7.
(4) The higher traffic counts between the AM and PM Peak Hour traffic are used for peak hourly traffic for emission estimation.
(5) Data provided by CNC.

Emission Calculations:

Methodology: U.S. EPA MOVES program
EPA's MOtor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria pollutants, greenhouse gases, and air toxics. MOVES3 project level is used in estimating the vehicle on-road emissions for the project.

Table AR-6: Key Input Data to MOVES3

Parameter	Input Description	
	Year -1	Year 7
Modelling Scale	Project scale	Project scale
Calculation Type	Emission rates	Emission rates
Baseline Year	2027	2034
Evaluation Month and Time	January and July 7AM-8AM - the higher emission factors out of the two months are conservatively used	January and July 7AM-8AM - the higher emission factors out of the two months are conservatively used
Geographic Bounds	Niagara County, NY (36063)	Niagara County, NY (36063)
On road Vehicles	74% Passenger Car 0% Combination Short-haul Truck 26% Other Bus	72% Passenger Car 10% Combination Short-haul Truck 18% Other Bus
Road Type	Rural Restricted Access	Rural Restricted Access
Contaminants	CoPCs - CO, NO_x, PM_{10}, $PM_{2.5}$, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and select PAHs GHGs - Atmospheric CO_2, CH_4 and N_2O	CoPCs - CO, NO_x, PM_{10}, $PM_{2.5}$, Acetaldehyde, Formaldehyde, 1,3-Butadiene, Benzene, Acrolein, and select PAHs GHGs - Atmospheric CO_2, CH_4 and N_2O
Meteorology (ambient temp., relative humidity)	Canadian Climate Normals, 1971-2000 for Timmins Victor Power Airport Daily Average temperatures: January -17.5 degrees C July 17.4 degrees C Canadian Climate Normals, 1971-2000 for Timmins Victor Power Airport Average relative humidity: January 75% (AM) July 88.6% (AM)	Canadian Climate Normals, 1971-2000 for Timmins Victor Power Airport Daily Average temperatures: January -17.5 degrees C July 17.4 degrees C Canadian Climate Normals, 1971-2000 for Timmins Victor Power Airport Average relative humidity: January 75% (AM) July 88.6% (AM)
Fuel Type	MOVES defaults	MOVES defaults
Fuel Data	Ontario	Ontario
Traffic Volume	See table above	See table above
Traffic Speed	See table above	See table above
Vehicle Age Distribution	U.S. EPA default for the modelling year	U.S. EPA default for the modelling year

Table AR-7: Emission Data for Road Year -1:

Road Source ID	CoPC	CAS	ACCESS ROAD						
			Emission Factor[1] (g/VMT)	ADT	Daily VMT	Daily Emission Rate [2] (g/s)	Peak Hourly	Hourly VMT	Hourly Emission Rate [3] (g/s)
1	Nitrogen Oxides (NOx)	10102-44-0	15.17	119	810	1.42E-01	60	405	1.71E+00
1	Carbon Monoxide (CO)	630-08-0	64.29			6.03E-01			7.24E+00
1	Sulphur Dioxide (SO_2)	7446-09-5	3.68E-02			3.45E-04			4.14E-03
1	PM	<<PM>>	2.03E+00			1.91E-02			2.29E-01
1	PM_{10}	<<PM10>>	2.03E+00			1.91E-02			2.29E-01
1	$PM_{2.5}$	<<PM2.5>>	1.58E-01			1.48E-03			1.78E-02
1	Benzene	71-43-2	1.32E-02			1.24E-04			1.49E-03
1	1,3-Butadiene	106-99-0	1.16E-03			1.09E-05			1.30E-04
1	Acrolein	107-02-8	4.38E-03			4.11E-05			4.93E-04
1	Acetaldehyde	75-07-0	3.08E-01			2.89E-03			3.47E-02
1	Formaldehyde	50-00-0	7.70E-01			7.22E-03			8.66E-02
1	Napthalene	91-20-3	3.14E-03			2.94E-05			3.53E-04
1	Dibenz(a,h)anthracene	53-70-3	4.30E-07			4.03E-09			4.84E-08
1	Fluoranthene	206-44-0	1.61E-04			1.51E-06			1.81E-05
1	Acenaphthene	83-32-9	9.50E-05			8.91E-07			1.07E-05
1	Acenaphthylene	208-96-8	1.72E-04			1.61E-06			1.94E-05
1	Anthracene	120-12-7	8.71E-05			8.16E-07			9.80E-06
1	Benzo(a)anthracene	56-55-3	3.88E-05			3.64E-07			4.36E-06
1	Benzo(a)pyrene	50-32-8	1.16E-05			1.09E-07			1.31E-06
1	Benzo(b)fluoranthene	205-99-2	4.21E-06			3.95E-08			4.74E-07
1	Benzo(g,h,i)perylene	191-24-2	7.63E-06			7.15E-08			8.58E-07
1	Benzo(k)fluoranthene	207-08-9	1.88E-06			1.76E-08			2.12E-07
1	Chrysene	218-01-9	2.24E-05			2.10E-07			2.52E-06
1	Fluorene	86-73-7	1.61E-04			1.51E-06			1.81E-05
1	Indeno(1,2,3-cd)pyrene	193-39-5	2.14E-05			2.01E-07			2.41E-06
1	Phenanthrene	85-01-8	2.70E-04			2.53E-06			3.03E-05
1	Pyrene	129-00-0	2.08E-04			1.95E-06			2.34E-05
1	Diesel Particulate Matter (PM2	<<DPM>>	3.04E-01			2.85E-03			3.42E-02
1	Elemental Carbon (from diesel	7440-44-0	1.17E-01			1.09E-03			1.31E-02

Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene

Table AR-8: Emission Data for Road Year 7:

Road Source ID	CoPC	CAS	ACCESS ROAD						
			Emission Factor[1] (g/VMT)	ADT	Daily VMT	Daily Emission Rate [2] (g/s)	Peak Hourly	Hourly VMT	Hourly Emission Rate [3] (g/s)
1	Nitrogen Oxides (NOx)	10102-44-0	10.74	284	1,932	2.40E-01	137	929	2.77E+00
1	Carbon Monoxide (CO)	630-08-0	71.02			1.59E+00			1.83E+01
1	Sulphur Dioxide (SO_2)	7446-09-5	3.33E-02			7.45E-04			8.60E-03
1	PM	<<PM>>	1.85E+00			4.13E-02			4.77E-01
1	PM_{10}	<<PM10>>	1.85E+00			4.13E-02			4.77E-01
1	$PM_{2.5}$	<<PM2.5>>	1.40E-01			3.14E-03			3.62E-02
1	Benzene	71-43-2	9.92E-03			2.22E-04			2.56E-03
1	1,3-Butadiene	106-99-0	2.07E-04			4.63E-06			5.34E-05
1	Acrolein	107-02-8	9.31E-04			2.08E-05			2.40E-04
1	Acetaldehyde	75-07-0	3.34E-01			7.47E-03			8.62E-02
1	Formaldehyde	50-00-0	3.95E-01			8.83E-03			1.02E-01
1	Napthalene	91-20-3	9.18E-04			2.05E-05			2.37E-04
1	Dibenz(a,h)anthracene	53-70-3	1.12E-07			2.50E-09			2.89E-08
1	Fluoranthene	206-44-0	4.21E-05			9.41E-07			1.09E-05
1	Acenaphthene	83-32-9	2.68E-05			6.00E-07			6.92E-06
1	Acenaphthylene	208-96-8	5.28E-05			1.18E-06			1.36E-05
1	Anthracene	120-12-7	2.35E-05			5.26E-07			6.07E-06
1	Benzo(a)anthracene	56-55-3	9.34E-06			2.09E-07			2.41E-06
1	Benzo(a)pyrene	50-32-8	3.37E-06			7.53E-08			8.68E-07
1	Benzo(b)fluoranthene	205-99-2	1.42E-06			3.17E-08			3.65E-07
1	Benzo(g,h,i)perylene	191-24-2	4.16E-06			9.31E-08			1.07E-06
1	Benzo(k)fluoranthene	207-08-9	9.31E-07			2.08E-08			2.40E-07
1	Chrysene	218-01-9	5.79E-06			1.30E-07			1.49E-06
1	Fluorene	86-73-7	4.81E-05			1.08E-06			1.24E-05
1	Indeno(1,2,3-cd)pyrene	193-39-5	4.65E-06			1.04E-07			1.20E-06
1	Phenanthrene	85-01-8	9.44E-05			2.11E-06			2.43E-05
1	Pyrene	129-00-0	5.58E-05			1.25E-06			1.44E-05
1	Diesel Particulate Matter (PM2	<<DPM>>	1.67E-01			3.74E-03			4.31E-02
1	Elemental Carbon (from diesel	7440-44-0	3.25E-02			7.26E-04			8.38E-03

Notes:
(1) Emission factor data are produced using MOVES3. The higher of the two emission factors in January or July are used. For PM emissions from the tailpipe of the equipment is conservatively assumed that PM=PM10.
(2) Daily emission rate (g/s) = Emission factor (g/VMT) x Daily VMT x 1day/24hours x 1hour/3600s
(3) Hourly emission rate (g/s) = Emission factor (g/VMT) x Hourly VMT x 1hour/3600s

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on 2027 traffic data using assumed travelling speeds along the access road. Meteorological data (temperature and humidity) in January and July are used in the model. The calculated emission rate should be conservative.

Summary of 24-hour On Road Mobile Emissions

CoPC	CAS	Unpaved Road Dust				Tailpipe Emissions		Total Emissions (Road dust + tailpipe)			
		Year -1		Year 7		Year -1	Year 7	Year -1		Year 7	
		Summer Emission Rates (g/s)	Winter Emission Rates (g/s)	Summer Emission Rates (g/s)	Winter Emission Rates (g/s)	Emission Rate (g/s)	Emission Rate (g/s)	Summer Emission Rates (g/s)	Winter Emission Rates (g/s)	Summer Emission Rates (g/s)	Winter Emission Rates (g/s)
PM	<<PM>>	3.810	1.270	9.32	3.11	1.91E-02	4.13E-02	3.83E+00	1.29E+00	9.36E+00	3.15E+00
PM_{10}	<<PM10>>	1.104	0.368	2.70	0.90	1.91E-02	4.13E-02	1.12E+00	3.87E-01	2.74E+00	9.41E-01
$PM_{2.5}$	<<PM2.5>>	0.110	0.037	0.27	0.09	1.48E-03	3.14E-03	1.12E-01	3.83E-02	2.73E-01	9.32E-02
NOx	10102-44-0					1.42E-01	2.40E-01	1.42E-01	1.42E-01	2.40E-01	2.40E-01
CO	630-08-0					6.03E-01	1.59E+00	6.03E-01	6.03E-01	1.59E+00	1.59E+00
SO_2	7446-09-5					3.45E-04	7.45E-04	3.45E-04	3.45E-04	7.45E-04	7.45E-04
Benzene	71-43-2					1.24E-04	2.22E-04	1.24E-04	1.24E-04	2.22E-04	2.22E-04
1,3-Butadiene	106-99-0					1.09E-05	4.63E-06	1.09E-05	1.09E-05	4.63E-06	4.63E-06
Acrolein	107-02-8					4.11E-05	2.08E-05	4.11E-05	4.11E-05	2.08E-05	2.08E-05
Acetaldehyde	75-07-0					2.89E-03	7.47E-03	2.89E-03	2.89E-03	7.47E-03	7.47E-03
Formaldehyde	50-00-0					7.22E-03	8.83E-03	7.22E-03	7.22E-03	8.83E-03	8.83E-03
Napthalene	91-20-3					2.94E-05	2.05E-05	2.94E-05	2.94E-05	2.05E-05	2.05E-05
Dibenz(a,h)anthracene	53-70-3					4.03E-09	2.50E-09	4.03E-09	4.03E-09	2.50E-09	2.50E-09
Fluoranthene	206-44-0					1.51E-06	9.41E-07	1.51E-06	1.51E-06	9.41E-07	9.41E-07
Acenaphthene	83-32-9					8.91E-07	6.00E-07	8.91E-07	8.91E-07	6.00E-07	6.00E-07
Acenaphthylene	208-96-8					1.61E-06	1.18E-06	1.61E-06	1.61E-06	1.18E-06	1.18E-06
Anthracene	120-12-7					8.16E-07	5.26E-07	8.16E-07	8.16E-07	5.26E-07	5.26E-07
Benzo(a)anthracene	56-55-3					3.64E-07	2.09E-07	3.64E-07	3.64E-07	2.09E-07	2.09E-07
Benzo(a)pyrene	50-32-8					1.09E-07	7.53E-08	1.09E-07	1.09E-07	7.53E-08	7.53E-08
Benzo(b)fluoranthene	205-99-2					3.95E-08	3.17E-08	3.95E-08	3.95E-08	3.17E-08	3.17E-08
Benzo(g,h,i)perylene	191-24-2					7.15E-08	9.31E-08	7.15E-08	7.15E-08	9.31E-08	9.31E-08
Benzo(k)fluoranthene	207-08-9					1.76E-08	2.08E-08	1.76E-08	1.76E-08	2.08E-08	2.08E-08
Chrysene	218-01-9					2.10E-07	1.30E-07	2.10E-07	2.10E-07	1.30E-07	1.30E-07
Fluorene	86-73-7					1.51E-06	1.08E-06	1.51E-06	1.51E-06	1.08E-06	1.08E-06
Indeno(1,2,3-cd)pyrene	193-39-5					2.01E-07	1.04E-07	2.01E-07	2.01E-07	1.04E-07	1.04E-07
Phenanthrene	85-01-8					2.53E-06	2.11E-06	2.53E-06	2.53E-06	2.11E-06	2.11E-06
Pyrene	129-00-0					1.95E-06	1.25E-06	1.95E-06	1.95E-06	1.25E-06	1.25E-06
Diesel Particulate Matter (PM2.5 from Diesel Combust	<<DPM>>					2.85E-03	3.74E-03	2.85E-03	2.85E-03	3.74E-03	3.74E-03
Fluoride	7664-39-3	-	-	-	-			-	-	-	-
Chromium VI	18540-29-9	-	-	-	-			-	-	-	-
Mercury	7439-97-6	-	-	-	-			-	-	-	-
Aluminum	7429-90-5	2.82E-01	9.41E-02	6.91E-01	2.30E-01			2.82E-01	9.41E-02	6.91E-01	2.30E-01
Silver	7440-22-4	9.53E-07	3.18E-07	2.33E-06	7.77E-07			9.53E-07	3.18E-07	2.33E-06	7.77E-07
Arsenic	7440-38-2	8.68E-06	2.89E-06	2.13E-05	7.08E-06			8.68E-06	2.89E-06	2.13E-05	7.08E-06
Barium	7440-39-3	3.68E-04	1.23E-04	9.01E-04	3.00E-04			3.68E-04	1.23E-04	9.01E-04	3.00E-04
Beryllium	7440-41-7	2.57E-07	8.57E-08	6.29E-07	2.10E-07			2.57E-07	8.57E-08	6.29E-07	2.10E-07
Boron	7440-42-8	2.96E-05	9.85E-06	7.23E-05	2.41E-05			2.96E-05	9.85E-06	7.23E-05	2.41E-05
Bismuth	7440-69-9	1.78E-07	5.92E-08	4.35E-07	1.45E-07			1.78E-07	5.92E-08	4.35E-07	1.45E-07
Calcium	7440-70-2	3.46E-01	1.15E-01	8.46E-01	2.82E-01			3.46E-01	1.15E-01	8.46E-01	2.82E-01
Cadmium	7440-43-9	1.96E-07	6.52E-08	4.79E-07	1.60E-07			1.96E-07	6.52E-08	4.79E-07	1.60E-07
Cobalt	7440-48-4	1.71E-04	5.71E-05	4.19E-04	1.40E-04			1.71E-04	5.71E-05	4.19E-04	1.40E-04
Chromium	7440-47-3	1.88E-03	6.59E-04	4.84E-03	1.61E-03			1.98E-03	6.59E-04	4.84E-03	1.61E-03
Copper	7440-50-8	3.94E-04	1.31E-04	9.64E-04	3.21E-04			3.94E-04	1.31E-04	9.64E-04	3.21E-04
Iron	7439-89-6	1.66E-01	5.53E-02	4.06E-01	1.35E-01			1.66E-01	5.53E-02	4.06E-01	1.35E-01
Potassium	7440-09-7	1.02E-02	3.40E-03	2.50E-02	8.33E-03			1.02E-02	3.40E-03	2.50E-02	8.33E-03
Lithium	7439-93-2	4.71E-05	1.57E-05	1.15E-04	3.84E-05			4.71E-05	1.57E-05	1.15E-04	3.84E-05
Magnesium	7439-95-4	2.68E-01	8.92E-02	6.55E-01	2.18E-01			2.68E-01	8.92E-02	6.55E-01	2.18E-01
Manganese	7439-96-5	3.61E-03	1.20E-03	8.83E-03	2.94E-03			3.61E-03	1.20E-03	8.83E-03	2.94E-03
Molybdenum	7439-98-7	2.02E-06	6.74E-07	4.95E-06	1.65E-06			2.02E-06	6.74E-07	4.95E-06	1.65E-06
Silicon	7440-21-3	1.91E-02	6.38E-03	4.68E-02	1.56E-02			1.91E-02	6.38E-03	4.68E-02	1.56E-02
Sodium	7440-23-5	3.05E-02	1.02E-02	7.46E-02	2.49E-02			3.05E-02	1.02E-02	7.46E-02	2.49E-02
Nickel	7440-02-0	8.17E-04	2.72E-04	2.00E-03	6.66E-04			8.17E-04	2.72E-04	2.00E-03	6.66E-04
Lead	7439-92-1	1.74E-06	5.79E-07	4.25E-06	1.42E-06			1.74E-06	5.79E-07	4.25E-06	1.42E-06
Antimony	7440-36-0	1.59E-06	5.31E-07	3.90E-06	1.30E-06			1.59E-06	5.31E-07	3.90E-06	1.30E-06
Selenium	7782-49-2	1.09E-06	3.65E-07	2.68E-06	8.93E-07			1.09E-06	3.65E-07	2.68E-06	8.93E-07
Tin	7440-31-5	1.19E-05	3.98E-06	2.92E-05	9.73E-06			1.19E-05	3.98E-06	2.92E-05	9.73E-06
Strontium	7440-24-6	4.88E-04	1.63E-04	1.19E-03	3.98E-04			4.88E-04	1.63E-04	1.19E-03	3.98E-04
Titanium	7440-32-6	4.44E-03	1.48E-03	1.09E-02	3.62E-03			4.44E-03	1.48E-03	1.09E-02	3.62E-03
Thallium	7440-28-0	9.39E-08	3.13E-08	2.30E-07	7.66E-08			9.39E-08	3.13E-08	2.30E-07	7.66E-08
Uranium	7440-61-1	1.37E-07	4.56E-08	3.35E-07	1.12E-07			1.37E-07	4.56E-08	3.35E-07	1.12E-07
Vanadium	7440-62-2	4.34E-04	1.45E-04	1.06E-03	3.54E-04			4.34E-04	1.45E-04	1.06E-03	3.54E-04
Tungsten	7440-33-7	4.61E-07	1.54E-07	1.13E-06	3.76E-07			4.61E-07	1.54E-07	1.13E-06	3.76E-07
Yttrium	7440-65-5	1.71E-05	5.69E-06	4.18E-05	1.39E-05			1.71E-05	5.69E-06	4.18E-05	1.39E-05
Zinc	7440-66-6	1.29E-04	4.30E-05	3.15E-04	1.05E-04			1.29E-04	4.30E-05	3.15E-04	1.05E-04
Thorium	7440-29-1	2.59E-06	8.64E-07	6.34E-06	2.11E-06			2.59E-06	8.64E-07	6.34E-06	2.11E-06
Quartz (in PM10)	14808-60-7	1.46E-03	4.87E-04	3.58E-03	1.19E-03			1.46E-03	4.87E-04	3.58E-03	1.19E-03
Pyrite	12068-85-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biotite	1302-27-8	1.86E-02	6.19E-03	4.55E-02	1.52E-02			1.86E-02	6.19E-03	4.55E-02	1.52E-02
Magnetite	1309-38-2	1.31E-02	4.35E-03	3.19E-02	1.06E-02			1.31E-02	4.35E-03	3.19E-02	1.06E-02
Hematite	1317-60-8	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chlorite	1318-59-8	4.27E-01	1.42E-01	1.04E+00	3.48E-01			4.27E-01	1.42E-01	1.04E+00	3.48E-01
Muscovite	1318-94-1	6.17E-02	2.06E-02	1.51E-01	5.03E-02			6.17E-02	2.06E-02	1.51E-01	5.03E-02
Talc (fibrous)	14807-96-6	0.00E+00	0.00E+00	0.00E+00	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phosphorus	7723-14-0	-	-	-	-			-	-	-	-
Platinum	7440-06-4	-	-	-	-			-	-	-	-
Palladium	7440-05-3	-	-	-	-			-	-	-	-
Nickel (in PM10)	<<Ni_PM10>>	2.37E-04	7.89E-05	5.79E-04	1.93E-04			2.37E-04	7.89E-05	5.79E-04	1.93E-04
Uranium (in PM10)	<<U_PM10>>	3.96E-08	1.32E-08	9.70E-08	3.23E-08			3.96E-08	1.32E-08	9.70E-08	3.23E-08
Chrysotile Asbestos	132207-32-0	9.48E-06	3.16E-06	2.32E-05	7.73E-06			9.48E-06	3.16E-06	2.32E-05	7.73E-06
Manganese (in PM10)	<<Mn_PM10>>	1.04E-03	3.48E-04	2.56E-03	8.52E-04			1.04E-03	3.48E-04	2.56E-03	8.52E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	1.04E-04	3.48E-05	2.56E-04	8.52E-05			1.04E-04	3.48E-05	2.56E-04	8.52E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	-	-	-	-			-	-	-	-
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9					5.72E-08	5.25E-08	5.72E-08	5.72E-08	5.25E-08	5.25E-08
Elemental Carbon (from diesel exhaust)	7440-44-0					1.09E-03	7.26E-04	1.09E-03	1.09E-03	7.26E-04	7.26E-04

Summary of 1-hour On Road Emission Rate

CoPC	CAS	Unpaved Road Dust				Tailpipe Emissions	
		Year -1		Year 7		Year -1	Year 7
		Summer Emission Rates (g/s)	Winter Emission Rates (g/s)	Summer Emission Rates (g/s)	Winter Emission Rates (g/s)	Emission Rate (g/s)	Emission Rate (g/s)
PM	<<PM>>	-	-	-	-	2.29E-01	4.77E-01
PM_{10}	<<PM10>>	-	-	-	-	2.29E-01	4.77E-01
$PM_{2.5}$	<<PM2.5>>	-	-	-	-	1.78E-02	3.62E-02
NOx	10102-44-0	-	-	-	-	1.71E+00	2.77E+00
CO	630-08-0	-	-	-	-	7.24E+00	1.83E+01
SO_2	7446-09-5	-	-	-	-	4.14E-03	8.60E-03
Benzene	71-43-2	-	-	-	-	1.49E-03	2.56E-03
1,3-Butadiene	106-99-0	-	-	-	-	1.30E-04	5.34E-05
Acrolein	107-02-8	-	-	-	-	4.93E-04	2.40E-04
Acetaldehyde	75-07-0	-	-	-	-	3.47E-02	8.62E-02
Formaldehyde	50-00-0	-	-	-	-	8.66E-02	1.02E-01
Napthalene	91-20-3	-	-	-	-	3.53E-04	2.37E-04
Dibenzo(a,h) anthracene	53-70-3	-	-	-	-	4.84E-08	2.89E-08
Fluoranthene	206-44-0	-	-	-	-	1.81E-05	1.09E-05
Acenaphthene	83-32-9	-	-	-	-	1.07E-05	6.92E-06
Acenaphthylene	208-96-8	-	-	-	-	1.94E-05	1.36E-05
Anthracene	120-12-7	-	-	-	-	9.80E-06	6.07E-06
Benzo(a)anthracene	56-55-3	-	-	-	-	4.36E-06	2.41E-06
Benzo(a)pyrene	50-32-8	-	-	-	-	1.31E-06	8.68E-07
Benzo(b)fluoranthene	205-99-2	-	-	-	-	4.74E-07	3.65E-07
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	8.58E-07	1.07E-06
Benzo(k)fluoranthene	207-08-9	-	-	-	-	2.12E-07	2.40E-07
Chrysene	218-01-9	-	-	-	-	2.52E-06	1.49E-06
Fluorene	86-73-7	-	-	-	-	1.81E-05	1.24E-05
Indeno(1,2,3,c,d)pyrene	193-39-5	-	-	-	-	2.41E-06	1.20E-06
Phenanthrene	85-01-8	-	-	-	-	3.03E-05	2.43E-05
Pyrene	129-00-0	-	-	-	-	2.34E-05	1.44E-05
Diesel Particulate Matter (PM2.5 from Diesel Combust	<<DPM>>	-	-	-	-	3.42E-02	4.31E-02
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	-	-	-	-	6.86E-07	6.05E-07
Elemental Carbon (from diesel exhaust)	7440-44-0	-	-	-	-	1.31E-02	8.38E-03

Mobile Emissions from Locomotive Tailpipes

Source : Tailpipe Emissions from Locomotives (RAIL1, RAIL2, RAIL3, RAIL4, RAIL5)

Description:
Tailpipe emissions from locomotives idling and travelling.

Contaminant(s) of Concern:
CO, SO_2, hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.
NOx, PM, CO, hydrocarbons, and SO_2 emissions are the contaminants of concern from fuel combustions in locomotive engines. Primary speciated VOCs and a key PAH (Benzo(a) pyrene) are also included in the assessment.

Methodology: Exhaust Emission standards (EF/ MB)
Emissions are based on the regulated emissions from nonroad equipment. It is assumed that CNC locomotives will meet the US EPA "Locomotives: Exhaust Emission Standards" for Tier 4 line-haul engines.
For other contaminants such as VOCs/ PAHs, speciation profiles from the MOVES documentation "Speciation Profiles and Toxic Emission Factors for Non-road Engines" were applied to the total VOCs.
VOCs were calculated based on the ratio of VOC/NMHC as provided in the MOVES documentation. Particulate PAHs speciation profiles were based on PM2.5 emissions.

E=R*ES/3600
Where
E is the emission rate (g/s)
R is the equipment rating (bhp)
ES is the emission standard dependent on the power rating of the equipment (g/bhphr)

NOx, PM, CO, and non-methane hydrocarbon (NMHC) emissions from locomotive tailpipe exhaust are calculated based on the US EPA Locomotives: Exhaust Emission Standards.
Tier 2, 3 and 4 emission standards are assumed in this assessment. These emission factors are listed below along with the emission calculations for both maximum hourly and daily emission rates.

				Tier 2/Tier 3	Tier 4
Line-haul Locomotives: Exhaust Emission Standards (g/bhp-hr)	**HC**			0.3	0.14
	NOx			5.5	1.3
	PM			0.1	0.03
	CO			1.5	1.5
PAHs/ VOC (g/bhp-hr) (Speciation profile from MOVES documentation)	**1,3-Butadiene**	**Gaseous**	0.00186	0.000558	0.0002604
	Acenaphthene	**Gaseous**	0.000606	0.0001818	0.00008484
	Acenaphthylene	**Gaseous**	0.00124	0.000372	0.0001736
	Acetaldehyde	**Gaseous**	0.104	0.0312	0.01456
	Acrolein	**Gaseous**	0.0187	0.00561	0.002618
		Gaseous	0.0000881	0.00002643	0.000012334
		Particulate	0.000029	0.0000029	0.00000087
	Anthracene	**Total**		0.00002933	0.000013204
	Benzene	**Gaseous**	0.0541	0.01623	0.007574
		Gaseous	0.00000781	0.000002343	1.0934E-06
		Particulate	0.00000776	0.000000776	2.328E-07
	Benzo(a)anthracene	**Total**		0.000003119	1.3262E-06
	Benzo(a)pyrene	**Particulate**	0.00000667	0.000000667	2.001E-07
	Benzo(b+k)fluoranthene	**Particulate**	0.0000188	0.00000188	0.000000564
		Gaseous	0.0000057	0.00000171	0.000000798
		Particulate	0.00000755	0.000000755	2.265E-07
	Benzo(g,h,i)perylene	**Total**		0.000002465	1.0245E-06
		Gaseous	0.00000768	0.000002304	1.0752E-06
		Particulate	0.0000131	0.00000131	0.000000393
	Chrysene	**Total**		0.000003614	1.4682E-06
		Gaseous	0.000145	0.0000435	0.0000203
		Particulate	0.0000559	0.00000559	0.000001677
	Fluoranthene	**Total**		0.00004999	0.000021977
		Gaseous	0.00079	0.000237	0.0001106
		Particulate	0.0000798	0.00000798	0.000002394
	Fluorene	**Total**		0.00024498	0.000112994
	Formaldehyde	**Gaseous**	0.292	0.0876	0.04088
		Gaseous	0.00128	0.000384	0.0001792
		Particulate	0.000237	0.0000237	0.00000711
	Phenanthrene	**Total**		0.0004077	0.00018631
		Gaseous	0.00013	0.000039	0.0000182
		Particulate	0.0000615	0.00000615	0.000001845
	Pyrene	**Total**		0.00004515	0.000020045
	Dibenz(a,h)anthracene	**Particulate**	0.000000952	9.52E-08	2.856E-08
	Indeno(1,2,3-cd)pyrene	**Particulate**	0.00000672	0.000000672	2.016E-07
	Napthalene	**Gaseous**	0.00464	0.001392	0.0006496

Notes:
1. US EPA Locomotives: Exhaust Emission Standards (March 2016).
2. Ratio from Table 3-3 in the MOVES documentation US EPA, "Speciation Profiles and Toxic Emission Factors for Non-road Engines", July 2022
3. Speciation profile in MOVES documentation USEPA, "Speciation Profiles and Toxic Emission Factors for Non-road Engines" July 2022, multiplied by VOC emission factor. Particulate PAHs multiplied by PM2.5 emission factor - conservatively assume PM2.5=PM

Sample Calculation Pyrene (Tier2/Tier3 engine)

Gaseous pyrene emission factor (g/bhp-hr) = HC emission standard x PAH/VOC ratio = 0.3699 x 0.00013 =	3.90E-05	g/bhp-hr
Particulate pyrene emission factor (g/bhp-hr) = PM2.5 emission standard x PAH/ particulate ratio = 0.0000615 x 0.1 =	6.15E-06	g/bhp-hr
Pyrene emission factor (g/bhp-hr) = particulate pyrene emission factor + gaseous particulate emission factor = 4.8E-05 + 6.15E-06 =	4.52E-05	g/bhp-hr

SO2 Emission Factor Calculation:

Data	Value	Unit	Reference
Sulphur content in diesel	15	ppm	Sulphur in Diesel Fuel Regulations (SOR/2002-254)
Diesel Engine Efficiency	45%		"Just the basics: Diesel Energy", US department of energy
Lower Heating Value	128.488	BTU/gal	"Alternative Fuels Data Center – Fuel Properties Comparison " from the US Department of Energy
Unit Conversion	0.00029	kWh/BTU	Conversion
	454	g/lb	Conversion
Density of diesel	7.00	lb/gal	-
Energy output	16.95	kWh/gal	Efficiency x LHV
SO_2/ gallon of diesel	0.0953	g SO_2/gal	Sulphur content x density x 2 A factor of 2 is applied to convert sulfur to SO_2, assuming all the sulfur will be oxidized to SO_2
Emission Factor	0.0056	g/kWh	-

Note: Emissions are calculated based on sulphur content in diesel as per Sulphur in Diesel Fuel Regulations.

The train data and assumptions are presented below. It is assumed that the train data are identical for scenario Year -1 and Year 7.

Parameter	CNC	Kidd Mine	Unit	CNC Reference	Kidd Mine Reference
Number of line-haul trains	4	5	trains/day	CNC (DP) Data	CNC
	1	1	trains/hour	Stantec assumption	Stantec assumption
Engine tier rating	Tier 4	Tier 2 / Tier 3	-	CNC (DP) Data	Stantec assumption
Engines per train	2	2	engines	CNC (DP) Data	Stantec assumption
Line-haul locomotive power	3200	-	kW	CNC (DP) Data	
	4300	1000	hp	Based on EMD SD75I Operator's Manual	http://www.trainweb.org/oldtimetrains/industrial/ont/kidd_creek.htm
Fuel	Diesel	Diesel	-	Based on EMD SD75I Operator's Manual	http://www.trainweb.org/oldtimetrains/industrial/ont/kidd_creek.htm
Engine operating load while idling	10%	10%	%	Stantec assumption	Stantec assumption
Engine operating load while travelling	50%	50%	%	Stantec assumption	Stantec assumption
Loading Time in Loadout Facility (engines idling/moving cars) per train	3	2.3	hours	CNC (DP) Data	Stantec assumption based on CNC load time
Cars per Train	24	18	cars/train	CNC (DP) Data	http://www.trainweb.org/oldtimetrains/industrial/ont/kidd_creek.htm
Average travel speed	50	50	km/h	Stantec assumption of 50 km/h or Notch 5	Stantec assumption of 50 km/h or Notch 5
Line volume source inputs in AERMOD					
Locomotive height	16.0	16.0	feet	Based on EMD SD75I Operator's Manual	Stantec assumption, same as CNC
	4.9	4.9	m		
Locomotive width	10.0	10.0	feet	Based on EMD SD75I Operator's Manual	Stantec assumption, same as CNC
	3.0	3.0	m		
RAIL1 - within new CNC property boundary	3.7	-	km	Modelled length of train idling at CNC loadout	
RAIL2 - within new CNC property boundary	13.3	-	km	Modelled length of new CNC rail spur	
RAIL3 - outside of new CNC property boundary	-	1.9	km	Modelled length of train idling at Kidd Mine loadout	
RAIL4 - outside of new CNC property boundary	-	4.7	km	Modelled length of existing Kidd Mine rail spur	
RAIL5 - outside of new CNC property boundary	23.4	23.4	km	Modelled length of from southern terminus of new CNC rail spur to Kidd Mine Met	

Emission Calculations: CNC Diesel Trains

Source ID	CoPC	CAS#	Engine Maximum Power Rating (hp)	Tier 4 Emission Standard[1] (g/bhp-h)	Engine Operating Load	Peak Emission Rate per Equipment[4] (g/s)	Number of Engines per Hour	Number of Engines per Day	Idling or Travelling Time[3] (hour/train)	Hourly Emission Rate (g/s)	Daily Average Emission Rate (g/s)
RAIL1 - within new CNC property boundary	SO_2	7446-09-5	4300	0.0075	10%	0.0009	2	8	1	1.80E-03	9.00E-04
RAIL1 - within new CNC property boundary	NO_x	10102-44-0	4300	1.30	10%	0.1553	2	8	1	3.11E-01	1.55E-01
RAIL1 - within new CNC property boundary	PM	<<PM>>	4300	0.03	10%	0.0036	2	8	1	7.17E-03	3.58E-03
RAIL1 - within new CNC property boundary	PM10	<<PM10>>	4300	0.03	10%	0.0036	2	8	1	7.17E-03	3.58E-03
RAIL1 - within new CNC property boundary	PM2.5	<<PM2.5>>	4300	0.03	10%	0.0036	2	8	1	7.17E-03	3.58E-03
RAIL1 - within new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4300	0.03	10%	0.0036	2	8	1	7.17E-03	3.58E-03
RAIL1 - within new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	4300	0.03	10%	0.0036	2	8	1	7.17E-03	3.58E-03
RAIL1 - within new CNC property boundary	CO	630-08-0	4300	1.50	10%	0.1792	2	8	1	3.58E-01	1.79E-01
RAIL1 - within new CNC property boundary	HC	<<HC>>	4300	0.14	10%	0.0167	2	8	1	3.34E-02	1.67E-02
RAIL1 - within new CNC property boundary	1,3-Butadiene	106-99-0	4300	2.60E-04	10%	0.0000	2	8	1	6.22E-05	3.11E-05
RAIL1 - within new CNC property boundary	Acenaphthene	83-32-9	4300	8.48E-05	10%	0.0000	2	8	1	2.03E-05	1.01E-05
RAIL1 - within new CNC property boundary	Acenaphthylene	208-96-8	4300	1.74E-04	10%	0.0000	2	8	1	4.15E-05	2.07E-05
RAIL1 - within new CNC property boundary	Acetaldehyde	75-07-0	4300	1.46E-02	10%	0.0017	2	8	1	3.48E-03	1.74E-03
RAIL1 - within new CNC property boundary	Acrolein	107-02-8	4300	2.62E-03	10%	0.0003	2	8	1	6.25E-04	3.13E-04
RAIL1 - within new CNC property boundary	Anthracene	120-12-7	4300	1.32E-05	10%	0.0000	2	8	1	3.15E-06	1.58E-06
RAIL1 - within new CNC property boundary	Benzene	71-43-2	4300	7.57E-03	10%	0.0009	2	8	1	1.81E-03	9.05E-04
RAIL1 - within new CNC property boundary	Benzo(a)anthracene	56-55-3	4300	1.33E-06	10%	0.0000	2	8	1	3.17E-07	1.58E-07
RAIL1 - within new CNC property boundary	Benzo(a)pyrene	50-32-8	4300	2.00E-07	10%	0.0000	2	8	1	4.78E-08	2.39E-08
RAIL1 - within new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	4300	5.64E-07	10%	0.0000	2	8	1	1.35E-07	6.74E-08
RAIL1 - within new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	4300	1.02E-06	10%	0.0000	2	8	1	2.45E-07	1.22E-07
RAIL1 - within new CNC property boundary	Chrysene	218-01-9	4300	1.47E-06	10%	0.0000	2	8	1	3.51E-07	1.75E-07
RAIL1 - within new CNC property boundary	Fluoranthene	206-44-0	4300	2.20E-05	10%	0.0000	2	8	1	5.25E-06	2.63E-06
RAIL1 - within new CNC property boundary	Fluorene	86-73-7	4300	1.13E-04	10%	0.0000	2	8	1	2.70E-05	1.35E-05
RAIL1 - within new CNC property boundary	Formaldehyde	50-00-0	4300	4.09E-02	10%	0.0049	2	8	1	9.77E-03	4.88E-03
RAIL1 - within new CNC property boundary	Phenanthrene	85-01-8	4300	1.86E-04	10%	0.0000	2	8	1	4.45E-05	2.23E-05
RAIL1 - within new CNC property boundary	Pyrene	129-00-0	4300	2.00E-05	10%	0.0000	2	8	1	4.79E-06	2.39E-06
RAIL1 - within new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	4300	2.86E-08	10%	0.0000	2	8	1	6.82E-09	3.41E-09
RAIL1 - within new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	4300	2.02E-07	10%	0.0000	2	8	1	4.82E-08	2.41E-08
RAIL1 - within new CNC property boundary	Napthalene	91-20-3	4300	6.50E-04	10%	0.0001	2	8	1	1.55E-04	7.76E-05
RAIL2 - within new CNC property boundary	SO_2	7446-09-5	4300	0.0075	50%	0.0045	2	8	0.265	2.39E-03	3.98E-04
RAIL2 - within new CNC property boundary	NO_x	10102-44-0	4300	1.30	50%	0.7764	2	8	0.265	4.12E-01	6.86E-02
RAIL2 - within new CNC property boundary	PM	<<PM>>	4300	0.03	50%	0.0179	2	8	0.265	9.50E-03	1.58E-03
RAIL2 - within new CNC property boundary	PM10	<<PM10>>	4300	0.03	50%	0.0179	2	8	0.265	9.50E-03	1.58E-03
RAIL2 - within new CNC property boundary	PM2.5	<<PM2.5>>	4300	0.03	50%	0.0179	2	8	0.265	9.50E-03	1.58E-03
RAIL2 - within new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4300	0.03	50%	0.0179	2	8	0.265	9.50E-03	1.58E-03
RAIL2 - within new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	4300	0.03	50%	0.0179	2	8	0.265	9.50E-03	1.58E-03
RAIL2 - within new CNC property boundary	CO	630-08-0	4300	1.50	50%	0.8958	2	8	0.265	4.75E-01	7.92E-02
RAIL2 - within new CNC property boundary	HC	<<HC>>	4300	0.14	50%	0.0836	2	8	0.265	4.43E-02	7.39E-03
RAIL2 - within new CNC property boundary	1,3-Butadiene	106-99-0	4300	2.60E-04	50%	0.0002	2	8	0.265	8.25E-05	1.37E-05
RAIL2 - within new CNC property boundary	Acenaphthene	83-32-9	4300	8.48E-05	50%	0.0001	2	8	0.265	2.69E-05	4.48E-06
RAIL2 - within new CNC property boundary	Acenaphthylene	208-96-8	4300	1.74E-04	50%	0.0001	2	8	0.265	5.50E-05	9.16E-06
RAIL2 - within new CNC property boundary	Acetaldehyde	75-07-0	4300	1.46E-02	50%	0.0087	2	8	0.265	4.61E-03	7.68E-04
RAIL2 - within new CNC property boundary	Acrolein	107-02-8	4300	2.62E-03	50%	0.0016	2	8	0.265	8.29E-04	1.38E-04
RAIL2 - within new CNC property boundary	Anthracene	120-12-7	4300	1.32E-05	50%	0.0000	2	8	0.265	4.18E-06	6.97E-07
RAIL2 - within new CNC property boundary	Benzene	71-43-2	4300	7.57E-03	50%	0.0045	2	8	0.265	2.40E-03	4.00E-04
RAIL2 - within new CNC property boundary	Benzo(a)anthracene	56-55-3	4300	1.33E-06	50%	0.0000	2	8	0.265	4.20E-07	7.00E-08
RAIL2 - within new CNC property boundary	Benzo(a)pyrene	50-32-8	4300	2.00E-07	50%	0.0000	2	8	0.265	6.34E-08	1.06E-08
RAIL2 - within new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	4300	5.64E-07	50%	0.0000	2	8	0.265	1.79E-07	2.98E-08
RAIL2 - within new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	4300	1.02E-06	50%	0.0000	2	8	0.265	3.24E-07	5.41E-08
RAIL2 - within new CNC property boundary	Chrysene	218-01-9	4300	1.47E-06	50%	0.0000	2	8	0.265	4.65E-07	7.75E-08
RAIL2 - within new CNC property boundary	Fluoranthene	206-44-0	4300	2.20E-05	50%	0.0000	2	8	0.265	6.96E-06	1.16E-06
RAIL2 - within new CNC property boundary	Fluorene	86-73-7	4300	1.13E-04	50%	0.0001	2	8	0.265	3.58E-05	5.96E-06
RAIL2 - within new CNC property boundary	Formaldehyde	50-00-0	4300	4.09E-02	50%	0.0244	2	8	0.265	1.29E-02	2.16E-03
RAIL2 - within new CNC property boundary	Phenanthrene	85-01-8	4300	1.86E-04	50%	0.0001	2	8	0.265	5.90E-05	9.83E-06
RAIL2 - within new CNC property boundary	Pyrene	129-00-0	4300	2.00E-05	50%	0.0000	2	8	0.265	6.35E-06	1.06E-06
RAIL2 - within new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	4300	2.86E-08	50%	0.0000	2	8	0.265	9.04E-09	1.51E-09
RAIL2 - within new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	4300	2.02E-07	50%	0.0000	2	8	0.265	6.38E-08	1.06E-08
RAIL2 - within new CNC property boundary	Napthalene	91-20-3	4300	6.50E-04	50%	0.0004	2	8	0.265	2.06E-04	3.43E-05
RAIL5 - outside of new CNC property boundary	SO_2	7446-09-5	4300	0.0075	50%	0.0045	2	8	0.469	4.22E-03	7.03E-04
RAIL5 - outside of new CNC property boundary	NO_x	10102-44-0	4300	1.30	50%	0.7764	2	8	0.469	7.28E-01	1.21E-01
RAIL5 - outside of new CNC property boundary	PM	<<PM>>	4300	0.03	50%	0.0179	2	8	0.469	1.68E-02	2.80E-03
RAIL5 - outside of new CNC property boundary	PM10	<<PM10>>	4300	0.03	50%	0.0179	2	8	0.469	1.68E-02	2.80E-03
RAIL5 - outside of new CNC property boundary	PM2.5	<<PM2.5>>	4300	0.03	50%	0.0179	2	8	0.469	1.68E-02	2.80E-03
RAIL5 - outside of new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4300	0.03	50%	0.0179	2	8	0.469	1.68E-02	2.80E-03
RAIL5 - outside of new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	4300	0.03	50%	0.0179	2	8	0.469	1.68E-02	2.80E-03
RAIL5 - outside of new CNC property boundary	CO	630-08-0	4300	1.50	50%	0.8958	2	8	0.469	8.40E-01	1.40E-01
RAIL5 - outside of new CNC property boundary	HC	<<HC>>	4300	0.14	50%	0.0836	2	8	0.469	7.84E-02	1.31E-02
RAIL5 - outside of new CNC property boundary	1,3-Butadiene	106-99-0	4300	2.60E-04	50%	0.0002	2	8	0.469	1.46E-04	2.43E-05
RAIL5 - outside of new CNC property boundary	Acenaphthene	83-32-9	4300	8.48E-05	50%	0.0001	2	8	0.469	4.75E-05	7.92E-06
RAIL5 - outside of new CNC property boundary	Acenaphthylene	208-96-8	4300	1.74E-04	50%	0.0001	2	8	0.469	9.72E-05	1.62E-05
RAIL5 - outside of new CNC property boundary	Acetaldehyde	75-07-0	4300	1.46E-02	50%	0.0087	2	8	0.469	8.15E-03	1.36E-03
RAIL5 - outside of new CNC property boundary	Acrolein	107-02-8	4300	2.62E-03	50%	0.0016	2	8	0.469	1.47E-03	2.44E-04
RAIL5 - outside of new CNC property boundary	Anthracene	120-12-7	4300	1.32E-05	50%	0.0000	2	8	0.469	7.39E-06	1.23E-06
RAIL5 - outside of new CNC property boundary	Benzene	71-43-2	4300	7.57E-03	50%	0.0045	2	8	0.469	4.24E-03	7.07E-04
RAIL5 - outside of new CNC property boundary	Benzo(a)anthracene	56-55-3	4300	1.33E-06	50%	0.0000	2	8	0.469	7.43E-07	1.24E-07
RAIL5 - outside of new CNC property boundary	Benzo(a)pyrene	50-32-8	4300	2.00E-07	50%	0.0000	2	8	0.469	1.12E-07	1.87E-08
RAIL5 - outside of new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	4300	5.64E-07	50%	0.0000	2	8	0.469	3.16E-07	5.26E-08
RAIL5 - outside of new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	4300	1.02E-06	50%	0.0000	2	8	0.469	5.74E-07	9.56E-08
RAIL5 - outside of new CNC property boundary	Chrysene	218-01-9	4300	1.47E-06	50%	0.0000	2	8	0.469	8.22E-07	1.37E-07
RAIL5 - outside of new CNC property boundary	Fluoranthene	206-44-0	4300	2.20E-05	50%	0.0000	2	8	0.469	1.23E-05	2.05E-06
RAIL5 - outside of new CNC property boundary	Fluorene	86-73-7	4300	1.13E-04	50%	0.0001	2	8	0.469	6.33E-05	1.05E-05
RAIL5 - outside of new CNC property boundary	Formaldehyde	50-00-0	4300	4.09E-02	50%	0.0244	2	8	0.469	2.29E-02	3.82E-03
RAIL5 - outside of new CNC property boundary	Phenanthrene	85-01-8	4300	1.86E-04	50%	0.0001	2	8	0.469	1.04E-04	1.74E-05
RAIL5 - outside of new CNC property boundary	Pyrene	129-00-0	4300	2.00E-05	50%	0.0000	2	8	0.469	1.12E-05	1.87E-06
RAIL5 - outside of new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	4300	2.86E-08	50%	0.0000	2	8	0.469	1.60E-08	2.67E-09
RAIL5 - outside of new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	4300	2.02E-07	50%	0.0000	2	8	0.469	1.13E-07	1.88E-08
RAIL5 - outside of new CNC property boundary	Napthalene	91-20-3	4300	6.50E-04	50%	0.0004	2	8	0.469	3.64E-04	6.06E-05

Emission Calculations: Kidd Mine Diesel Trains

Source ID	CoPC	CAS#	Engine Maximum Power Rating (hp)	Tier 2/3 Emission Standard[1] (g/bhp-h)	Engine Operating Load	Peak Emission Rate per Equipment[4] (g/s)	Number of Engines per Hour	Number of Engines per Day	Idling or Travelling Time[3] (hour/train)	Hourly Emission Rate (g/s)	Daily Average Emission Rate (g/s)
RAIL3 - outside of new CNC property boundary	SO_2	7446-09-5	1000	0.0075	10%	2.09E-04	2	10	1	4.19E-04	1.96E-04
RAIL3 - outside of new CNC property boundary	NO_x	10102-44-0	1000	5.5	10%	1.53E-01	2	10	1	3.06E-01	1.43E-01
RAIL3 - outside of new CNC property boundary	PM	<<PM>>	1000	0.10	10%	2.78E-03	2	10	1	5.56E-03	2.60E-03
RAIL3 - outside of new CNC property boundary	PM10	<<PM10>>	1000	0.10	10%	2.78E-03	2	10	1	5.56E-03	2.60E-03
RAIL3 - outside of new CNC property boundary	PM2.5	<<PM2.5>>	1000	0.10	10%	2.78E-03	2	10	1	5.56E-03	2.60E-03
RAIL3 - outside of new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	1000	0.10	10%	2.78E-03	2	10	1	5.56E-03	2.60E-03
RAIL3 - outside of new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	1000	0.10	10%	2.78E-03	2	10	1	5.56E-03	2.60E-03
RAIL3 - outside of new CNC property boundary	CO	630-08-0	1000	1.5	10%	4.17E-02	2	10	1	8.33E-02	3.91E-02
RAIL3 - outside of new CNC property boundary	HC	<<HC>>	1000	0.3	10%	8.33E-03	2	10	1	1.67E-02	7.81E-03
RAIL3 - outside of new CNC property boundary	1,3-Butadiene	106-99-0	1000	5.58E-04	10%	1.55E-05	2	10	1	3.10E-05	1.45E-05
RAIL3 - outside of new CNC property boundary	Acenaphthene	83-32-9	1000	1.82E-04	10%	5.05E-06	2	10	1	1.01E-05	4.73E-06
RAIL3 - outside of new CNC property boundary	Acenaphthylene	208-96-8	1000	3.72E-04	10%	1.03E-05	2	10	1	2.07E-05	9.69E-06
RAIL3 - outside of new CNC property boundary	Acetaldehyde	75-07-0	1000	3.12E-02	10%	8.67E-04	2	10	1	1.73E-03	8.13E-04
RAIL3 - outside of new CNC property boundary	Acrolein	107-02-8	1000	5.61E-03	10%	1.56E-04	2	10	1	3.12E-04	1.46E-04
RAIL3 - outside of new CNC property boundary	Anthracene	120-12-7	1000	2.93E-05	10%	8.15E-07	2	10	1	1.63E-06	7.64E-07
RAIL3 - outside of new CNC property boundary	Benzene	71-43-2	1000	1.62E-02	10%	4.51E-04	2	10	1	9.02E-04	4.23E-04
RAIL3 - outside of new CNC property boundary	Benzo(a)anthracene	56-55-3	1000	3.12E-06	10%	8.66E-08	2	10	1	1.73E-07	8.12E-08
RAIL3 - outside of new CNC property boundary	Benzo(a)pyrene	50-32-8	1000	6.67E-07	10%	1.85E-08	2	10	1	3.71E-08	1.74E-08
RAIL3 - outside of new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1000	1.88E-06	10%	5.22E-08	2	10	1	1.04E-07	4.90E-08
RAIL3 - outside of new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	1000	2.47E-06	10%	6.85E-08	2	10	1	1.37E-07	6.42E-08
RAIL3 - outside of new CNC property boundary	Chrysene	218-01-9	1000	3.61E-06	10%	1.00E-07	2	10	1	2.01E-07	9.41E-08
RAIL3 - outside of new CNC property boundary	Fluoranthene	206-44-0	1000	4.91E-05	10%	1.36E-06	2	10	1	2.73E-06	1.28E-06
RAIL3 - outside of new CNC property boundary	Fluorene	86-73-7	1000	2.45E-04	10%	6.81E-06	2	10	1	1.36E-05	6.38E-06
RAIL3 - outside of new CNC property boundary	Formaldehyde	50-00-0	1000	8.76E-02	10%	2.43E-03	2	10	1	4.87E-03	2.28E-03
RAIL3 - outside of new CNC property boundary	Phenanthrene	85-01-8	1000	4.08E-04	10%	1.13E-05	2	10	1	2.27E-05	1.06E-05
RAIL3 - outside of new CNC property boundary	Pyrene	129-00-0	1000	4.52E-05	10%	1.25E-06	2	10	1	2.51E-06	1.18E-06
RAIL3 - outside of new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	1000	9.52E-08	10%	2.64E-09	2	10	1	5.29E-09	2.48E-09
RAIL3 - outside of new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	1000	6.72E-07	10%	1.87E-08	2	10	1	3.73E-08	1.75E-08
RAIL3 - outside of new CNC property boundary	Napthalene	91-20-3	1000	1.39E-03	10%	3.87E-05	2	10	1	7.73E-05	3.63E-05
RAIL4 - outside of new CNC property boundary	SO_2	7446-09-5	1000	0.0075	50%	1.05E-03	2	10	0.095	1.98E-04	4.13E-05
RAIL4 - outside of new CNC property boundary	NO_x	10102-44-0	1000	5.5	50%	7.64E-01	2	10	0.095	1.45E-01	3.01E-02
RAIL4 - outside of new CNC property boundary	PM	<<PM>>	1000	0.1	50%	1.39E-02	2	10	0.095	2.63E-03	5.48E-04
RAIL4 - outside of new CNC property boundary	PM10	<<PM10>>	1000	0.1	50%	1.39E-02	2	10	0.095	2.63E-03	5.48E-04
RAIL4 - outside of new CNC property boundary	PM2.5	<<PM2.5>>	1000	0.1	50%	1.39E-02	2	10	0.095	2.63E-03	5.48E-04
RAIL4 - outside of new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	1000	0.1	50%	1.39E-02	2	10	0.095	2.63E-03	5.48E-04
RAIL4 - outside of new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	1000	0.1	50%	1.39E-02	2	10	0.095	2.63E-03	5.48E-04
RAIL4 - outside of new CNC property boundary	CO	630-08-0	1000	1.5	50%	2.08E-01	2	10	0.095	3.94E-02	8.22E-03
RAIL4 - outside of new CNC property boundary	HC	<<HC>>	1000	0.3	50%	4.17E-02	2	10	0.095	7.89E-03	1.64E-03
RAIL4 - outside of new CNC property boundary	1,3-Butadiene	106-99-0	1000	5.58E-04	50%	7.75E-05	2	10	0.095	1.47E-05	3.06E-06
RAIL4 - outside of new CNC property boundary	Acenaphthene	83-32-9	1000	1.82E-04	50%	2.53E-05	2	10	0.095	4.78E-06	9.96E-07
RAIL4 - outside of new CNC property boundary	Acenaphthylene	208-96-8	1000	3.72E-04	50%	5.17E-05	2	10	0.095	9.78E-06	2.04E-06
RAIL4 - outside of new CNC property boundary	Acetaldehyde	75-07-0	1000	3.12E-02	50%	4.33E-03	2	10	0.095	8.20E-04	1.71E-04
RAIL4 - outside of new CNC property boundary	Acrolein	107-02-8	1000	5.61E-03	50%	7.79E-04	2	10	0.095	1.47E-04	3.07E-05
RAIL4 - outside of new CNC property boundary	Anthracene	120-12-7	1000	2.93E-05	50%	4.07E-06	2	10	0.095	7.71E-07	1.61E-07
RAIL4 - outside of new CNC property boundary	Benzene	71-43-2	1000	1.62E-02	50%	2.25E-03	2	10	0.095	4.27E-04	8.89E-05
RAIL4 - outside of new CNC property boundary	Benzo(a)anthracene	56-55-3	1000	3.12E-06	50%	4.33E-07	2	10	0.095	8.20E-08	1.71E-08
RAIL4 - outside of new CNC property boundary	Benzo(a)pyrene	50-32-8	1000	6.67E-07	50%	9.26E-08	2	10	0.095	1.75E-08	3.65E-09
RAIL4 - outside of new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1000	1.88E-06	50%	2.61E-07	2	10	0.095	4.94E-08	1.03E-08
RAIL4 - outside of new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	1000	2.47E-06	50%	3.42E-07	2	10	0.095	6.48E-08	1.35E-08
RAIL4 - outside of new CNC property boundary	Chrysene	218-01-9	1000	3.61E-06	50%	5.02E-07	2	10	0.095	9.50E-08	1.98E-08
RAIL4 - outside of new CNC property boundary	Fluoranthene	206-44-0	1000	4.91E-05	50%	6.82E-06	2	10	0.095	1.29E-06	2.69E-07
RAIL4 - outside of new CNC property boundary	Fluorene	86-73-7	1000	2.45E-04	50%	3.40E-05	2	10	0.095	6.44E-06	1.34E-06
RAIL4 - outside of new CNC property boundary	Formaldehyde	50-00-0	1000	8.76E-02	50%	1.22E-02	2	10	0.095	2.30E-03	4.80E-04
RAIL4 - outside of new CNC property boundary	Phenanthrene	85-01-8	1000	4.08E-04	50%	5.66E-05	2	10	0.095	1.07E-05	2.23E-06
RAIL4 - outside of new CNC property boundary	Pyrene	129-00-0	1000	4.52E-05	50%	6.27E-06	2	10	0.095	1.19E-06	2.47E-07
RAIL4 - outside of new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	1000	9.52E-08	50%	1.32E-08	2	10	0.095	2.50E-09	5.21E-10
RAIL4 - outside of new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	1000	6.72E-07	50%	9.33E-08	2	10	0.095	1.77E-08	3.68E-09
RAIL4 - outside of new CNC property boundary	Napthalene	91-20-3	1000	1.39E-03	50%	1.93E-04	2	10	0.095	3.66E-05	7.62E-06
RAIL5 - outside of new CNC property boundary	SO_2	7446-09-5	1000	0.0075	50%	1.05E-03	2	10	0.469	9.81E-04	2.04E-04
RAIL5 - outside of new CNC property boundary	NO_x	10102-44-0	1000	5.5	50%	7.64E-01	2	10	0.469	7.16E-01	1.49E-01
RAIL5 - outside of new CNC property boundary	PM	<<PM>>	1000	0.1	50%	1.39E-02	2	10	0.469	1.30E-02	2.71E-03
RAIL5 - outside of new CNC property boundary	PM10	<<PM10>>	1000	0.1	50%	1.39E-02	2	10	0.469	1.30E-02	2.71E-03
RAIL5 - outside of new CNC property boundary	PM2.5	<<PM2.5>>	1000	0.1	50%	1.39E-02	2	10	0.469	1.30E-02	2.71E-03
RAIL5 - outside of new CNC property boundary	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	1000	0.1	50%	1.39E-02	2	10	0.469	1.30E-02	2.71E-03
RAIL5 - outside of new CNC property boundary	Elemental Carbon (from diesel exhaust)	7440-44-0	1000	0.1	50%	1.39E-02	2	10	0.469	1.30E-02	2.71E-03
RAIL5 - outside of new CNC property boundary	CO	630-08-0	1000	1.5	50%	2.08E-01	2	10	0.469	1.95E-01	4.07E-02
RAIL5 - outside of new CNC property boundary	HC	<<HC>>	1000	0.3	50%	4.17E-02	2	10	0.469	3.91E-02	8.14E-03
RAIL5 - outside of new CNC property boundary	1,3-Butadiene	106-99-0	1000	5.58E-04	50%	7.75E-05	2	10	0.469	7.27E-05	1.51E-05
RAIL5 - outside of new CNC property boundary	Acenaphthene	83-32-9	1000	1.82E-04	50%	2.53E-05	2	10	0.469	2.37E-05	4.93E-06
RAIL5 - outside of new CNC property boundary	Acenaphthylene	208-96-8	1000	3.72E-04	50%	5.17E-05	2	10	0.469	4.84E-05	1.01E-05
RAIL5 - outside of new CNC property boundary	Acetaldehyde	75-07-0	1000	3.12E-02	50%	4.33E-03	2	10	0.469	4.06E-03	8.46E-04
RAIL5 - outside of new CNC property boundary	Acrolein	107-02-8	1000	5.61E-03	50%	7.79E-04	2	10	0.469	7.31E-04	1.52E-04
RAIL5 - outside of new CNC property boundary	Anthracene	120-12-7	1000	2.93E-05	50%	4.07E-06	2	10	0.469	3.82E-06	7.96E-07
RAIL5 - outside of new CNC property boundary	Benzene	71-43-2	1000	1.62E-02	50%	2.25E-03	2	10	0.469	2.11E-03	4.40E-04
RAIL5 - outside of new CNC property boundary	Benzo(a)anthracene	56-55-3	1000	3.12E-06	50%	4.33E-07	2	10	0.469	4.06E-07	8.46E-08
RAIL5 - outside of new CNC property boundary	Benzo(a)pyrene	50-32-8	1000	6.67E-07	50%	9.26E-08	2	10	0.469	8.69E-08	1.81E-08
RAIL5 - outside of new CNC property boundary	Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1000	1.88E-06	50%	2.61E-07	2	10	0.469	2.45E-07	5.10E-08
RAIL5 - outside of new CNC property boundary	Benzo(g,h,i)perylene	191-24-2	1000	2.47E-06	50%	3.42E-07	2	10	0.469	3.21E-07	6.69E-08
RAIL5 - outside of new CNC property boundary	Chrysene	218-01-9	1000	3.61E-06	50%	5.02E-07	2	10	0.469	4.71E-07	9.80E-08
RAIL5 - outside of new CNC property boundary	Fluoranthene	206-44-0	1000	4.91E-05	50%	6.82E-06	2	10	0.469	6.39E-06	1.33E-06
RAIL5 - outside of new CNC property boundary	Fluorene	86-73-7	1000	2.45E-04	50%	3.40E-05	2	10	0.469	3.19E-05	6.65E-06
RAIL5 - outside of new CNC property boundary	Formaldehyde	50-00-0	1000	8.76E-02	50%	1.22E-02	2	10	0.469	1.14E-02	2.38E-03
RAIL5 - outside of new CNC property boundary	Phenanthrene	85-01-8	1000	4.08E-04	50%	5.66E-05	2	10	0.469	5.31E-05	1.11E-05
RAIL5 - outside of new CNC property boundary	Pyrene	129-00-0	1000	4.52E-05	50%	6.27E-06	2	10	0.469	5.88E-06	1.22E-06
RAIL5 - outside of new CNC property boundary	Dibenz(a,h)anthracene	53-70-3	1000	9.52E-08	50%	1.32E-08	2	10	0.469	1.24E-08	2.58E-09
RAIL5 - outside of new CNC property boundary	Indeno(1,2,3-cd)pyrene	193-39-5	1000	6.72E-07	50%	9.33E-08	2	10	0.469	8.75E-08	1.82E-08
RAIL5 - outside of new CNC property boundary	Napthalene	91-20-3	1000	1.39E-03	50%	1.93E-04	2	10	0.469	1.81E-04	3.78E-05

Notes:
(1) SO_2 emission factor is calculated in above table and based on the fuel sulphur content. Other emission factors were obtained from the US EPA Locomotives: Exhaust Emission Standards (March 2016) for Tier 2, Tier 3 and Tier 4 engines.
(2) Travelling time is estimated based on the modelled railway length assessed and the assumed train travel speed.
(3) Emission rates are estimated based on the train passing time, emission factor, power rating and number of locomotives.
(4) For PM emissions from the tailpipe of the equipment is conservatively assumed that PM=PM10=PM2.5=DPM=Elemental Carbon.
(5) Key VOC emission factors are calculated from the data in US EPA "Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3 (July 2022)".

Sample Calculation -Pyrene emissions from idling trains at CNC loadout (RAIL1)

Peak emission rate of each locomotive (g/s) =	Engine Maximum Power Rating (hp) x (Tier 4 HC Engine EF (g/bhp-hr) x Toxic Fraction of VOC (pyrene) x 1 hour/3600 s =	2.39E-08 g/s
Maximum hourly emission rate (g/s) =	peak emission rate of each engine (g/hr) x onsite idling or traveling time (hour) x number of train engine/hour x 1hr/3600s =	4.78E-08 g/s
Daily average emission rate (g/s) =	peak short-term emission rate (g/hr) x onsite idling or travelling time (hour) x 1 day/24 hour x number of equipment/day x 1hour/3600s =	2.39E-08 g/s

Data Quality: Average
The calculation methodology is based on the US EPA reference document for Exhaust Emission Standards and the maximum allowable sulphur content in diesel and fuel consumption of the vehicles. This gives a MECP data quality of "Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source group is based on the maximum number of equipment operating in the study area and reference exhaust emission standards. The calculated emission rate should be conservative.

Summary of Locomotive Emissions

Contaminant	CAS #	1-Hour Emissions (g/s)					24-Hour Emissions (g/s)				
		Trains idling at CNC loadout	Trains travelling on new CNC rail spur	Trains idling at Kidd Mine loadout	Trains travelling on existing Kidd Mine rail spur	Trains travelling on existing Kidd Mine rail spur	Trains idling at CNC loadout	Trains travelling on new CNC rail spur	Trains idling at Kidd Mine loadout	Trains travelling on existing Kidd Mine rail spur	Trains travelling on existing Kidd Mine rail spur
		RAIL1 - within new CNC property boundary	RAIL2 - within new CNC property boundary	RAIL3 - outside of new CNC property boundary	RAIL4 - outside of new CNC property boundary	RAIL5 - outside of new CNC property boundary	RAIL1 - within new CNC property boundary	RAIL2 - within new CNC property boundary	RAIL3 - outside of new CNC property boundary	RAIL4 - outside of new CNC property boundary	RAIL5 - outside of new CNC property boundary
SO2	7446-09-5	1.80E-03	2.39E-03	4.19E-04	1.98E-04	5.20E-03	9.00E-04	3.98E-04	1.96E-04	4.13E-05	9.08E-04
NOx	10102-44-0	3.11E-01	4.12E-01	3.06E-01	1.45E-01	1.44E+00	1.55E-01	6.86E-02	1.43E-01	3.01E-02	2.71E-01
PM	<<PM>>	7.17E-03	9.50E-03	5.56E-03	2.63E-03	2.98E-02	3.58E-03	1.58E-03	2.60E-03	5.48E-04	5.51E-03
PM10	<<PM10>>	7.17E-03	9.50E-03	5.56E-03	2.63E-03	2.98E-02	3.58E-03	1.58E-03	2.60E-03	5.48E-04	5.51E-03
PM2.5	<<PM2.5>>	7.17E-03	9.50E-03	5.56E-03	2.63E-03	2.98E-02	3.58E-03	1.58E-03	2.60E-03	5.48E-04	5.51E-03
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	7.17E-03	9.50E-03	5.56E-03	2.63E-03	2.98E-02	3.58E-03	1.58E-03	2.60E-03	5.48E-04	5.51E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	7.17E-03	9.50E-03	5.56E-03	2.63E-03	2.98E-02	3.58E-03	1.58E-03	2.60E-03	5.48E-04	5.51E-03
CO	630-08-0	3.58E-01	4.75E-01	8.33E-02	3.94E-02	1.04E+00	1.79E-01	7.92E-02	3.91E-02	8.22E-03	1.81E-01
HC	<<HC>>	3.34E-02	4.43E-02	1.67E-02	7.89E-03	1.17E-01	1.67E-02	7.39E-03	7.81E-03	1.64E-03	2.12E-02
1,3-Butadiene	106-99-0	6.22E-05	8.25E-05	3.10E-05	1.47E-05	2.18E-04	3.11E-05	1.37E-05	1.45E-05	3.06E-06	3.94E-05
Acenaphthene	83-32-9	2.03E-05	2.69E-05	1.01E-05	4.78E-06	7.12E-05	1.01E-05	4.48E-06	4.73E-06	9.96E-07	1.28E-05
Acenaphthylene	208-96-8	4.15E-05	5.50E-05	2.07E-05	9.78E-06	1.46E-04	2.07E-05	9.16E-06	9.69E-06	2.04E-06	2.63E-05
Acetaldehyde	75-07-0	3.48E-03	4.61E-03	1.73E-03	8.20E-04	1.22E-02	1.74E-03	7.68E-04	8.13E-04	1.71E-04	2.21E-03
Acrolein	107-02-8	6.25E-04	8.29E-04	3.12E-04	1.47E-04	2.20E-03	3.13E-04	1.38E-04	1.46E-04	3.07E-05	3.97E-04
Anthracene	120-12-7	3.15E-06	4.18E-06	1.63E-06	7.71E-07	1.12E-05	1.58E-06	6.97E-07	7.64E-07	1.61E-07	2.03E-06
Benzene	71-43-2	1.81E-03	2.40E-03	9.02E-04	4.27E-04	6.35E-03	9.05E-04	4.00E-04	4.23E-04	8.89E-05	1.15E-03
Benzo(a)anthracene	56-55-3	3.17E-07	4.20E-07	1.73E-07	8.20E-08	1.15E-06	1.58E-07	7.00E-08	8.12E-08	1.71E-08	2.08E-07
Benzo(a)pyrene	50-32-8	4.78E-08	6.34E-08	3.71E-08	1.75E-08	1.99E-07	2.39E-08	1.06E-08	1.74E-08	3.65E-09	3.68E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1.35E-07	1.79E-07	1.04E-07	4.94E-08	5.61E-07	6.74E-08	2.98E-08	4.90E-08	1.03E-08	1.04E-07
Benzo(g,h,i)perylene	191-24-2	2.45E-07	3.24E-07	1.37E-07	6.48E-08	8.95E-07	1.22E-07	5.41E-08	6.42E-08	1.35E-08	1.62E-07
Chrysene	218-01-9	3.51E-07	4.65E-07	2.01E-07	9.50E-08	1.29E-06	1.75E-07	7.75E-08	9.41E-08	1.98E-08	2.35E-07
Fluoranthene	206-44-0	5.25E-06	6.96E-06	2.73E-06	1.29E-06	1.87E-05	2.63E-06	1.16E-06	1.28E-06	2.69E-07	3.38E-06
Fluorene	86-73-7	2.70E-05	3.58E-05	1.36E-05	6.44E-06	9.52E-05	1.35E-05	5.96E-06	6.38E-06	1.34E-06	1.72E-05
Formaldehyde	50-00-0	9.77E-03	1.29E-02	4.87E-03	2.30E-03	3.43E-02	4.88E-03	2.16E-03	2.28E-03	4.80E-04	6.19E-03
Phenanthrene	85-01-8	4.45E-05	5.90E-05	2.27E-05	1.07E-05	1.57E-04	2.23E-05	9.83E-06	1.06E-05	2.23E-06	2.84E-05
Pyrene	129-00-0	4.79E-06	6.35E-06	2.51E-06	1.19E-06	1.71E-05	2.39E-06	1.06E-06	1.18E-06	2.47E-07	3.10E-06
Dibenz(a,h)anthracene	53-70-3	6.82E-09	9.04E-09	5.29E-09	2.50E-09	2.84E-08	3.41E-09	1.51E-09	2.48E-09	5.21E-10	5.25E-09
Indeno(1,2,3-cd)pyrene	193-39-5	4.82E-08	6.38E-08	3.73E-08	1.77E-08	2.00E-07	2.41E-08	1.06E-08	1.75E-08	3.68E-09	3.70E-08
Napthalene	91-20-3	1.55E-04	2.06E-04	7.73E-05	3.66E-05	5.45E-04	7.76E-05	3.43E-05	3.63E-05	7.62E-06	9.84E-05

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Construction of the process plant area include the following emissions:

1) Dust from construction of process plant area (PLANT_CONSA)
2) Mobile Emissions (PLANT_CONSB)

Source : Dust emissions from various construction activities associated with the process plant area (PLANT_CONSA)

Description:
The construction of the process plant area would generate dust emissions and impact the local air quality.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NOx, VOCs, PAHs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC, VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet

Methodology: Emission Factor (EF) and Engineering Calculation (EC)
A generic emission factor from US EPA AP-42 Section 13.2.3 (Heavy Construction Operations) is used to estimate the overall area-wide dust emissions.

Source ID	Construction Area Description	Construction Area (m^2) [1]	Construction Area (hectare)	Hours of Operation (Hours/day)
PLANT_CONS	Process Plant Construction	148,899	14.88991	24

1) Approximated from site plan.

Emission Calculation

Contaminant	CAS#	Emission Factor[1] (Mg/hectare/ month of activity)	Dust Control Efficiency[2]	PM Scaling Factor[3]	Emission rate (g/s-hectare)[4]	Area of Site (hectare)	Working Area of Site (hectare)[5]	Total Emission Rate in Working Area (g/s)
PM	<<PM>>	2.69	0%	4.9	1.04	14.9	1.5	1.55
PM_{10}	<<PM10>>	-	0%	1.5	0.32			0.47
$PM_{2.5}$	<<PM2.5>>	-	0%	0.15	0.03			0.05

1 - Emission factor from US EPA AP-42 Chapter 13.2.3.
These values are most useful for developing estimates of overall emissions from construction scattered throughout a geographical area. The value is most applicable to construction operations with:
• medium activity level
• moderate silt content
• semiarid climate
• occurs 30 days per month

2 - Emission factor is derived from a desert area with watering used for control.
3 - PM10 and PM2.5 emission rates are calculated using scaling factors from US EPA Unpaved Roads Section.
4 - 30 days/month
5 -Only a small portion of the entire construction area would be active at any given time. 1/10 of the entire area is assumed.

Sample Calculation PM emissions:
PM emission factor (g/s-hectare) = 2.69 Mg/hectare/month * 1,000,000 g/Mg * 1 month/ 30 days * 1 day/24 hours * 1 hour/ 3,600 s * (1-0.50) 1.04 g/s-hectare
PM emission rate (g/s) = 0.52 g/s-hectare * 15.3 hectare * 1/10 active construction area= 1.545 g/s

Data Quality:
There is no indication of data quality associated with the emission factor used. The accompanying text indicates the emission factor "…will result in conservatively high estimates".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for the construction activities is based on the emissions factors and operating time. The calculated emission rate should be conservative since not all the areas will be active for construction at one time.

Summary of Processing Plant Construction Dust Emissions

Contaminant	CAS #	Metals Speciation Factor for Overburden	PLANT_CONSA - Emissions (g/s)
PM	<<PM>>	N/A	1.55E+00
PM_{10}	<<PM10>>	N/A	4.73E-01
$PM_{2.5}$	<<PM2.5>>	N/A	4.73E-02
Fluoride	7664-39-3	2.40E-06	3.71E-06
Chromium VI	18540-29-9	6.20E-09	9.58E-09
Mercury	7439-97-6	4.20E-11	6.49E-11
Aluminum	7429-90-5	4.55E-02	7.03E-02
Silver	7440-22-4	2.50E-07	3.86E-07
Arsenic	7440-38-2	2.32E-06	3.58E-06
Barium	7440-39-3	3.57E-04	5.52E-04
Beryllium	7440-41-7	8.44E-07	1.30E-06
Boron	7440-42-8	0.00E+00	0.00E+00
Bismuth	7440-69-9	1.64E-07	2.53E-07
Calcium	7440-70-2	8.43E-02	1.30E-01
Cadmium	7440-43-9	1.24E-07	1.92E-07
Cobalt	7440-48-4	7.70E-06	1.19E-05
Chromium	7440-47-3	4.66E-05	7.20E-05
Copper	7440-50-8	2.00E-05	3.08E-05
Iron	7439-89-6	2.00E-02	3.10E-02
Potassium	7440-09-7	1.50E-02	2.31E-02
Lithium	7439-93-2	2.18E-05	3.36E-05
Magnesium	7439-95-4	2.33E-02	3.60E-02
Manganese	7439-96-5	3.91E-04	6.04E-04
Molybdenum	7439-98-7	6.00E-07	9.27E-07
Silicon	7440-21-3	0.00E+00	0.00E+00
Sodium	7440-23-5	0.00E+00	0.00E+00
Nickel	7440-02-0	2.11E-05	3.26E-05
Lead	7439-92-1	9.87E-06	1.52E-05
Antimony	7440-36-0	4.00E-07	6.18E-07
Selenium	7782-49-2	4.80E-07	7.42E-07
Tin	7440-31-5	4.90E-06	7.57E-06
Strontium	7440-24-6	2.09E-04	3.22E-04
Titanium	7440-32-6	1.80E-03	2.78E-03
Thallium	7440-28-0	2.68E-07	4.14E-07
Uranium	7440-61-1	1.36E-06	2.11E-06
Vanadium	7440-62-2	4.67E-05	7.22E-05
Tungsten	7440-33-7	0.00E+00	0.00E+00
Yttrium	7440-65-5	1.00E-05	1.55E-05
Zinc	7440-66-6	3.81E-05	5.88E-05
Thorium	7440-29-1	0.00E+00	0.00E+00
Quartz (in PM10)	14808-60-7	9.98E-02	4.72E-02
Pyrite	12068-85-8	6.50E-07	1.01E-06
Biotite	1302-27-8	5.78E-03	8.94E-03
Magnetite	1309-38-2	1.13E-02	1.75E-02
Hematite	1317-60-8	7.16E-04	1.11E-03
Chlorite	1318-59-8	9.58E-02	1.48E-01
Muscovite	1318-94-1	4.60E-02	7.11E-02
Talc (fibrous)	14807-96-6	3.25E-03	5.03E-03
Phosphorus	7723-14-0	0.00E+00	0.00E+00
Platinum	7440-06-4	0.00E+00	0.00E+00
Palladium	7440-05-3	0.00E+00	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	2.11E-05	9.97E-06
Uranium (in PM10)	<<U_PM10>>	1.36E-06	6.46E-07
Chrysotile Asbestos	132207-32-0	1.25E-03	1.93E-03
Manganese (in PM10)	<<Mn_PM10>>	3.91E-04	1.85E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	3.91E-04	1.85E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	6.20E-09	2.93E-09

Source : Mobile Emissions (PLANT_CONSB)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

1-Hour and 24-Hour Tailpipe Emissions

CoPC	CAS #	Equipment Tailpipe Emissions (g/s)	
		Year -1	
		1-Hour	24-Hour
PM	<<PM>>	4.44E-02	2.96E-02
PM_{10}	<<PM10>>	4.44E-02	2.96E-02
$PM_{2.5}$	<<PM2.5>>	4.44E-02	2.96E-02
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4.44E-02	2.96E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	4.44E-02	2.96E-02
CO	630-08-0	8.68E+00	5.78E+00
SO_2	7446-09-5	1.14E-02	7.59E-03
Non-methane hydrocarbons	<<NMHC>>	3.85E-01	2.56E-01
NOx	10102-44-0	8.10E-01	5.40E-01
1,3-butadiene	106-99-0	3.95E-04	2.64E-04
Acenaphthene	83-32-9	2.60E-05	1.73E-05
Acenaphthylene	208-96-8	4.22E-05	2.81E-05
Acetaldehyde	75-07-0	3.43E-02	2.29E-02
Acrolein	107-02-8	4.94E-03	3.29E-03
Anthracene	120-12-7	1.62E-05	1.08E-05
Benzene	71-43-2	6.38E-03	4.25E-03
Benzo(a)anthracene	56-55-3	1.84E-07	1.23E-07
Benzo(a)pyrene	50-32-8	1.46E-07	9.77E-08
Benzo(b+k)fluoranthene	205-99-2	1.24E-07	8.29E-08
Benzo(g,h,i)perylene	191-24-2	1.08E-07	7.18E-08
Chrysene	218-01-9	3.58E-07	2.39E-07
Fluoranthene	206-44-0	2.48E-05	1.65E-05
Fluorene	86-73-7	9.93E-05	6.62E-05
Formaldehyde	50-00-0	1.07E-01	7.17E-02
Phenanthrene	85-01-8	4.40E-04	2.93E-04
Pyrene	129-00-0	2.08E-05	1.39E-05
Dibenz(a,h)anthracene	53-70-3	4.44E-08	2.96E-08
Indeno(1,2,3-cd)pyrene	193-39-5	2.22E-08	1.48E-08
Napthalene	91-20-3	8.06E-03	5.37E-03

Emissions Summary (24-Hour Average)

CoPC	CAS #	Unit	PLANT_CONS - Dust and Mobile
			Year -1
PM	<<PM>>	g/s	1.57E+00
PM_{10}	<<PM10>>	g/s	5.03E-01
$PM_{2.5}$	<<PM2.5>>	g/s	7.69E-02
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	2.96E-02
CO	630-08-0	g/s	5.78E+00
SO_2	7446-09-5	g/s	7.59E-03
Non-methane hydrocarbons	<<NMHC>>	g/s	2.56E-01
NOx	10102-44-0	g/s	5.40E-01
Fluoride	7664-39-3	g/s	3.71E-06
Chromium VI	18540-29-9	g/s	9.58E-09
Mercury	7439-97-6	g/s	6.49E-11
Aluminum	7429-90-5	g/s	7.03E-02
Silver	7440-22-4	g/s	3.86E-07
Arsenic	7440-38-2	g/s	3.58E-06
Barium	7440-39-3	g/s	5.52E-04
Beryllium	7440-41-7	g/s	1.30E-06
Boron	7440-42-8	g/s	0.00E+00
Bismuth	7440-69-9	g/s	2.53E-07
Calcium	7440-70-2	g/s	1.30E-01
Cadmium	7440-43-9	g/s	1.92E-07
Cobalt	7440-48-4	g/s	1.19E-05
Chromium	7440-47-3	g/s	7.20E-05
Copper	7440-50-8	g/s	3.08E-05
Iron	7439-89-6	g/s	3.10E-02
Potassium	7440-09-7	g/s	2.31E-02
Lithium	7439-93-2	g/s	3.36E-05
Magnesium	7439-95-4	g/s	3.60E-02
Manganese	7439-96-5	g/s	6.04E-04
Molybdenum	7439-98-7	g/s	9.27E-07
Silicon	7440-21-3	g/s	0.00E+00
Sodium	7440-23-5	g/s	0.00E+00
Nickel	7440-02-0	g/s	3.26E-05
Lead	7439-92-1	g/s	1.52E-05
Antimony	7440-36-0	g/s	6.18E-07
Selenium	7782-49-2	g/s	7.42E-07
Tin	7440-31-5	g/s	7.57E-06
Strontium	7440-24-6	g/s	3.22E-04
Titanium	7440-32-6	g/s	2.78E-03
Thallium	7440-28-0	g/s	4.14E-07
Uranium	7440-61-1	g/s	2.11E-06
Vanadium	7440-62-2	g/s	7.22E-05
Tungsten	7440-33-7	g/s	0.00E+00
Yttrium	7440-65-5	g/s	1.55E-05
Zinc	7440-66-6	g/s	5.88E-05
Thorium	7440-29-1	g/s	0.00E+00
Quartz (in PM10)	14808-60-7	g/s	4.72E-02
Pyrite	12068-85-8	g/s	1.01E-06
Biotite	1302-27-8	g/s	8.94E-03
Magnetite	1309-38-2	g/s	1.75E-02
Hematite	1317-60-8	g/s	1.11E-03
Chlorite	1318-59-8	g/s	1.48E-01
Muscovite	1318-94-1	g/s	7.11E-02
Talc (fibrous)	14807-96-6	g/s	5.03E-03
Phosphorus	7723-14-0	g/s	0.00E+00
Platinum	7440-06-4	g/s	0.00E+00
Palladium	7440-05-3	g/s	0.00E+00
Nickel (in PM10)	<<Ni_PM10>>	g/s	9.97E-06
Uranium (in PM10)	<<U_PM10>>	g/s	6.46E-07
Chrysotile Asbestos	132207-32-0	g/s	1.93E-03
Manganese (in PM10)	<<Mn_PM10>>	g/s	1.85E-04
Manganese (in PM2.5)	<<Mn_PM2.5>>	g/s	1.85E-05
Chromium VI (in PM10)	<<Cr6_PM10>>	g/s	2.93E-09
0	--	g/s	
1,3-butadiene	106-99-0	g/s	2.64E-04
Acenaphthene	83-32-9	g/s	1.73E-05
Acenaphthylene	208-96-8	g/s	2.81E-05
Acetaldehyde	75-07-0	g/s	2.29E-02
Acrolein	107-02-8	g/s	3.29E-03
Anthracene	120-12-7	g/s	1.08E-05
Benzene	71-43-2	g/s	4.25E-03
Benzo(a)anthracene	56-55-3	g/s	1.23E-07
Benzo(a)pyrene	50-32-8	g/s	9.77E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	8.29E-08
Benzo(g,h,i)perylene	191-24-2	g/s	7.18E-08
Chrysene	218-01-9	g/s	2.39E-07
Fluoranthene	206-44-0	g/s	1.65E-05
Fluorene	86-73-7	g/s	6.62E-05
Formaldehyde	50-00-0	g/s	7.17E-02
Phenanthrene	85-01-8	g/s	2.93E-04
Pyrene	129-00-0	g/s	1.39E-05
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	2.96E-02
Dibenz(a,h)anthracene	53-70-3	g/s	2.96E-08
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	1.48E-08
Napthalene	91-20-3	g/s	5.37E-03

Emissions Summary (1-Hour Average)

CoPC	CAS	Units	PLANT_CONSB - Mobile Emissions
			Year -1
PM	<<PM>>	g/s	4.44E-02
PM10	<<PM10>>	g/s	4.44E-02
PM2.5	<<PM2.5>>	g/s	4.44E-02
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	g/s	4.44E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	g/s	4.44E-02
CO	630-08-0	g/s	8.68E+00
SO_2	7446-09-5	g/s	1.14E-02
Non-methane hydrocarbons	<<NMHC>>	g/s	3.85E-01
NOx	10102-44-0	g/s	8.10E-01
1,3-butadiene	106-99-0	g/s	3.95E-04
Acenaphthene	83-32-9	g/s	2.60E-05
Acenaphthylene	208-96-8	g/s	4.22E-05
Acetaldehyde	75-07-0	g/s	3.43E-02
Acrolein	107-02-8	g/s	4.94E-03
Anthracene	120-12-7	g/s	1.62E-05
Benzene	71-43-2	g/s	6.38E-03
Benzo(a)anthracene	56-55-3	g/s	1.84E-07
Benzo(a)pyrene	50-32-8	g/s	1.46E-07
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	g/s	1.24E-07
Benzo(g,h,i)perylene	191-24-2	g/s	1.08E-07
Chrysene	218-01-9	g/s	3.58E-07
Fluoranthene	206-44-0	g/s	2.48E-05
Fluorene	86-73-7	g/s	9.93E-05
Formaldehyde	50-00-0	g/s	1.07E-01
Phenanthrene	85-01-8	g/s	4.40E-04
Pyrene	129-00-0	g/s	2.08E-05
Dibenz(a,h)anthracene	53-70-3	g/s	4.44E-08
Indeno(1,2,3-cd)pyrene	193-39-5	g/s	2.22E-08
Napthalene	91-20-3	g/s	8.06E-03

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Mobile Emissions from Plant Equipment During Operation (PLANT_OP)

Source : Mobile Emissions (PLANT_OP)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Mobile Emissions" tab for details. Results from that tab are linked back to this tab

CoPC	CAS #	Equipment Tailpipe Emissions (g/s)	
		Year 7	
		1-Hour	24-Hour
PM	<<PM>>	3.10E-02	1.97E-02
PM10	<<PM10>>	3.10E-02	1.97E-02
PM2.5	<<PM2.5>>	3.10E-02	1.97E-02
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	3.10E-02	1.97E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	3.10E-02	1.97E-02
CO	630-08-0	5.47E+00	3.48E+00
SO2	7446-09-5	8.54E-03	5.40E-03
Non-methane hydrocarbons	<<NMHC>>	2.88E-01	1.82E-01
NOx	10102-44-0	6.07E-01	3.84E-01
1,3-butadiene	106-99-0	2.97E-04	1.87E-04
Acenaphthene	83-32-9	1.95E-05	1.23E-05
Acenaphthylene	208-96-8	3.16E-05	2.00E-05
Acetaldehyde	75-07-0	2.57E-02	1.62E-02
Acrolein	107-02-8	3.70E-03	2.34E-03
Anthracene	120-12-7	1.21E-05	7.64E-06
Benzene	71-43-2	4.79E-03	3.02E-03
Benzo(a)anthracene	56-55-3	1.36E-07	8.61E-08
Benzo(a)pyrene	50-32-8	1.02E-07	6.51E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	8.69E-08	5.52E-08
Benzo(g,h,i)perylene	191-24-2	8.03E-08	5.08E-08
Chrysene	218-01-9	2.63E-07	1.66E-07
Fluoranthene	206-44-0	1.85E-05	1.17E-05
Fluorene	86-73-7	7.43E-05	4.70E-05
Formaldehyde	50-00-0	8.06E-02	5.09E-02
Phenanthrene	85-01-8	3.29E-04	2.08E-04
Pyrene	129-00-0	1.55E-05	9.80E-06
Dibenz(a,h)anthracene	53-70-3	3.10E-08	1.97E-08
Indeno(1,2,3-cd)pyrene	193-39-5	1.55E-08	9.86E-09
Napthalene	91-20-3	6.04E-03	3.82E-03

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Mobile Emissions from Non-Road Equipment Tailpipes

Source : Combustion emissions from operating equipment and vehicles

Description:
Note that total emissions found at the bottom of this sheet are referenced in the corresponding source tab - this sheet is not an actual source tab. It calculates tailpipe emissions for site operations
Emissions due to fuel combustion in heavy equipment are calculated here. Individual equipment emissions are calculated and their emissions are added to their corresponding source.
Some sources are assumed to have negligible emissions due to their relatively low usage from equipment and vehicles.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.
NOx, PM, CO, hydrocarbons, and SO_2 emissions are the contaminants of concern from fuel combustions in locomotive engines. Primary speciated VOCs and a key PAH (Benzo(a) pyrene) are also included in the assessment.

Methodology: Exhaust Emission standards (EF/ MB)
Emissions are based on the regulated emissions from nonroad equipment. By the end of 2018, all engines will be required to meet the new Tier 4 standards. USEPA "Nonroad Compression-Ignition Engines- Exhaust Emission Standards". Where applicable, Tier 4 standards are used.
For other contaminants such as VOCs/ PAHs, speciation profiles from the MOVES documentation "Speciation Profiles and Toxic Emission Factors for Non-road Engines" were applied to the total VOCs.
VOCs were calculated based on the ratio of VOC/NMHC as provided in the MOVES documentation. Particulate PAHs speciation profiles were based on PM2.5 emissions

E=R*ES/3600
Where
E is the emission rate (g/s)
R is the equipment rating (kW)
ES is the emission standard dependent on the power rating of the equipment (g/kWhr)

				Range									
				1	2	3	4	5	6	7	8	9	10
Power Range (kW)	**Min**			**900**	**560**	**450**	**225**	**130**	**56**	**37**	**19**	**8**	
	Max				**900**	**560**	**450**	**225**	**130**	**56**	**37**	**19**	**8**
Exhaust Emission Standards (Tier 4) (g/kWhr)	**Non-methane hydrocarbons**			0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	NOx			3.5	3.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	PM			0.04	0.04	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.4
	CO			3.5	3.5	3.5	3.5	3.5	5	5	5.5	6.6	8
	VOC/ NMHC Ratio[2]			1.285	1.285	1.285	1.285	1.285	1.285	1.285	1.285	1.285	1.285
PAHs/ VOC (g/kWhr) (Speciation profile from MOVES documentation)[3]	**VOCs**			0.24415	0.24415	0.24415	0.24415	0.24415	0.24415	0.24415	0.24415	0.24415	0.24415
	1,3-Butadiene	**Gaseous**	0.0008	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532	0.00019532
	Acenaphthene	**Gaseous**	0.0000526	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05	1.28423E-05
	Acenaphthylene	**Gaseous**	0.0000853	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05	2.0826E-05
	Acetaldehyde	**Gaseous**	0.06934	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361	0.016929361
	Acrolein	**Gaseous**	0.00999	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059	0.002439059
		Gaseous	0.0000304	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06	7.42216E-06
		Particulate	0.0000265	0.00000106	0.00000106	0.00000053	0.00000053	0.00000053	0.00000053	0.00000053	0.00000795	0.00000795	0.00000795	0.0000106
	Anthracene	**Total**		8.48216E-06	8.48216E-06	7.95216E-06	7.95216E-06	7.95216E-06	7.95216E-06	7.95216E-06	8.21716E-06	8.21716E-06	8.21716E-06	1.80222E-05
	Benzene	**Gaseous**	0.01291	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977	0.003151977
		Gaseous	0.0000003	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08	7.3245E-08
		Particulate	0.0000008	0.000000032	0.000000032	0.000000016	0.000000016	0.000000016	0.000000016	0.000000016	0.000000024	0.000000024	0.000000024	0.000000032
	Benzo(a)anthracene	**Total**		1.05245E-07	1.05245E-07	8.9245E-08	8.9245E-08	8.9245E-08	8.9245E-08	8.9245E-08	9.7245E-08	9.7245E-08	9.7245E-08	3.93245E-07
	Benzo(a)pyrene	**Particulate**	0.0000033	0.000000132	0.000000132	0.000000066	0.000000066	0.000000066	0.000000066	0.000000066	0.000000099	0.000000099	0.000000099	0.0000132
	Benzo(b+k)fluoranthene	**Particulate**	0.0000028	0.000000112	0.000000112	0.000000056	0.000000056	0.000000056	0.000000056	0.000000056	0.000000084	0.000000084	0.000000084	0.0000112
		Gaseous	0.0000002	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08	4.883E-08
		Particulate	0.0000002	0.000000008	0.000000008	0.000000004	0.000000004	0.000000004	0.000000004	0.000000004	0.000000006	0.000000006	0.000000006	0.0000008
	Benzo(g,h,i)perylene	**Total**		5.683E-08	5.683E-08	5.283E-08	5.283E-08	5.283E-08	5.283E-08	5.283E-08	5.483E-08	5.483E-08	5.483E-08	1.2883E-07
		Gaseous	0.0000005	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07	1.22075E-07
		Particulate	0.0000025	0.0000001	0.0000001	0.00000005	0.00000005	0.00000005	0.00000005	0.00000005	0.000000075	0.000000075	0.000000075	0.000001
	Chrysene	**Total**		2.22075E-07	2.22075E-07	1.72075E-07	1.72075E-07	1.72075E-07	1.72075E-07	1.72075E-07	1.97075E-07	1.97075E-07	1.97075E-07	1.12208E-06
		Gaseous	0.0000457	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05	1.11577E-05
		Particulate	0.0000487	0.000001948	0.000001948	0.000000974	0.000000974	0.000000974	0.000000974	0.000000974	0.000001461	0.000001461	0.000001461	0.00001948
	Fluoranthene	**Total**		1.31057E-05	1.31057E-05	1.21317E-05	1.21317E-05	1.21317E-05	1.21317E-05	1.21317E-05	1.26187E-05	1.26187E-05	1.26187E-05	3.06377E-05
		Gaseous	0.00196	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05	4.78534E-05
		Particulate	0.0000538	0.000002152	0.000002152	0.000001076	0.000001076	0.000001076	0.000001076	0.000001076	0.000001614	0.000001614	0.000001614	0.00002152
	Fluorene	**Total**		5.00054E-05	5.00054E-05	4.89294E-05	4.89294E-05	4.89294E-05	4.89294E-05	4.89294E-05	4.94674E-05	4.94674E-05	4.94674E-05	6.93734E-05
	Formaldehyde	**Gaseous**	0.21744	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976	0.053087976
		Gaseous	0.000851	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772	0.000207772
		Particulate	0.000429	0.00001716	0.00001716	0.00000858	0.00000858	0.00000858	0.00000858	0.00000858	0.00001287	0.00001287	0.00001287	0.0001716
	Phenanthrene	**Total**		0.000224932	0.000224932	0.000216352	0.000216352	0.000216352	0.000216352	0.000216352	0.000220642	0.000220642	0.000220642	0.000379372
		Gaseous	0.0000379	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06	9.25329E-06
		Particulate	0.0000467	0.000001868	0.000001868	0.000000934	0.000000934	0.000000934	0.000000934	0.000000934	0.000001401	0.000001401	0.000001401	0.00001868
	Pyrene	**Total**		1.11213E-05	1.11213E-05	1.01873E-05	1.01873E-05	1.01873E-05	1.01873E-05	1.01873E-05	1.06543E-05	1.06543E-05	1.06543E-05	2.79333E-05
	Dibenz(a,h)anthracene	**Particulate**	0.000001	0.00000004	0.00000004	0.00000002	0.00000002	0.00000002	0.00000002	0.00000002	0.00000003	0.00000003	0.00000003	0.0000004
	Indeno(1,2,3-cd)pyrene	**Particulate**	0.0000005	0.00000002	0.00000002	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000015	0.00000015	0.00000015	0.0000002
	Napthalene	**Gaseous**	0.0163	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645	0.003979645

Notes:
1. CAT 789D emission data from manufacturing sheet.
2. Ratio from Table 3-3 in the MOVES documentation US EPA, "Speciation Profiles and Toxic Emission Factors for Non-road Engines". July 2022
3. Speciation profile in MOVES documentation USEPA, "Speciation Profiles and Toxic Emission Factors for Non-road Engines". July 2022. multiplied by VOC emission factor. Particulate PAHs multiplied by PM2.5 emission factor - conservatively assume PM2.5=PM=Diesel Particulate Matter=Elemental Carbon.
4. US EPA, "Nonroad Compression-Ignition Engines: Exhaust Emission Standards", March 2016.
5. The 56 ≤ kW <75 emission standard for NMHC and NOx are assumed for equipment rated less than 56 kW.

Sample Calculation Pyrene (>900kW engine)

VOC emission factor (g/kWh) = NMHC emission factor x VOC/NMHC ratio = 0.19 x 1.285 =	0.24415	g/kWh
Gaseous pyrene emission factor (g/kWh) = VOC emission factor x PAH/VOC ratio = 0.24415 x 0.0000379 =	9.25329E-06	g/kWh
Particulate pyrene emission factor (g/kWh) = PM2.5 emission factor x PAH/ particulate ratio = 0.0000467 x 0.04 =	1.87E-06	g/kWh
Pyrene emission factor (g/kWh) = particulate pyrene emission factor + gaseous particulate emission factor = 9.3E-06+ 1.9E-06 =	1.11213E-05	g/kWh

SO_2 Emissions

Diesel Engine Efficiency	45%		"Just the basics: Diesel Energy" US department of energy
Lower Heating Value	128,488	btu/gal	"Alternative Fuels Data Center – Fuel Properties Comparison " from the US Department of Energy
Sulphur content in diesel	15	ppm	Sulphur in Diesel Fuel Regulations [SOR/2002-254]
	0.00029	kWh/Btu	Conversion
	454	g/lb	Conversion
Density of diesel	7.00	lb/gal	-
Energy output	16.95	kWh/gal	Efficiency x LHV
SO2/ gallon of diesel	0.0953	gSO2/gal	Sulphur content x density x 2 A factor of 2 is applied to convert sulfur to SO2, assuming all the sulfur will be oxidized to SO2.
Emission Factor	0.0056	g/kWh	

Note: Emissions are calculated based on sulphur content in diesel as per Sulphur in Diesel Fuel Regulations.

Equipment List	Max Power (kW)	Engine Load Factor	Average Power (kW)	Number of units		Power Range	Utilization - Operating Hours per Day	Trolley Assist Control Factor	Notes
				Year -1	Year 7				
MINING FLEET									
Drill1	751	70%	526	3	7	2	19	-	
Drill2	403	70%	282	1	1	4	19	-	
Excavator 1	607	70%	425	7	5	2	17	-	
Excavator 2	1,142	70%	799	2	2	1	17	-	
Excavator 3	1,669	70%	1,168	1	2	1	19	-	
Shovel	2,000	70%	1,400	0	3	1	20	-	
Truck 1	336	70%	235	65	34	4	16	-	It is assumed that trucks spend 20 minutes in the pits and 40 minutes on haul roads outside of the pits in any given hour. For example, tailpipe emissions from the pits are adjusted by a ratio of 20/60. Mobile emissions from trucks in the pits are calculated in this tab. Mobile emissions from trucks on haul roads are calculated in the "HR - Haul Road Mobile Emissions" tab. During Year -1, there is no trolley assist control factor applied to the mobile emission estimate. During Year 7, it is assumed that trolley assist will only be utilized in MZ.
Truck 2	758	70%	531	10	28	2	16	-	
Truck 3	2,612	70%	1,828	7	54	1	19	50%	
TD 1	294	70%	206	7	7	4	8	-	
TD 2	572	70%	400	3	5	2	8	-	
TD 3	714	70%	500	6	11	2	8	-	
RT	419	70%	294	2	2	4	8	-	
Grader 2	247	70%	173	1	4	4	8	-	
Tanker 1	1,194	70%	836	2	3	1	19	-	
FEL 1	433	70%	303	1	2	4	14	-	
FEL 2	672	70%	470	2	2	2	14	-	
FEL 3	1,396	70%	977	1	1	1	14	-	
UX	391	70%	274	6	5	4	3	-	
PLANT AREA CONSTRUCTION UNITS									
Mobile Crane - 300 T	455	45%	205	2	-	3	16	-	
Mobile Crane - 75 T	205	45%	92	3	-	5	16	-	
Mobile Crane - 100 T	199	45%	90	2	-	5	16	-	
Skid Steer Loader	55	45%	25	8	-	7	16	-	
Boom Truck 28t	224	45%	101	4	-	5	16	-	
Telehandler	101	35%	35	10	-	6	16	-	
Forklift Diesel 4t	45	35%	16	4	-	7	16	-	
Tire Handler Truck	317	45%	143	1	-	4	16	-	
Lube Truck	224	45%	101	1	-	5	16	-	
Truck Tractor for trailers	283	45%	127	2	-	4	16	-	
Mobile Air Compressor 185CFM	45	40%	18	8	-	7	16	-	
Welding Machine Diesel 400A	25	50%	13	8	-	8	16	-	
Light Plant	10	70%	7	12	-	9	16	-	
Genset 6kW	7	80%	6	3	-	10	16	-	
Genset 60kW	67	80%	54	1	-	6	16	-	
Generator 125-149 kVA	125	90%	113	4	-	6	16	-	
Generator 19-29 kVA	25	90%	23	4	-	8	16	-	
Generator 400-499 kVA	401	90%	361	4	-	4	16	-	
Generator 50-59 kVA	48	90%	43	2	-	7	16	-	
Generator 70-84 kVA	79	90%	71	2	-	6	16	-	
Elevated Work Platform (electric)	N/A	40%	-	10	-	1	16	-	
Front Fighter	103	90%	92	20	-	6	16	-	
Wheel Loader (425hp)	317	45%	143	2	-	4	16	-	
Utility Wheel Loader (250hp)	186	45%	84	2	-	5	16	-	
PLANT AREA OPERATION UNITS									
4 x 4 light pickup truck	336	45%	151	-	20	4	16	-	
Ambulance	287	45%	129	-	1	4	1	-	
Water truck (fire response and dust control)	298	45%	134	-	1	4	16	-	
Rock Breaker	271	70%	190	-	2	4	24	-	
2.5t All terrain forklift	35	70%	25	-	4	8	19	-	
Skid steer loader	50	70%	35	-	4	7	19	-	
Plant Front End Loader	185	45%	83	-	2	5	19	-	
Elevated Work Platform	N/A	45%	-	-	3	1	19	-	
3.5t Hiab flat bed truck	112	45%	50	-	2	6	19	-	
10t Hiab flat bed truck	313	45%	141	-	1	4	19	-	
Concentrate Train Wagons	N/A	N/A	-	-	45	1	N/A	-	
Concentrate Locomotives	3,200	0%	0	-	4	1	12	-	Emissions from locomotives are estimated in the "L - Locomotives" worksheet.
Magnetite railcar side dumper	N/A - Electric Powered	0%	-	-	2	1	14	-	
Concentrate Front End Loaders	433	70%	303	-	2	4	14	-	
Concentrate Railcar unloading excavator	391	70%	274	-	2	4	3	-	

Emissions for a single unit	Hourly Emissions (g/s)																						
	Non-methane hydrocarbons	NOx	PM	CO	SO2	1,3-butadiene	Acenaphthene	Acenaphthylene	Acetaldehyde	Acrolein	Anthracene	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b+k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Fluoranthene	Fluorene	Formaldehyde	Phenanthrene	Pyrene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Napthalene
MINING FLEET																								
Drill1	2.78E-02	5.11E-01	5.84E-03	5.11E-01	8.22E-04	2.85E-05	1.88E-06	3.04E-06	2.47E-03	3.56E-04	1.24E-06	4.61E-04	1.54E-08	1.93E-08	1.64E-08	8.30E-09	3.25E-08	1.92E-06	7.31E-06	7.76E-03	3.29E-05	1.63E-06	5.84E-09	2.92E-09	5.82E-04
Drill2	1.49E-02	3.13E-02	1.57E-03	2.74E-01	4.41E-04	1.53E-05	1.01E-06	1.63E-06	1.33E-03	1.91E-04	6.23E-07	2.47E-04	6.99E-09	5.17E-09	4.39E-09	4.14E-09	1.35E-08	9.51E-07	3.83E-06	4.16E-03	1.70E-05	7.98E-07	1.57E-09	7.84E-10	3.12E-04
Excavator 1	2.24E-02	4.13E-01	4.72E-03	4.13E-01	6.64E-04	2.30E-05	1.52E-06	2.46E-06	2.00E-03	2.88E-04	1.00E-06	3.72E-04	1.24E-08	1.56E-08	1.32E-08	6.70E-09	2.62E-08	1.55E-06	5.90E-06	6.26E-03	2.65E-05	1.31E-06	4.72E-09	2.36E-09	4.69E-04
Excavator 2	4.22E-02	7.77E-01	8.88E-03	7.77E-01	1.25E-03	4.34E-05	2.85E-06	4.62E-06	3.76E-03	5.42E-04	1.88E-06	7.00E-04	2.34E-08	2.93E-08	2.49E-08	1.26E-08	4.93E-08	2.91E-06	1.11E-05	1.18E-02	4.99E-05	2.47E-06	8.88E-09	4.44E-09	8.84E-04
Excavator 3	6.16E-02	1.14E+00	1.30E-02	1.14E+00	1.83E-03	6.34E-05	4.17E-06	6.76E-06	5.49E-03	7.91E-04	2.75E-06	1.02E-03	3.41E-08	4.28E-08	3.63E-08	1.84E-08	7.21E-08	4.25E-06	1.62E-05	1.72E-02	7.30E-05	3.61E-06	1.30E-08	6.49E-09	1.29E-03
Shovel	7.39E-02	1.36E+00	1.56E-02	1.36E+00	2.19E-03	7.60E-05	4.99E-06	8.10E-06	6.58E-03	9.49E-04	3.30E-06	1.23E-03	4.09E-08	5.13E-08	4.36E-08	2.21E-08	8.64E-08	5.10E-06	1.94E-05	2.06E-02	8.75E-05	4.32E-06	1.56E-08	7.78E-09	1.55E-03
Truck 1	1.24E-02	2.61E-02	3.67E-04	1.28E-01	8.39E-07	1.36E-06	1.36E-06	1.11E-03	1.59E-04	5.16E-07	2.06E-04	5.83E-09	4.31E-09	3.66E-09	3.45E-09	1.12E-08	7.92E-07	3.20E-06	3.47E-03	1.41E-05	6.65E-07	1.31E-09	6.53E-10	2.60E-04
Truck 2	2.80E-02	5.16E-01	5.90E-03	5.16E-01	8.29E-04	2.88E-05	1.89E-06	3.07E-06	2.50E-03	3.60E-04	1.25E-06	4.65E-04	1.55E-08	1.95E-08	1.65E-08	8.38E-09	3.27E-08	1.93E-06	7.37E-06	7.83E-03	3.32E-05	1.64E-06	5.90E-09	2.95E-09	5.87E-04
Truck 3	9.65E-02	1.78E+00	2.03E-02	1.78E+00	2.86E-03	9.92E-05	6.52E-06	1.06E-05	8.60E-03	1.24E-03	4.31E-06	1.60E-03	5.35E-08	6.70E-08	5.69E-08	2.89E-08	1.13E-07	6.66E-06	2.54E-05	2.70E-02	1.14E-04	5.65E-06	2.03E-08	1.02E-08	2.02E-03
TD 1	1.09E-02	2.29E-02	3.22E-04	1.12E-01	7.34E-07	1.19E-06	1.19E-06	9.68E-04	1.39E-04	4.50E-07	1.80E-04	5.10E-09	3.77E-09	3.20E-09	3.02E-09	9.84E-09	6.94E-07	2.80E-06	3.04E-03	1.24E-05	5.82E-07	1.14E-09	5.72E-10	2.28E-04
TD 2	2.11E-02	3.89E-01	4.45E-03	3.89E-01	6.25E-04	2.17E-05	1.43E-06	2.31E-06	1.88E-03	2.71E-04	9.43E-07	3.50E-04	1.17E-08	1.47E-08	1.24E-08	6.32E-09	2.47E-08	1.46E-06	5.56E-06	5.90E-03	2.50E-05	1.24E-06	4.45E-09	2.22E-09	4.42E-04
TD 3	2.64E-02	4.86E-01	5.55E-03	4.86E-01	7.81E-04	2.71E-05	1.79E-06	2.89E-06	2.35E-03	3.39E-04	1.18E-06	4.38E-04	1.46E-08	1.83E-08	1.56E-08	7.89E-09	3.09E-08	1.82E-06	6.94E-06	7.37E-03	3.12E-05	1.54E-06	5.55E-09	2.78E-09	5.53E-04
RT	1.55E-02	3.26E-02	4.59E-04	1.60E-01	1.05E-06	1.70E-06	1.70E-06	1.38E-03	1.99E-04	6.44E-07	2.57E-04	7.28E-09	5.38E-09	4.57E-09	4.31E-09	1.40E-08	9.89E-07	3.99E-06	4.33E-03	1.76E-05	8.31E-07	1.63E-09	8.16E-10	3.25E-04
Grader 2	9.13E-03	1.92E-02	9.61E-04	1.68E-01	2.70E-04	9.38E-06	6.17E-07	1.00E-06	8.13E-04	1.17E-04	3.82E-07	1.51E-04	4.29E-09	3.17E-09	2.69E-09	2.54E-09	8.26E-09	5.83E-07	2.35E-06	2.55E-03	1.04E-05	4.89E-07	9.61E-10	4.80E-10	1.91E-04
Tanker 1	4.41E-02	8.13E-01	9.29E-03	8.13E-01	1.31E-03	4.53E-05	2.98E-06	4.84E-06	3.93E-03	5.66E-04	1.97E-06	7.32E-04	2.44E-08	3.06E-08	2.60E-08	1.32E-08	5.16E-08	3.04E-06	1.16E-05	1.23E-02	5.22E-05	2.58E-06	9.29E-09	4.64E-09	9.24E-04
FEL 1	1.60E-02	3.37E-02	4.74E-04	1.64E-01	1.08E-06	1.75E-06	1.75E-06	1.42E-03	2.05E-04	6.66E-07	2.65E-04	7.51E-09	5.55E-09	4.71E-09	4.45E-09	1.45E-08	1.02E-06	4.12E-06	4.47E-03	1.82E-05	8.57E-07	1.68E-09	8.42E-10	3.35E-04
FEL 2	2.48E-02	4.57E-01	5.22E-03	4.57E-01	7.35E-04	2.55E-05	1.68E-06	2.72E-06	2.21E-03	3.19E-04	1.11E-06	4.12E-04	1.37E-08	1.72E-08	1.46E-08	7.42E-09	2.90E-08	1.71E-06	6.53E-06	6.93E-03	2.94E-05	1.45E-06	5.22E-09	2.61E-09	5.20E-04
FEL 3	5.16E-02	9.50E-01	1.09E-02	9.50E-01	1.53E-03	5.30E-05	3.48E-06	5.65E-06	4.59E-03	6.62E-04	2.30E-06	8.55E-04	2.86E-08	3.58E-08	3.04E-08	1.54E-08	6.03E-08	3.56E-06	1.36E-05	1.44E-02	6.10E-05	3.02E-06	1.09E-08	5.43E-09	1.08E-03
UX	1.44E-02	3.04E-02	1.52E-03	2.66E-01	1.49E-05	9.76E-07	1.58E-06	1.29E-03	1.85E-04	6.05E-07	2.40E-04	6.79E-09	5.02E-09	4.26E-09	4.02E-09	1.31E-08	9.22E-07	3.72E-06	4.04E-03	1.65E-05	7.75E-07	1.52E-09	7.60E-10	3.03E-04
PLANT AREA CONSTRUCTION UNITS																								
Mobile Crane - 300 T	1.08E-02	2.28E-02	1.14E-03	1.99E-01	3.20E-04	1.11E-05	7.30E-07	1.18E-06	9.63E-04	1.39E-04	4.52E-07	1.79E-04	5.08E-09	3.75E-09	3.19E-09	3.00E-09	9.79E-09	6.90E-07	2.78E-06	3.02E-03	1.23E-05	5.79E-07	1.14E-09	5.69E-10	2.26E-04
Mobile Crane - 75 T	4.87E-03	1.03E-02	5.13E-04	8.97E-02	1.44E-04	5.01E-06	3.29E-07	5.34E-07	4.34E-04	6.26E-05	2.04E-07	8.08E-05	2.29E-09	1.69E-09	1.44E-09	1.36E-09	4.41E-09	3.11E-07	1.25E-06	1.36E-03	5.55E-06	2.61E-07	5.13E-10	2.56E-10	1.02E-04
Mobile Crane - 100 T	4.73E-03	9.96E-03	4.98E-04	8.71E-02	1.40E-04	4.86E-06	3.20E-07	5.18E-07	4.21E-04	6.07E-05	1.98E-07	7.84E-05	2.22E-09	1.64E-09	1.39E-09	1.31E-09	4.28E-09	3.02E-07	1.22E-06	1.32E-03	5.38E-06	2.54E-07	4.98E-10	2.49E-10	9.90E-05
Skid Steer Loader	1.31E-03	2.76E-03	2.07E-04	3.45E-02	3.88E-05	1.35E-06	8.86E-08	1.44E-07	1.17E-04	1.68E-05	5.67E-08	2.17E-05	6.71E-10	6.83E-10	5.79E-10	3.78E-10	1.36E-09	8.70E-08	3.41E-07	3.66E-04	1.52E-06	7.35E-08	2.07E-10	1.03E-10	2.75E-05
Boom Truck 28t	5.31E-03	1.12E-02	5.59E-04	9.79E-02	1.57E-04	5.46E-06	3.59E-07	5.82E-07	4.73E-04	6.82E-05	2.22E-07	8.81E-05	2.50E-09	1.85E-09	1.57E-09	1.48E-09	4.81E-09	3.39E-07	1.37E-06	1.48E-03	6.05E-06	2.85E-07	5.59E-10	2.80E-10	1.11E-04
Telehandler	1.86E-03	3.91E-03	1.96E-04	4.89E-02	5.51E-05	1.91E-06	1.26E-07	2.04E-07	1.66E-04	2.39E-05	7.78E-08	3.08E-05	8.73E-10	6.46E-10	5.48E-10	5.17E-10	1.68E-09	1.19E-07	4.79E-07	5.20E-04	2.12E-06	9.97E-08	1.96E-10	9.79E-11	3.90E-05
Forklift Diesel 4t	8.26E-04	1.74E-03	1.30E-04	2.17E-02	2.45E-05	8.50E-07	5.59E-08	9.06E-08	7.36E-05	1.06E-05	3.51E-08	1.37E-05	4.23E-10	4.31E-10	3.65E-10	2.39E-10	8.57E-10	5.49E-08	2.15E-07	2.31E-04	9.60E-07	4.63E-08	1.30E-10	6.52E-11	1.73E-05
Tire Handler Truck	7.53E-03	1.58E-02	7.92E-04	1.39E-01	2.23E-04	7.74E-06	5.09E-07	8.25E-07	6.71E-04	9.66E-05	3.15E-07	1.25E-04	3.54E-09	2.61E-09	2.22E-09	2.09E-09	6.82E-09	4.81E-07	1.94E-06	2.10E-03	8.57E-06	4.04E-07	7.92E-10	3.96E-10	1.58E-04
Lube Truck	5.32E-03	1.12E-02	5.60E-04	9.80E-02	1.58E-04	5.47E-06	3.60E-07	5.83E-07	4.74E-04	6.83E-05	2.23E-07	8.83E-05	2.50E-09	1.85E-09	1.57E-09	1.48E-09	4.82E-09	3.40E-07	1.37E-06	1.49E-03	6.06E-06	2.85E-07	5.60E-10	2.80E-10	1.11E-04
Truck Tractor for trailers	6.72E-03	1.42E-02	7.08E-04	1.24E-01	1.99E-04	6.91E-06	4.54E-07	7.37E-07	5.99E-04	8.63E-05	2.81E-07	1.12E-04	3.16E-09	2.33E-09	1.98E-09	1.87E-09	6.09E-09	4.29E-07	1.73E-06	1.88E-03	7.65E-06	3.60E-07	7.08E-10	3.54E-10	1.41E-04
Mobile Air Compressor 185CFM	9.50E-04	2.00E-03	1.00E-04	2.50E-02	2.81E-05	9.77E-07	6.42E-08	1.04E-07	8.46E-05	1.22E-05	4.11E-08	1.58E-05	4.86E-10	4.96E-10	4.20E-10	2.74E-10	9.85E-10	6.31E-08	2.47E-07	2.65E-04	1.10E-06	5.33E-08	1.50E-10	7.50E-11	1.99E-05
Welding Machine Diesel 400A	6.60E-04	1.39E-03	1.04E-04	1.91E-02	1.95E-05	6.78E-07	4.46E-08	7.23E-08	5.88E-05	8.47E-06	2.85E-08	1.09E-05	3.38E-10	3.44E-10	2.92E-10	1.90E-10	6.84E-10	4.38E-08	1.72E-07	1.84E-04	7.66E-07	3.70E-08	1.04E-10	5.21E-11	1.38E-05
Light Plant	3.69E-04	7.78E-04	5.83E-05	1.28E-02	1.09E-05	3.80E-07	2.50E-08	4.05E-08	3.29E-05	4.74E-06	1.60E-08	6.13E-06	1.89E-10	1.93E-10	1.63E-10	1.07E-10	3.83E-10	2.45E-08	9.62E-08	1.03E-04	4.29E-07	2.07E-08	5.83E-11	2.92E-11	7.74E-06
Genset 6kW	2.96E-04	6.22E-04	4.66E-05	1.24E-02	8.76E-06	3.04E-07	2.00E-08	3.24E-08	2.63E-05	3.79E-06	1.28E-08	4.90E-06	6.12E-10	2.02E-10	1.74E-09	2.00E-10	1.75E-09	4.77E-08	1.08E-07	8.26E-05	5.90E-07	4.36E-08	6.22E-10	3.11E-10	6.19E-06
Genset 60kW	2.83E-03	5.96E-03	2.98E-04	7.44E-02	8.38E-05	2.91E-06	1.91E-07	3.10E-07	2.52E-04	3.63E-05	1.18E-07	4.69E-05	1.33E-09	9.83E-10	8.34E-10	7.87E-10	2.56E-09	1.81E-07	7.29E-07	7.90E-04	3.22E-06	1.52E-07	2.98E-10	1.49E-10	5.93E-05
Generator 125-149 kVA	5.94E-03	1.25E-02	6.25E-04	1.56E-01	1.76E-04	6.10E-06	4.01E-07	6.51E-07	5.29E-04	7.62E-05	2.49E-07	9.85E-05	2.79E-09	2.06E-09	1.75E-09	1.65E-09	5.38E-09	3.79E-07	1.53E-06	1.66E-03	6.76E-06	3.18E-07	6.25E-10	3.13E-10	1.24E-04
Generator 19-29 kVA	1.19E-03	2.50E-03	1.88E-04	3.44E-02	3.52E-05	1.22E-06	8.09E-08	1.30E-07	1.06E-04	1.52E-05	5.14E-08	1.97E-05	6.08E-10	6.19E-10	5.25E-10	3.43E-10	1.23E-09	7.89E-08	3.09E-07	3.32E-04	1.38E-06	6.66E-08	1.88E-10	9.38E-11	2.49E-05
Generator 400-499 kVA	1.91E-02	4.01E-02	2.01E-03	3.51E-01	5.64E-04	1.96E-05	1.29E-06	2.09E-06	1.70E-03	2.45E-04	7.98E-07	3.16E-04	8.95E-09	6.62E-09	5.62E-09	5.30E-09	1.73E-08	1.22E-06	4.91E-06	5.33E-03	2.17E-05	1.02E-06	2.01E-09	1.00E-09	3.99E-04
Generator 50-59 kVA	2.26E-03	4.75E-03	3.56E-04	5.94E-02	6.68E-05	2.32E-06	1.53E-07	2.47E-07	2.01E-04	2.90E-05	9.76E-08	3.74E-05	1.15E-09	1.18E-09	9.98E-10	6.51E-10	2.34E-09	1.50E-07	5.87E-07	6.30E-04	2.62E-06	1.27E-07	3.56E-10	1.78E-10	4.73E-05
Generator 70-84 kVA	3.74E-03	7.88E-03	3.94E-04	9.84E-02	1.11E-04	3.85E-06	2.53E-07	4.10E-07	3.33E-04	4.80E-05	1.57E-07	6.21E-05	1.76E-09	1.30E-09	1.10E-09	1.04E-09	3.34E-09	2.39E-07	9.63E-07	1.05E-03	4.26E-06	2.01E-07	3.94E-10	1.97E-10	7.83E-05
Elevated Work Platform (electric)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Front Fighter	4.87E-03	1.03E-02	5.13E-04	1.28E-01	1.44E-04	5.01E-06	3.29E-07	5.34E-07	4.34E-04	6.25E-05	2.04E-07	8.08E-05	2.29E-09	1.69E-09	1.44E-09	1.36E-09	4.41E-09	3.11E-07	1.25E-06	1.36E-03	5.55E-06	2.61E-07	5.13E-10	2.56E-10	1.02E-04
Wheel Loader (425hp)	7.53E-03	1.59E-02	7.93E-04	1.39E-01	2.23E-04	7.74E-06	5.09E-07	8.25E-07	6.71E-04	9.66E-05	3.15E-07	1.25E-04	3.54E-09	2.62E-09	2.22E-09	2.09E-09	6.82E-09	4.81E-07	1.94E-06	2.10E-03	8.57E-06	4.04E-07	7.93E-10	3.96E-10	1.58E-04
Utility Wheel Loader (250hp)	4.42E-03	9.30E-03	4.65E-04	8.14E-02	1.31E-04	4.54E-06	2.99E-07	4.84E-07	3.94E-04	5.67E-05	1.85E-07	7.33E-05	2.07E-09	1.53E-09	1.30E-09	1.23E-09	4.00E-09	2.82E-07	1.14E-06	1.23E-03	5.03E-06	2.37E-07	4.65E-10	2.33E-10	9.25E-05
PLANT AREA OPERATION UNITS																								
4 x 4 light pickup truck	7.96E-03	1.68E-02	8.40E-04	1.47E-01	2.36E-04	8.20E-06	5.39E-07	8.75E-07	7.11E-04	1.02E-04	3.34E-07	1.32E-04	3.75E-09	2.77E-09	2.35E-09	2.22E-09	7.23E-09	5.10E-07	2.06E-06	2.23E-03	9.09E-06	4.28E-07	8.40E-10	4.20E-10	1.67E-04
Ambulance	6.81E-03	1.43E-02	7.17E-04	1.25E-01	2.02E-04	7.00E-06	4.60E-07	7.47E-07	6.07E-04	8.74E-05	2.85E-07	1.13E-04	3.20E-09	2.37E-09	2.01E-09	1.89E-09	6.17E-09	4.35E-07	1.75E-06	1.90E-03	7.76E-06	3.65E-07	7.17E-10	3.59E-10	1.43E-04
Water truck (fire response and dust control)	7.08E-03	1.49E-02	7.45E-04	1.30E-01	2.10E-04	7.28E-06	4.78E-07	7.76E-07	6.31E-04	9.09E-05	2.96E-07	1.17E-04	3.32E-09	2.46E-09	2.09E-09	1.97E-09	6.41E-09	4.52E-07	1.82E-06	1.98E-03	8.06E-06	3.79E-07	7.45E-10	3.73E-10	1.48E-04
Rock Breaker	1.00E-02	2.11E-02	1.05E-03	1.84E-01	2.96E-04	1.03E-05	6.77E-07	1.10E-06	8.92E-04	1.28E-04	4.19E-07	1.66E-04	4.70E-09	3.48E-09	2.95E-09	2.78E-09	9.07E-09	6.39E-07	2.58E-06	2.80E-03	1.14E-05	5.37E-07	1.05E-09	5.27E-10	2.10E-04
2.5t All terrain forklift	1.29E-03	2.72E-03	2.04E-04	3.74E-02	3.83E-05	1.33E-06	8.74E-08	1.42E-07	1.15E-04	1.66E-05	5.59E-08	2.15E-05	6.62E-10	6.74E-10	5.72E-10	3.73E-10	1.34E-09	8.59E-08	3.37E-07	3.61E-04	1.50E-06	7.25E-08	2.04E-10	1.02E-10	2.71E-05
Skid steer loader	1.85E-03	3.89E-03	2.92E-04	4.86E-02	5.47E-05	1.90E-06	1.25E-07	2.02E-07	1.65E-04	2.37E-05	7.99E-08	3.06E-05	9.45E-10	9.63E-10	8.17E-10	5.33E-10	1.92E-09	1.23E-07	4.81E-07	5.16E-04	2.15E-06	1.04E-07	2.92E-10	1.46E-10	3.87E-05
Plant Front End Loader	4.39E-03	9.24E-03	4.62E-04	8.08E-02	1.30E-04	4.51E-06	2.97E-07	4.81E-07	3.91E-04	5.63E-05	1.84E-07	7.28E-05	2.06E-09	1.52E-09	1.29E-09	1.23E-09	3.97E-09	2.80E-07	1.13E-06	1.23E-03	5.00E-06	2.35E-07	4.62E-10	2.31E-10	9.19E-05
Elevated Work Platform	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5t Hiab flat bed truck	2.65E-03	5.59E-03	2.79E-04	6.98E-02	7.86E-05	2.73E-06	1.79E-07	2.91E-07	2.36E-04	3.41E-05	1.11E-07	4.40E-05	1.25E-09	9.22E-10	7.82E-10	7.38E-10	2.40E-09	1.69E-07	6.83E-07	7.42E-04	3.02E-06	1.42E-07	2.79E-10	1.40E-10	5.56E-05
10t Hiab flat bed truck	7.43E-03	1.56E-02	7.82E-04	1.37E-01	2.20E-04	7.64E-06	5.02E-07	8.15E-07	6.62E-04	9.54E-05	3.11E-07	1.23E-04	3.49E-09	2.58E-09	2.19E-09	2.07E-09	6.73E-09	4.74E-07	1.91E-06	2.08E-03	8.46E-06	3.98E-07	7.82E-10	3.91E-10	1.56E-04
Concentrate

Number of units at each source (Year -1)		Number of units at each source (Year -1)								
	Total Number of Units	PLANT_CONS	MZ	EZ1	TMF	Haul Roads	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile	Water Management Excavation
MINING FLEET										
Drill1	**3**		0	3	0	0	0	0	0	0
Drill2	**1**		1	0	0	0	0	0	0	0
Excavator 1	**7**		7	0	0	0	0	0	0	0
Excavator 2	**2**		0	2	0	0	0	0	0	0
Excavator 3	**1**		0	1	0	0	0	0	0	0
Shovel	**0**		0	0	0	0	0	0	0	0
Truck 1	**65**		*22	0	0	*	0	0	0	0
Truck 2	**10**		0	*3	0	*	0	0	0	0
Truck 3	**7**		0	*2	0	*	0	0	0	0
TD 1	**7**		6	0	0	0	1	0	0	0
TD 2	**3**		0	2	0	0	1	0	0	0
TD 3	**6**		0	3	0	0	1	1	1	0
RT	**2**		1	1	0	0	0	0	0	0
Grader 2	**1**		0	0	0	1	0	0	0	0
Tanker 1	**2**		0	0	0	2	0	0	0	0
FEL 1	**1**		0	0	0	0	1	0	0	0
FEL 2	**2**		0	0	0	0	2	0	0	0
FEL 3	**1**		0	0	0	0	1	0	0	0
UX	**6**		1	1	2	0	0	0	0	2
PLANT AREA CONSTRUCTION UNITS	**0**									
Mobile Crane - 300 T	**2**	2								
Mobile Crane - 75 T	**3**	3								
Mobile Crane - 100 T	**2**	2								
Skid Steer Loader	**8**	8								
Boom Truck 28t	**4**	4								
Telehandler	**10**	10								
Forklift Diesel 4t	**4**	4								
Tire Handler Truck	**1**	1								
Lube Truck	**1**	1								
Truck Tractor for trailers	**2**	2								
Mobile Air Compressor 185CFM	**8**	8								
Welding Machine Diesel 400A	**8**	8								
Light Plant	**12**	12								
Genset 6kW	**3**	3								
Genset 60kW	**1**	1								
Generator 125-149 kVA	**4**	4								
Generator 19-29 kVA	**4**	4								
Generator 400-499 kVA	**4**	4								
Generator 50-59 kVA	**2**	2								
Generator 70-84 kVA	**2**	2								
Elevated Work Platform (electric)	**10**	10								
Frost Fighter	**20**	20								
Wheel Loader (425hp)	**2**	2								
Utility Wheel Loader (250hp)	**2**	2								

Note: Each column in this table represents a source in the emission inventory. Differing numbers of equipment are assumed to be operating at each source based on site operations, waste/ ore/ overburden mining schedules. After assigning equipment to each source, the emission rate for 1 equipment is multiplied by the number of equipment assigned to that source in the table below. The total number of equipment assigned to all source is equal to the number of equipment CNC has purchased.

* - Total number of haul trucks adjusted for time in pit versus travelling on haul roads outside of pit. 1-Hour and 24-Hour emission estimates for Truck 1, Truck 2 and Truck 3 are calculated in the HR - Haul Road Mobile Emissions tab.

Summary of 1-Hour Mobile Emissions (Year -1)

	Summary of 1-Hour Emissions (g/s)									
	CAS	PLANT_CONS	MZ	EZ1	TMF	Per Haul Road Segment [1]	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile	Water Management Excavation
PM	<<PM>>	4.44E-02	7.33E-02	1.35E-01	3.04E-03	1.78E-03	3.41E-02	5.55E-03	5.55E-03	3.04E-03
PM10	<<PM10>>	4.44E-02	7.33E-02	1.35E-01	3.04E-03	1.78E-03	3.41E-02	5.55E-03	5.55E-03	3.04E-03
PM2.5	<<PM2.5>>	4.44E-02	7.33E-02	1.35E-01	3.04E-03	1.78E-03	3.41E-02	5.55E-03	5.55E-03	3.04E-03
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	4.44E-02	7.33E-02	1.35E-01	3.04E-03	1.78E-03	3.41E-02	5.55E-03	5.55E-03	3.04E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	4.44E-02	7.33E-02	1.35E-01	3.04E-03	1.78E-03	3.41E-02	5.55E-03	5.55E-03	3.04E-03
CO	630-08-0	8.68	9.84	12.11	5.32E-01	1.63E-01	3.23	4.86E-01	4.86E-01	5.32E-01
SO2	7446-09-5	1.14E-02	1.60E-02	1.95E-02	8.56E-04	2.62E-04	5.20E-03	7.81E-04	7.81E-04	8.56E-04
Non-methane hydrocarbons	<<NMHC>>	3.85E-01	5.40E-01	6.58E-01	2.89E-02	8.85E-03	1.76E-01	2.64E-02	2.64E-02	2.89E-02
NOx	10102-44-0	8.10E-01	3.70	11.63	6.08E-02	1.49E-01	2.80	4.86E-01	4.86E-01	6.08E-02
1,3-butadiene	106-99-0	3.95E-04	5.55E-04	6.76E-04	2.97E-05	9.10E-06	1.80E-04	2.71E-05	2.71E-05	2.97E-05
Acenaphthene	83-32-9	2.60E-05	3.65E-05	4.45E-05	1.95E-06	5.98E-07	1.19E-05	1.78E-06	1.78E-06	1.95E-06
Acenaphthylene	208-96-8	4.22E-05	5.92E-05	7.21E-05	3.17E-06	9.70E-07	1.92E-05	2.89E-06	2.89E-06	3.17E-06
Acetaldehyde	75-07-0	3.43E-02	4.81E-02	5.86E-02	2.57E-03	7.89E-04	1.56E-02	2.35E-03	2.35E-03	2.57E-03
Acrolein	107-02-8	4.94E-03	6.93E-03	8.44E-03	3.71E-04	1.14E-04	2.25E-03	3.39E-04	3.39E-04	3.71E-04
Anthracene	120-12-7	1.62E-05	2.30E-05	2.93E-05	1.21E-06	3.93E-07	7.76E-06	1.18E-06	1.18E-06	1.21E-06
Benzene	71-43-2	6.38E-03	8.96E-03	1.09E-02	4.79E-04	1.47E-04	2.91E-03	4.38E-04	4.38E-04	4.79E-04
Benzo(a)anthracene	56-55-3	1.84E-07	2.67E-07	3.62E-07	1.36E-08	4.83E-09	9.50E-08	1.46E-08	1.46E-08	1.36E-08
Benzo(a)pyrene	50-32-8	1.46E-07	2.42E-07	4.47E-07	1.00E-08	5.86E-09	1.13E-07	1.83E-08	1.83E-08	1.00E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	1.24E-07	2.05E-07	3.79E-07	8.52E-09	4.97E-09	9.56E-08	1.56E-08	1.56E-08	8.52E-09
Benzo(g,h,i)perylene	191-24-2	1.08E-07	1.53E-07	1.96E-07	8.03E-09	2.63E-09	5.19E-08	7.89E-09	7.89E-09	8.03E-09
Chrysene	218-01-9	3.58E-07	5.30E-07	7.61E-07	2.62E-08	1.01E-08	1.98E-07	3.08E-08	3.08E-08	2.62E-08
Fluoranthene	206-44-0	2.48E-05	3.53E-05	4.52E-05	1.84E-06	6.06E-07	1.20E-05	1.82E-06	1.82E-06	1.84E-06
Fluorene	86-73-7	9.93E-05	1.40E-04	1.73E-04	7.44E-06	2.32E-06	4.60E-05	6.94E-06	6.94E-06	7.44E-06
Formaldehyde	50-00-0	1.07E-01	1.51E-01	1.84E-01	8.07E-03	2.47E-03	4.90E-02	7.37E-03	7.37E-03	8.07E-03
Phenanthrene	85-01-8	4.40E-04	6.22E-04	7.77E-04	3.29E-05	1.04E-05	2.07E-04	3.12E-05	3.12E-05	3.29E-05
Pyrene	129-00-0	2.08E-05	2.97E-05	3.83E-05	1.55E-06	5.14E-07	1.01E-05	1.54E-06	1.54E-06	1.55E-06
Dibenz(a,h)anthracene	53-70-3	4.44E-08	7.33E-08	1.35E-07	3.04E-09	1.78E-09	3.41E-08	5.55E-09	5.55E-09	3.04E-09
Indeno(1,2,3-cd)pyrene	193-39-5	2.22E-08	3.67E-08	6.77E-08	1.52E-09	8.88E-10	1.71E-08	2.78E-09	2.78E-09	1.52E-09
Napthalene	91-20-3	8.06E-03	1.13E-02	1.38E-02	6.05E-04	1.85E-04	3.68E-03	5.53E-04	5.53E-04	6.05E-04

*Conservatively assume that PM=PM10=PM2.5. "PARTICULATE MATTER EMISSION PROFILES OF ALBERTA HEAVY DUTY VEHICLES". Combustion & Environment Research Group. 2005

1. Emissions from the grader and tanker are everly distributed among all haul road segments. Total # of haul road segments during year -1: 11

Summary of 24-Hour Mobile Emissions (Year -1)

	Summary of 24-Hour Emissions (g/s)									
	CAS	PLANT_CONS	MZ	EZ1	TMF	Per Haul Road Segment [1]	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile	Water Management Excavation
PM	<<PM>>	2.96E-02	4.72E-02	9.08E-02	3.47E-04	1.38E-03	1.69E-02	1.90E-03	1.90E-03	3.47E-04
PM10	<<PM10>>	2.96E-02	4.72E-02	9.08E-02	3.47E-04	1.38E-03	1.69E-02	1.90E-03	1.90E-03	3.47E-04
PM2.5	<<PM2.5>>	2.96E-02	4.72E-02	9.08E-02	3.47E-04	1.38E-03	1.69E-02	1.90E-03	1.90E-03	3.47E-04
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	2.96E-02	4.72E-02	9.08E-02	3.47E-04	1.38E-03	1.69E-02	1.90E-03	1.90E-03	3.47E-04
Elemental Carbon (from diesel exhaust)	7440-44-0	2.96E-02	4.72E-02	9.08E-02	3.47E-04	1.38E-03	1.69E-02	1.90E-03	1.90E-03	3.47E-04
CO	630-08-0	5.78	6.22	8.01	6.08E-02	1.23E-01	1.60	1.66E-01	1.66E-01	6.08E-02
SO2	7446-09-5	7.59E-03	9.99E-03	1.29E-02	9.77E-05	1.98E-04	2.57E-03	2.68E-04	2.68E-04	9.77E-05
Non-methane hydrocarbons	<<NMHC>>	2.56E-01	3.37E-01	4.35E-01	3.30E-03	6.70E-03	8.69E-02	9.04E-03	9.04E-03	3.30E-03
NOx	10102-44-0	5.40E-01	2.52	7.90	6.94E-03	1.19E-01	1.39	1.66E-01	1.66E-01	6.94E-03
1,3-butadiene	106-99-0	2.64E-04	3.47E-04	4.47E-04	3.39E-06	6.85E-06	8.93E-05	9.29E-06	9.29E-06	3.39E-06
Acenaphthene	83-32-9	1.73E-05	2.28E-05	2.94E-05	2.23E-07	4.53E-07	5.87E-06	6.11E-07	6.11E-07	2.23E-07
Acenaphthylene	208-96-8	2.81E-05	3.70E-05	4.77E-05	3.62E-07	7.34E-07	9.52E-06	9.90E-07	9.90E-07	3.62E-07
Acetaldehyde	75-07-0	2.29E-02	3.01E-02	3.87E-02	2.94E-04	5.97E-04	7.74E-03	8.05E-04	8.05E-04	2.94E-04
Acrolein	107-02-8	3.29E-03	4.33E-03	5.58E-03	4.23E-05	8.60E-05	1.12E-03	1.16E-04	1.16E-04	4.23E-05
Anthracene	120-12-7	1.08E-05	1.44E-05	1.94E-05	1.38E-07	2.98E-07	3.84E-06	4.03E-07	4.03E-07	1.38E-07
Benzene	71-43-2	4.25E-03	5.60E-03	7.21E-03	5.47E-05	1.11E-04	1.44E-03	1.50E-04	1.50E-04	5.47E-05
Benzo(a)anthracene	56-55-3	1.22E-07	1.68E-07	2.40E-07	1.55E-09	3.69E-09	4.70E-08	5.01E-09	5.01E-09	1.55E-09
Benzo(a)pyrene	50-32-8	9.77E-08	1.56E-07	3.00E-07	1.15E-09	4.56E-09	5.59E-08	6.28E-09	6.28E-09	1.15E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	8.29E-08	1.32E-07	2.54E-07	9.72E-10	3.87E-09	4.74E-08	5.33E-09	5.33E-09	9.72E-10
Benzo(g,h,i)perylene	191-24-2	7.16E-08	9.62E-08	1.30E-07	9.17E-10	2.00E-09	2.57E-08	2.70E-09	2.70E-09	9.17E-10
Chrysene	218-01-9	2.39E-07	3.35E-07	5.06E-07	2.99E-09	7.76E-09	9.82E-08	1.06E-08	1.06E-08	2.99E-09
Fluoranthene	206-44-0	1.65E-05	2.21E-05	3.00E-05	2.11E-07	4.61E-07	5.93E-06	6.23E-07	6.23E-07	2.11E-07
Fluorene	86-73-7	6.62E-05	8.75E-05	1.14E-04	8.49E-07	1.76E-06	2.28E-05	2.38E-06	2.38E-06	8.49E-07
Formaldehyde	50-00-0	7.17E-02	9.43E-02	1.21E-01	9.22E-04	1.87E-03	2.43E-02	2.52E-03	2.52E-03	9.22E-04
Phenanthrene	85-01-8	2.93E-04	3.89E-04	5.14E-04	3.76E-06	7.92E-06	1.02E-04	1.07E-05	1.07E-05	3.76E-06
Pyrene	129-00-0	1.39E-05	1.86E-05	2.54E-05	1.77E-07	3.91E-07	5.02E-06	5.25E-07	5.25E-07	1.77E-07
Dibenz(a,h)anthracene	53-70-3	2.96E-08	4.72E-08	9.08E-08	3.47E-10	1.38E-09	1.69E-08	1.90E-09	1.90E-09	3.47E-10
Indeno(1,2,3-cd)pyrene	193-39-5	1.48E-08	2.36E-08	4.54E-08	1.74E-10	6.90E-10	8.47E-09	9.51E-10	9.51E-10	1.74E-10
Napthalene	91-20-3	5.37E-03	7.07E-03	9.11E-03	6.91E-05	1.40E-04	1.82E-03	1.89E-04	1.89E-04	6.91E-05

*Conservatively assume that PM=PM10=PM2.5. "PARTICULATE MATTER EMISSION PROFILES OF ALBERTA HEAVY DUTY VEHICLES". Combustion & Environment Research Group. 2005

1. Emissions from the grader and tanker are everly distributed among all haul road segments. Total # of haul road segments during year -1: 11

Number of units at each source (Year 7)		# of units at each source (Year 7)							
	Total Number of Units	PLANT_OP	MZ	EZ2	TMF	Haul Roads	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile
MINING FLEET									
Drill1	7		7	0	0	0	0	0	0
Drill2	1		0	1	0	0	0	0	0
Excavator 1	5		0	5	0	0	0	0	0
Excavator 2	2		0	2	0	0	0	0	0
Excavator 3	2		2	0	0	0	0	0	0
Shovel	3		3	0	0	0	0	0	0
Truck 1	34		0	*11	0	*	0	0	0
Truck 2	28		0	*9	0	*	0	0	0
Truck 3	54		*18	0	0	*	0	0	0
TD 1	7		0	6	0	0	1	0	0
TD 2	5		0	4	0	0	1	0	0
TD 3	11		8	0	0	0	1	1	1
RT	2		1	1	0	0	0	0	0
Grader 2	4		0	0	0	4	0	0	0
Tanker 1	3		0	0	0	3	0	0	0
FEL 1	2		0	0	0	0	2	0	0
FEL 2	2		0	0	0	0	2	0	0
FEL 3	1		0	0	0	0	1	0	0
UX	5		1	1	1	0	2	0	0
PLANT AREA OPERATION UNITS									
4 x 4 light pickup truck	20	20							
Ambulance	1	1							
Water truck (fire response and dust control)	1	1							
Rock Breaker	2	2							
2.5t All terrain forklift	4	4							
Skid steer loader	4	4							
Plant Front End Loader	2	2							
Elevated Work Platform	3	3							
3.5t Hiab flat bed truck	2	2							
10t Hiab flat bed truck	1	1							
Concentrate Train Wagons	45	45							
Concentrate Locomotives	4	4							
Magnetite railcar side dumper	2	2							
Concentrate Front End Loaders	2	2							
Concentrate Railcar unloading excavator	2	2							

Note: Each column in this table represents a source in the emission inventory. Differing numbers of equipment are assumed to be operating at each source based on site operations, waste/ ore/ overburden mining schedules. After assigning equipment to each source, the emission rate for 1 equipment is multiplied by the number of equipment assigned to that source in the table below. The total number of equipment assigned to all source is equal to the number of equipment CNC has purchased.
* - Total number of haul trucks adjusted for time in pit versus travelling on haul roads outside of pit.

Summary of 1-Hour Mobile Emissions (Year 7)

		Summary of 1-Hour Emissions (g/s)							
	CAS	PLANT_OP	MZ	EZ2	TMF	Per Haul Road Segment [1]	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile
PM	<<PM>>	3.10E-02	1.83E-01	1.38E-01	1.52E-03	1.76E-03	3.89E-02	5.55E-03	5.55E-03
PM10	<<PM10>>	3.10E-02	1.83E-01	1.38E-01	1.52E-03	1.76E-03	3.89E-02	5.55E-03	5.55E-03
PM2.5	<<PM2.5>>	3.10E-02	1.83E-01	1.38E-01	1.52E-03	1.76E-03	3.89E-02	5.55E-03	5.55E-03
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	3.10E-02	1.83E-01	1.38E-01	1.52E-03	1.76E-03	3.89E-02	5.55E-03	5.55E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	3.10E-02	1.83E-01	1.38E-01	1.52E-03	1.76E-03	3.89E-02	5.55E-03	5.55E-03
CO	630-08-0	5.47E+00	1.60E+01	1.44E+01	2.66E-01	1.73E-01	4.06E+00	4.86E-01	4.86E-01
SO2	7446-09-5	8.54E-03	2.57E-02	2.31E-02	4.28E-04	2.78E-04	6.53E-03	7.81E-04	7.81E-04
Non-methane hydrocarbons	<<NMHC>>	2.88E-01	8.68E-01	7.80E-01	1.44E-02	9.38E-03	2.20E-01	2.64E-02	2.64E-02
NOx	10102-44-0	6.07E-01	1.60E+01	1.03E+01	3.04E-02	1.40E-01	2.89E+00	4.86E-01	4.86E-01
1,3-butadiene	106-99-0	2.97E-04	8.93E-04	8.01E-04	1.49E-05	9.64E-06	2.27E-04	2.71E-05	2.71E-05
Acenaphthene	83-32-9	1.95E-05	5.87E-05	5.27E-05	9.76E-07	6.34E-07	1.49E-05	1.78E-06	1.78E-06
Acenaphthylene	208-96-8	3.16E-05	9.52E-05	8.54E-05	1.58E-06	1.03E-06	2.42E-05	2.89E-06	2.89E-06
Acetaldehyde	75-07-0	2.57E-02	7.74E-02	6.95E-02	1.29E-03	8.36E-04	1.96E-02	2.35E-03	2.35E-03
Acrolein	107-02-8	3.70E-03	1.11E-02	1.00E-02	1.85E-04	1.20E-04	2.83E-03	3.39E-04	3.39E-04
Anthracene	120-12-7	1.21E-05	3.88E-05	3.41E-05	6.05E-07	4.13E-07	9.64E-06	1.18E-06	1.18E-06
Benzene	71-43-2	4.79E-03	1.44E-02	1.29E-02	2.40E-04	1.56E-04	3.66E-03	4.38E-04	4.38E-04
Benzo(a)anthracene	56-55-3	1.36E-07	4.81E-07	4.11E-07	6.79E-09	5.03E-09	1.16E-07	1.46E-08	1.46E-08
Benzo(a)pyrene	50-32-8	1.02E-07	6.03E-07	4.56E-07	5.02E-09	5.81E-09	1.28E-07	1.83E-08	1.83E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	8.69E-08	5.12E-07	3.87E-07	4.26E-09	4.93E-09	1.09E-07	1.56E-08	1.56E-08
Benzo(g,h,i)perylene	191-24-2	8.03E-08	2.60E-07	2.28E-07	4.02E-09	2.77E-09	6.44E-08	7.89E-09	7.89E-09
Chrysene	218-01-9	2.63E-07	1.02E-06	8.46E-07	1.31E-08	1.04E-08	2.39E-07	3.08E-08	3.08E-08
Fluoranthene	206-44-0	1.85E-05	5.99E-05	5.25E-05	9.22E-07	6.37E-07	1.48E-05	1.82E-06	1.82E-06
Fluorene	86-73-7	7.43E-05	2.29E-04	2.04E-04	3.72E-06	2.48E-06	5.76E-05	6.94E-06	6.94E-06
Formaldehyde	50-00-0	8.06E-02	2.43E-01	2.18E-01	4.04E-03	2.62E-03	6.16E-02	7.37E-03	7.37E-03
Phenanthrene	85-01-8	3.29E-04	1.03E-03	9.12E-04	1.65E-05	1.10E-05	2.58E-04	3.12E-05	3.12E-05
Pyrene	129-00-0	1.55E-05	5.08E-05	4.44E-05	7.75E-07	5.39E-07	1.25E-05	1.54E-06	1.54E-06
Dibenz(a,h)anthracene	53-70-3	3.10E-08	1.83E-07	1.38E-07	1.52E-09	1.76E-09	3.89E-08	5.55E-09	5.55E-09
Indeno(1,2,3-cd)pyrene	193-39-5	1.55E-08	9.14E-08	6.91E-08	7.60E-10	8.81E-10	1.94E-08	2.78E-09	2.78E-09
Napthalene	91-20-3	6.04E-03	1.82E-02	1.63E-02	3.03E-04	1.96E-04	4.62E-03	5.53E-04	5.53E-04

*Conservatively assume that PM=PM10=PM2.5. "PARTICULATE MATTER EMISSION PROFILES OF ALBERTA HEAVY DUTY VEHICLES". Combustion & Environment Research Group. 2005
1. Emissions from the grader and tanker are evenly distributed among all haul road segments. Total # of haul road segments during year 7: 18

Summary of 24-Hour Mobile Emissions (Year 7)

		Summary of 24-Hour Emissions (g/s)							
	CAS	PLANT_OP	MZ	EZ2	TMF	Per Haul Road Segment [1]	Clay/ Sand/ Waste Rock Impoundment Areas	West LG Ore stockpile	East LG Ore stockpile
PM	<<PM>>	1.97E-02	1.46E-01	8.55E-02	1.74E-04	1.31E-03	1.82E-02	1.90E-03	1.90E-03
PM10	<<PM10>>	1.97E-02	1.46E-01	8.55E-02	1.74E-04	1.31E-03	1.82E-02	1.90E-03	1.90E-03
PM2.5	<<PM2.5>>	1.97E-02	1.46E-01	8.55E-02	1.74E-04	1.31E-03	1.82E-02	1.90E-03	1.90E-03
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	1.97E-02	1.46E-01	8.55E-02	1.74E-04	1.31E-03	1.82E-02	1.90E-03	1.90E-03
Elemental Carbon (from diesel exhaust)	7440-44-0	1.97E-02	1.46E-01	8.55E-02	1.74E-04	1.31E-03	1.82E-02	1.90E-03	1.90E-03
CO	630-08-0	3.48E+00	1.28E+01	8.71E+00	3.04E-02	1.21E-01	1.83E+00	1.66E-01	1.66E-01
SO2	7446-09-5	5.40E-03	2.06E-02	1.40E-02	4.88E-05	1.95E-04	2.94E-03	2.68E-04	2.68E-04
Non-methane hydrocarbons	<<NMHC>>	1.82E-01	6.95E-01	4.73E-01	1.65E-03	6.57E-03	9.93E-02	9.04E-03	9.04E-03
NOx	10102-44-0	3.84E-01	1.28E+01	6.53E+00	3.47E-03	1.10E-01	1.42E+00	1.66E-01	1.66E-01
1,3-butadiene	106-99-0	1.87E-04	7.14E-04	4.86E-04	1.70E-06	6.76E-06	1.02E-04	9.29E-06	9.29E-06
Acenaphthene	83-32-9	1.23E-05	4.69E-05	3.20E-05	1.11E-07	4.44E-07	6.71E-06	6.11E-07	6.11E-07
Acenaphthylene	208-96-8	2.00E-05	7.61E-05	5.18E-05	1.81E-07	7.21E-07	1.09E-05	9.90E-07	9.90E-07
Acetaldehyde	75-07-0	1.62E-02	6.19E-02	4.21E-02	1.47E-04	5.86E-04	8.85E-03	8.05E-04	8.05E-04
Acrolein	107-02-8	2.34E-03	8.92E-03	6.07E-03	2.12E-05	8.44E-05	1.27E-03	1.16E-04	1.16E-04
Anthracene	120-12-7	7.64E-06	3.10E-05	2.07E-05	6.90E-08	2.92E-07	4.36E-06	4.03E-07	4.03E-07
Benzene	71-43-2	3.02E-03	1.15E-02	7.85E-03	2.74E-05	1.09E-04	1.65E-03	1.50E-04	1.50E-04
Benzo(a)anthracene	56-55-3	8.61E-08	3.85E-07	2.51E-07	7.75E-10	3.58E-09	5.29E-08	5.01E-09	5.01E-09
Benzo(a)pyrene	50-32-8	6.51E-08	4.83E-07	2.82E-07	5.73E-10	4.33E-09	6.02E-08	6.28E-09	6.28E-09
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	5.52E-08	4.09E-07	2.39E-07	4.86E-10	3.67E-09	5.11E-08	5.33E-09	5.33E-09
Benzo(g,h,i)perylene	191-24-2	5.08E-08	2.08E-07	1.39E-07	4.59E-10	1.95E-09	2.92E-08	2.70E-09	2.70E-09
Chrysene	218-01-9	1.66E-07	8.12E-07	5.18E-07	1.49E-09	7.50E-09	1.09E-07	1.06E-08	1.06E-08
Fluoranthene	206-44-0	1.17E-05	4.79E-05	3.19E-05	1.05E-07	4.50E-07	6.72E-06	6.23E-07	6.23E-07
Fluorene	86-73-7	4.70E-05	1.83E-04	1.24E-04	4.25E-07	1.73E-06	2.60E-05	2.38E-06	2.38E-06
Formaldehyde	50-00-0	5.09E-02	1.94E-01	1.32E-01	4.61E-04	1.84E-03	2.77E-02	2.52E-03	2.52E-03
Phenanthrene	85-01-8	2.08E-04	8.22E-04	5.54E-04	1.88E-06	1.40E-04	1.16E-04	1.07E-05	1.07E-05
Pyrene	129-00-0	9.80E-06	4.07E-05	2.70E-05	8.84E-08	6.87E-06	5.69E-06	5.29E-07	5.29E-07
Dibenz(a,h)anthracene	53-70-3	1.96E-08	1.46E-07	8.55E-08	1.74E-10	2.36E-08	1.82E-08	1.90E-09	1.90E-09
Indeno(1,2,3-cd)pyrene	193-39-5	9.86E-09	7.31E-08	4.27E-08	8.68E-11	1.18E-08	9.12E-09	9.51E-10	9.51E-10
Napthalene	91-20-3	3.82E-03	1.45E-02	9.91E-03	3.45E-05	2.48E-03	2.08E-03	1.89E-04	1.89E-04

1. Emissions from the grader and tanker are evenly distributed among all haul road segments. Total # of haul road segments during year 7: 18

Sample Calculation for Drill1 - PM Emissions

Drill1 Power Rating	751 kW > 560kW but <900kW
Assumed Average Power Rating	526 kW
Therefore, the grader will comply with Range 4 Exhaust Emission Standards:	4.00E-02 g/kWhr
A single Drill1 unit PM Emission rate (g/s) =4E-02 g/kWhr x 526kW x 1/3600 hr/s=	5.84E-03 g/s
PM Emissions in Pit from Drill1 operations (g/s) = # of units x individual emission rate =	1.75E-02 g/s

Data Quality: Average
The calculation methodology is based on the US EPA reference document for Exhaust Emission Standards and the maximum allowable sulphur content in diesel and fuel consumption of the vehicles. This gives a MECP data quality of "Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the maximum estimated number of equipment in each area. The calculated emission rate should be conservative.

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Tailpipe Emissions from Haul Trucks Travelling on Routes Outside of the Pits

Haul-Road Mobile emissions from haul trucks are adjusted based on the following:
1. Time spent hauling outside of pits (40-minutes during any given hour)
2. # of trucks travelling on each haul road (estimated by Stantec)
3. Length of each road segment on each travel route (as modelled in AERMOD)

# of Trucks Travelling Exclusively on Haul Routes (i.e., equivelant to total # of trucks x 40/60 minutes per hour)

Truck Type	Year -1	Year 7	Operating Hours per Day
Truck 1	43	23	16
Truck 2	7	19	16
Truck 3	5	36	19

CoPC	Tailpipe Emissions from Single Haul Truck (g/s)		
	Truck1	Truck2	Truck3
Non-methane hydrocarbons	1.24E-02	2.80E-02	9.65E-02
NOx	2.61E-02	5.16E-01	1.78
PM	1.31E-03	5.90E-03	2.03E-02
CO	2.29E-01	5.16E-01	1.78
SO2	3.67E-04	8.29E-04	2.86E-03
1,3-butadiene	1.28E-05	2.88E-05	9.92E-05
Acenaphthene	8.39E-07	1.89E-06	6.52E-06
Acenaphthylene	1.36E-06	3.07E-06	1.06E-05
Acetaldehyde	1.11E-03	2.50E-03	8.60E-03
Acrolein	1.59E-04	3.60E-04	1.24E-03
Anthracene	5.19E-07	1.25E-06	4.31E-06
Benzene	2.06E-04	4.65E-04	1.60E-03
Benzo(a)anthracene	5.83E-09	1.55E-08	5.35E-08
Benzo(a)pyrene	4.31E-09	1.95E-08	6.70E-08
Benzo(b+k)fluoranthene	3.66E-09	1.65E-08	5.69E-08
Benzo(g,h,i)perylene	3.45E-09	8.38E-09	2.89E-08
Chrysene	1.12E-08	3.27E-08	1.13E-07
Fluoranthene	7.92E-07	1.93E-06	6.66E-06
Fluorene	3.20E-06	7.37E-06	2.54E-05
Formaldehyde	3.47E-03	7.83E-03	2.70E-02
Phenanthrene	1.41E-05	3.32E-05	1.14E-04
Pyrene	6.65E-07	1.64E-06	5.65E-06
Dibenz(a,h)anthracene	1.31E-09	5.90E-09	2.03E-08
Indeno(1,2,3-cd)pyrene	6.53E-10	2.95E-09	1.02E-08
Napthalene	2.60E-04	5.87E-04	2.02E-03
PM10	1.31E-03	5.90E-03	2.03E-02
PM2.5	1.31E-03	5.90E-03	2.03E-02
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	1.31E-03	5.90E-03	2.03E-02
Elemental Carbon (from diesel exhaust)	1.31E-03	5.90E-03	2.03E-02

Year -1 Haul Truck Routes

Modelled Source ID			Equivalent # of Trucks	HAUL1AB	HAUL2A	HAUL3A	HAUL4AB	HAUL5A	HAUL6A	HAUL7A	HAUL8A	HAUL9A	HAUL16A	HAUL21A	Total
Modelled Source Lengths (m)			**Outside of Pit**	**414**	**12828**	**647**	**680**	**2740**	**163**	**2559**	**9130**	**550**	**1192**	**1440**	**-**
Daily Truck Trips	TRUCK1_1	Organic to Revegetation Stockpiles	43	0	0	326	326	326	326	163	163	0	0	0	1,630
	TRUCK2_2	Sand to Revegetation Stockpiles		0	0	91	91	91	91	46	46	0	0	0	457
From Road Data Tab	TRUCK2_4	Clay + Sand & Till - Clay Impoundment	7	0	0	710	710	710	710	0	710	0	0	0	3,548
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0	0	36	36	36	231	231	0	195	0	0	766
	TRUCK3_3	ROM Ore to LG East		0	0	0	0	125	0	0	0	125	125	0	376
	TRUCK3_7	Waste Rock to Clay Impoundment ROM		0	0	0	0	0	160	0	160	160	0	0	479
	TRUCK3_8	Waste Rock to TMF ROM	5	5	5	0	5	5	0	0	0	5	0	0	24
	TRUCK3_10	Waste Rock to Miscellaneus Construction		36	0	36	0	36	0	0	0	36	0	0	144
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0	0	0	0	0	13	0	0	13	0	13	38
Estimated # of Trucks on Each Haul Road	TRUCK1_1	Organic to Revegetation Stockpiles	43			43	43	43	43	22	22				
	TRUCK2_2	Sand to Revegetation Stockpiles	2			2	2	2	2	1	1				-
Adjusted for time on haul roads outside of pit	TRUCK2_4	Clay + Sand & Till - Clay Impoundment	3			3	3	3	3		3				-
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment	2			1	1	1	2	2		1			-
	TRUCK3_3	ROM Ore to LG East	1					1				1	1		-
	TRUCK3_7	Waste Rock to Clay Impoundment ROM	1						1		1	1			-
	TRUCK3_8	Waste Rock to TMF ROM	1	1	1		1	1				1			-
	TRUCK3_10	Waste Rock to Miscellaneus Construction	1	1		1		1				1			-
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)	1						1			1		1	-
Truck Count Weighted Equivalent Haul Road Distancse (m)	TRUCK1_1	Organic to Revegetation Stockpiles		0	0	647	680	2,740	163	1,280	4,565	0	0	0	10,075
	TRUCK2_2	Sand to Revegetation Stockpiles		0	0	647	680	2,740	163	1,280	4,565	0	0	0	10,075
As modelled in AERMOD	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		0	0	647	680	2,740	163	0	9,130	0	0	0	13,360
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0	0	324	340	1,370	163	2,559	0	275	0	0	5,031
	TRUCK3_3	ROM Ore to LG East		0	0	0	0	2,740	0	0	0	550	1,192	0	4,482
	TRUCK3_7	Waste Rock to Clay Impoundment ROM		0	0	0	0	0	163	0	9,130	550	0	0	9,843
	TRUCK3_8	Waste Rock to TMF ROM		414	12,828	0	680	2,740	0	0	0	550	0	0	17,212
	TRUCK3_10	Waste Rock to Miscellaneus Construction		414	0	647	0	2,740	0	0	0	550	0	0	4,351
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0	0	0	0	0	163	0	0	550	0	1,440	2,153
% of Total Equivalent Haul Road Distance	TRUCK1_1	Organic to Revegetation Stockpiles		0.0%	0.0%	6.4%	6.7%	27.2%	1.6%	12.7%	45.3%	0.0%	0.0%	0.0%	100.0%
	TRUCK2_2	Sand to Revegetation Stockpiles		0.0%	0.0%	6.4%	6.7%	27.2%	1.6%	12.7%	45.3%	0.0%	0.0%	0.0%	100.0%
= Haul Road Distance (m) / Total Travel Route Distance (m)	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		0.0%	0.0%	4.8%	5.1%	20.5%	1.2%	0.0%	68.3%	0.0%	0.0%	0.0%	100.0%
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0.0%	0.0%	6.4%	6.8%	27.2%	3.2%	50.9%	0.0%	5.5%	0.0%	0.0%	100.0%
	TRUCK3_3	ROM Ore to LG East		0.0%	0.0%	0.0%	0.0%	61.1%	0.0%	0.0%	0.0%	12.3%	26.6%	0.0%	100.0%
	TRUCK3_7	Waste Rock to Clay Impoundment ROM		0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	0.0%	92.8%	5.6%	0.0%	0.0%	100.0%
	TRUCK3_8	Waste Rock to TMF ROM		2.4%	74.5%	0.0%	4.0%	15.9%	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	100.0%
	TRUCK3_10	Waste Rock to Miscellaneus Construction		9.5%	0.0%	14.9%	0.0%	63.0%	0.0%	0.0%	0.0%	12.6%	0.0%	0.0%	100.0%
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0.0%	0.0%	0.0%	0.0%	0.0%	7.6%	0.0%	0.0%	25.5%	0.0%	66.9%	100.0%
Non Road Mobile Emissions Multiplier	TRUCK1_1	Organic to Revegetation Stockpiles		**0.00**	**0.00**	**2.76**	**2.90**	**11.69**	**0.70**	**5.46**	**19.48**	**0.00**	**0.00**	**0.00**	43.00
	TRUCK2_2	Sand to Revegetation Stockpiles		**0.00**	**0.00**	**0.13**	**0.13**	**0.54**	**0.03**	**0.25**	**0.91**	**0.00**	**0.00**	**0.00**	2.00
= # of Trucks on each Haul Road x % of Haul Road Distance	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		**0.00**	**0.00**	**0.15**	**0.15**	**0.62**	**0.04**	**0.00**	**2.05**	**0.00**	**0.00**	**0.00**	3.00
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		**0.00**	**0.00**	**0.13**	**0.14**	**0.54**	**0.06**	**1.02**	**0.00**	**0.11**	**0.00**	**0.00**	2.00
	TRUCK3_3	ROM Ore to LG East		**0.00**	**0.00**	**0.00**	**0.00**	**0.61**	**0.00**	**0.00**	**0.00**	**0.12**	**0.27**	**0.00**	1.00
	TRUCK3_7	Waste Rock to Clay Impoundment ROM		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.00**	**0.93**	**0.06**	**0.00**	**0.00**	1.00
	TRUCK3_8	Waste Rock to TMF ROM		**0.02**	**0.75**	**0.00**	**0.04**	**0.16**	**0.00**	**0.00**	**0.00**	**0.03**	**0.00**	**0.00**	1.00
	TRUCK3_10	Waste Rock to Miscellaneus Construction		**0.10**	**0.00**	**0.15**	**0.00**	**0.63**	**0.00**	**0.00**	**0.00**	**0.13**	**0.00**	**0.00**	1.00
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.26**	**0.00**	**0.67**	1.00
Adjusted 1-Hour Haul Truck Mobile Emissions Year -1 (g/s)	**COPC**		**CAS**	**HAUL1AB**	**HAUL2A**	**HAUL3A**	**HAUL4AB**	**HAUL5A**	**HAUL6A**	**HAUL7A**	**HAUL8A**	**HAUL9A**	**HAUL16A**	**HAUL21A**	**Total**
	Non-methane hydrocarbons		**<<NMHC>>**	1.15E-02	7.19E-02	5.99E-02	5.17E-02	3.28E-01	2.13E-02	1.03E-01	4.14E-01	6.02E-02	2.57E-02	6.45E-02	1.21
= Tailpipe Emissions from Single Truck1 (g/s) x Truck1 Multiplier +	**NOx**		**10102-44-0**	2.12E-01	1.32	5.44E-01	3.64E-01	3.67	2.51E-01	7.99E-01	3.68	1.11	4.73E-01	1.19	13.62
Tailpipe Emissions from Single Truck2 (g/s) x Truck2 Multiplier +	**PM**		**<<PM>>**	2.42E-03	1.51E-02	9.00E-03	7.09E-03	5.38E-02	3.57E-03	1.46E-02	6.17E-02	1.27E-02	5.40E-03	1.36E-02	1.99E-01
Tailpipe Emissions from Single Truck3 (g/s) x Truck3 Multiplier	**CO**		**630-08-0**	2.12E-01	1.32	1.10	9.52E-01	6.04	3.92E-01	1.90	7.63	1.11	4.73E-01	1.19	22.33
	SO2		**7446-09-5**	3.41E-04	2.13E-03	1.77E-03	1.53E-03	9.71E-03	6.30E-04	3.06E-03	1.23E-02	1.78E-03	7.60E-04	1.91E-03	3.59E-02
	1,3-butadiene		**106-99-0**	1.18E-05	7.39E-05	6.16E-05	5.31E-05	3.37E-04	2.19E-05	1.06E-04	4.26E-04	6.19E-05	2.64E-05	6.63E-05	1.25E-03
	Acenaphthene		**83-32-9**	7.77E-07	4.86E-06	4.05E-06	3.49E-06	2.22E-05	1.44E-06	6.99E-06	2.80E-05	4.07E-06	1.73E-06	4.36E-06	8.19E-05
	Acenaphthylene		**208-96-8**	1.26E-06	7.88E-06	6.56E-06	5.66E-06	3.59E-05	2.33E-06	1.13E-05	4.54E-05	6.60E-06	2.81E-06	7.07E-06	1.33E-04
	Acetaldehyde		**75-07-0**	1.02E-03	6.41E-03	5.34E-03	4.60E-03	2.92E-02	1.90E-03	9.21E-03	3.69E-02	5.37E-03	2.29E-03	5.75E-03	1.08E-01
	Acrolein		**107-02-8**	1.48E-04	9.23E-04	7.69E-04	6.63E-04	4.21E-03	2.73E-04	1.33E-03	5.32E-03	7.73E-04	3.29E-04	8.29E-04	1.56E-02
	Anthracene		**120-12-7**	5.14E-07	3.21E-06	2.58E-06	2.21E-06	1.42E-05	9.26E-07	4.43E-06	1.78E-05	2.69E-06	1.15E-06	2.88E-06	5.26E-05
	Benzene		**71-43-2**	1.91E-04	1.19E-03	9.93E-04	8.57E-04	5.44E-03	3.53E-04	1.71E-03	6.87E-03	9.99E-04	4.26E-04	1.07E-03	2.01E-02
	Benzo(a)anthracene		**56-55-3**	6.37E-09	3.98E-08	3.03E-08	2.56E-08	1.69E-07	1.11E-08	5.16E-08	2.09E-07	3.34E-08	1.42E-08	3.58E-08	6.26E-07
	Benzo(a)pyrene		**50-32-8**	7.99E-09	5.00E-08	2.97E-08	2.34E-08	1.77E-07	1.18E-08	4.83E-08	2.04E-07	4.18E-08	1.78E-08	4.48E-08	6.57E-07
	Benzo(b+k)fluoranthene		**205-99-2 / 207-08-9**	6.78E-09	4.24E-08	2.52E-08	1.98E-08	1.51E-07	1.00E-08	4.10E-08	1.73E-07	3.55E-08	1.51E-08	3.80E-08	5.57E-07
	Benzo(g,h,i)perylene		**191-24-2**	3.44E-09	2.15E-08	1.72E-08	1.47E-08	9.50E-08	6.18E-09	2.95E-08	1.19E-07	1.80E-08	7.68E-09	1.93E-08	3.51E-07
	Chrysene		**218-01-9**	1.34E-08	8.41E-08	6.10E-08	5.09E-08	3.45E-07	2.26E-08	1.03E-07	4.20E-07	7.04E-08	3.00E-08	7.54E-08	1.28E-06
	Fluoranthene		**206-44-0**	7.93E-07	4.96E-06	3.95E-06	3.38E-06	2.19E-05	1.42E-06	6.78E-06	2.73E-05	4.15E-06	1.77E-06	4.45E-06	8.09E-05
	Fluorene		**86-73-7**	3.03E-06	1.89E-05	1.56E-05	1.34E-05	8.55E-05	5.55E-06	2.68E-05	1.08E-04	1.59E-05	6.75E-06	1.70E-05	3.16E-04
	Formaldehyde		**50-00-0**	3.21E-03	2.01E-02	1.67E-02	1.44E-02	9.16E-02	5.95E-03	2.89E-02	1.16E-01	1.68E-02	7.17E-03	1.80E-02	3.39E-01
	Phenanthrene		**85-01-8**	1.36E-05	8.51E-05	6.93E-05	5.95E-05	3.82E-04	2.48E-05	1.19E-04	4.79E-04	7.13E-05	3.04E-05	7.64E-05	1.41E-03
	Pyrene		**129-00-0**	6.73E-07	4.21E-06	3.34E-06	2.85E-06	1.85E-05	1.20E-06	5.72E-06	2.30E-05	3.53E-06	1.50E-06	3.76E-06	6.83E-05
	Dibenz(a,h)anthracene		**53-70-3**	2.42E-09	1.51E-08	9.00E-09	7.09E-09	5.38E-08	3.57E-09	1.46E-08	6.17E-08	1.27E-08	5.40E-09	1.36E-08	1.99E-07
	Indeno(1,2,3-cd)pyrene		**193-39-5**	1.21E-09	7.57E-09	4.50E-09	3.54E-09	2.69E-08	1.79E-09	7.31E-09	3.09E-08	6.34E-09	2.70E-09	6.79E-09	9.95E-08
	Napthalene		**91-20-3**	2.41E-04	1.51E-03	1.25E-03	1.08E-03	6.87E-03	4.46E-04	2.17E-03	8.67E-03	1.26E-03	5.38E-04	1.35E-03	2.54E-02
	PM10		**<<PM10>>**	2.42E-03	1.51E-02	9.00E-03	7.09E-03	5.38E-02	3.57E-03	1.46E-02	6.17E-02	1.27E-02	5.40E-03	1.36E-02	1.99E-01
	PM2.5		**<<PM2.5>>**	2.42E-03	1.51E-02	9.00E-03	7.09E-03	5.38E-02	3.57E-03	1.46E-02	6.17E-02	1.27E-02	5.40E-03	1.36E-02	1.99E-01
	Diesel Particulate Matter (PM2.5 from Diesel Combustion)		**<<DPM>>**	2.42E-03	1.51E-02	9.00E-03	7.09E-03	5.38E-02	3.57E-03	1.46E-02	6.17E-02	1.27E-02	5.40E-03	1.36E-02	1.99E-01
	Elemental Carbon (from diesel exhaust)		**7440-44-0**	2.42E-03	1.51E-02	9.00E-03	7.09E-03	5.38E-02	3.57E-03	1.46E-02	6.17E-02	1.27E-02	5.40E-03	1.36E-02	1.99E-01
Adjusted 24-Hour Haul Truck Mobile Emissions Year -1 (g/s)	**COPC**		**CAS**	**HAUL1AB**	**HAUL2A**	**HAUL3A**	**HAUL4AB**	**HAUL5A**	**HAUL6A**	**HAUL7A**	**HAUL8A**	**HAUL9A**	**HAUL16A**	**HAUL21A**	**Total**
	Non-methane hydrocarbons		**<<NMHC>>**	9.20E-03	5.75E-02	4.24E-02	3.56E-02	2.39E-01	1.55E-02	7.03E-02	2.92E-01	4.78E-02	2.05E-02	5.16E-02	8.82E-01
= Tailpipe Emissions from Single Truck1 (g/s) x Truck1 Multiplier x 16hours/24hours +	**NOx**		**10102-44-0**	1.69E-01	1.06	4.02E-01	2.56E-01	2.80	1.90E-01	5.43E-01	2.70	8.81E-01	3.78E-01	9.51E-01	10.33
Tailpipe Emissions from Single Truck2 (g/s) x Truck2 Multiplier x 16hours/24hours+	**PM**		**<<PM>>**	1.94E-03	1.21E-02	6.48E-03	4.92E-03	4.00E-02	2.65E-03	9.95E-03	4.42E-02	1.01E-02	4.32E-03	1.09E-02	1.47E-01
Tailpipe Emissions from Single Truck3 (g/s) x Truck3 Multiplier x 19hours/24hours	**CO**		**630-08-0**	1.69E-01	1.06	7.82E-01	6.56E-01	4.41	2.86E-01	1.29	5.38	8.81E-01	3.78E-01	9.51E-01	16.25
	SO2		**7446-09-5**	2.72E-04	1.70E-03	1.26E-03	1.05E-03	7.08E-03	4.60E-04	2.08E-03	8.66E-03	1.42E-03	6.08E-04	1.53E-03	2.61E-02
	1,3-butadiene		**106-99-0**	9.46E-06	5.91E-05	4.36E-05	3.66E-05	2.46E-04	1.60E-05	7.23E-05	3.00E-04	4.91E-05	2.11E-05	5.31E-05	9.07E-04
	Acenaphthene		**83-32-9**	6.22E-07	3.89E-06	2.87E-06	2.41E-06	1.62E-05	1.05E-06	4.75E-06	1.98E-05	3.23E-06	1.39E-06	3.49E-06	5.96E-05
	Acenaphthylene		**208-96-8**	1.01E-06	6.30E-06	4.65E-06	3.90E-06	2.62E-05	1.70E-06	7.70E-06	3.20E-05	5.24E-06	2.25E-06	5.66E-06	9.67E-05
	Acetaldehyde		**75-07-0**	8.20E-04	5.13E-03	3.78E-03	3.17E-03	2.13E-02	1.38E-03	6.26E-03	2.60E-02	4.26E-03	1.83E-03	4.60E-03	7.86E-02
	Acrolein		**107-02-8**	1.18E-04	7.38E-04	5.45E-04	4.57E-04	3.07E-03	1.99E-04	9.02E-04	3.75E-03	6.14E-04	2.63E-04	6.63E-04	1.13E-02
	Anthracene		**120-12-7**	4.11E-07	2.57E-06	1.83E-06	1.52E-06	1.04E-05	6.77E-07	3.01E-06	1.26E-05	2.13E-06	9.16E-07	2.30E-06	3.84E-05
	Benzene		**71-43-2**	1.53E-04	9.54E-04	7.04E-04	5.90E-04	3.97E-03	2.58E-04	1.17E-03	4.85E-03	7.93E-04	3.41E-04	8.56E-04	1.46E-02
	Benzo(a)anthracene		**56-55-3**	5.10E-09	3.19E-08	2.15E-08	1.77E-08	1.24E-07	8.11E-09	3.51E-08	1.48E-07	2.65E-08	1.14E-08	2.86E-08	4.58E-07
	Benzo(a)pyrene		**50-32-8**	6.39E-09	4.00E-08	2.14E-08	1.62E-08	1.32E-07	8.76E-09	3.28E-08	1.46E-07	3.32E-08	1.43E-08	3.59E-08	4.87E-07
	Benzo(b+k)fluoranthene		**205-99-2 / 207-08-9**	5.42E-09	3.39E-08	1.81E-08	1.38E-08	1.12E-07	7.43E-09	2.79E-08	1.24E-07	2.82E-08	1.21E-08	3.04E-08	4.13E-07
	Benzo(g,h,i)perylene		**191-24-2**	2.75E-09	1.72E-08	1.22E-08	1.01E-08	6.95E-08	4.52E-09	2.01E-08	8.40E-08	1.43E-08	6.14E-09	1.54E-08	2.56E-07
	Chrysene		**218-01-9**	1.08E-08	6.72E-08	4.35E-08	3.52E-08	2.54E-07	1.66E-08	7.00E-08	2.98E-07	5.59E-08	2.40E-08	6.03E-08	9.35E-07
	Fluoranthene		**206-44-0**	6.35E-07	3.97E-06	2.81E-06	2.33E-06	1.60E-05	1.04E-06	4.61E-06	1.93E-05	3.30E-06	1.42E-06	3.56E-06	5.90E-05
	Fluorene		**86-73-7**	2.42E-06	1.51E-05	1.10E-05	9.23E-06	6.24E-05	4.06E-06	1.82E-05	7.60E-05	1.26E-05	5.40E-06	1.36E-05	2.30E-04
	Formaldehyde		**50-00-0**	2.57E-03	1.61E-02	1.19E-02	9.94E-03	6.68E-02	4.34E-03	1.96E-02	8.17E-02	1.34E-02	5.74E-03	1.44E-02	2.46E-01
	Phenanthrene		**85-01-8**	1.09E-05	6.81E-05	4.92E-05	4.10E-05	2.79E-04	1.81E-05	8.11E-05	3.39E-04	5.66E-05	2.43E-05	6.11E-05	1.03E-03
	Pyrene		**129-00-0**	5.38E-07	3.37E-06	2.37E-06	1.96E-06	1.35E-05	8.81E-07	3.89E-06	1.63E-05	2.80E-06	1.20E-06	3.02E-06	4.98E-05
	Dibenz(a,h)anthracene		**53-70-3**	1.94E-09	1.21E-08	6.48E-09	4.92E-09	4.00E-08	2.65E-09	9.95E-09	4.42E-08	1.01E-08	4.32E-09	1.09E-08	1.47E-07
	Indeno(1,2,3-cd)pyrene		**193-39-5**	9.68E-10	6.05E-09	3.24E-09	2.46E-09	2.00E-08	1.33E-09	4.97E-09	2.21E-08	5.03E-09	2.16E-09	5.43E-09	7.37E-08
	Napthalene		**91-20-3**	1.93E-04	1.20E-03	8.89E-04	7.45E-04	5.01E-03	3.25E-04	1.47E-03	6.12E-03	1.00E-03	4.30E-04	1.08E-03	1.85E-02
	PM10		**<<PM10>>**	1.94E-03	1.21E-02	6.48E-03	4.92E-03	4.00E-02	2.65E-03	9.95E-03	4.42E-02	1.01E-02	4.32E-03	1.09E-02	1.47E-01
	PM2.5		**<<PM2.5>>**	1.94E-03	1.21E-02	6.48E-03	4.92E-03	4.00E-02	2.65E-03	9.95E-03	4.42E-02	1.01E-02	4.32E-03	1.09E-02	1.47E-01
	Diesel Particulate Matter (PM2.5 from Diesel Combustion)		**<<DPM>>**	1.94E-03	1.21E-02	6.48E-03	4.92E-03	4.00E-02	2.65E-03	9.95E-03	4.42E-02	1.01E-02	4.32E-03	1.09E-02	1.47E-01
	Elemental Carbon (from diesel exhaust)		**7440-44-0**	1.94E-03	1.21E-02	6.48E-03	4.92E-03	4.00E-02	2.65E-03	9.95E-03	4.42E-02	1.01E-02	4.32E-03	1.09E-02	1.47E-01

Year 7 Haul Truck Routes

Modelled Source ID			Equivalent # of Trucks outside of pit	HAUL1AB	HAUL2B	HAUL4AB	HAUL8B	HAUL5B	HAUL6B	HAUL7B	HAUL11B	HAUL12B	HAUL13B	HAUL14B	HAUL15B	HAUL16B	HAUL17B	HAUL18B	HAUL19B	HAUL20B	HAUL21B	Total
Modelled Source Lengths (m)				**414**	**14948**	**680**	**9738**	**1819**	**1155**	**3357**	**1904**	**679**	**1028**	**1290**	**1194**	**1622**	**860**	**2142**	**3591**	**142**	**1211**	-
Daily Truck Trips	TRUCK1_2	Clay - ROM TMF Construction	23	28	28	3	0	3	0	0	0	0	0	0	0	0	0	0	0	3	25	90
	TRUCK2_1	Sand to ROM Revegetation		0	0	92	49	92	97	49	0	0	0	0	0	0	0	0	0	5	92	475
From Road Data Tab	TRUCK2_3	Sand & Till - TMF Construction	19	43	43	2	0	2	0	0	0	0	0	0	0	0	0	0	0	2	38	131
	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		0	0	0	0	0	48	422	374	374	374	374	374	0	0	0	0	48	0	2,387
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0	0	0	593	0	32	0	561	561	561	561	561	0	0	0	0	32	0	3,464
	TRUCK3_1	ROM Ore to Crusher1		207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	207	413
	TRUCK3_2	ROM Ore to Crusher2		0	0	0	0	0	0	0	0	0	0	0	141	0	141	0	0	0	0	281
	TRUCK3_3	ROM Ore to LG East		0	0	59	0	0	0	0	0	0	0	0	0	59	0	0	0	0	59	176
	TRUCK3_4	ROM Ore to LG West		0	0	0	0	0	0	0	0	0	0	59	59	0	0	59	0	0	0	176
	TRUCK3_5	LG East - Cr2	36	0	0	48	0	0	0	0	0	0	0	0	48	48	48	0	0	0	48	242
	TRUCK3_6	LG West - Cr2		0	0	0	0	0	0	0	0	0	0	18	0	0	18	18	0	0	0	53
	TRUCK3_8	Waste Rock to TMF ROM		56	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	168
	TRUCK3_10	Waste Rock to Miscellaneus Construction		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0	0	0	0	0	0	0	0	1,272	1,272	1,272	1,272	0	0	0	1,272	0	0	6,359
Estimated # of Trucks on Each Haul Road	TRUCK1_2	Clay - ROM TMF Construction	23.0	23	23	3		3												3	20	-
	TRUCK2_1	Sand to ROM Revegetation	2			2	1	2	2	1										1	2	-
Adjusted for time on haul roads outside of pit	TRUCK2_3	Sand & Till - TMF Construction	1	1	1	1		1												1	1	-
	TRUCK2_4	Clay + Sand & Till - Clay Impoundment	7						1	7	6	6	6	6	6					1		-
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment	9				9		1		8	8	8	8	8					1		-
	TRUCK3_1	ROM Ore to Crusher1	2	2																	2	-
	TRUCK3_2	ROM Ore to Crusher2	1												1		1					-
	TRUCK3_3	ROM Ore to LG East	1			1										1					1	-
	TRUCK3_4	ROM Ore to LG West	1											1	1			1				-
	TRUCK3_5	LG East - Cr2	1			1									1	1	1				1	-
	TRUCK3_6	LG West - Cr2	1											1			1	1				-
	TRUCK3_8	Waste Rock to TMF ROM	1	1	1																1	-
	TRUCK3_10	Waste Rock to Miscellaneus Construction	1	1																	1	-
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)	27.0									27	27	27	27				27			-
Truck Count Weighted Equivalent Haul Road Distancse (m)	TRUCK1_2	Clay - ROM TMF Construction		414	14,948	89	0	237	0	0	0	0	0	0	0	0	0	0	0	19	1,053	16,760
	TRUCK2_1	Sand to ROM Revegetation		0	0	680	4,869	1,819	1,155	1,679	0	0	0	0	0	0	0	0	0	71	1,211	11,484
As modelled in AERMOD	TRUCK2_3	Sand & Till - TMF Construction		414	14,948	680	0	1,819	0	0	0	0	0	0	0	0	0	0	0	142	1,211	19,214
	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		0	0	0	0	0	165	3,357	1,632	582	881	1,106	1,023	0	0	0	0	20	0	8,767
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0	0	0	9,738	0	128	0	1,692	604	914	1,147	1,061	0	0	0	0	16	0	15,300
	TRUCK3_1	ROM Ore to Crusher1		414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,211	1,625
	TRUCK3_2	ROM Ore to Crusher2		0	0	0	0	0	0	0	0	0	0	0	1,194	0	860	0	0	0	0	2,054
	TRUCK3_3	ROM Ore to LG East		0	0	680	0	0	0	0	0	0	0	0	0	1,622	0	0	0	0	1,211	3,513
	TRUCK3_4	ROM Ore to LG West		0	0	0	0	0	0	0	0	0	0	1,290	1,194	0	0	2,142	0	0	0	4,626
	TRUCK3_5	LG East - Cr2		0	0	680	0	0	0	0	0	0	0	0	1,194	1,622	860	0	0	0	1,211	5,567
	TRUCK3_6	LG West - Cr2		0	0	0	0	0	0	0	0	0	0	1,290	0	0	860	2,142	0	0	0	4,292
	TRUCK3_8	Waste Rock to TMF ROM		414	14,948	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,211	16,573
	TRUCK3_10	Waste Rock to Miscellaneus Construction		414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,211	1,625
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0	0	0	0	0	0	0	0	679	1,028	1,290	1,194	0	0	0	3,591	0	0	7,782
% of Equivalent Haul Road Distance	TRUCK1_2	Clay - ROM TMF Construction		2.47%	89.19%	0.53%	0.00%	1.42%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.11%	6.28%	100.00%
	TRUCK2_1	Sand to ROM Revegetation		0.00%	0.00%	5.92%	42.40%	15.84%	10.06%	14.62%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.62%	10.55%	100.00%
= Haul Road Distance (m) / Total Travel Route Distance (m)	TRUCK2_3	Sand & Till - TMF Construction		2.15%	77.80%	3.54%	0.00%	9.47%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.74%	6.30%	100.00%
	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		0.00%	0.00%	0.00%	0.00%	0.00%	1.88%	38.29%	18.62%	6.64%	10.05%	12.61%	11.67%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	100.00%
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		0.00%	0.00%	0.00%	63.65%	0.00%	0.84%	0.00%	11.06%	3.94%	5.97%	7.49%	6.94%	0.00%	0.00%	0.00%	0.00%	0.10%	0.00%	100.00%
	TRUCK3_1	ROM Ore to Crusher1		25.48%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	74.52%	100.00%
	TRUCK3_2	ROM Ore to Crusher2		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	58.13%	0.00%	41.87%	0.00%	0.00%	0.00%	0.00%	100.00%
	TRUCK3_3	ROM Ore to LG East		0.00%	0.00%	19.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	46.17%	0.00%	0.00%	0.00%	0.00%	34.47%	100.00%
	TRUCK3_4	ROM Ore to LG West		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	27.89%	25.81%	0.00%	0.00%	46.30%	0.00%	0.00%	0.00%	100.00%
	TRUCK3_5	LG East - Cr2		0.00%	0.00%	12.21%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	21.45%	29.14%	15.45%	0.00%	0.00%	0.00%	21.75%	100.00%
	TRUCK3_6	LG West - Cr2		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	30.06%	0.00%	0.00%	20.04%	49.91%	0.00%	0.00%	0.00%	100.00%
	TRUCK3_8	Waste Rock to TMF ROM		2.50%	90.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.31%	100.00%
	TRUCK3_10	Waste Rock to Miscellaneus Construction		25.48%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	74.52%	100.00%
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.73%	13.21%	16.58%	15.34%	0.00%	0.00%	0.00%	46.14%	0.00%	0.00%	100.00%
Non Road Mobile Emissions Multiplier	TRUCK1_2	Clay - ROM TMF Construction		**0.6**	**20.5**	**0.1**	**0.0**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	23.0
	TRUCK2_1	Sand to ROM Revegetation		**0.0**	**0.0**	**0.1**	**0.8**	**0.3**	**0.2**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	2.0
= # of Trucks on each Haul Road x % of Haul Road Distance	TRUCK2_3	Sand & Till - TMF Construction		**0.0**	**0.8**	**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	1.0
	TRUCK2_4	Clay + Sand & Till - Clay Impoundment		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**2.7**	**1.3**	**0.5**	**0.7**	**0.9**	**0.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	7
	TRUCK2_5	Clay + Sand & Till - S&T Impoundment		**0.0**	**0.0**	**0.0**	**5.7**	**0.0**	**0.1**	**0.0**	**1.0**	**0.4**	**0.5**	**0.7**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	9
	TRUCK3_1	ROM Ore to Crusher1		**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.5**	2
	TRUCK3_2	ROM Ore to Crusher2		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.6**	**0.0**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**	1
	TRUCK3_3	ROM Ore to LG East		**0.0**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	1
	TRUCK3_4	ROM Ore to LG West		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.3**	**0.0**	**0.0**	**0.5**	**0.0**	**0.0**	**0.0**	1
	TRUCK3_5	LG East - Cr2		**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**0.3**	**0.2**	**0.0**	**0.0**	**0.0**	**0.2**	1
	TRUCK3_6	LG West - Cr2		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.0**	**0.0**	**0.2**	**0.5**	**0.0**	**0.0**	**0.0**	1
	TRUCK3_8	Waste Rock to TMF ROM		**0.0**	**0.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.1**	1
	TRUCK3_10	Waste Rock to Miscellaneus Construction		**0.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.7**	1
	TRUCK3_11	Waste Rock to WRD1 (Waste Rock Impounding)		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.4**	**3.6**	**4.5**	**4.1**	**0.0**	**0.0**	**0.0**	**12.5**	**0.0**	**0.0**	27

Adjusted 1-Hour Haul Truck Mobile Emissions Year 7 (g/s)	**COPC**	**CAS**	**HAUL1AB**	**HAUL2B**	**HAUL4AB**	**HAUL8B**	**HAUL5B**	**HAUL6B**	**HAUL7B**	**HAUL11B**	**HAUL12B**	**HAUL13B**	**HAUL14B**	**HAUL15B**	**HAUL16B**	**HAUL17B**	**HAUL18B**	**HAUL19B**	**HAUL20B**	**HAUL21B**	**Total**
	Non-methane hydrocarbons	**<<NMHC>>**	8.38E-02	3.63E-01	3.63E-02	1.84E-01	1.56E-02	1.14E-02	8.33E-02	6.44E-02	2.50E-01	3.79E-01	5.31E-01	5.42E-01	7.27E-02	7.46E-02	9.28E-02	1.20	1.58E-03	3.03E-01	4.29
= Tailpipe Emissions from Single Truck1 (g/s) x Truck1 Multiplier +	**NOx**	**10102-44-0**	1.43	2.54	6.44E-01	3.39	2.21E-01	2.11E-01	1.53	1.19	4.61	6.98	9.79	9.98	1.34	1.38	1.71	22.15	2.40E-02	5.28	74.40
Tailpipe Emissions from Single Truck2 (g/s) x Truck2 Multiplier +	**PM**	**<<PM>>**	1.69E-02	4.97E-02	7.48E-03	3.88E-02	2.85E-03	2.41E-03	1.75E-02	1.36E-02	5.27E-02	7.98E-02	1.12E-01	1.14E-01	1.53E-02	1.57E-02	1.95E-02	2.53E-01	3.00E-04	6.18E-02	8.73E-01
Tailpipe Emissions from Single Truck3 (g/s) x Truck3 Multiplier	**CO**	**630-08-0**	1.54	6.69	6.68E-01	3.39	2.87E-01	2.11E-01	1.53	1.19	4.61	6.98	9.79	9.98	1.34	1.38	1.71	22.15	2.92E-02	5.58	79.05
	SO2	**7446-09-5**	2.48E-03	1.08E-02	1.07E-03	5.45E-03	4.61E-04	3.39E-04	2.47E-03	1.91E-03	7.41E-03	1.12E-02	1.57E-02	1.60E-02	2.15E-03	2.21E-03	2.75E-03	3.56E-02	4.69E-05	8.96E-03	1.27E-01
	1,3-butadiene	**106-99-0**	8.62E-05	3.74E-04	3.73E-05	1.89E-04	1.60E-05	1.18E-05	8.56E-05	6.62E-05	2.57E-04	3.90E-04	5.46E-04	5.57E-04	7.47E-05	7.67E-05	9.54E-05	1.24E-03	1.63E-06	3.11E-04	4.41E-03
	Acenaphthene	**83-32-9**	5.67E-06	2.46E-05	2.45E-06	1.25E-05	1.05E-06	7.73E-07	5.63E-06	4.35E-06	1.69E-05	2.56E-05	3.59E-05	3.66E-05	4.91E-06	5.05E-06	6.28E-06	8.13E-05	1.07E-07	2.05E-05	2.90E-04
	Acenaphthylene	**208-96-8**	9.19E-06	3.98E-05	3.98E-06	2.02E-05	1.71E-06	1.25E-06	9.13E-06	7.06E-06	2.74E-05	4.15E-05	5.83E-05	5.94E-05	7.97E-06	8.18E-06	1.02E-05	1.32E-04	1.73E-07	3.32E-05	4.70E-04
	Acetaldehyde	**75-07-0**	7.47E-03	3.24E-02	3.23E-03	1.64E-02	1.39E-03	1.02E-03	7.42E-03	5.74E-03	2.23E-02	3.38E-02	4.74E-02	4.83E-02	6.47E-03	6.65E-03	8.27E-03	1.07E-01	1.41E-04	2.70E-02	3.82E-01
	Acrolein	**107-02-8**	1.08E-03	4.66E-03	4.66E-04	2.36E-03	2.00E-04	1.47E-04	1.07E-03	8.27E-04	3.21E-03	4.86E-03	6.82E-03	6.96E-03	9.33E-04	9.58E-04	1.19E-03	1.54E-02	2.03E-05	3.89E-03	5.51E-02
	Anthracene	**120-12-7**	3.72E-06	1.55E-05	1.62E-06	8.22E-06	6.84E-07	5.11E-07	3.72E-06	2.87E-06	1.12E-05	1.69E-05	2.37E-05	2.42E-05	3.24E-06	3.33E-06	4.14E-06	5.37E-05	6.98E-08	1.35E-05	1.91E-04
	Benzene	**71-43-2**	1.39E-03	6.03E-03	6.02E-04	3.06E-03	2.58E-04	1.90E-04	1.38E-03	1.07E-03	4.15E-03	6.29E-03	8.82E-03	8.99E-03	1.21E-03	1.24E-03	1.54E-03	1.99E-02	2.63E-05	5.02E-03	7.12E-02
	Benzo(a)anthracene	**56-55-3**	4.58E-08	1.80E-07	2.00E-08	1.02E-07	8.28E-09	6.34E-09	4.61E-08	3.57E-08	1.39E-07	2.10E-07	2.94E-07	3.00E-07	4.03E-08	4.13E-08	5.14E-08	6.66E-07	8.50E-10	1.66E-07	2.35E-06
	Benzo(a)pyrene	**50-32-8**	5.58E-08	1.64E-07	2.47E-08	1.28E-07	9.41E-09	7.95E-09	5.79E-08	4.47E-08	1.74E-07	2.63E-07	3.69E-07	3.76E-07	5.05E-08	5.19E-08	6.45E-08	8.35E-07	9.90E-10	2.04E-07	2.88E-06
	Benzo(b+k)fluoranthene	**205-99-2 / 207-08-9**	4.73E-08	1.39E-07	2.09E-08	1.09E-07	7.98E-09	6.74E-09	4.91E-08	3.80E-08	1.48E-07	2.23E-07	3.13E-07	3.19E-07	4.28E-08	4.40E-08	5.47E-08	7.09E-07	8.40E-10	1.73E-07	2.45E-06
	Benzo(g,h,i)perylene	**191-24-2**	2.49E-08	1.03E-07	1.08E-08	5.51E-08	4.57E-09	3.42E-09	2.49E-08	1.93E-08	7.49E-08	1.13E-07	1.59E-07	1.62E-07	2.17E-08	2.23E-08	2.78E-08	3.60E-07	4.67E-10	9.01E-08	1.28E-06
	Chrysene	**218-01-9**	9.61E-08	3.58E-07	4.20E-08	2.15E-07	1.71E-08	1.34E-08	9.73E-08	7.53E-08	2.93E-07	4.43E-07	6.21E-07	6.33E-07	8.49E-08	8.72E-08	1.09E-07	1.41E-06	1.77E-09	3.49E-07	4.94E-06
	Fluoranthene	**206-44-0**	5.75E-06	2.38E-05	2.50E-06	1.27E-05	1.05E-06	7.89E-07	5.74E-06	4.44E-06	1.73E-05	2.61E-05	3.67E-05	3.74E-05	5.01E-06	5.15E-06	6.40E-06	8.29E-05	1.08E-07	2.08E-05	2.95E-04
	Fluorene	**86-73-7**	2.20E-05	9.42E-05	9.54E-06	4.85E-05	4.07E-06	3.01E-06	2.19E-05	1.69E-05	6.59E-05	9.97E-05	1.40E-04	1.43E-04	1.91E-05	1.96E-05	2.44E-05	3.16E-04	4.15E-07	7.96E-05	1.13E-03
	Formaldehyde	**50-00-0**	2.34E-02	1.02E-01	1.01E-02	5.15E-02	4.35E-03	3.20E-03	2.33E-02	1.80E-02	6.99E-02	1.06E-01	1.48E-01	1.51E-01	2.03E-02	2.09E-02	2.59E-02	3.36E-01	4.42E-04	8.46E-02	1.20
	Phenanthrene	**85-01-8**	9.89E-05	4.19E-04	4.29E-05	2.18E-04	1.82E-05	1.35E-05	9.86E-05	7.62E-05	2.96E-04	4.49E-04	6.29E-04	6.41E-04	8.60E-05	8.84E-05	1.10E-04	1.42E-03	1.86E-06	3.57E-04	5.07E-03
	Pyrene	**129-00-0**	4.87E-06	2.00E-05	2.12E-06	1.08E-05	8.91E-07	6.70E-07	4.87E-06	3.77E-06	1.47E-05	2.22E-05	3.11E-05	3.17E-05	4.25E-06	4.37E-06	5.43E-06	7.04E-05	9.11E-08	1.76E-05	2.50E-04
	Dibenz(a,h)anthracene	**53-70-3**	1.69E-08	4.97E-08	7.48E-09	3.88E-08	2.85E-09	2.41E-09	1.75E-08	1.36E-08	5.27E-08	7.98E-08	1.12E-07	1.14E-07	1.53E-08	1.57E-08	1.95E-08	2.53E-07	3.00E-10	6.18E-08	8.73E-07
	Indeno(1,2,3-cd)pyrene	**193-39-5**	8.45E-09	2.49E-08	3.74E-09	1.94E-08	1.43E-09	1.20E-09	8.77E-09	6.78E-09	2.63E-08	3.99E-08	5.59E-08	5.70E-08	7.65E-09	7.86E-09	9.77E-09	1.27E-07	1.50E-10	3.09E-08	4.37E-07
	Napthalene	**91-20-3**	1.76E-03	7.61E-03	7.60E-04	3.86E-03	3.26E-04	2.40E-04	1.74E-03	1.35E-03	5.24E-03	7.94E-03	1.11E-02	1.13E-02	1.52E-03	1.56E-03	1.94E-03	2.52E-02	3.31E-05	6.34E-03	8.99E-02
	PM10	**<<PM10>>**	1.69E-02	4.97E-02	7.48E-03	3.88E-02	2.85E-03	2.41E-03	1.75E-02	1.36E-02	5.27E-02	7.98E-02	1.12E-01	1.14E-01	1.53E-02	1.57E-02	1.95E-02	2.53E-01	3.00E-04	6.18E-02	8.73E-01
	PM2.5	**<<PM2.5>>**	1.69E-02	4.97E-02	7.48E-03	3.88E-02	2.85E-03	2.41E-03	1.75E-02	1.36E-02	5.27E-02	7.98E-02	1.12E-01	1.14E-01	1.53E-02	1.57E-02	1.95E-02	2.53E-01	3.00E-04	6.18E-02	8.73E-01
	Diesel Particulate Matter (PM2.5 from Diesel Combustion)	**<<DPM>>**	1.69E-02	4.97E-02	7.48E-03	3.88E-02	2.85E-03	2.41E-03	1.75E-02	1.36E-02	5.27E-02	7.98E-02	1.12E-01	1.14E-01	1.53E-02	1.57E-02	1.95E-02	2.53E-01	3.00E-04	6.18E-02	8.73E-01
	Elemental Carbon (from diesel exhaust)	**7440-44-0**	1.69E-02	4.97E-02	7.48E-03	3.88E-02	2.85E-03	2.41E-03	1.75E-02	1.36E-02	5.27E-02	7.98E-02	1.12E-01	1.14E-01	1.53E-02	1.57E-02	1.95E-02	2.53E-01	3.00E-04	6.18E-02	8.73E-01

Adjusted 24-Hour Haul Truck Mobile Emissions Year 7 (g/s)	**COPC**	**CAS**	**HAUL1AB**	**HAUL2B**	**HAUL4AB**	**HAUL8B**	**HAUL5B**	**HAUL6B**	**HAUL7B**	**HAUL11B**	**HAUL12B**	**HAUL13B**	**HAUL14B**	**HAUL15B**	**HAUL16B**	**HAUL17B**	**HAUL18B**	**HAUL19B**	**HAUL20B**	**HAUL21B**	**Total**
	Non-methane hydrocarbons	**<<NMHC>>**	6.61E-02	2.57E-01	2.83E-02	1.25E-01	1.06E-02	7.78E-03	5.66E-02	4.38E-02	1.97E-01	2.99E-01	4.20E-01	4.29E-01	5.81E-02	5.97E-02	7.43E-02	9.62E-01	1.08E-03	2.39E-01	3.33
= Tailpipe Emissions from Single Truck1 (g/s) x Truck1 Multiplier x 16hours/24hours +	**NOx**	**10102-44-0**	1.14	1.92	5.05E-01	2.31	1.50E-01	1.43E-01	1.04	8.07E-01	3.64	5.51	7.73	7.89	1.07	1.10	1.37	17.71	1.63E-02	4.20	58.26
Tailpipe Emissions from Single Truck2 (g/s) x Truck2 Multiplier x 16hours/24hours+	**PM**	**<<PM>>**	1.34E-02	3.60E-02	5.85E-03	2.64E-02	1.94E-03	1.64E-03	1.19E-02	9.22E-03	4.16E-02	6.29E-02	8.84E-02	9.02E-02	1.22E-02	1.26E-02	1.56E-02	2.02E-01	2.04E-04	4.90E-02	6.82E-01
Tailpipe Emissions from Single Truck3 (g/s) x Truck3 Multiplier x 19hours/24hours	**CO**	**630-08-0**	1.22	4.74	5.22E-01	2.31	1.95E-01	1.43E-01	1.04	8.07E-01	3.64	5.51	7.73	7.89	1.07	1.10	1.37	17.71	1.98E-02	4.40	61.42
	SO2	**7446-09-5**	1.96E-03	7.63E-03	8.39E-04	3.71E-03	3.13E-04	2.30E-04	1.68E-03	1.30E-03	5.85E-03	8.85E-03	1.24E-02	1.27E-02	1.72E-03	1.77E-03	2.20E-03	2.85E-02	3.19E-05	7.08E-03	9.87E-02
	1,3-butadiene	**106-99-0**	6.80E-05	2.65E-04	2.91E-05	1.29E-04	1.09E-05	8.00E-06	5.82E-05	4.50E-05	2.03E-04	3.07E-04	4.32E-04	4.41E-04	5.97E-05	6.14E-05	7.63E-05	9.88E-04	1.11E-06	2.46E-04	3.43E-03
	Acenaphthene	**83-32-9**	4.47E-06	1.74E-05	1.91E-06	8.47E-06	7.15E-07	5.26E-07	3.83E-06	2.96E-06	1.33E-05	2.02E-05	2.84E-05	2.90E-05	3.93E-06	4.04E-06	5.02E-06

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Emissions from unpaved roads outside the pit include the following:
Winter and summer conditions have differing degrees of dust mitigation from use of unpaved roads and are modeled as separate sources
1) Emissions from trucks travelling on unpaved haul roads outside of the pits (HR1)
2) Mobile Emissions from trucks, graders and tanker trucks (HR2)

Source : Emissions from trucks travelling on unpaved roads outside of the pits (HR1)

Description:
As trucks travel on unpaved roads throughout the site, dust is kicked up into the air.

Contaminant(s) of Concern:
PM, PM_{10}, $PM_{2.5}$, metals, NOx, VOCs, PAHs, CO and SO_2 emissions are the contaminants of concern. Tailpipe emissions such as NOx, NMHC, VOCs, PAHs, CO and SO are calculated in the "Mobile Emissions" sheet

Methodology: Emission Factor (EF)
Emission factor for material loading was calculated using Equation (1a) in the US EPA AP-42 document Chapter 13.2.2. (Unpaved Road). The equation is:
$E = k\ (s/12)^a\ (W/3)^b$
where:
k, a, b, c and d are empirical constants
E = size-specific emission factor (lb/VMT) (1 lb/VMT = 281.9 g/VKT)
s = surface material silt content (%)
W = mean vehicle weight (tons)

Parameter	Year -1	Year 7	Units	Reference
Operating time	8760	8760	hours/year	
	365	365	day/year	DP/CNC
Hours of Operation per day	24	24	hours	
Average Vehicle Weight	varies by haul road	varies by haul road		Calculated separate weighted average for each haul road. See tables below.
Haul Roads Silt Content	9.1	9.1	%	Mean silt content (%) for unpaved roads at Ontario mining sites from Table 2, Centre for Excellence in Mining Inovation (CEMI), Literature Review of Current Fugitive Dust Control Practices within the Mining Industry, 2012.
Road Lengths	varies by haul road	varies by haul road	km	Modelled source length in AERMOD x 2 for most roads to account for a round trip. See tables below.
Total Daily truck counts	varies by haul road	varies by haul road	trucks/day	Calculated for each haul road based on annual production data provided by CNC. See tables below.
Watering road during non-precipitation days in summer control efficiency	85%	85%	%	Summer - assumed a combination of watering, chemical suppressant. Winter - Based on "Determination of Natural Winter Mitigation of Road Dust Emissions from Mining Operations in Northern Canada", Golder Associates, 2012. Assumed average control efficiency.
Winter months natural mitigation control efficiency	95%	95%	%	

Emission Factor (E) Calculation: Year -1 Road Dust

Haul Road	CoPC	Average Vehicle Weight (tonnes)	Emission Constants [1]			Haul Roads Silt Content	Emission Factor	
			k	a	b			
			(lb./VMT)			(%)	(lb./VMT)	(g/VKT)
Haul1AB	PM	376	4.9	0.7	0.45	9.1	37.07	10,448
Haul1AB	PM10	376	1.5	0.9	0.45	9.1	10.74	3,026
Haul1AB	PM2.5	376	0.15	0.9	0.45	9.1	1.07	303
Haul2A	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
Haul2A	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
Haul2A	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
Haul3A	PM	107	4.9	0.7	0.5	9.1	21.07	5,937
Haul3A	PM10	107	1.5	0.9	0.5	9.1	6.10	1,720
Haul3A	PM2.5	107	0.2	0.9	0.5	9.1	0.61	172
HAUL4AB	PM	100	4.9	0.7	0.5	9.1	20.42	5,754
HAUL4AB	PM10	100	1.5	0.9	0.5	9.1	5.91	1,667
HAUL4AB	PM2.5	100	0.2	0.9	0.5	9.1	0.59	167
HAUL5A	PM	133	4.9	0.7	0.5	9.1	23.25	6,553
HAUL5A	PM10	133	1.5	0.9	0.5	9.1	6.73	1,898
HAUL5A	PM2.5	133	0.2	0.9	0.5	9.1	0.67	190
HAUL6A	PM	132	4.9	0.7	0.5	9.1	23.18	6,534
HAUL6A	PM10	132	1.5	0.9	0.5	9.1	6.71	1,892
HAUL6A	PM2.5	132	0.2	0.9	0.5	9.1	0.67	189
HAUL7A	PM	92	4.9	0.7	0.5	9.1	19.72	5,558
HAUL7A	PM10	92	1.5	0.9	0.5	9.1	5.71	1,610
HAUL7A	PM2.5	92	0.2	0.9	0.5	9.1	0.57	161
HAUL8A	PM	146	4.9	0.7	0.5	9.1	24.21	6,825
HAUL8A	PM10	146	1.5	0.9	0.5	9.1	7.01	1,977
HAUL8A	PM2.5	146	0.2	0.9	0.5	9.1	0.70	198
HAUL9A	PM	282	4.9	0.7	0.5	9.1	32.56	9,178
HAUL9A	PM10	282	1.5	0.9	0.5	9.1	9.43	2,658
HAUL9A	PM2.5	282	0.2	0.9	0.5	9.1	0.94	266
HAUL16A	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL16A	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL16A	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
HAUL21A	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL21A	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL21A	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303

Notes:
(1) US EPA AP-42 Table 13.2.2-2, factors rating B and C.

Emission Rate Calculation: Year -1 Road Dust

Haul Road	CoPC	Summer Control Efficiency	Winter Control Efficiency	Road Length (Round trip unless one way road)	Total Daily Truck Trips	Total Uncontrolled Emissions	Summer Controlled Short Term Emission Rate	Winter Naturally Mitigated Short-Term Emission Rate
				(km)		(kg/day)	(g/s)	(g/s)
Haul1AB	PM	85%	95%	0.83	41	352	0.61	0.20
Haul1AB	PM10	85%	95%	0.83	41	102	0.18	0.06
Haul1AB	PM2.5	85%	95%	0.83	41	10	0.02	5.89E-03
Haul2A	PM	85%	95%	12.83	5	632	1.10	0.37
Haul2A	PM10	85%	95%	12.83	5	183	0.32	0.11
Haul2A	PM2.5	85%	95%	12.83	5	18	0.03	0.01
Haul3A	PM	85%	95%	1.29	1,200	9,216	16.00	5.33
Haul3A	PM10	85%	95%	1.29	1,200	2,669	4.63	1.54
Haul3A	PM2.5	85%	95%	1.29	1,200	267	0.46	0.15
HAUL4AB	PM	85%	95%	1.36	1,168	9,144	15.87	5.29
HAUL4AB	PM10	85%	95%	1.36	1,168	2,645	4.60	1.53
HAUL4AB	PM2.5	85%	95%	1.36	1,168	265	0.46	0.15
HAUL5A	PM	85%	95%	5.48	1,329	47,744	82.89	27.63
HAUL5A	PM10	85%	95%	5.48	1,329	13,829	24.01	8.00
HAUL5A	PM2.5	85%	95%	5.48	1,329	1,383	2.40	0.80
HAUL6A	PM	85%	95%	0.33	1,530	3,260	5.66	1.89
HAUL6A	PM10	85%	95%	0.33	1,530	944	1.64	0.55
HAUL6A	PM2.5	85%	95%	0.33	1,530	94	0.16	0.05
HAUL7A	PM	85%	95%	5.12	440	12,507	21.71	7.24
HAUL7A	PM10	85%	95%	5.12	440	3,623	6.29	2.10
HAUL7A	PM2.5	85%	95%	5.12	440	362	0.63	0.21
HAUL8A	PM	85%	95%	9.13	1,078	67,181	116.63	38.88
HAUL8A	PM10	85%	95%	9.13	1,078	19,459	33.78	11.26
HAUL8A	PM2.5	85%	95%	9.13	1,078	1,946	3.38	1.13
HAUL9A	PM	85%	95%	1.10	533	5,377	9.33	3.11
HAUL9A	PM10	85%	95%	1.10	533	1,557	2.70	0.90
HAUL9A	PM2.5	85%	95%	1.10	533	156	0.27	0.09
HAUL16A	PM	85%	95%	2.38	125	3,118	5.41	1.80
HAUL16A	PM10	85%	95%	2.38	125	903	1.57	0.52
HAUL16A	PM2.5	85%	95%	2.38	125	90	0.16	0.05
HAUL21A	PM	85%	95%	2.88	13	377	0.65	0.22
HAUL21A	PM10	85%	95%	2.88	13	109	0.19	0.06
HAUL21A	PM2.5	85%	95%	2.88	13	11	0.02	6.32E-03

*Dust control efficiency is assumed for water and chemical suppressant on unpaved road when there is no precipitation.

Sample Calculation Haul Road 1AB PM emissions: Year -1
PM Emission Factor (g/VKT) = 4.9 lb/VMT x (2.0/12)^0.7 x (376 tonnes / 0.908 tonnes/ ton / 3)^0.45 * 453.5924 g/lb * 0.6213712 miles/km = 10,448 g/VKT
PM Uncontrolled Emission Rate (kg/day) = 3,618 g/VKT x 0.83 km x 41 vehicles x 1/1000 g/kg = 352 kg/day
PM Controlled Emissions (g/s) = 122 kg/day x 1000 g/kg x 1 day/24 hrs x 1hr/3600 s x (100% - 80%) = 6.11E-01 g/s

Emission Factor (E) Calculation: Year 7 Road Dust

Haul Road	CoPC	Average Vehicle Weight (tonnes)	Emission Constants [1]			Haul Roads Silt Content	Emission Factor	
			k	a	b			
				(lb./VMT)		(%)	(lb./VMT)	(g/VKT)
Haul1AB	PM	316	4.9	0.7	0.45	9.1	34.26	9,657
Haul1AB	PM10	316	1.5	0.9	0.45	9.1	9.92	2,797
Haul1AB	PM2.5	316	0.15	0.9	0.45	9.1	0.99	280
HAUL2B	PM	217	4.9	0.7	0.5	9.1	28.93	8,155
HAUL2B	PM10	217	1.5	0.9	0.5	9.1	8.38	2,362
HAUL2B	PM2.5	217	0.2	0.9	0.5	9.1	0.84	236
HAUL4AB	PM	252	4.9	0.7	0.5	9.1	30.98	8,730
HAUL4AB	PM10	252	1.5	0.9	0.5	9.1	8.97	2,529
HAUL4AB	PM2.5	252	0.2	0.9	0.5	9.1	0.90	253
HAUL8B	PM	118	4.9	0.7	0.5	9.1	22.03	6,210
HAUL8B	PM10	118	1.5	0.9	0.5	9.1	6.38	1,799
HAUL8B	PM2.5	118	0.2	0.9	0.5	9.1	0.64	180
HAUL5B	PM	116	4.9	0.7	0.5	9.1	21.84	6,156
HAUL5B	PM10	116	1.5	0.9	0.5	9.1	6.33	1,783
HAUL5B	PM2.5	116	0.2	0.9	0.5	9.1	0.63	178
HAUL6B	PM	118	4.9	0.7	0.5	9.1	22.03	6,210
HAUL6B	PM10	118	1.5	0.9	0.5	9.1	6.38	1,799
HAUL6B	PM2.5	118	0.2	0.9	0.5	9.1	0.64	180
HAUL7B	PM	118	4.9	0.7	0.5	9.1	22.03	6,210
HAUL7B	PM10	118	1.5	0.9	0.5	9.1	6.38	1,799
HAUL7B	PM2.5	118	0.2	0.9	0.5	9.1	0.64	180
HAUL11B	PM	118	4.9	0.7	0.5	9.1	22.03	6,210
HAUL11B	PM10	118	1.5	0.9	0.5	9.1	6.38	1,799
HAUL11B	PM2.5	118	0.2	0.9	0.5	9.1	0.64	180
HAUL12B	PM	267	4.9	0.7	0.5	9.1	31.77	8,953
HAUL12B	PM10	267	1.5	0.9	0.5	9.1	9.20	2,593
HAUL12B	PM2.5	267	0.2	0.9	0.5	9.1	0.92	259
HAUL13B	PM	267	4.9	0.7	0.5	9.1	31.77	8,953
HAUL13B	PM10	267	1.5	0.9	0.5	9.1	9.20	2,593
HAUL13B	PM2.5	267	0.2	0.9	0.5	9.1	0.92	259
HAUL14B	PM	270	4.9	0.7	0.5	9.1	31.96	9,008
HAUL14B	PM10	270	1.5	0.9	0.5	9.1	9.26	2,609
HAUL14B	PM2.5	270	0.2	0.9	0.5	9.1	0.93	261
HAUL15B	PM	278	4.9	0.7	0.5	9.1	32.35	9,118
HAUL15B	PM10	278	1.5	0.9	0.5	9.1	9.37	2,641
HAUL15B	PM2.5	278	0.2	0.9	0.5	9.1	0.94	264
HAUL16B	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL16B	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL16B	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
HAUL17B	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL17B	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL17B	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
HAUL18B	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL18B	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL18B	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
HAUL19B	PM	376	4.9	0.7	0.5	9.1	37.07	10,448
HAUL19B	PM10	376	1.5	0.9	0.5	9.1	10.74	3,026
HAUL19B	PM2.5	376	0.2	0.9	0.5	9.1	1.07	303
HAUL20B	PM	116	4.9	0.7	0.5	9.1	21.83	6,152
HAUL20B	PM10	116	1.5	0.9	0.5	9.1	6.32	1,782
HAUL20B	PM2.5	116	0.2	0.9	0.5	9.1	0.63	178
HAUL21B	PM	297	4.9	0.7	0.5	9.1	33.33	9,395
HAUL21B	PM10	297	1.5	0.9	0.5	9.1	9.65	2,721
HAUL21B	PM2.5	297	0.2	0.9	0.5	9.1	0.97	272

Notes:
(1) US EPA AP-42 Table 13.2.2-2, factors rating B and C.

Emission Rate Calculation: Year 7 Road Dust

Haul Road	CoPC	Summer Control Efficiency	Winter Control Efficiency	Modelled Road Length (Round trip unless one way road)	Total Daily Truck Trips	Total Uncontrolled Emissions	Summer Controlled Short-Term Emission Rate	Winter Naturally Mitigated Short-Term Emission Rate
				(km)		(kg/day)	(g/s)	(g/s)
Haul1AB	PM	85%	95%	0.83	335	2,676	4.65	1.55
Haul1AB	PM10	85%	95%	0.83	335	775	1.35	0.45
Haul1AB	PM2.5	85%	95%	0.83	335	78	0.13	0.04
HAUL2B	PM	85%	95%	29.90	127	30,933	53.70	17.90
HAUL2B	PM10	85%	95%	29.90	127	8,960	15.56	5.19
HAUL2B	PM2.5	85%	95%	29.90	127	896	1.56	0.52
HAUL4AB	PM	85%	95%	1.36	205	2,429	4.22	1.41
HAUL4AB	PM10	85%	95%	1.36	205	704	1.22	0.41
HAUL4AB	PM2.5	85%	95%	1.36	205	70	0.12	0.04
HAUL8B	PM	85%	95%	9.74	642	38,815	67.39	22.46
HAUL8B	PM10	85%	95%	9.74	642	11,243	19.52	6.51
HAUL8B	PM2.5	85%	95%	9.74	642	1,124	1.95	0.65
HAUL5B	PM	85%	95%	3.64	97	2,181	3.79	1.26
HAUL5B	PM10	85%	95%	3.64	97	632	1.10	0.37
HAUL5B	PM2.5	85%	95%	3.64	97	63	0.11	0.04
HAUL6B	PM	85%	95%	2.31	177	2,542	4.41	1.47
HAUL6B	PM10	85%	95%	2.31	177	736	1.28	0.43
HAUL6B	PM2.5	85%	95%	2.31	177	74	0.13	0.04
HAUL7B	PM	85%	95%	6.71	471	19,618	34.06	11.35
HAUL7B	PM10	85%	95%	6.71	471	5,682	9.87	3.29
HAUL7B	PM2.5	85%	95%	6.71	471	568	0.99	0.33
HAUL11B	PM	85%	95%	3.81	935	22,115	38.39	12.80
HAUL11B	PM10	85%	95%	3.81	935	6,406	11.12	3.71
HAUL11B	PM2.5	85%	95%	3.81	935	641	1.11	0.37
HAUL12B	PM	85%	95%	1.36	2,207	26,833	46.59	15.53
HAUL12B	PM10	85%	95%	1.36	2,207	7,772	13.49	4.50
HAUL12B	PM2.5	85%	95%	1.36	2,207	777	1.35	0.45
HAUL13B	PM	85%	95%	2.06	2,207	40,625	70.53	23.51
HAUL13B	PM10	85%	95%	2.06	2,207	11,767	20.43	6.81
HAUL13B	PM2.5	85%	95%	2.06	2,207	1,177	2.04	0.68
HAUL14B	PM	85%	95%	2.58	2,283	53,065	92.13	30.71
HAUL14B	PM10	85%	95%	2.58	2,283	15,370	26.68	8.89
HAUL14B	PM2.5	85%	95%	2.58	2,283	1,537	2.67	0.89
HAUL15B	PM	85%	95%	2.39	2,455	53,451	92.80	30.93
HAUL15B	PM10	85%	95%	2.39	2,455	15,482	26.88	8.96
HAUL15B	PM2.5	85%	95%	2.39	2,455	1,548	2.69	0.90
HAUL16B	PM	85%	95%	3.24	107	3,633	6.31	2.10
HAUL16B	PM10	85%	95%	3.24	107	1,052	1.83	0.61
HAUL16B	PM2.5	85%	95%	3.24	107	105	0.18	0.06
HAUL17B	PM	85%	95%	1.72	207	3,714	6.45	2.15
HAUL17B	PM10	85%	95%	1.72	207	1,076	1.87	0.62
HAUL17B	PM2.5	85%	95%	1.72	207	108	0.19	0.06
HAUL18B	PM	85%	95%	4.28	76	3,416	5.93	1.98
HAUL18B	PM10	85%	95%	4.28	76	989	1.72	0.57
HAUL18B	PM2.5	85%	95%	4.28	76	99	0.17	0.06
HAUL19B	PM	85%	95%	7.18	1,272	95,426	165.67	55.22
HAUL19B	PM10	85%	95%	7.18	1,272	27,640	47.99	16.00
HAUL19B	PM2.5	85%	95%	7.18	1,272	2,764	4.80	1.60
HAUL20B	PM	85%	95%	0.28	91	159	0.28	0.09
HAUL20B	PM10	85%	95%	0.28	91	46	0.08	0.03
HAUL20B	PM2.5	85%	95%	0.28	91	5	7.98E-03	2.66E-03
HAUL21B	PM	85%	95%	2.42	526	11,961	20.77	6.92
HAUL21B	PM10	85%	95%	2.42	526	3,465	6.01	2.00
HAUL21B	PM2.5	85%	95%	2.42	526	346	0.60	0.20

*Dust control efficiency is assumed for water and chemical suppressant on unpaved road when there is no precipitation.

Sample Calculation Haul Road 1AB PM emissions: Year 7
PM Emission Factor (g/VKT) = 4.9 lb/VMT x (2.0/12)^0.7 x (376 tonnes / 0.908 tonnes/ ton / 3)^0.45 * 453.5924 g/lb * 0.6213712 miles/km = 9,657 g/VKT
PM Uncontrolled Emission Rate (kg/day) = 3,344 g/VKT x 0.83 km x 335 vehicles x 1/1000 g/kg = 2,676 kg/day
PM Controlled Emissions (g/s) = 920 kg/day x 1000 g/kg x 1 day/24 hrs x 1hr/3600 s x (100% - 80%) = 4.65E+00 g/s

Data Quality: Above-Average
The emission factor calculation methodology has a US EPA data rating of "B" based on the AP-42 chapter. This gives a MECP data quality of "Above-Average Data Quality".

Operating Condition, Individual Maximum Rates of Production:
The emission rate calculation for this source is based on the equipment operating continuously at its maximum production rate. The calculated emission rate should be conservative.

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Source : Mobile Emissions from trucks, graders and tanker trucks (HR2)

Description:
Tailpipe emissions are generated from internal combustion of fuel from onsite equipment. Note that less commonly travelled roads are considered to have negligible tailpipe emissions compared to commonly travelled roads.

Contaminant(s) of Concern:
CO, SO_2, Non-methane hydrocarbons, PAHs, VOCs, NOx, PM, PM_{10} and $PM_{2.5}$ emissions are the contaminants of concern.

Methodology:
See "Non Road - Mobile Emissions" tab for details on grader and tanker tailpipe emissions. See "HR - Haul Road Mobile Emissions" tab for details on haul truck tailpipe emissions. Results from those tabs are linked back to this tab

Emission Calculation: Haul Road Mobile Emissions Year -1 (24-Hour)

Summary of 24-Hour Emissions (g/s)													
CoPC	**CAS**	**HAUL1AB**	**HAUL2A**	**HAUL3A**	**HAUL4AB**	**HAUL5A**	**HAUL6A**	**HAUL7A**	**HAUL8A**	**HAUL9A**	**HAUL16A**	**HAUL21A**	**Total**
PM	<<Pb>>	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	1.63E-01
PM10	<<PM10>>	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	1.63E-01
PM2.5	<<PM2.5>>	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	1.63E-01
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	1.63E-01
Elemental Carbon (from diesel exhaust)	7440-44-0	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	1.63E-01
CO	630-08-0	2.93E-01	1.18	9.05E-01	7.79E-01	4.53	4.10E-01	1.42	5.51	1.00	5.02E-01	1.07	17.60
SO2	7446-09-5	4.71E-04	1.90E-03	1.46E-03	1.25E-03	7.28E-03	6.59E-04	2.28E-03	8.85E-03	1.61E-03	8.06E-04	1.73E-03	2.83E-02
Non-methane hydrocarbons	<<NMHC>>	1.59E-02	6.42E-02	4.91E-02	4.23E-02	2.46E-01	2.22E-02	7.70E-02	2.99E-01	5.45E-02	2.72E-02	5.83E-02	9.56E-01
NOx	10102-44-0	2.66E-01	1.18	5.26E-01	3.75E-01	2.92	3.09E-01	2.82	9.99E-01	4.97E-01	1.07	1.07	11.63
1,3-butadiene	106-99-0	1.63E-05	6.60E-05	5.05E-05	4.35E-05	2.53E-04	2.29E-05	7.91E-05	3.07E-04	5.60E-05	2.80E-05	6.00E-05	9.82E-04
Acenaphthene	83-32-9	1.07E-06	4.34E-06	3.32E-06	2.86E-06	1.66E-05	1.50E-06	5.20E-06	2.02E-05	3.68E-06	1.84E-06	3.94E-06	6.46E-05
Acenaphthylene	208-96-8	1.74E-06	7.04E-06	5.38E-06	4.64E-06	2.70E-05	2.44E-06	8.44E-06	3.28E-05	5.97E-06	2.98E-06	6.39E-06	1.05E-04
Acetaldehyde	75-07-0	1.42E-03	5.72E-03	4.38E-03	3.77E-03	2.19E-02	1.98E-03	6.86E-03	2.66E-02	4.86E-03	2.43E-03	5.20E-03	8.52E-02
Acrolein	107-02-8	2.04E-04	8.24E-04	6.31E-04	5.43E-04	3.16E-03	2.85E-04	9.88E-04	3.84E-03	7.00E-04	3.49E-04	7.49E-04	1.23E-02
Anthracene	120-12-7	7.09E-07	2.87E-06	2.13E-06	1.82E-06	1.07E-05	9.76E-07	3.31E-06	1.29E-05	2.43E-06	1.21E-06	2.60E-06	4.16E-05
Benzene	71-43-2	2.64E-04	1.07E-03	8.15E-04	7.02E-04	4.08E-03	3.69E-04	1.28E-03	4.96E-03	9.04E-04	4.52E-04	9.67E-04	1.59E-02
Benzo(a)anthracene	56-55-3	8.78E-09	3.55E-08	2.52E-08	2.13E-08	1.28E-07	1.18E-08	3.87E-08	1.52E-07	3.02E-08	1.51E-08	3.23E-08	4.99E-07
Benzo(a)pyrene	50-32-8	1.09E-08	4.45E-08	2.56E-08	2.08E-08	1.36E-07	1.33E-08	3.74E-08	1.51E-07	3.78E-08	1.88E-08	4.04E-08	5.37E-07
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	9.29E-09	3.78E-08	2.20E-08	1.76E-08	1.16E-07	1.13E-08	3.17E-08	1.28E-07	3.20E-08	1.60E-08	3.43E-08	4.56E-07
Benzo(g,h,i)perylene	191-24-2	4.75E-09	1.92E-08	1.42E-08	1.21E-08	7.15E-08	6.52E-09	2.21E-08	8.60E-08	1.63E-08	8.14E-09	1.74E-08	2.78E-07
Chrysene	218-01-9	1.85E-08	7.50E-08	5.12E-08	4.29E-08	2.81E-07	2.44E-08	7.78E-08	3.06E-07	6.36E-08	3.17E-08	6.81E-08	1.02E-06
Fluoranthene	206-44-0	1.10E-06	4.43E-06	3.27E-06	2.79E-06	1.65E-05	1.50E-06	5.07E-06	1.98E-05	3.76E-06	1.86E-06	4.02E-06	6.40E-05
Fluorene	86-73-7	4.18E-06	1.69E-05	1.28E-05	1.10E-05	6.42E-05	5.82E-06	2.00E-05	7.78E-05	1.43E-05	7.16E-06	1.53E-05	2.49E-04
Formaldehyde	50-00-0	4.44E-03	1.79E-02	1.37E-02	1.18E-02	6.87E-02	6.21E-03	2.15E-02	8.35E-02	1.52E-02	7.61E-03	1.63E-02	2.67E-01
Phenanthrene	85-01-8	1.88E-05	7.60E-05	5.71E-05	4.89E-05	2.87E-04	2.60E-05	8.91E-05	3.47E-04	6.45E-05	3.22E-05	6.90E-05	1.11E-03
Pyrene	129-00-0	9.29E-07	3.76E-06	2.76E-06	2.35E-06	1.39E-05	1.27E-06	4.28E-06	1.67E-05	3.19E-06	1.56E-06	3.41E-06	5.41E-05
Dibenz(a,h)anthracene	53-70-3	3.32E-09	1.35E-08	7.86E-09	6.30E-09	4.14E-08	4.03E-09	1.13E-08	4.56E-08	1.14E-08	5.70E-09	1.22E-08	1.63E-07
Indeno(1,2,3-cd)pyrene	193-39-5	1.66E-09	6.74E-09	3.93E-09	3.15E-09	2.07E-08	2.02E-09	5.66E-09	2.28E-08	5.72E-09	2.85E-09	6.12E-09	8.13E-08
Napthalene	91-20-3	3.33E-04	1.35E-03	1.03E-03	8.86E-04	5.15E-03	4.66E-04	1.61E-03	6.26E-03	1.14E-03	5.70E-04	1.22E-03	2.00E-02

Emission Calculation: Haul Road Mobile Emissions Year 7 (24-Hour)

Summary of 24-Hour Emissions (g/s)																			
CoPC	**CAS**	**HAUL1AB**	**HAUL2B**	**HAUL4AB**	**HAUL8B**	**HAUL5B**	**HAUL6B**	**HAUL7B**	**HAUL11B**	**HAUL12B**	**HAUL13B**	**HAUL14B**	**HAUL15B**	**HAUL16B**	**HAUL17B**	**HAUL18B**	**HAUL19B**	**HAUL20B**	**HAUL21B**	**Total**
PM	<<Pb>>	1.47E-02	3.73E-02	7.17E-03	2.77E-02	3.25E-03	2.95E-03	1.32E-02	1.05E-02	4.29E-02	6.42E-02	8.97E-02	9.15E-02	1.35E-02	1.39E-02	1.69E-02	2.04E-01	1.52E-03	5.03E-02	7.05E-01
PM10	<<PM10>>	1.47E-02	3.73E-02	7.17E-03	2.77E-02	3.25E-03	2.95E-03	1.32E-02	1.05E-02	4.29E-02	6.42E-02	8.97E-02	9.15E-02	1.35E-02	1.39E-02	1.69E-02	2.04E-01	1.52E-03	5.03E-02	7.05E-01
PM2.5	<<PM2.5>>	1.47E-02	3.73E-02	7.17E-03	2.77E-02	3.25E-03	2.95E-03	1.32E-02	1.05E-02	4.29E-02	6.42E-02	8.97E-02	9.15E-02	1.35E-02	1.39E-02	1.69E-02	2.04E-01	1.52E-03	5.03E-02	7.05E-01
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	1.47E-02	3.73E-02	7.17E-03	2.77E-02	3.25E-03	2.95E-03	1.32E-02	1.05E-02	4.29E-02	6.42E-02	8.97E-02	9.15E-02	1.35E-02	1.39E-02	1.69E-02	2.04E-01	1.52E-03	5.03E-02	7.05E-01
Elemental Carbon (from diesel exhaust)	7440-44-0	1.47E-02	3.73E-02	7.17E-03	2.77E-02	3.25E-03	2.95E-03	1.32E-02	1.05E-02	4.29E-02	6.42E-02	8.97E-02	9.15E-02	1.35E-02	1.39E-02	1.69E-02	2.04E-01	1.52E-03	5.03E-02	7.05E-01
CO	630-08-0	1.34	4.86	6.43E-01	3.16E-01	2.64E-01	1.16	9.28E-01	3.76	5.63	7.85	8.01	1.19	1.22	1.49	17.83	1.41E-01	4.52	63.60	
SO2	7446-09-5	2.15E-03	7.82E-03	1.10E-03	3.90E-03	6.98E-04	4.25E-04	1.87E-03	1.49E-03	6.04E-03	9.05E-03	1.26E-02	1.29E-02	1.92E-03	1.96E-03	2.39E-03	2.87E-02	2.27E-04	7.27E-03	1.02E-01
Non-methane hydrocarbons	<<NMHC>>	7.27E-02	2.64E-01	3.49E-02	1.32E-01	1.72E-02	1.44E-02	6.32E-02	5.04E-02	2.04E-01	3.05E-01	4.26E-01	4.35E-01	6.47E-02	6.63E-02	8.08E-02	9.68E-01	7.65E-03	2.46E-01	3.45
NOx	10102-44-0	1.25	2.03	6.15E-01	2.42	2.60E-01	2.53E-01	1.15	9.16E-01	3.75	5.62	7.84	8.00	1.18	1.21	1.48	17.82	1.26E-01	4.31	60.23	
1,3-butadiene	106-99-0	7.47E-05	2.71E-04	3.59E-05	1.36E-04	1.76E-05	1.48E-05	6.50E-05	5.18E-05	2.10E-04	3.14E-04	4.38E-04	4.47E-04	6.65E-05	6.81E-05	8.31E-05	9.95E-04	7.87E-06	2.52E-04	3.55E-03	
Acenaphthene	83-32-9	4.91E-06	1.78E-05	2.36E-06	8.91E-06	1.16E-06	9.70E-07	4.27E-06	3.40E-06	1.38E-05	2.06E-05	2.88E-05	2.94E-05	4.37E-06	4.48E-06	5.46E-06	6.54E-05	5.17E-07	1.66E-05	2.33E-04	
Acenaphthylene	208-96-8	7.97E-06	2.89E-05	3.83E-06	1.45E-05	1.88E-06	1.57E-06	6.93E-06	5.52E-06	2.24E-05	3.35E-05	4.67E-05	4.77E-05	7.09E-06	7.26E-06	8.86E-06	1.06E-04	8.39E-07	2.69E-05	3.78E-04	
Acetaldehyde	75-07-0	6.48E-03	2.35E-02	3.11E-03	1.17E-02	1.53E-03	1.28E-03	5.63E-03	4.49E-03	1.82E-02	2.72E-02	3.80E-02	3.88E-02	5.76E-03	5.91E-03	7.20E-03	8.63E-02	6.82E-04	2.19E-02	3.08E-01	
Acrolein	107-02-8	9.33E-04	3.39E-03	4.48E-04	1.69E-03	2.20E-04	1.84E-04	8.11E-04	6.46E-04	2.62E-03	3.92E-03	5.47E-03	5.59E-03	8.31E-04	8.51E-04	1.04E-03	1.24E-02	9.82E-05	3.15E-03	4.43E-02	
Anthracene	120-12-7	3.23E-06	1.13E-05	1.55E-06	5.88E-06	7.56E-07	6.36E-07	2.82E-06	2.25E-06	9.11E-06	1.36E-05	1.90E-05	1.94E-05	2.88E-06	2.95E-06	3.61E-06	4.32E-05	3.36E-07	1.09E-05	1.54E-04	
Benzene	71-43-2	1.21E-03	4.38E-03	5.79E-04	2.19E-03	2.85E-04	2.38E-04	1.05E-03	8.35E-04	3.38E-03	5.07E-03	7.07E-03	7.22E-03	1.07E-03	1.10E-03	1.34E-03	1.61E-02	1.27E-04	4.07E-03	5.73E-02	
Benzo(a)anthracene	56-55-3	3.99E-08	1.32E-07	1.92E-08	7.30E-08	9.28E-09	7.86E-09	3.50E-08	2.78E-08	1.13E-07	1.68E-07	2.35E-07	2.41E-07	3.58E-08	3.67E-08	4.47E-08	5.36E-07	4.16E-09	1.36E-07	1.90E-06	
Benzo(a)pyrene	50-32-8	4.86E-08	1.23E-07	2.36E-08	9.14E-08	1.07E-08	9.73E-09	4.37E-08	3.47E-08	1.41E-07	2.12E-07	2.96E-07	3.02E-07	4.47E-08	4.58E-08	5.59E-08	6.72E-07	5.00E-09	1.66E-07	2.33E-06	
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	4.12E-08	1.04E-07	2.01E-08	7.75E-08	9.10E-09	8.26E-09	3.71E-08	2.95E-08	1.20E-07	1.80E-07	2.51E-07	2.56E-07	3.79E-08	3.89E-08	4.74E-08	5.70E-07	4.24E-09	1.41E-07	1.97E-06	
Benzo(g,h,i)perylene	191-24-2	2.16E-08	7.53E-08	1.04E-08	3.94E-08	5.06E-09	4.26E-09	1.89E-08	1.50E-08	6.10E-08	9.14E-08	1.28E-07	1.30E-07	1.93E-08	1.98E-08	2.42E-08	2.90E-07	2.27E-09	7.32E-08	1.03E-06	
Chrysene	218-01-9	8.35E-08	2.63E-07	4.03E-08	1.54E-07	1.92E-08	1.66E-08	7.37E-08	5.87E-08	2.38E-07	3.57E-07	4.98E-07	5.08E-07	7.54E-08	7.73E-08	9.43E-08	1.13E-06	8.70E-09	2.84E-07	3.98E-06	
Fluoranthene	206-44-0	4.99E-06	1.73E-05	2.40E-06	9.09E-06	1.17E-06	9.87E-07	4.36E-06	3.47E-06	1.41E-05	2.11E-05	2.94E-05	3.00E-05	4.46E-06	4.57E-06	5.57E-06	6.68E-05	5.21E-07	1.69E-05	2.37E-04	
Fluorene	86-73-7	1.91E-05	6.85E-05	9.17E-06	3.47E-05	4.50E-06	3.77E-06	1.66E-05	1.33E-05	5.37E-05	8.04E-05	1.12E-04	1.15E-04	1.70E-05	1.74E-05	2.13E-05	2.55E-04	2.01E-06	6.46E-05	9.08E-04	
Formaldehyde	50-00-0	2.03E-02	7.38E-02	9.75E-03	3.68E-02	4.79E-03	4.01E-03	1.77E-02	1.41E-02	5.70E-02	8.54E-02	1.19E-01	1.22E-01	1.81E-02	1.85E-02	2.26E-02	2.71E-01	2.14E-03	6.86E-02	9.65E-01	
Phenanthrene	85-01-8	2.16E-04	4.37E-04	1.73E-04	2.88E-04	1.52E-04	1.49E-04	2.07E-04	1.91E-04	3.73E-04	4.37E-04	6.37E-04	6.47E-04	2.08E-04	2.10E-04	2.27E-04	1.28E-03	1.41E-04	4.22E-04	6.45E-03	
Pyrene	129-00-0	1.07E-05	2.11E-05	8.52E-06	1.42E-05	7.47E-06	7.32E-06	1.02E-05	9.43E-06	1.84E-05	2.44E-05	3.14E-05	3.19E-05	1.03E-05	1.04E-05	1.12E-05	6.31E-05	6.93E-06	2.08E-05	3.18E-04	
Dibenz(a,h)anthracene	53-70-3	3.75E-08	5.96E-08	2.95E-08	5.00E-08	2.55E-08	2.52E-08	3.55E-08	3.29E-08	6.52E-08	8.60E-08	1.12E-07	1.14E-07	3.58E-08	3.62E-08	3.92E-08	2.26E-07	2.38E-08	7.26E-08	1.11E-06	
Indeno(1,2,3-cd)pyrene	193-39-5	1.85E-08	2.98E-08	1.47E-08	2.50E-08	1.28E-08	1.26E-08	1.79E-08	1.64E-08	3.26E-08	4.30E-08	5.60E-08	5.69E-08	1.79E-08	1.81E-08	1.96E-08	1.13E-07	1.19E-08	3.63E-08	5.53E-07	
Napthalene	91-20-3	3.86E-03	7.87E-03	3.07E-03	5.10E-03	2.70E-03	2.64E-03	3.66E-03	3.40E-03	6.61E-03	8.74E-03	1.13E-02	1.15E-02	3.70E-03	3.73E-03	4.03E-03	2.26E-02	2.50E-03	7.48E-03	1.14E-01	

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Summary of Mobile + Road Dust Emission: Year -1 (24-Hour)

COPC	CAS #	Metals Speciation Factor for Haul Roads [1]	Summary of Haul Road Emissions (g/s)																			
			Summer Months[2]										Winter Months[2]									
			HAUL1AB	HAUL2A	HAUL3A	HAUL4AB	HAUL5A	HAUL6A	HAUL7A	HAUL8A	HAUL9A	HAUL16A	HAUL21A	HAUL1AB	HAUL2A	HAUL3A	HAUL4AB	HAUL5A	HAUL6A	HAUL7A	HAUL8A	HAUL9A	HAUL16A	HAUL21A
PM (excluting tailpipe)	<<PM>>		0.61	1.10	16.00	15.87	82.89	5.66	21.71	116.63	9.33	5.41	0.65	0.20	0.37	5.33	5.29	27.63	1.89	7.24	38.88	3.11	1.80	0.22
PM10 (excluting tailpipe)	<<PM10>>		0.18	0.32	4.63	4.60	24.01	1.64	6.29	33.78	2.70	1.57	0.19	0.06	0.11	1.54	1.53	8.00	0.55	2.10	11.26	0.90	0.52	0.06
PM2.5 (excluting tailpipe)	<<PM2.5>>		0.02	0.03	0.46	0.46	2.40	0.16	0.63	3.38	0.27	0.16	0.02	0.01	0.01	0.15	0.15	0.80	0.05	0.21	1.13	0.09	0.05	0.01
PM	<<PM>>	-	0.61	1.11	16.01	15.88	82.93	5.66	21.72	116.68	9.35	5.42	0.67	0.21	0.38	5.34	5.30	27.67	1.89	7.25	38.92	3.12	1.81	0.23
PM10	<<PM10>>	-	0.18	0.33	4.64	4.60	24.05	1.64	6.30	33.83	2.72	1.57	0.20	0.06	0.12	1.55	1.54	8.04	0.55	2.11	11.31	0.91	0.53	0.08
PM2.5	<<PM2.5>>	-	0.02	0.05	0.47	0.47	2.44	0.17	0.64	3.42	0.28	0.16	0.03	0.01	0.02	0.16	0.16	0.84	0.06	0.22	1.17	0.10	0.06	0.02
Fluoride	7664-39-3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium VI	18540-29-9		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	7439-97-6																							
Aluminum	7429-90-5	7.41E-02	4.52E-02	8.12E-02	1.19E+00	1.18E+00	6.14E+00	4.19E-01	1.61E+00	8.64E+00	6.91E-01	4.01E-01	4.85E-02	1.51E-02	2.71E-02	3.99E-01	3.93E-01	2.05E+00	1.40E-01	5.36E-01	2.88E+00	2.30E-01	1.34E-01	1.62E-02
Silver	7440-22-4	2.50E-07	1.53E-07	2.74E-07	4.00E-06	3.97E-06	2.07E-05	1.41E-06	5.43E-06	2.92E-05	2.33E-06	1.35E-06	1.64E-07	5.09E-08	9.14E-08	1.33E-06	1.32E-06	6.91E-06	4.72E-07	1.81E-06	9.72E-06	7.78E-07	4.51E-07	5.46E-08
Arsenic	7440-38-2	2.26E-06	1.39E-06	2.50E-06	3.65E-05	3.62E-05	1.89E-04	1.29E-05	4.95E-05	2.66E-04	2.13E-05	1.23E-05	1.49E-06	4.64E-07	8.33E-07	1.22E-05	1.21E-05	6.30E-05	4.30E-06	1.65E-05	8.86E-05	7.09E-06	4.11E-06	4.97E-07
Barium	7440-39-3	9.66E-05	5.90E-05	1.06E-04	1.55E-03	1.53E-03	8.01E-03	5.47E-04	2.10E-03	1.13E-02	9.02E-04	5.22E-04	6.33E-05	1.97E-05	3.53E-05	5.15E-04	5.11E-04	2.67E-03	1.82E-04	6.99E-04	3.76E-03	3.01E-04	1.74E-04	2.11E-05
Beryllium	7440-41-7	6.74E-08	4.12E-08	7.40E-08	1.08E-06	1.07E-06	5.59E-06	3.82E-07	1.46E-06	7.87E-06	6.30E-07	3.65E-07	4.42E-08	1.37E-08	2.47E-08	3.60E-07	3.57E-07	1.86E-06	1.27E-07	4.88E-07	2.62E-06	2.10E-07	1.22E-07	1.47E-08
Boron	7440-42-8	7.76E-06	4.74E-06	8.51E-06	1.24E-04	1.23E-04	6.43E-04	4.39E-05	1.68E-04	9.05E-04	7.24E-05	4.20E-05	5.08E-06	1.58E-06	2.84E-06	4.14E-05	4.10E-05	2.14E-04	1.46E-05	5.61E-05	3.02E-04	2.41E-05	1.40E-05	1.69E-06
Bismuth	7440-69-9	2.85E-08	1.74E-08	3.12E-08	4.56E-07	4.52E-07	2.36E-06	1.61E-07	6.18E-07	3.32E-06	2.66E-07	1.54E-07	1.87E-08	5.77E-09	1.04E-08	1.52E-07	1.50E-07	7.86E-07	5.37E-08	2.06E-07	1.11E-06	8.86E-08	5.15E-08	6.22E-09
Calcium	7440-70-2	9.07E-02	5.54E-02	9.95E-02	1.45E+00	1.44E+00	7.52E+00	5.13E-01	1.97E+00	1.06E+01	8.47E-01	4.91E-01	5.94E-02	1.85E-02	3.32E-02	4.84E-01	4.80E-01	2.51E+00	1.71E-01	6.57E-01	3.53E+00	2.82E-01	1.64E-01	1.98E-02
Cobalt	7440-48-4	4.49E-05	2.74E-05	4.93E-05	7.19E-04	7.13E-04	3.72E-03	2.54E-04	9.75E-04	5.24E-03	4.19E-04	2.43E-04	2.94E-05	9.14E-06	1.64E-05	2.40E-04	2.38E-04	1.24E-03	8.47E-05	3.25E-04	1.75E-03	1.40E-04	8.11E-05	9.81E-06
Chromium	7440-47-3	5.19E-04	3.17E-04	5.69E-04	8.30E-03	8.24E-03	4.30E-02	2.94E-03	1.13E-02	6.05E-02	4.84E-03	2.81E-03	3.40E-04	1.06E-04	1.90E-04	2.77E-03	2.75E-03	1.43E-02	9.79E-04	3.76E-03	2.02E-02	1.61E-03	9.36E-04	1.13E-04
Copper	7440-50-8	1.03E-04	6.31E-05	1.13E-04	1.65E-03	1.64E-03	8.57E-03	5.85E-04	2.25E-03	1.21E-02	9.66E-04	5.60E-04	6.77E-05	2.10E-05	3.78E-05	5.52E-04	5.47E-04	2.86E-03	1.95E-04	7.49E-04	4.02E-03	3.22E-04	1.87E-04	2.26E-05
Iron	7439-89-6	4.35E-02	2.66E-02	4.78E-02	6.97E-01	6.91E-01	3.61E+00	2.46E-01	9.46E-01	5.08E+00	4.07E-01	2.36E-01	2.85E-02	8.86E-03	1.59E-02	2.32E-01	2.30E-01	1.20E+00	8.21E-02	3.15E-01	1.69E+00	1.35E-01	7.86E-02	9.50E-03
Potassium	7440-09-7	2.68E-03	1.64E-03	2.94E-03	4.29E-02	4.25E-02	2.22E-01	1.52E-02	5.82E-02	3.13E-01	2.50E-02	1.45E-02	1.75E-03	5.45E-04	9.80E-04	1.43E-02	1.42E-02	7.40E-02	5.06E-03	1.94E-02	1.04E-01	8.34E-03	4.84E-03	5.85E-04
Lithium	7439-93-2	1.24E-05	7.54E-06	1.35E-05	1.98E-04	1.96E-04	1.02E-03	6.99E-05	2.68E-04	1.44E-03	1.11E-04	6.69E-05	8.09E-06	2.51E-06	4.52E-06	6.59E-05	6.53E-05	3.41E-04	2.33E-05	8.94E-05	4.80E-04	3.84E-05	2.23E-05	2.70E-06
Magnesium	7439-95-4	7.02E-02	4.29E-02	7.71E-02	1.12E+00	1.12E+00	5.82E+00	3.98E-01	1.53E+00	8.19E+00	6.56E-01	3.80E-01	4.60E-02	1.43E-02	2.57E-02	3.75E-01	3.72E-01	1.94E+00	1.33E-01	5.08E-01	2.73E+00	2.19E-01	1.27E-01	1.53E-02
Manganese	7439-96-5	9.47E-04	5.78E-04	1.04E-03	1.51E-02	1.50E-02	7.85E-02	5.36E-03	2.06E-02	1.10E-01	8.84E-03	5.12E-03	6.20E-04	1.93E-04	3.46E-04	5.05E-03	5.01E-03	2.62E-02	1.79E-03	6.85E-03	3.68E-02	2.95E-03	1.71E-03	2.07E-04
Molybdenum	7439-98-7	5.30E-07	3.24E-07	5.82E-07	8.49E-06	8.42E-06	4.40E-05	3.00E-06	1.15E-05	6.19E-05	4.95E-06	2.87E-06	3.47E-07	1.08E-07	1.94E-07	2.83E-06	2.81E-06	1.47E-05	1.00E-06	3.84E-06	2.06E-05	1.65E-06	9.57E-07	1.16E-07
Silicon	7440-21-3	5.02E-03	3.07E-03	5.51E-03	8.04E-02	7.97E-02	4.16E-01	2.84E-02	1.09E-01	5.86E-01	4.69E-02	2.72E-02	3.29E-03	1.02E-03	1.84E-03	2.68E-02	2.66E-02	1.39E-01	9.48E-03	3.64E-02	1.95E-01	1.56E-02	9.06E-03	1.10E-03
Sodium	7440-23-5	8.00E-03	4.88E-03	8.78E-03	1.28E-01	1.27E-01	6.63E-01	4.53E-02	1.74E-01	9.33E-01	7.47E-02	4.33E-02	5.24E-03	1.63E-03	2.93E-03	4.27E-02	4.23E-02	2.21E-01	1.51E-02	5.79E-02	3.11E-01	2.49E-02	1.44E-02	1.75E-03
Nickel	7440-02-0	2.14E-04	1.31E-04	2.35E-04	3.43E-03	3.40E-03	1.78E-02	1.21E-03	4.65E-03	2.50E-02	2.00E-03	1.16E-03	1.40E-04	4.36E-05	7.84E-05	1.14E-03	1.13E-03	5.92E-03	4.04E-04	1.55E-03	8.33E-03	6.67E-04	3.87E-04	4.68E-05
Lead	7439-92-1	4.55E-07	2.78E-07	5.00E-07	7.29E-06	7.23E-06	3.78E-05	2.58E-06	9.89E-06	5.31E-05	4.25E-06	2.47E-06	2.98E-07	9.27E-08	1.67E-07	2.43E-06	2.41E-06	1.26E-05	8.59E-07	3.30E-06	1.77E-05	1.42E-06	8.22E-07	9.94E-08
Antimony	7440-36-0	4.15E-07	2.55E-07	4.59E-07	6.69E-06	6.64E-06	3.47E-05	2.37E-06	9.08E-06	4.88E-05	3.90E-06	2.26E-06	2.74E-07	8.51E-08	1.53E-07	2.23E-06	2.21E-06	1.16E-05	7.89E-07	3.03E-06	1.63E-05	1.30E-06	7.54E-07	9.13E-08
Selenium	7782-49-2	2.87E-07	1.75E-07	3.15E-07	4.60E-06	4.56E-06	2.38E-05	1.63E-06	6.24E-06	3.35E-05	2.68E-06	1.55E-06	1.88E-07	5.84E-08	1.05E-07	1.53E-06	1.52E-06	7.94E-06	5.42E-07	2.08E-06	1.12E-05	8.94E-07	5.18E-07	6.27E-08
Tin	7440-31-5	3.13E-06	1.91E-06	3.43E-06	5.01E-05	4.97E-05	2.59E-04	1.77E-05	6.80E-05	3.65E-04	2.92E-05	1.69E-05	2.05E-06	6.37E-07	1.14E-06	1.67E-05	1.66E-05	8.65E-05	5.91E-06	2.27E-05	1.22E-04	9.74E-06	5.65E-06	6.83E-07
Strontium	7440-24-6	1.29E-04	7.82E-05	1.47E-04	2.05E-03	2.03E-03	1.06E-02	7.25E-04	2.78E-03	1.49E-02	1.20E-03	6.93E-04	8.36E-05	2.61E-05	4.68E-05	6.83E-04	6.78E-04	3.54E-03	2.42E-04	9.27E-04	4.98E-03	3.99E-04	2.31E-04	2.80E-05
Titanium	7440-32-6	1.17E-03	7.12E-04	1.28E-03	1.87E-02	1.85E-02	9.66E-02	6.60E-03	2.53E-02	1.36E-01	1.09E-02	6.31E-03	7.63E-04	2.37E-04	4.26E-04	6.22E-03	6.17E-03	3.22E-02	2.20E-03	8.44E-03	4.53E-02	3.63E-03	2.10E-03	2.54E-04
Thallium	7440-28-0	2.46E-08	1.50E-08	2.70E-08	3.94E-07	3.91E-07	2.04E-06	1.39E-07	5.35E-07	2.87E-06	2.30E-07	1.33E-07	1.61E-08	5.01E-09	9.01E-09	1.31E-07	1.30E-07	6.81E-07	4.65E-08	1.78E-07	9.58E-07	7.67E-08	4.44E-08	5.38E-09
Uranium	7440-61-1	3.59E-08	2.19E-08	3.94E-08	5.75E-07	5.70E-07	2.98E-06	2.03E-07	7.80E-07	4.19E-06	3.35E-07	1.94E-07	2.35E-08	7.31E-09	1.31E-08	1.92E-07	1.90E-07	9.93E-07	6.78E-08	2.60E-07	1.40E-06	1.12E-07	6.48E-08	7.84E-09
Vanadium	7440-62-2	1.14E-04	6.96E-05	1.25E-04	1.82E-03	1.81E-03	9.44E-03	6.45E-04	2.47E-03	1.33E-02	1.06E-03	6.17E-04	7.46E-05	2.32E-05	4.17E-05	6.08E-04	6.03E-04	3.15E-03	2.15E-04	8.25E-04	4.43E-03	3.54E-04	2.06E-04	2.49E-05
Tungsten	7440-33-7	1.21E-07	7.39E-08	1.33E-07	1.93E-06	1.92E-06	1.00E-05	6.83E-07	2.63E-06	1.41E-05	1.13E-06	6.54E-07	7.93E-08	2.46E-08	4.43E-08	6.46E-07	6.41E-07	3.35E-06	2.28E-07	8.77E-07	4.71E-06	3.77E-07	2.19E-07	2.64E-08
Yttrium	7440-65-5	4.48E-06	2.73E-06	4.91E-06	7.16E-05	7.11E-05	3.71E-04	2.53E-05	9.72E-05	5.22E-04	4.18E-05	2.42E-05	2.93E-06	9.11E-07	1.64E-06	2.39E-05	2.37E-05	1.24E-04	8.45E-06	3.24E-05	1.74E-04	1.39E-05	8.08E-06	9.77E-07
Zinc	7440-66-6	3.38E-05	2.07E-05	3.71E-05	5.41E-04	5.37E-04	2.80E-03	1.91E-04	7.35E-04	3.95E-03	3.16E-04	1.83E-04	2.22E-05	6.88E-06	1.24E-05	1.80E-04	1.79E-04	9.35E-04	6.38E-05	2.45E-04	1.32E-03	1.05E-04	6.11E-05	7.38E-06
Thorium	7440-29-1	6.80E-07	4.15E-07	7.46E-07	1.08E-05	1.08E-05	5.64E-05	3.85E-06	1.48E-05	7.93E-05	6.36E-06	3.68E-06	4.47E-07	1.38E-07	2.49E-07	3.63E-06	3.60E-06	1.88E-05	1.28E-06	4.92E-06	2.64E-05	2.12E-06	1.23E-06	1.48E-07
Quartz (in PM10)	14808-60-7	1.33E-03	2.34E-04	4.21E-04	6.14E-03	6.09E-03	3.18E-02	2.17E-03	8.33E-03	4.48E-02	3.58E-03	2.08E-03	2.51E-04	7.81E-05	1.40E-04	2.05E-03	2.03E-03	1.06E-02	7.24E-04	2.78E-03	1.49E-02	1.19E-03	6.92E-04	8.36E-05
Pyrite	12068-85-8	0.00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biotite	1302-27-8	4.88E-03	2.98E-03	5.35E-03	7.80E-02	7.74E-02	4.04E-01	2.76E-02	1.06E-01	5.69E-01	4.56E-02	2.64E-02	3.19E-03	9.92E-04	1.78E-03	2.60E-02	2.58E-02	1.35E-01	9.20E-03	3.53E-02	1.90E-01	1.52E-02	8.80E-03	1.06E-03
Magnetite	1309-38-2	3.43E-03	2.09E-03	3.76E-03	5.48E-02	5.44E-02	2.84E-01	1.94E-02	7.44E-02	3.99E-01	3.20E-02	1.85E-02	2.24E-03	6.97E-04	1.25E-03	1.83E-02	1.81E-02	9.46E-02	6.46E-03	2.48E-02	1.33E-01	1.07E-02	6.18E-03	7.48E-04
Hematite	1317-60-8	0.00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorite	1318-59-8	1.12E-01	6.84E-02	1.23E-01	1.79E+00	1.78E+00	9.28E+00	6.34E-01	2.43E+00	1.31E+01	1.05E+00	6.06E-01	7.33E-02	2.28E-02	4.10E-02	5.97E-01	5.93E-01	3.09E+00	2.11E-01	8.11E-01	4.35E+00	3.49E-01	2.02E-01	2.44E-02
Muscovite	1318-94-1	1.62E-02	9.89E-03	1.78E-02	2.59E-01	2.57E-01	1.34E+00	9.17E-02	3.52E-01	1.89E+00	1.51E-01	8.77E-02	1.06E-02	3.30E-03	5.92E-03	8.64E-02	8.57E-02	4.48E-01	3.06E-02	1.17E-01	6.30E-01	5.04E-02	2.92E-02	3.54E-03
Talc (fibrous)	14807-96-6	0.00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phosphorus	7723-14-0		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Platinum	7440-06-4		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Palladium	7440-05-3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (in PM10)	<<Ni_PM10>>	2.14E-04	3.79E-05	6.81E-05	9.93E-04	9.86E-04	5.15E-03	3.51E-04	1.35E-03	7.24E-03	5.80E-04	3.36E-04	4.07E-05	1.26E-05	2.27E-05	3.31E-04	3.29E-04	1.72E-03	1.17E-04	4.49E-04	2.41E-03	1.93E-04	1.12E-04	1.36E-05
Uranium (in PM10)	<<U_PM10>>	3.59E-08	6.35E-09	1.14E-08	1.66E-07	1.65E-07	8.63E-07	5.89E-08	2.26E-07	1.21E-06	9.71E-08	5.63E-08	6.81E-09	2.12E-09	3.81E-09	5.55E-08	5.51E-08	2.88E-07	1.96E-08	7.53E-08	4.09E-07	3.24E-08	1.88E-08	2.27E-09
Chrysotile Asbestos	132207-32-0	2.49E-06	1.52E-06	2.73E-06	3.98E-05	3.95E-05	2.06E-04	1.41E-05	5.40E-05	2.90E-04	2.32E-05	1.35E-05	1.63E-06	5.06E-07	9.09E-07	1.33E-05	1.32E-05	6.87E-05	4.69E-06	1.80E-05	9.67E-05	7.74E-06	4.49E-06	5.43E-07
Manganese (in PM10)	<<Mn_PM10>>	9.47E-04	1.67E-04	3.01E-04	4.39E-03	4.35E-03	2.27E-02	1.55E-03	5.95E-03	3.20E-02	2.56E-03	1.48E-03	1.80E-04	5.58E-05	1.00E-04	1.46E-03	1.45E-03	7.58E-03	5.17E-04	1.98E-03	1.07E-02	8.53E-04	4.95E-04	5.98E-05
Manganese (in PM2.5)	<<Mn_PM2.5>>	9.47E-04	1.67E-05	3.01E-05	4.39E-04	4.35E-04	2.27E-03	1.55E-04	5.95E-04	3.20E-03	2.56E-04	1.48E-04	1.80E-05	5.58E-06	1.00E-05	1.46E-04	1.45E-04	7.58E-04	5.17E-05	1.98E-04	1.07E-03	8.53E-05	4.95E-05	5.98E-06
Chromium VI (in PM10)	<<Cr6_PM10>>		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.00			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Particulate Matter (PM2.5 from Diesel Combustion)	<<DPM>>	-	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02
Elemental Carbon (from diesel exhaust)	7440-44-0	-	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02	3.32E-03	1.35E-02	7.86E-03	6.30E-03	4.14E-02	4.03E-03	1.13E-02	4.56E-02	1.14E-02	5.70E-03	1.22E-02
CO	630-08-0	-	2.93E-01	1.18E+00	9.05E-01	7.79E-01	5.63E+00	4.10E-01	1.42E+00	5.51E+00	1.00E+00	5.02E-01	1.07E+00	2.93E-01	1.18E+00	9.05E-01	7.79E-01	4.53E+00	4.10E-01	1.42E+00	5.51E+00	1.00E+00	5.02E-01	1.07E+00
SO2	7446-09-5	-	4.71E-04	1.90E-03	1.46E-03	1.25E-03	7.28E-03	6.59E-04	2.28E-03	8.85E-03	1.61E-03	8.06E-04	1.73E-03	4.71E-04	1.90E-03	1.46E-03	1.25E-03	7.28E-03	6.59E-04	2.28E-03	8.85E-03	1.61E-03	8.06E-04	1.73E-03
Non-methane hydrocarbons	<<NMHC>>	-	1.59E-02	6.42E-02	4.91E-02	4.23E-02	2.46E-01	2.22E-02	7.70E-02	2.99E-01	5.45E-02	2.72E-02	5.83E-02	1.59E-02	6.42E-02	4.91E-02	4.23E-02	2.46E-01	2.22E-02	7.70E-02	2.99E-01	5.45E-02	2.72E-02	5.83E-02
NOx	10102-44-0	-	2.88E-01	1.18E+00	5.20E-01	3.75E-01	2.92E+00	3.09E-01	8.62E-01	2.82E+00	9.99E-01	4.97E-01	1.07E+00	2.88E-01	1.18E+00	5.20E-01	3.75E-01	2.92E+00	3.09E-01	8.62E-01	2.82E+00	9.99E-01	4.97E-01	1.07E+00
1,3-butadiene	106-99-0	-	1.63E-05	6.60E-05	5.05E-05	4.35E-05	2.53E-04	2.29E-05	7.91E-05	3.07E-04	5.60E-05	2.80E-05	6.00E-05	1.63E-05	6.60E-05	5.05E-05	4.35E-05	2.53E-04	2.29E-05	7.91E-05	3.07E-04	5.60E-05	2.80E-05	6.00E-05
Acenaphthene	83-32-9	-	3.32E-06	4.34E-06	2.86E-06	1.90E-06	9.88E-06	3.84E-03	7.00E-04	3.48E-04	7.49E-04	2.04E-04	8.24E-04	3.32E-06	4.34E-06	2.86E-06	1.90E-06	9.88E-06	3.84E-03	7.00E-04	3.49E-04	7.49E-04	2.04E-04	8.24E-04
Acenaphthylene	208-96-8	-	1.74E-06	7.04E-06	5.39E-06	4.64E-06	2.70E-05	2.44E-06	8.44E-06	3.28E-05	5.97E-06	2.98E-06	6.39E-06	1.74E-06	7.04E-06	5.39E-06	4.64E-06	2.70E-05	2.44E-06	8.44E-06	3.28E-05	5.97E-06	2.98E-06	6.39E-06
Acetaldehyde	75-07-0	-	1.42E-03	5.72E-03	4.38E-03	3.77E-03	2.19E-02	1.98E-03	6.86E-03	2.66E-02	4.86E-03	2.43E-03	5.20E-03	1.42E-03	5.72E-03	4.38E-03	3.77E-03	2.19E-02	1.98E-03	6.86E-03	2.66E-02	4.86E-03	2.43E-03	5.20E-03
Acrolein	107-02-8	-	2.04E-04	8.24E-04	6.31E-04	5.43E-04	3.16E-03	2.85E-04	9.88E-04	3.84E-03	7.00E-04	3.49E-04	7.49E-04	2.04E-04	8.24E-04	6.31E-04	5.43E-04	3.16E-03	2.85E-04	9.88E-04	3.84E-03	7.00E-04	3.49E-04	7.49E-04
Anthracene	120-12-7	-	7.09E-07	2.87E-06	2.13E-06	1.82E-06	1.07E-05	9.76E-07	3.31E-06	1.29E-05	2.43E-06	1.21E-06	2.60E-06	7.09E-07	2.87E-06	2.13E-06	1.82E-06	1.07E-05	9.76E-07	3.31E-06	1.29E-05	2.43E-06	1.21E-06	2.60E-06
Benzene	71-43-2	-	2.64E-04	1.07E-03	8.15E-04	7.02E-04	4.08E-03	3.69E-04	1.28E-03	4.96E-03	9.04E-04	4.52E-04	9.67E-04	2.64E-04	1.07E-03	8.15E-04	7.02E-04	4.08E-03	3.69E-04	1.28E-03	4.96E-03	9.04E-04	4.52E-04	9.67E-04
Benzo(a)anthracene	56-55-3	-	8.78E-09	3.56E-08	2.52E-08	2.13E-08	1.28E-07	1.18E-08	3.87E-08	1.52E-07	3.02E-08	1.51E-08	3.23E-08	8.78E-09	3.56E-08	2.52E-08	2.13E-08	1.28E-07	1.18E-08	3.87E-08	1.52E-07	3.02E-08	1.51E-08	3.23E-08
Benzo(a)pyrene	50-32-8	-	1.09E-08	4.45E-08	2.59E-08	2.08E-08	1.36E-07	1.33E-08	3.74E-08	1.51E-07	3.78E-08	1.88E-08	4.04E-08	1.09E-08	4.45E-08	2.59E-08	2.08E-08	1.36E-07	1.33E-08	3.74E-08	1.51E-07	3.78E-08	1.88E-08	4.04E-08
Benzo(b+k)fluoranthene	205-99-2 / 207-08-9	-	9.29E-09	3.79E-08	2.20E-08	1.76E-08	1.16E-07	3.17E-08	1.28E-07	3.20E-08	1.60E-08	3.43E-08	9.29E-09	3.79E-08	2.20E-08	1.76E-08	1.16E-07	3.17E-08	1.28E-07	3.20E-08	1.60E-08	3.43E-08	9.29E-09	3.79E-08
Benzo(g,h,i)perylene	191-24-2	-	4.75E-09	1.92E-08	1.42E-08	1.21E-08	7.15E-08	6.52E-09	2.21E-08	8.60E-08	1.63E-08	8.14E-09	1.74E-08	4.75E-09	1.92E-08	1.42E-08	1.21E-08	7.15E-08	6.52E-09	2.21E-08	8.60E-08	1.63E-08	8.14E-09	1.74E-08
Chrysene	218-01-9	-	1.85E-08	7.50E-08	5.12E-08	4.29E-08	2.61E-07	2.44E-08	7.78E-08	3.06E-07	6.36E-08	3.17E-08	6.81E-08	1.85E-08	7.50E-08	5.12E-08	4.29E-08	2.61E-07	2.44E-08	7.78E-08	3.06E-07	6.36E-08	3.17E-08	6.81E-08
Fluoranthene	206-44-0	-	1.10E-06	4.43E-06	3.27E-06	2.79E-06	1.65E-05	1.50E-06	5.07E-06	1.98E-05	3.76E-06	1.88E-06	4.02E-06	1.10E-06	4.43E-06	3.27E-06	2.79E-06	1.65E-05	1.50E-06	5.07E-06	1.98E-05	3.76E-06	1.88E-06	4.02E-06

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Summary of Mobile + Road Dust Emission: Year 7 (24-Hour)

COPC	CAS #	Metals Speciation Factor for Haul Roads [1]	Summary of Haul Road Emissions (Road Dust + Tailpipe) (g/s)																												
			Summer Months[2]														Winter Months[2]														
			HAUL1AB	HAUL2B	HAUL4AB	HAUL5B	HAUL6B	HAUL7B	HAUL11B	HAUL12B	HAUL13B	HAUL14B	HAUL15B	HAUL16B	HAUL17B	HAUL18B	HAUL19B	HAUL20B	HAUL21B	HAUL1AB	HAUL2B	HAUL4AB	HAUL5B	HAUL6B	HAUL7B	HAUL11B	HAUL12B	HAUL13B	HAUL14B	HAUL15B	HAUL16B	HAUL17B	HAUL18B	HAUL19B	HAUL20B	HAUL21B
PM (excluding tailpipe)	<<Pd>>		4.65	53.70	4.22	67.39	3.79	4.41	34.06	38.39	46.59	70.53	92.13	92.80	6.31	6.45	5.93	165.67	0.28	20.77	1.55	17.90	1.41	22.46	1.26	1.47	11.35	12.80	15.53	23.51	30.71	30.93	2.10	2.15	1.98	55.22	0.09	6.92
PM10 (excluding tailpipe)	<<PM10>>		1.35	15.56	1.22	19.52	1.10	1.28	9.87	11.12	13.49	20.43	26.68	26.88	1.83	1.87	1.72	47.99	0.08	6.01	0.45	5.19	0.41	6.51	0.37	0.43	3.29	3.71	4.50	6.81	8.89	8.96	0.61	0.62	0.57	16.00	0.03	2.00
PM2.5 (excluding tailpipe)	<<PM2.5>>		0.13	1.56	0.12	1.95	0.11	0.13	0.99	1.11	1.35	2.04	2.67	2.69	0.18	0.19	0.17	4.80	0.01	0.60	0.04	0.52	0.04	0.65	0.04	0.04	0.33	0.37	0.45	0.68	0.89	0.90	0.06	0.06	0.06	1.60	0.00	0.20
PM	<<Pd>>	-	4.66	53.74	4.22	67.42	3.79	4.42	34.07	38.41	46.63	70.59	92.22	92.89	6.32	6.46	5.95	165.87	0.28	20.82	1.56	17.94	1.41	22.49	1.27	1.47	11.37	12.81	15.57	23.57	30.80	31.02	2.12	2.16	1.99	55.43	0.09	6.97
PM10	<<PM10>>	-	1.36	15.59	1.23	19.55	1.10	1.28	9.88	11.13	13.54	20.49	26.77	26.97	1.84	1.88	1.73	48.19	0.08	6.07	0.46	5.22	0.41	6.53	0.37	0.43	3.30	3.72	4.54	6.87	8.98	9.05	0.62	0.64	0.59	16.20	0.03	2.06
PM2.5	<<PM2.5>>	-	0.15	1.59	0.13	1.98	0.11	0.13	1.00	1.12	1.39	2.11	2.76	2.78	0.20	0.20	0.19	5.00	0.01	0.65	0.06	0.56	0.05	0.68	0.04	0.05	0.34	0.38	0.49	0.75	0.98	0.99	0.07	0.08	0.07	1.80	0.00	0.25
Fluoride	7664-39-3		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium VI	18540-29-9		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	7439-97-6		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	7429-90-5	7.41E-02	3.44E-01	3.98E+00	3.12E-01	4.99E+00	2.80E-01	3.27E-01	2.52E+00	2.84E+00	3.45E+00	5.22E+00	6.82E+00	6.87E+00	4.67E-01	4.78E-01	4.39E-01	1.23E+01	2.04E-02	1.54E+00	1.15E-01	1.33E+00	1.04E-01	1.66E+00	9.35E-02	1.09E-01	8.41E-01	9.48E-01	1.15E+00	1.74E+00	2.27E+00	2.29E+00	1.56E-01	1.59E-01	1.46E-01	4.09E+00	6.80E-03	5.13E-01
Silver	7440-22-4	2.50E-07	1.16E-06	1.34E-05	1.05E-06	1.68E-05	9.47E-07	1.10E-06	8.51E-06	9.60E-06	1.16E-05	1.76E-05	2.30E-05	2.32E-05	1.58E-06	1.61E-06	1.48E-06	4.14E-05	6.88E-08	5.19E-06	3.87E-07	4.48E-06	3.51E-07	5.62E-06	3.16E-07	3.68E-07	2.84E-06	3.20E-06	3.88E-06	5.88E-06	7.68E-06	7.73E-06	5.26E-07	5.37E-07	4.94E-07	1.38E-05	2.29E-08	1.73E-06
Arsenic	7440-38-2	2.28E-06	1.06E-05	1.22E-04	9.61E-06	1.54E-04	8.63E-06	1.01E-05	7.76E-05	8.75E-05	1.06E-04	1.61E-04	2.10E-04	2.12E-04	1.44E-05	1.47E-05	1.35E-05	3.78E-04	6.28E-07	4.73E-05	3.53E-06	4.09E-05	3.20E-06	5.12E-05	2.88E-06	3.35E-06	2.59E-05	2.92E-05	3.54E-05	5.36E-05	7.00E-05	7.05E-05	4.79E-06	4.90E-06	4.51E-06	1.26E-04	2.09E-07	1.58E-05
Barium	7440-39-3	6.66E-05	4.49E-04	5.19E-03	4.08E-04	6.51E-03	3.66E-04	4.26E-04	3.29E-03	3.71E-03	4.50E-03	6.82E-03	8.90E-03	8.97E-03	6.10E-04	6.23E-04	5.73E-04	1.60E-02	2.66E-05	2.01E-03	1.50E-04	1.73E-03	1.36E-04	2.17E-03	1.22E-04	1.42E-04	1.10E-03	1.24E-03	1.50E-03	2.27E-03	2.97E-03	2.99E-03	2.03E-04	2.08E-04	1.91E-04	5.34E-03	8.87E-06	6.69E-04
Beryllium	7440-41-7	6.74E-08	3.13E-07	3.62E-06	2.84E-07	4.54E-06	2.55E-07	2.98E-07	2.30E-06	2.59E-06	3.14E-06	4.76E-06	6.21E-06	6.26E-06	4.25E-07	4.35E-07	4.00E-07	1.12E-05	1.86E-08	1.40E-06	1.04E-07	1.21E-06	9.48E-08	1.51E-06	8.51E-08	9.92E-08	7.66E-07	8.63E-07	1.05E-06	1.59E-06	2.07E-06	2.09E-06	1.42E-07	1.45E-07	1.33E-07	3.72E-06	6.19E-09	4.67E-07
Boron	7440-42-8	7.76E-06	3.60E-05	4.17E-04	3.27E-05	5.23E-04	2.94E-05	2.98E-04	2.64E-04	2.98E-04	3.61E-04	5.47E-04	7.14E-04	7.20E-04	4.89E-05	5.00E-05	4.60E-05	1.28E-03	2.14E-06	1.61E-04	1.20E-05	1.39E-04	1.09E-05	1.74E-04	9.79E-06	1.14E-05	8.81E-05	9.93E-05	1.20E-04	1.82E-04	2.38E-04	2.40E-04	1.63E-05	1.67E-05	1.53E-05	4.28E-04	7.12E-07	5.37E-05
Bismuth	7440-69-9	4.66E-08	2.17E-07	2.51E-06	1.97E-07	3.14E-06	1.77E-07	2.06E-07	1.59E-06	1.79E-06	2.17E-06	3.29E-06	4.30E-06	4.33E-06	2.94E-07	3.01E-07	2.77E-07	7.73E-06	1.28E-08	9.69E-07	7.22E-08	8.35E-07	6.56E-08	1.05E-06	5.89E-08	6.86E-08	5.30E-07	5.97E-07	7.24E-07	1.10E-06	1.43E-06	1.44E-06	9.81E-08	1.00E-07	9.22E-08	2.58E-06	4.28E-09	3.23E-07
Calcium	7440-70-2	9.07E-02	4.22E-01	4.87E+00	3.83E-01	6.11E+00	3.44E-01	4.00E-01	3.09E+00	3.48E+00	4.23E+00	6.40E+00	8.36E+00	8.42E+00	5.72E-01	5.85E-01	5.38E-01	1.50E+01	2.50E-02	1.88E+00	1.41E-01	1.62E+00	1.28E-01	2.04E+00	1.15E-01	1.33E-01	1.03E+00	1.16E+00	1.41E+00	2.13E+00	2.79E+00	2.81E+00	1.91E-01	1.95E-01	1.79E-01	5.01E+00	8.33E-03	6.28E-01
Cadmium	7440-43-9	5.13E-08	2.39E-07	2.76E-06	2.16E-07	3.46E-06	1.94E-07	2.27E-07	1.75E-06	1.97E-06	2.39E-06	3.62E-06	4.74E-06	4.76E-06	3.24E-07	3.31E-07	3.04E-07	8.51E-06	1.41E-08	1.07E-06	7.95E-08	9.19E-07	7.22E-08	1.15E-06	6.49E-08	7.56E-08	5.83E-07	6.57E-07	7.97E-07	1.21E-06	1.58E-06	1.59E-06	1.08E-07	1.10E-07	1.01E-07	2.84E-06	4.71E-09	3.55E-07
Cobalt	7440-48-4	4.49E-05	2.09E-04	2.41E-03	1.89E-04	3.03E-03	1.70E-04	1.98E-04	1.53E-03	1.72E-03	2.09E-03	3.17E-03	4.14E-03	4.17E-03	2.83E-04	2.90E-04	2.66E-04	7.44E-03	1.24E-05	9.33E-04	6.96E-05	8.04E-04	6.31E-05	1.01E-03	5.67E-05	6.61E-05	5.10E-04	5.75E-04	6.98E-04	1.06E-03	1.38E-03	1.39E-03	9.45E-05	9.66E-05	8.88E-05	2.48E-03	4.12E-06	3.11E-04
Chromium	7440-47-3	5.19E-04	2.41E-03	2.79E-02	2.19E-03	3.50E-02	1.96E-03	2.29E-03	1.77E-02	1.99E-02	2.42E-02	3.66E-02	4.78E-02	4.82E-02	3.27E-03	3.35E-03	3.08E-03	8.60E-02	1.43E-04	1.08E-02	8.04E-04	9.29E-03	7.29E-04	1.17E-02	6.55E-04	7.63E-04	5.89E-03	6.64E-03	8.06E-03	1.22E-02	1.59E-02	1.61E-02	1.09E-03	1.12E-03	1.03E-03	2.87E-02	4.76E-05	3.59E-03
Copper	7440-50-8	1.02E-04	4.81E-04	5.56E-03	4.36E-04	6.97E-03	3.92E-04	4.56E-04	3.52E-03	3.97E-03	4.82E-03	7.30E-03	9.53E-03	9.61E-03	6.52E-04	6.67E-04	6.13E-04	1.71E-02	2.85E-05	2.15E-03	1.60E-04	1.85E-03	1.45E-04	2.32E-03	1.31E-04	1.52E-04	1.17E-03	1.32E-03	1.61E-03	2.43E-03	3.18E-03	3.20E-03	2.17E-04	2.22E-04	2.04E-04	5.71E-03	9.48E-06	7.16E-04
Iron	7439-89-6	4.35E-02	2.02E-01	2.34E+00	1.84E-01	2.93E+00	1.65E-01	1.92E-01	1.48E+00	1.67E+00	2.03E+00	3.07E+00	4.01E+00	4.04E+00	2.75E-01	2.81E-01	2.58E-01	7.21E+00	1.20E-02	9.04E-01	6.74E-02	7.80E-01	6.12E-02	9.78E-01	5.50E-02	6.41E-02	4.94E-01	5.57E-01	6.76E-01	1.02E+00	1.34E+00	1.35E+00	9.16E-02	9.36E-02	8.61E-02	2.40E+00	4.00E-03	3.01E-01
Potassium	7440-09-7	2.68E-03	1.29E-02	1.44E-01	1.81E-01	1.51E-02	1.18E-02	9.13E-02	1.07E-01	1.25E-01	1.86E-01	2.47E-01	3.64E-01	1.69E-02	1.72E-02	1.58E-02	4.44E-01	7.38E-04	5.57E-01	4.15E-03	4.80E-02	3.77E-03	6.02E-02	3.38E-03	3.94E-03	3.04E-02	3.43E-02	4.16E-02	6.30E-02	8.23E-02	8.29E-02	5.63E-03	5.76E-03	5.30E-03	1.48E-01	2.46E-04	1.86E-02
Lithium	7439-93-2	1.24E-05	5.74E-05	6.63E-04	5.21E-05	8.32E-04	4.68E-05	5.45E-05	4.21E-04	4.74E-04	5.76E-04	8.71E-04	1.14E-03	1.15E-03	7.79E-05	7.96E-05	7.32E-05	2.05E-03	3.40E-06	2.56E-04	1.91E-05	2.21E-04	1.74E-05	2.77E-04	1.56E-05	1.82E-05	1.40E-04	1.58E-04	1.92E-04	2.90E-04	3.79E-04	3.82E-04	2.60E-05	2.65E-05	2.44E-05	6.82E-04	1.13E-06	8.55E-05
Magnesium	7439-95-4	7.02E-02	3.26E-01	3.77E+00	2.96E-01	4.73E+00	2.66E-01	3.10E-01	2.39E+00	2.70E+00	3.27E+00	4.95E+00	6.47E+00	6.52E+00	4.43E-01	4.53E-01	4.17E-01	1.16E+01	1.93E-02	1.46E+00	1.09E-01	1.26E+00	9.87E-02	1.58E+00	8.86E-02	1.03E-01	7.97E-01	8.99E-01	1.09E+00	1.65E+00	2.16E+00	2.17E+00	1.48E-01	1.51E-01	1.39E-01	3.88E+00	6.45E-03	4.86E-01
Manganese	7439-96-5	9.47E-04	4.40E-03	5.08E-02	3.99E-03	6.38E-02	3.58E-03	4.18E-03	3.23E-02	3.63E-02	4.41E-02	6.68E-02	8.73E-02	8.79E-02	5.97E-03	6.10E-03	5.61E-03	1.57E-01	2.61E-04	1.97E-02	1.47E-03	1.69E-02	1.33E-03	2.12E-02	1.20E-03	1.39E-03	1.09E-02	1.21E-02	1.48E-02	2.23E-02	2.91E-02	2.93E-02	1.99E-03	2.03E-03	1.87E-03	5.23E-02	8.69E-05	6.55E-03
Molybdenum	7439-98-7	5.30E-07	2.46E-06	2.85E-05	2.24E-06	3.57E-05	2.01E-06	2.34E-06	1.81E-05	2.04E-05	2.47E-05	3.74E-05	4.89E-05	4.92E-05	3.34E-06	3.42E-06	3.15E-06	8.79E-05	1.46E-07	1.10E-05	8.22E-07	9.50E-06	7.46E-07	1.19E-05	6.69E-07	7.80E-07	6.02E-06	6.79E-06	8.24E-06	1.25E-05	1.63E-05	1.64E-05	1.12E-06	1.14E-06	1.05E-06	2.93E-05	4.87E-08	3.67E-06
Silicon	7440-21-3	2.58E-03	1.23E-02	2.70E-01	2.10E-02	3.30E-01	1.90E-02	2.21E-02	2.34E-01	1.54E-02	2.34E-01	1.56E-02	4.62E-01	4.66E-01	3.17E-02	3.24E-02	2.69E-02	8.32E-01	1.38E-03	1.04E-01	7.78E-03	8.99E-02	7.06E-03	1.13E-01	6.34E-03	7.39E-03	5.17E-02	6.43E-02	7.86E-02	1.18E-01	1.54E-01	1.55E-01	1.06E-02	1.08E-02	9.93E-03	2.77E-01	4.61E-04	3.48E-02
Sodium	7440-23-5	8.00E-03	3.72E-02	4.30E-01	3.37E-02	5.39E-01	3.03E-02	3.53E-02	2.72E-01	3.07E-01	3.73E-01	5.64E-01	7.37E-01	7.42E-01	5.05E-02	5.16E-02	4.74E-02	1.33E+00	2.20E-03	1.66E-01	1.24E-02	1.43E-01	1.12E-02	1.80E-01	1.01E-02	1.18E-02	9.08E-02	1.02E-01	1.24E-01	1.88E-01	2.46E-01	2.47E-01	1.68E-02	1.72E-02	1.58E-02	4.42E-01	7.34E-04	5.54E-02
Nickel	7440-02-0	2.14E-04	9.96E-04	1.15E-02	9.04E-04	1.44E-02	8.12E-04	9.46E-04	7.30E-03	8.23E-03	9.99E-03	1.51E-02	1.97E-02	1.99E-02	1.35E-03	1.38E-03	1.27E-03	3.55E-02	5.90E-05	4.45E-03	3.32E-04	3.84E-03	3.01E-04	4.81E-03	2.71E-04	3.15E-04	2.43E-03	2.74E-03	3.33E-03	5.04E-03	6.58E-03	6.63E-03	4.51E-04	4.61E-04	4.24E-04	1.18E-02	1.97E-05	1.48E-03
Lead	7439-92-1	4.56E-07	2.12E-06	2.45E-05	1.92E-06	3.07E-05	1.72E-06	2.01E-06	1.56E-05	1.75E-05	2.12E-05	3.21E-05	4.20E-05	4.23E-05	2.87E-06	2.94E-06	2.70E-06	7.55E-05	1.26E-07	9.46E-06	7.05E-07	8.15E-06	6.40E-07	1.02E-05	5.75E-07	6.70E-07	5.17E-06	5.83E-06	7.07E-06	1.07E-05	1.40E-05	1.41E-05	9.58E-07	9.79E-07	9.00E-07	2.52E-05	4.18E-08	3.15E-06
Antimony	7440-36-0	4.18E-07	1.94E-06	2.25E-05	1.76E-06	2.82E-05	1.58E-06	1.85E-06	1.42E-05	1.61E-05	1.95E-05	2.95E-05	3.85E-05	3.88E-05	2.64E-06	2.70E-06	2.48E-06	6.93E-05	1.15E-07	8.69E-06	6.48E-07	7.49E-06	5.88E-07	9.40E-06	5.28E-07	6.15E-07	4.75E-06	5.35E-06	6.50E-06	9.83E-06	1.28E-05	1.29E-05	8.79E-07	8.99E-07	8.27E-07	2.31E-05	3.84E-08	2.90E-06
Selenium	7782-49-2	2.87E-07	1.33E-06	1.54E-05	1.21E-06	1.94E-05	1.09E-06	1.27E-06	9.78E-06	1.10E-05	1.34E-05	2.03E-05	2.65E-05	2.67E-05	1.81E-06	1.85E-06	1.70E-06	4.76E-05	7.91E-08	5.96E-06	4.45E-07	5.14E-06	4.04E-07	6.45E-06	3.62E-07	4.22E-07	3.26E-06	3.68E-06	4.46E-06	6.75E-06	8.82E-06	8.88E-06	6.04E-07	6.17E-07	5.68E-07	1.59E-05	2.64E-08	1.99E-06
Tin	7440-31-5	3.13E-06	1.45E-05	1.68E-04	1.32E-05	2.11E-04	1.19E-05	1.38E-05	1.07E-04	1.20E-04	1.46E-04	2.21E-04	2.88E-04	2.91E-04	1.97E-05	2.02E-05	1.86E-05	5.19E-04	8.63E-07	6.51E-05	4.86E-06	5.61E-05	4.42E-06	7.04E-05	3.95E-06	4.61E-06	3.56E-05	4.01E-05	4.87E-05	7.36E-05	9.61E-05	9.68E-05	6.59E-06	6.73E-06	6.19E-06	1.73E-04	2.87E-07	2.17E-05
Strontium	7440-24-6	1.28E-04	5.95E-04	6.88E-03	5.40E-04	8.63E-03	4.85E-04	5.65E-04	4.36E-03	4.92E-03	5.97E-03	9.03E-03	1.18E-02	1.19E-02	8.08E-04	8.26E-04	7.60E-04	2.12E-02	3.53E-05	2.66E-03	1.98E-04	2.29E-03	1.80E-04	2.88E-03	1.62E-04	1.88E-04	1.45E-03	1.64E-03	1.99E-03	3.01E-03	3.93E-03	3.96E-03	2.69E-04	2.75E-04	2.53E-04	7.07E-03	1.18E-05	8.87E-04
Titanium	7440-32-6	1.17E-03	5.42E-03	6.28E-02	4.92E-03	7.88E-02	4.41E-03	5.14E-03	3.97E-02	4.48E-02	5.43E-02	8.22E-02	1.07E-01	1.08E-01	7.35E-03	7.52E-03	6.97E-03	1.93E-01	3.21E-03	2.42E-02	1.80E-03	2.08E-02	1.64E-03	2.62E-02	1.47E-03	1.71E-03	1.32E-02	1.49E-02	1.81E-02	2.74E-02	3.58E-02	3.61E-02	2.45E-03	2.50E-03	2.30E-03	6.44E-02	1.07E-04	8.07E-03
Thallium	7440-28-0	2.46E-08	1.14E-07	1.32E-06	1.04E-07	1.66E-06	9.33E-08	1.09E-07	8.39E-07	9.46E-07	1.15E-06	1.74E-06	2.27E-06	2.29E-06	1.55E-07	1.59E-07	1.46E-07	4.08E-06	6.78E-09	5.12E-07	3.82E-08	4.41E-07	3.46E-08	5.53E-07	3.11E-08	3.62E-08	2.80E-07	3.15E-07	3.83E-07	5.79E-07	7.56E-07	7.62E-07	5.18E-08	5.29E-08	4.87E-08	1.36E-06	2.26E-09	1.71E-07
Uranium	7440-61-1	3.56E-08	1.67E-07	1.93E-06	1.51E-07	2.42E-06	1.36E-07	1.59E-07	1.22E-06	1.38E-06	1.67E-06	2.53E-06	3.31E-06	3.33E-06	2.27E-07	2.32E-07	2.13E-07	5.95E-06	9.89E-09	7.46E-07	5.56E-08	6.43E-07	5.05E-08	8.07E-07	4.53E-08	5.28E-08	4.08E-07	4.60E-07	5.58E-07	8.45E-07	1.10E-06	1.11E-06	7.55E-08	7.72E-08	7.10E-08	1.98E-06	3.30E-09	2.49E-07
Vanadium	7440-62-2	1.14E-03	5.29E-03	6.12E-02	4.80E-03	7.68E-02	4.31E-03	5.03E-03	3.87E-02	4.37E-02	5.31E-02	8.04E-02	1.05E-01	1.06E-01	7.19E-03	7.35E-03	6.81E-03	1.89E-01	3.14E-03	2.37E-02	1.76E-03	2.04E-02	1.60E-03	2.56E-02	1.44E-03	1.68E-03	1.29E-02	1.46E-02	1.77E-02	2.68E-02	3.50E-02	3.53E-02	2.40E-03	2.45E-03	2.25E-03	6.29E-02	1.05E-04	7.89E-03
Tungsten	7440-33-7	1.21E-07	5.63E-07	6.50E-06	5.11E-07	8.16E-06	4.59E-07	5.34E-07	4.12E-06	4.65E-06	5.64E-06	8.54E-06	1.12E-05	1.12E-05	7.64E-07	7.81E-07	7.18E-07	2.01E-05	3.34E-08	2.51E-06	1.87E-07	2.17E-06	1.70E-07	2.72E-06	1.53E-07	1.78E-07	1.37E-06	1.55E-06	1.88E-06	2.85E-06	3.72E-06	3.75E-06	2.55E-07	2.60E-07	2.39E-07	6.69E-06	1.11E-08	8.38E-07
Yttrium	7440-65-5	4.48E-06	2.08E-05	2.40E-04	1.89E-05	3.02E-04	1.70E-05	1.98E-05	1.53E-04	1.72E-04	2.09E-04	3.17E-04	4.14E-04	4.17E-04	2.83E-05	2.90E-05	2.66E-05	7.44E-04	1.24E-06	9.33E-05	6.96E-06	8.04E-05	6.31E-06	1.01E-04	5.67E-06	6.61E-06	5.10E-05	5.75E-05	6.98E-05	1.06E-04	1.38E-04	1.39E-04	9.45E-06	9.66E-06	8.88E-06	2.48E-04	4.12E-07	3.11E-05
Zinc	7440-66-6	3.38E-05	1.57E-04	1.82E-03	1.43E-04	2.28E-03	1.28E-04	1.49E-04	1.15E-03	1.30E-03	1.58E-03	2.39E-03	3.12E-03	3.14E-03	2.13E-04	2.18E-04	2.01E-04	5.60E-03	9.32E-06	7.02E-04	5.24E-05	6.06E-04	4.75E-05	7.60E-04	4.27E-05	4.98E-05	3.84E-04	4.33E-04	5.25E-04	7.99E-04	1.04E-03	1.05E-03	7.11E-05	7.27E-05	6.69E-05	1.87E-03	3.11E-06	2.34E-04
Thorium	7440-29-1	6.80E-07	3.16E-06	3.65E-05	2.87E-06	4.58E-05	2.57E-06	3.00E-06	2.32E-05	2.61E-05	3.17E-05	4.80E-05	6.26E-05	6.31E-05	4.29E-06	4.38E-06	4.03E-06	1.13E-04	1.87E-07	1.41E-05	1.05E-06	1.22E-05	9.56E-07	1.53E-05	8.58E-07	1.00E-06	7.72E-06	8.70E-06	1.06E-05	1.60E-05	2.09E-05	2.10E-05	1.43E-06	1.46E-06	1.34E-06	3.76E-05	6.24E-08	4.71E-06
Quartz (in PM10)	14808-60-7	1.13E-03	1.78E-03	2.06E-02	1.62E-03	2.59E-02	1.45E-03	1.47E-02	1.76E-02	1.97E-02	2.40E-02	3.63E-02	4.74E-02	4.78E-02	3.24E-03	3.32E-03	3.05E-03	8.53E-02	1.42E-04	1.07E-02	7.97E-04	9.22E-03	7.23E-04	1.16E-02	6.50E-04	7.57E-04	5.84E-03	6.59E-03	7.99E-03	1.21E-02	1.58E-02	1.59E-02	1.08E-03	1.11E-03	1.02E-03	2.84E-02	4.72E-05	3.56E-03
Pyrite	12068-85-8	0.00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biotite	1302-27-8	4.66E-07	2.26E-06	2.62E-01	2.06E-02	3.29E-01	1.85E-02	2.15E-02	1.67E-01	2.27E-01	3.44E-01	4.80E-01	3.07E-02	3.14E-02	2.06E-02	8.06E-01	1.34E-03	1.01E-02	2.24E-04	1.52E-02	1.09E-06	8.73E-06	6.85E-03	1.10E-02	6.15E-03	7.17E-03	5.53E-02	6.24E-03	7.57E-03	1.16E-02	1.50E-02	1.51E-02	1.02E-02	1.05E-02	9.64E-03	2.69E-01	4.48E-04	3.37E-02
Magnetite	1309-38-2	3.43E-08	1.59E-07	1.84E-06	1.44E-07	2.31E-06	1.30E-07	1.51E-07	1.17E-06	1.32E-06	1.61E-06	2.42E-06	3.16E-06	3.18E-06	2.16E-07	2.21E-07	2.03E-07	5.67E-06	9.43E-09	7.11E-07	5.30E-08	6.13E-07	4.81E-08	7.69E-07	4.32E-08	5.04E-08	3.89E-07	4.38E-07	5.32E-07	8.05E-07	1.06E-06	1.07E-06	7.20E-08	7.36E-08	6.77E-08	1.89E-06	3.14E-09	2.37E-07
Hematite	1317-60-8	0.00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorite	1318-59-8	1.12E-01	5.20E-01	6.01E+00	4.72E-01	7.55E+00	4.24E-01	4.94E-01	3.81E+00	4.30E+00	5.22E+00	7.90E+00	1.02E+01	1.04E+01	7.06E-01	7.22E-01	6.64E-01	1.85E+01	3.09E-02	2.32E+00	1.72E-01	2.00E+00	1.57E-01	2.52E+00	1.41E-01	1.65E-01	1.27E+00	1.43E+00	1.74E+00	2.63E+00	3.44E+00	3.46E+00	2.35E-01	2.41E-01	2.21E-01	6.19E+00	1.03E-02	7.75E-01
Muscovite	1318-94-1	1.62E-02	7.53E-02	8.70E-01	6.83E-02	1.09E+00	6.13E-02	7.15E-02	5.52E-01	6.22E-01	7.55E-01	1.14E+00	1.49E+00	1.50E+00	1.02E-01	1.04E-01	9.61E-02	2.68E+00	4.46E-03	3.36E-01

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Source Parameters Used in AERMOD

Year -1 Construction

Open Pit Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	X Side Length (m)	Y Side Length (m)	Open Pit Volume (m3)	Angle from North (deg)	Pit Effective Depth (m)	Description	Comments
MZ	473526.09	5408185.1		6.1	384,400	620	620	4,690,169	0	12.2	main zone open pit year -1	includes tailpipe emissions. release height set to half of pit depth. volume and depth are based on CNC data.
MZ_BLAST	473526.09	5408185.1		6.1	384,400	620	620	4,690,169	0	12.2	blasting emissions from main zone open pit year -1	blasting emissions only
MZ_HAUL	473526.09	5408185.1		6.1	384,400	620	620	4,690,169	0	12.2	haul road dust emissions from main zone open pit year -1	haul road dust emissions only
EZ1	474788.34	5409651.99		21.1	643,204	802	802	27,133,567	0	42.2	east zone 2 open pit year -1	includes tailpipe emissions. release height set to half of pit depth. volume and depth are based on CNC data.
EZ1_BLAST	474788.34	5409651.99		21.1	643,204	802	802	27,133,567	0	42.2	blasting emissions from east zone 1 open pit year -1	blasting emissions only
EZ1_HAUL	474788.34	5409651.99		21.1	643,204	802	802	27,133,567	0	42.2	haul road dust emissions from east zone 1 open pit year -1	haul road dust emissions only

Area Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	X Side Length (m)	Y Side Length (m)	Angle from North (deg)	Initial Vertical Dimension (m)	Description	Comments
WR1	473142.57	5411394.3		9.0	54,961	234	234	0	2.1	waste rock impoundment unloading dust emissions	
WR2	473142.57	5411394.3		9.0	54,961	234	234	0	2.1	waste rock impoundment mucking/grading/mobile emissions	
WR3	473142.57	5411394.3		5.0	54,961	234	234	0	0	waste rock impoundment wind erosion	
LGE1	475215.34	5407692.61		9.0	593,871	771	771	0	2.1	low grade ore east unloading dust emissions	
LGE2	475215.34	5407692.61		9.0	593,871	771	771	0	2.1	low grade ore east mucking/grading/mobile emissions	
LGE3	475215.34	5407692.61		5.0	593,871	771	771	0	0	low grade ore east wind erosion	
ST1	474006.55	5411073.08		6.5	2,273,920	400	5,685	0	1.5	sand and till impoundment unloading dust emissions	
ST2	474006.55	5411073.08		6.5	2,273,920	400	5,685	0	1.5	sand and till impoundment mucking/grading/mobile emissions	
ST3	474006.55	5411073.08		2.5	2,273,920	400	5,685	0	0	sand and till impoundment wind erosion	
LGW2	470618.96	5408607.82		2.1	490,000	700	700	0	0.5	low grade ore west mucking/grading/mobile emissions	assumed similar area as LGE and assumed release height as half truck height
WMEX1	476566.58	5410390.64		2.1	17,400	435	40	82.4	0.5	water management excavation truck loading dust emissions	advised by surface water team that excavation is likely to occur in pond3
WMEX2	476566.58	5410390.64		2.1	17,400	435	40	82.4	0.5	water management excavation mobile emissions	advised by surface water team that excavation is likely to occur in pond3
TMFEX1	472317.6	5405631.85		2.1	6,160,000	4,400	1,400	0	0.5	tailings management facility excavation truck loading dust emissions	assumed model area - exact locations in year -1 unknown
TMF1	472317.6	5405631.85		4.0	6,160,000	4,400	1,400	0	0.9	tailings management truck unloading dust emissions	assumed model area - exact locations in year -1 unknown
TMF2	472317.6	5405631.85		2.1	6,160,000	4,400	1,400	0	0.5	tailings management excavation mobile emissions	assumed model area - exact locations in year -1 unknown
RDSC1B	474078.51	5407380.38		3	900	30	30	0	0.7	roadstone finished product loading onto stockpiles	
RDSC1C	474078.51	5407380.38		3.7	900	30	30	0	0.9	roadstone finished product loading into truck3	
RDSC4	474078.51	5407380.38		3	900	30	30	0	0.0	roadstone crushed material stockpile wind erosion	X and Y lengths based on RDSC4 wind erosion area

Area Poly Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	Initial Vertical Dimension (m)	No. of Vertices (or sides)	Description	Comments
CL1	474443.95	5411088.16		9.0	7,100,555	2.1	8	clay impoundment unloading dust emissions	
CL2	474443.95	5411088.16		9.0	7,100,555	2.1	8	clay impoundment mucking/grading/mobile emissions	
CL3	474443.95	5411088.16		5	7,100,555	0	8	clay impoundment wind erosion	
PLANT_CONS	470434.17	5407396.78		2.1	148,899	0.5	6	mobile emissions from construction equipment	drawn based on procesing plant area, release height assumed

Point Sources

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Emission Rate [g/s]	Gas Exit Temperature [K]	Gas Exit Velocity [m/s]	Inside Diameter [m]	Description	Comments

No point sources for year -1.

Volume Sources

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Emission Rate [g/s]	Side Length [m]	Building Height or Vertical Dimension [m]	Initial Lateral Dimension [m]	Initial Vertical Dimension [m]	Description	Comments
RDSC1A	474404.27	5407395.12		2.1		3.8	4.2	0.88	1.0	truck unloading rock to roadstone crusher	
RDSC2	474359.98	5407395.64		15.0		17.3	30.0	4.02	14.0	primary crushing at roadstone crusher	dimensions assume same building configuration as main plant crushing buildings
RDSC3	474132.21	5407397.04		19.5		34.0	39.0	7.91	18.1	secondary crushing/screening at roadstone crusher	dimensions assume same building configuration as main plant crushing buildings

Line Volume Sources - Separated 2W configuration

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Road Width [m]	Side Length [m]	Vehicle Height [m]	Plume Height (PH) [m]	Plume Width (PW) [m]	Total Length [m]	Description	Comments
ACCESSAB	469623.87	5406980.5		1.96	15	21	2.3	3.91	21	5,471	access road	weighted average vehicle height of cars/trucks/buses in year -1
HAUL1AB	474524.28	5407450.5		3.57	35	41	4.2	7.14	41	414	R1 to pit ring road	weighted average vehicle height of haul truck fleet in year -1
HAUL2A	474513.34	5407446.53		3.57	35	41	4.2	7.14	41	12,828	Haul1 around TMF perimter - 1 way road	
HAUL3A	474119.66	5408180.21		3.57	35	41	4.2	7.14	41	675	MZ entrance to pit ring road	
HAUL4AB	474477.56	5407858.11		3.57	35	41	4.2	7.14	41	680	MZ1 to LG east entrance	
HAUL5A	474942.82	5408377.05		3.57	35	41	4.2	7.14	41	2,741	LG east to EZ1 entrance	
HAUL6A	474263.35	5410659.83		3.57	35	41	4.2	7.14	41	163	EZ1 entrance to pit ring road intersection	
HAUL7A	474243.25	5410831.01		3.57	35	41	4.2	7.14	41	2,559	pit ring road to sand and till south end	
HAUL8A	474232.5	5410863.98		3.57	35	41	4.2	7.14	41	9,130	pit ring road to clay impoundment south end	
HAUL9A	474263.58	5410587.48		3.57	35	41	4.2	7.14	41	550	EZ1 entrance to HAUL6A	
HAUL16A	474946.08	5408316.05		3.57	35	41	4.2	7.14	41	1,192	ring road to LG east stockpile	
HAUL21A	474231.11	5410822.29		3.57	35	41	4.2	7.14	41	1,440	ring road into waste rock dump WRD1	
RAIL1	470508.31	5408552.63		4.17	3	9	4.9	8.33	9	3,733	locomotive emissions from train idling at CNC	dimensions from locomotive operators manual, locomotive emissions within CNC property boundary
RAIL2	470146.51	5404941.45		4.17	3	9	4.9	8.33	9	13,257	locomotive emissions from new CNC rail spur	locomotive emissions within CNC property boundary

Source Groups

Roads (12)	Rail (2)	Pit (4)	Roadston (6)	LGE (3)	LGW (1)	ST (3)	TMF (3)	WME (2)	WR (3)	Plant (1)	CL (3)	Blasting (2)	BMPP (26)
ACCESSAB	RAIL1	MZ	RDSC1A	LGE1	LGW2	ST1	TMFEX1	WMEX1	WR1	PLANT_CONS	CL1	MZ_BLAST	RAIL1
HAUL1AB	RAIL2	EZ1	RDSC2	LGE2		ST2	TMF1	WMEX2	WR2		CL2	EZ1_BLAST	RAIL2
HAUL2A		MZ_HAUL	RDSC3	LGE3		ST3	TMF2		WR3		CL3		MZ
HAUL3A		EZ1_HAUL	RDSC1B										EZ1
HAUL4AB			RDSC1C										RDSC1A
HAUL5A			RDSC4										RDSC2
HAUL6A													RDSC3
HAUL7A													RDSC1B
HAUL8A													RDSC1C
HAUL9A													LGE1
HAUL16A													LGE2
HAUL21A													LGW2
													ST1
													ST2
													TMFEX1
													TMF1
													TMF2
													WMEX1
													WMEX2
													WR1
													WR2
													PLANT_CONS
													CL1
													CL2
													MZ_BLAST
													EZ1_BLAST

Variable Emissions

By Month - haul roads - summer emission rates are used in model

ACCESSAB
HAUL1AB
HAUL2A
HAUL3A
HAUL4AB
HAUL5A
HAUL6A
HAUL7A
HAUL8A
HAUL9A
HAUL16A
HAUL21A
MZ_HAUL
EZ_HAUL

Month	Factor for Modelling	
Jan	0.34	winter
Feb	0.34	winter
Mar	0.34	winter
Apr	0.34	winter
May	1	summer
Jun	1	summer
Jul	1	summer
Aug	1	summer
Sep	1	summer
Oct	1	summer
Nov	0.34	winter
Dec	0.34	winter

By Wind Speed - material drops

CL1
LGE1
RDSC1A
RDSC1B
RDSC1C
ST1
TMFEX1
WMEX1
WR1
TMF1

Wind Speed (m/s)	Wind Speed Dependent Factor for Dispersion Modelling
1.54	0.37
3.09	0.92
5.14	1.79
8.23	3.29
10.80	4.69
12.40	5.61

By Wind Speed - wind erosion

LGE3
RDSC4
ST3
WR3

By Wind Speed - CL wind erosion

CL3

Wind Speed (m/s)	Wind Speed Dependent Factor for Dispersion Modelling		Wind Speed Dependent Factor for Dispersion Modelling	
1.54	0	no wind erosion	0	no wind erosion
3.09	0	no wind erosion	0	no wind erosion
5.14	0	no wind erosion	0	no wind erosion
8.23	0	no wind erosion	0	no wind erosion
10.80	0	no wind erosion	0.11	wind erosion
12.40	1	wind erosion	1	wind erosion

By Hour of Day - blasting

MZ_BLAST
EZ1_BLAST

Ending of Hour	Factor	
1	0	no blasting at night
2	0	no blasting at night
3	0	no blasting at night
4	0	no blasting at night
5	0	no blasting at night
6	0	no blasting at night
7	0	no blasting at night
8	1	blasting
9	1	blasting
10	1	blasting
11	1	blasting
12	1	blasting
13	1	blasting
14	1	blasting
15	1	blasting
16	1	blasting
17	1	blasting
18	0	no blasting at night
19	0	no blasting at night
20	0	no blasting at night
21	0	no blasting at night
22	0	no blasting at night
23	0	no blasting at night
24	0	no blasting at night

Buildings

Building Name	Elevation [m]	Height [m]	Description	Comments
BLD_11		30	roadstone primary crushing phase 1	no data provided - dimensions of structure are assumed to be similar to main primary crushing plant
BLD_12		39	roadstone secondary crushing phase 1	no data provided - dimensions of structure are assumed to be similar to main secondary crushing plant

Supporting Information for Air Emission Calculations
Canada Nickel Corporation

Source Parameters Used in AERMOD

Year 7 - Operation

Open Pit Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	X Side Length (m)	Y Side Length (m)	Open Pit Volume (m3)	Angle from North (deg)	Pit Effective Depth (m)	Description	Comments
MZ	473147.15	5408120.6		174.8	1,164,900	1,100	1,059	407,664,670	0	349.7	main zone open pit year 7	includes tailpipe emissions. release height set to half of pit depth. volume and depth are based on CNC data.
MZ_BLAST	473147.15	5408120.6		174.8	1,164,900	1,100	1,059	407,664,670	0	349.7	blasting emissions from main zone open pit year 7	blasting emissions only
MZ_HAUL	473147.15	5408120.6		174.8	1,164,900	1,100	1,059	407,664,670	0	349.7	haul road dust emissions from main zone open pit year 7	haul road dust emissions only
EZ2	472989.2	5409705.09		99.8	381,300	620	615	76,376,767	0	199.7	east zone 2 open pit year 7	includes tailpipe emissions. release height set to half of pit depth. volume and depth are based on CNC data.
EZ2_BLAST	472989.2	5409705.09		99.8	381,300	620	615	76,376,767	0	199.7	blasting emissions from east zone open pit year 7	blasting emissions only
EZ2_HAUL	472989.2	5409705.09		99.8	381,300	620	615	76,376,767	0	199.7	haul road dust emissions from east zone open pit year 7	haul road dust emissions only

Area Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	X Side Length (m)	Y Side Length (m)	Angle from North (deg)	Initial Vertical Dimension (m)	Description	Comments
CL1	474909.49	5413060.83		10.4	2,444,700	843	2,900	0	2.4	clay impoundment unloading dust emissions	
CL2	474909.49	5413060.83		10.4	2,444,700	843	2,900	0	2.4	clay impoundment mucking/grading/mobile emissions	
CL3	474909.49	5413060.83		5.0	2,444,700	843	2,900	0	0.0	clay impoundment wind erosion year 7	
ST1	474022.8	5411047.32		25.4	2,454,834	406	6,041	0	5.9	sand and till impoundment unloading dust emissions	
ST2	474022.8	5411047.32		25.4	2,454,834	406	6,041	0	5.9	sand and till impoundment mucking/grading/mobile emissions	
ST3	474022.8	5411047.32		20	2,454,834	406	6,041	0	0.0	sand and till impoundment wind erosion year 7	
PLANT_OP	470508.32	5407026.92		2.1	490,000	700	700	0	0.5	mobile emissions from processing plant equipment	drawn based on procesing plant area, release height assumed
RDSC1B	474078.51	5407380.38		3	1,119	34	33.5	0	0.7	roadstone finished product loading onto stockpiles	
RDSC1C	474078.51	5407380.38		3.7	1,119	34	33.5	0	0.9	roadstone finished product loading into truck3	
RDSC4	474078.51	5407380.38		3	1,119	34	33.5	0	0.0	roadstone crushed material stockpile wind erosion	X and Y lengths based on RDSC4 wind erosion area

Area Poly Sources

Source ID	X Coord. (m)	Y Coord. (m)	Base Elevation (m)	Release Height (m)	Area [m2]	Initial Vertical Dimension (m)	No. of Vertices (or sides)	Description	Comments
WR1	473893.5	5411435.24		15.4	16,205,515	3.6	18	waste rock impoundment unloading dust emissions	
WR2	473893.5	5411435.24		15.4	16,205,515	3.6	18	waste rock impoundment mucking/grading/mobile emissions	
WR3	473893.5	5411435.24		10	16,205,515	0	18	waste rock impoundment wind erosion year 7	
LGW1	470051.18	5410216.05		10.4	3,431,160	2.4	13	low grade ore west unloading dust emissions	
LGW2	470051.18	5410216.05		10.4	3,431,160	2.4	13	low grade ore west mucking/grading/mobile emissions	
LGW3	470051.18	5410216.05		5	3,431,160	0	13	low grade ore west wind erosion	
LGE1	475315.89	5408571.98		35.4	1,838,631	8.2	9	low grade ore east unloading dust emissions	
LGE2	475315.89	5408571.98		35.4	1,838,631	8.2	9	low grade ore east mucking/grading/mobile emissions	
LGE3	475315.89	5408571.98		30	1,838,631	0	9	low grade ore east wind erosion	
TMF1	472174.16	5407138.4		25.4	22,931,640	5.9	5	tailings management facility unloading dust emissions	
TMF2	472174.16	5407138.4		25.4	22,931,640	5.9	5	tailings management facility mucking/grading/mobile emissions	
TMF3	472174.16	5407138.4		20	22,931,640	0	5	tailings management facility wind erosion	

Point Sources

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Emission Rate [g/s]	Gas Exit Temperature [K]	Gas Exit Velocity [m/s]	Inside Diameter [m]	Release Type	Description	Comments
P1DC1	474386.92	5407331.77		12		0	15.739	1.2	Vertical	primary crushing dust collector at processing plant 1	locations and release type for dust collectors are assumed
P2DC1	471338.68	5407959.95		12		0	15.739	1.2	Vertical	primary crushing dust collector at processing plant 2	
P1DC2	474041.59	5407342.35		12		0	2.476	1.2	Vertical	secondary screening/crushing dust collector at processing plant 1	
P2DC2	471201.07	5407739.06		12		0	2.476	1.2	Vertical	secondary screening/crushing dust collector at processing plant 2	
P1DC3	471107.72	5407325.61		12		0	6.101	1.2	Vertical	crushed ore dust collector at processing plant 1	
P1DC4	471232.97	5407325.61		12		0	6.101	1.2	Vertical	crushed ore dust collector at processing plant 1	
P2DC3	471001.02	5407433.84		12		0	6.101	1.2	Vertical	crushed ore dust collector at processing plant 2	
P2DC4	471125.04	5407432.07		12		0	6.101	1.2	Vertical	crushed ore dust collector at processing plant 2	

Volume Sources

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Emission Rate [g/s]	Side Length [m]	Building Height or Vertical Dimension [m]	Initial Lateral Dimension [m]	Initial Vertical Dimension [m]	Description	Comments
P1A	474404.27	5407328.02		15.0		17.3	30	4.02	13.95	truck unloading to primary crusher at processing plant 1	assumed to occur inside primary crushing building
P2A	471349.23	5407971.15		15.0		17.3	30	4.02	13.95	truck unloading to primary crusher at Processing Plant 2	assumed to occur inside primary crushing building
P1B	474404.27	5407328.02		15.0		17.3	30	4.02	13.95	primary crushing and conveying at processing plant 1	
P2B	471349.23	5407971.15		15.0		17.3	30	4.02	13.95	primary crushing and conveying at processing plant 2	
P1C	474073.17	5407328.52		19.5		34.0	39	7.91	18.14	secondary screening/crushing/conveying at processing plant 1	
P2C	471235.88	5407754.88		19.5		34.0	39	7.91	18.14	secondary screening/crushing/conveying at processing plant 2	
P1D	471171.02	5407323.38		22.0		80.0	44	18.6	20.47	crushed ore stockpiling at processing plant 1	
P2D	471062.71	5407433.42		22.0		80.0	44	18.6	20.47	crushed ore stockpiling at processing plant 2	
P1E	470739.43	5407278.45		17.5		159.2	35	36.98	16.28	plant milling at processing plant 1	
P2E	470743.38	5407554.28		17.5		159.2	35	36.98	16.28	plant milling at processing plant 2	
P1CL1	470545.75	5407280.79		6.0		88.9	12	20.7	5.58	drop to pile inside processing plant 1	
P2CL1	470544.23	5407552.75		6.0		88.9	12	20.7	5.58	drop to pile inside processing plant 2	
RDSC1A	474404.27	5407395.12		2.9		5.4	5.7	1.26	1.33	truck unloading rock to roadstone crusher	assumed to occur outside of primary crusher building
RDSC2	474359.98	5407395.64		15.0		17.3	30.0	4.02	14.0	primary crushing at roadstone crusher	dimensions assume same building configuration as main plant crushing buildings
RDSC3	474132.21	5407397.04		19.5		34.0	39.0	7.91	18.1	secondary crushing/screening at roadstone crusher	dimensions assume same building configuration as main plant crushing buildings
P1R1	470739.43	5407278.45		17.5		159.2	35	36.98	16.28	reagents at processing plant 1	emissions are divided by 2 - assumed to be split evenly at each plant
P2R1	470743.38	5407554.28		17.5		159.2	35	36.98	16.28	reagents at processing plant 2	emissions are divided by 2 - split evenly at each plant
P1CL2	470545.75	5407280.79		6.0		88.9	12	20.7	5.58	drop to railcar inside processing plant 1	emissions are divided by 2 - split evenly at each plant
P2CL2	470544.23	5407552.75		6.0		88.9	12	20.7	5.58	drop to railcar inside processing plant 2	

Line Volume Sources - Separated 2W configuration

Source ID	X Coord. [m]	Y Coord. [m]	Base Elevation [m]	Release Height [m]	Road Width [m]	Side Length [m]	Vehicle Height [m]	Plume Height (PH) [m]	Plume Width (PW) [m]	Total Length [m]	Description	Comments
ACCESSAB	469623.87	5406980.5		1.87	15	21	2.2	3.74	21	5,471	access road	weighted average vehicle height of cars/trucks/buses in year 7
HAUL1AB	474524.28	5407450.5		4.85	35	41	5.7	9.69	41	414	R1 to pit ring road	weighted average vehicle height of haul truck fleet in year 7
HAUL2B	474513.34	5407464.43		4.85	35	41	5.7	9.69	41	14,948	Haul1 to TMF perimter road	
HAUL4AB	474477.56	5407858.11		4.85	35	41	5.7	9.69	41	680	MZ1A to LG east entrance	
HAUL5B	474942.82	5408377.05		4.85	35	41	5.7	9.69	41	1,819	LG east to EZ2 entrance	
HAUL6B	474337.24	5409684.4		4.85	35	41	5.7	9.69	41	1,155	EZ2 entrance to pit ring road intersection	
HAUL7B	474243.25	5410831.01		4.85	35	41	5.7	9.69	41	3,357	pit ring road to sand and till	
HAUL8B	474232.5	5410863.98		4.85	35	41	5.7	9.69	41	9,738	pit ring road to clay impoundment - one way road	
HAUL11B	474243.63	5410827.68		4.85	35	41	5.7	9.69	41	1,904	ring road S&T to WRD	
HAUL12B	472476	5410422.6		4.85	35	41	5.7	9.69	41	679	ring road - WRD to future MZ3 entrance	
HAUL13B	472381.3	5409770.26		4.85	35	41	5.7	9.69	41	1,028	ring road - future MZ3 entrance to LG west entrance	
HAUL14B	471605.33	5409170.53		4.85	35	41	5.7	9.69	41	1,290	LG east to PC 2 entrance	
HAUL15B	472291.86	5408120.99		4.85	35	41	5.7	9.69	41	1,194	ring road - PC 2 to MZ3 entrance	
HAUL16B	474935.43	5408326.16		4.85	35	41	5.7	9.69	41	1,622	ring road to LG east stockpile	
HAUL17B	472323.43	5408105.21		4.85	35	41	5.7	9.69	41	859	ring road to PC 2	
HAUL18B	471589.54	5409186.31		4.85	35	41	5.7	9.69	41	2,141	ring road to LG west stockpile	
HAUL19B	472481.25	5410480.47		4.85	35	41	5.7	9.69	41	3,592	ring road to waste rock impoundment	
HAUL20B	474197.67	5409737.65		4.85	35	41	5.7	9.69	41	142	ring road to EZ2 entrance	
HAUL21B	473348.94	5407590.64		4.85	35	41	5.7	9.69	41	1,211	ring road - MZ3 entrance to HAUL4AB	
RAIL1	470508.31	5408552.63		4.17	3	9	4.9	8.33	9	3,733	locomotive emissions from train idling at CNC	dimensions from locomotive operators manual, locomotive emissions within CNC property boundary
RAIL2	470146.51	5404941.45		4.17	3	9	4.9	8.33	9	13,257	locomotive emissions from new CNC rail spur	locomotive emissions within CNC property boundary

Source Groups

Roads (19)	Rail (2)	Pit (4)	Roadston (6)	LGE (3)	LGW (3)	ST (3)	TMF (3)	WR (3)	Plant (25)	CL (3)	Blasting (2)	BMPP (48)
ACCESSAB	RAIL1	MZ	RDSC1B	LGE1	LGW1	ST1	TMF1	WR1	P1A	CL1	MZ_BLAST	RAIL1
HAUL1AB	RAIL2	EZ2	RDSC1C	LGE2	LGW2	ST2	TMF2	WR2	P2A	CL2	EZ2_BLAST	RAIL2
HAUL2B		MZ_HAUL	RDSC4	LGE3	LGW3	ST3	TMF3	WR3	P1B	CL3		MZ
HAUL4AB		EZ2_HAUL	RDSC1A						P2B			EZ2
HAUL5B			RDSC2						P1C			RDSC1B
HAUL6B			RDSC3						P2C			RDSC1C
HAUL7B									P1D			RDSC1A
HAUL8B									P2D			RDSC2
HAUL11B									P1E			RDSC3
HAUL12B									P2E			LGE1
HAUL13B									P1CL1			LGE2
HAUL14B									P2CL1			LGW1
HAUL15B									P1R1			LGW2
HAUL16B									P2R1			ST1
HAUL17B									P1CL2			ST2
HAUL18B									P2CL2			TMF1
HAUL19B									P1DC1			TMF2
HAUL20B									P2DC1			WR1
HAUL21B									P1DC2			WR2
									P2DC2			P1A
									P1DC3			P2A
									P1DC4			P1B
									P2DC3			P2B
									P2DC4			P1C
									PLANT_OP			P2C
												P1D
												P2D
												P1E
												P2E
												P1CL1
												P2CL1
												P1R1
												P2R1
												P1CL2
												P2CL2
												P1DC1
												P2DC1
												P1DC2
												P2DC2
												P1DC3
												P1DC4
												P2DC3
												P2DC4
												PLANT_OP
												CL1
												CL2
												MZ_BLAST
												EZ2_BLAST

Variable Emissions

By Month - Haul Roads (21) — BY MONTH ONLY USED FOR PARTICULATES!!! NOT USED FOR GASES!!

ACCESSAB
HAUL1AB
HAUL2B
HAUL4AB
HAUL5B
HAUL6B
HAUL7B
HAUL8B
HAUL11B
HAUL12B
HAUL13B
HAUL14B
HAUL15B
HAUL16B
HAUL17B
HAUL18B
HAUL19B
HAUL20B
HAUL21B
EZ2_HAUL
MZ_HAUL

Month	Factor for Modelling	
Jan	0.34	winter
Feb	0.34	winter
Mar	0.34	winter
Apr	0.34	winter
May	1	summer
Jun	1	summer
Jul	1	summer
Aug	1	summer
Sep	1	summer
Oct	1	summer
Nov	0.34	winter
Dec	0.34	winter

By Hour of Day - Blasting (2)

MZ_BLAST
EZ2_BLAST

Ending of Hour	Factor	
1	0	no blasting at night
2	0	no blasting at night
3	0	no blasting at night
4	0	no blasting at night
5	0	no blasting at night
6	0	no blasting at night
7	0	no blasting at night
8	1	blasting
9	1	blasting
10	1	blasting
11	1	blasting
12	1	blasting
13	1	blasting
14	1	blasting
15	1	blasting
16	1	blasting
17	1	blasting
18	0	no blasting at night
19	0	no blasting at night
20	0	no blasting at night
21	0	no blasting at night
22	0	no blasting at night
23	0	no blasting at night
24	0	no blasting at night

By Wind Speed - Material Drops (9) — Drops that are assumed to occur indoors are not included in this variable emissions category

CL1
ST1
RDSC1B
RDSC1C
WR1
LGW1
LGE1
TMF1
RDSC1A

Wind Speed (m/s)	Wind Speed Dependent Factor for Dispersion Modelling
1.54	0.37
3.09	0.92
5.14	1.79
8.23	3.29
10.80	4.69
12.40	5.61

By Wind Speed - Wind Erosion (6)

ST3
RDSC4
WR3
LGW3
LGE3
TMF3

By Wind Speed - CL Wind Erosion (1)

CL3

Wind Speed (m/s)	Wind Speed Dependent Factor for Dispersion Modelling		Wind Speed Dependent Factor for Dispersion Modelling	
1.54	0	no wind erosion	0	no wind erosion
3.09	0	no wind erosion	0	no wind erosion
5.14	0	no wind erosion	0	no wind erosion
8.23	0	no wind erosion	0	no wind erosion
10.80	0	no wind erosion	0.11	wind erosion
12.40	1	wind erosion	1	wind erosion

Buildings

Building Name	Elevation [m]	Height [m]	Description	
BLD_1		30	primary crushing phase 1	
BLD_2		30	primary crushing phase 2	
BLD_3		39	secondary crushing phase 1	
BLD_4		39	secondary crushing phase 2	
BLD_5		44	crushed ore stockpile cover phase 1	
BLD_6		44	crushed ore stockpile cover phase 2	
BLD_7		35	process plant building phase 1	
BLD_8		35	process plant building phase 2	
BLD_9		12	concentrate loadout building phase 1	
BLD_10		12	concentrate loadout building phase 2	
BLD_11		30	roadstone primary crushing phase 1	no data provided - dimensions of structure are assumed to be similar to main primary crushing plant
BLD_12		39	roadstone secondary crushing phase 1	no data provided - dimensions of structure are assumed to be similar to main secondary crushing plant

Appendix D Predicted Concentrations at Special Receptors

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone Refined Method - with Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Maximum of Modelled Mine Boundary Receptors	1.0
Max % of Criteria	N/A

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative Refined Method - with Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	n/a
Background Concentration	0.2
Maximum of Modelled Mine Boundary Receptors	1.2
Max % of Criteria	N/A

Year -1 - Construction, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Refined Method - with Plume Depletion

COPC	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BIOTITE	BISMUTH	BORON	CADMIUM	CALCIUM	CHLORITE	CHROMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	COBALT	COPPER	ELEMENTAL CARBON (FROM DIESEL EXHAUST)	FLUORIDE	HEMATITE	IRON	LEAD	LITHIUM	MAGNESIUM	MAGNETITE	MANGANESE	MANGANESE (IN PM10)	MANGANESE (IN PM2.5)	MERCURY	MOLYBDENUM	MUSCOVITE	NICKEL	NICKEL (IN PM10)	PM	PM10	PM2.5	POTASSIUM	PYRITE	QUARTZ (IN PM10)	SELENIUM	SILICON	SILVER	SODIUM	STRONTIUM	TALC (FIBROUS)	THALLIUM	THORIUM	TIN	TITANIUM	TUNGSTEN	URANIUM	URANIUM (IN PM10)	VANADIUM	YTTRIUM	ZINC
Criteria	12	25	0.3	10	1.0E-02	n/a	2.5	120	2.5E-02	n/a	120	0.5	7.0E-04	3.5E-04	0.1	50	15	n/a	25	n/a	0.5	20	72	25	0.4	0.2	0.4	2	120	1.5	0.2	0.1	120	50	27	10	n/a	5	10	27	1	n/a	120	2	0.5	n/a	10	120	5	0.3	0.15	2	5	120
Maximum of Modelled Mine Boundary Receptors	6.7	3.9E-05	2.4E-04	1.1E-02	1.4E-05	0.5	5.5E-06	8.7E-04	5.3E-06	8.1	10	4.9E-02	6.6E-08	2.4E-08	4.2E-03	9.3E-03	0.1	1.8E-05	1.9E-02	4.1	1.2E-04	1.2E-03	6.5	0.5	8.8E-02	2.7E-02	2.8E-03	7.9E-10	5.1E-05	2.0	2.1E-02	6.8E-03	93	28	3.2	0.3	1.7E-05	1.0	2.7E-05	0.5	2.3E-05	0.8	1.2E-02	8.4E-02	3.9E-06	7.3E-05	3.0E-04	0.1	1.5E-05	1.3E-05	4.5E-06	1.0E-02	4.8E-04	3.5E-03
Max % of Criteria	56%	0%	0%	0%	0%	N/A	0%	0%	0%	N/A	8%	10%	0%	0%	4%	0%	1%	N/A	0%	N/A	0%	0%	9%	2%	22%	13%	1%	0%	0%	134%	11%	7%	78%	57%	12%	3%	N/A	20%	0%	2%	0%	N/A	0%	4%	0%	N/A	0%	0%	0%	0%	0%	0%	1%	0%	0%

Year -1 - Construction, Maximum 24-Hour Average Concentrations (µg/m³) - Cumulative Refined Method - with Plume Depletion

COPC	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	BIOTITE	BISMUTH	BORON	CADMIUM	CALCIUM	CHLORITE	CHROMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	COBALT	COPPER	ELEMENTAL CARBON (FROM DIESEL EXHAUST)	FLUORIDE	HEMATITE	IRON	LEAD	LITHIUM	MAGNESIUM	MAGNETITE	MANGANESE	MANGANESE (IN PM10)	MANGANESE (IN PM2.5)	MERCURY	MOLYBDENUM	MUSCOVITE	NICKEL	NICKEL (IN PM10)	PM	PM10	PM2.5	POTASSIUM	PYRITE	QUARTZ (IN PM10)	SELENIUM	SILICON	SILVER	SODIUM	STRONTIUM	TALC (FIBROUS)	THALLIUM	THORIUM	TIN	TITANIUM	TUNGSTEN	URANIUM	URANIUM (IN PM10)	VANADIUM	YTTRIUM	ZINC
Criteria	12	25	0.3	10	1.0E-02	n/a	2.5	120	0.025	n/a	120	0.5	7.0E-04	3.5E-04	0.1	50	15	n/a	25	n/a	0.5	20	72	25	0.4	0.2	0.4	2	120	1.5	0.2	0.1	120	50	27	10	n/a	5	10	27	1	n/a	120	2	0.5	n/a	10	120	5	0.3	0.15	2	5	120
Background Concentration	0.4	1.3E-03	1.3E-03	8.6E-03	7.6E-04	0	1.3E-03	2.6E-02	2.6E-04	0.7	ND	6.0E-03	-	-	7.6E-04	5.8E-03	9.4E-02	0.0E+00	ND	0.2	3.4E-03	-	0.2	ND	8.6E-03	8.6E-03	8.6E-03	6.4E-05	7.6E-04	ND	2.6E-03	2.6E-03	26	13	12	0.1	-	1.0	2.6E-03	-	2.6E-04	0.5	1.5E-03	ND	2.6E-04	0.0E+00	2.4E-03	8.8E-03	-	2.6E-04	2.6E-04	7.6E-04	-	1.5E-02
Maximum of Modelled Mine Boundary Receptors	7.1	1.3E-03	1.5E-03	1.9E-02	7.7E-04	0.5	1.3E-03	2.7E-02	2.7E-04	8.8	10	5.5E-02	6.6E-08	2.4E-08	5.0E-03	1.5E-02	0.2	1.8E-05	1.9E-02	4.4	3.5E-03	1.2E-03	6.6	0.5	9.6E-02	3.5E-02	1.1E-02	6.4E-05	8.1E-04	2.0	2.4E-02	9.4E-03	120	42	16	0.5	1.7E-05	2.0	2.6E-03	0.5	2.8E-04	1.4	1.4E-02	8.4E-02	2.6E-04	7.3E-05	2.7E-03	0.1	1.5E-05	2.7E-04	2.6E-04	1.1E-02	4.8E-04	1.8E-02
Max % of Criteria	60%	0%	0%	0%	8%	N/A	0%	0%	1%	N/A	8%	11%	0%	0%	5%	0%	1%	N/A	0%	N/A	1%	0%	9%	2%	24%	18%	3%	0%	0%	134%	12%	9%	100%	83%	58%	5%	N/A	40%	0%	2%	0%	N/A	0%	4%	0%	N/A	0%	0%	0%	0%	0%	0%	1%	0%	0%

Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Refined Method - with Plume Depletion

COPC	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	NICKEL	NICKEL (IN PM10)	PM	PM2.5	URANIUM	URANIUM (IN PM10)
Criteria	5.0E-03	1.4E-04	7.0E-05	N/A	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
Maximum of Modelled Mine Boundary Receptors	5.3E-07	6.4E-09	2.2E-09	1.4E-02	2.1E-03	6.6E-04	9.3	0.3	1.4E-06	4.8E-07
Max % of Criteria	0%	0%	0%	N/A	5%	3%	15%	4%	0%	0%

Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Refined Method - with Plume Depletion

COPC	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	NICKEL	NICKEL (IN PM10)	PM	PM2.5	URANIUM	URANIUM (IN PM10)
Criteria	5.0E-03	1.4E-04	7.0E-05	n/a	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
Background Concentration	2.6E-04	-	-	1.8E-02	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
Maximum of Modelled Mine Boundary Receptors	2.6E-04	6.4E-09	2.2E-09	3.2E-02	3.8E-03	2.3E-03	21	6.5	2.6E-04	2.6E-04
Max % of Criteria	5%	0.0%	0.0%		9%	12%	35%	74%	0.4%	0.9%

Year -1 - Construction, Maximum 0.5-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	ACETALDEHYDE	CO
Criteria	500	6,000
Maximum of Modelled Mine Boundary Receptors	2.0	1,370
Max % of Criteria	0.4%	23%

Year 7 - Operations, Maximum 0.5-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	ACETALDEHYDE	CO
Criteria	500	6,000
Background Concentration	-	1,170
Maximum of Modelled Mine Boundary Receptors	2.0	2,540
Max % of Criteria	0.4%	42%

Year -1 - Construction, Maximum 1-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	ACROLEIN	CO	SO_2
Criteria	4.5	36,200	100
Maximum of Modelled Mine Boundary Receptors	0.2	1,128	22
Max % of Criteria	4.6%	3.1%	22.0%

Year -1 - Construction, Maximum 1-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	ACROLEIN	CO	SO_2
Criteria	4.5	36,200	100
Background Concentration	0	965	5.2
Maximum of Modelled Mine Boundary Receptors	0.2	2,093	27
Max % of Criteria	4.6%	5.8%	27.2%

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Maximum of Modelled Mine Boundary Receptors	2.1
Max % of Criteria	N/A

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

AAQC / Schedule 3	n/a
Background Concentration	0.2
Maximum of Modelled Mine Boundary Receptors	2.3
Max % of Criteria	N/A

Year -1 - Construction, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Base Method - without Plume Depletion

| COPC | 1,3-BUTADIENE | ACENAPHTHENE | ACENAPHTHYLENE | ACETALDEHYDE | ACROLEIN | ALUMINUM | ANTHRACENE | ANTIMONY | ARSENIC | BARIUM | BENZENE | BENZO(A)ANTHRACENE | BENZO(A)PYRENE | BENZO(B+J)FLUORANTHENE | BENZO(E)PERYLENE | BERYLLIUM | BIOTITE | BISMUTH | BORON | CADMIUM | CALCIUM | CHLORITE | CHROMIUM | CHROMIUM VI | CHROMIUM VI (IN PM10) | CHRYSENE | CHRYSOTILE ASBESTOS (units are fibres/cm3) | COBALT | COPPER | DIBENZ(A,H)ANTHRACENE | ELEMENTAL CARBON (FROM DIESEL EXHAUST) | FLUORANTHENE | FLUORENE | FLUORIDE | FORMALDEHYDE | HEMATITE | HYDROCARBONS | INDENO(1,2,3-CD)PYRENE | IRON | LEAD | LITHIUM | MAGNESIUM | MAGNETITE | MANGANESE | MANGANESE (IN PM10) | MANGANESE (IN PM2.5) | MERCURY | MOLYBDENUM | MUSCOVITE | NAPTHALENE | NICKEL | NICKEL (IN PM10) | PHENANTHRENE | PM | PM10 | PM2.5 | POTASSIUM | PYRENE | PYRITE | QUARTZ (IN PM10) | SELENIUM | SILICON | SILVER | SODIUM | STRONTIUM | TALC (FIBROUS) | THALLIUM | THORIUM | TIN | TITANIUM | TUNGSTEN | URANIUM | URANIUM (IN PM10) | VANADIUM | YTTRIUM | ZINC |
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Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM10)	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM10)
Criteria	2.0	n/a	n/a	n/a	0.5	n/a	1.0E-05	n/a	n/a	5.0E-03	1.4E-04	7.0E-05	n/a	n/a	n/a	n/a	n/a	n/a	4.0E-02	2.0E-02	n/a	60	8.8	n/a	10	6.0E-02	3.0E-02
Maximum of Modelled Mine Boundary	1.5E-04	1.9E-05	3.9E-05	6.6E-06	2.5E-03	3.0E-07	9.1E-08	1.3E-07	2.3E-07	1.2E-06	1.5E-08	5.0E-09	3.4E-07	2.6E-08	2.6E-02	1.0E-05	3.9E-05	4.7E-08	4.6E-03	1.4E-03	1.7E-04	21	0.7	8.6E-06	5.5E-03	3.4E-06	1.1E-06
Max % of Criteria	0%	N/A	N/A	N/A	1%	N/A	1%	N/A	N/A	0%	0%	0%	N/A	N/A	N/A	N/A	N/A	N/A	11%	7%	N/A	35%	8%	N/A	0%	0%	0%

Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM10)	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM10)
Criteria	2	n/a	n/a	n/a	0.45	n/a	1.0E-05	n/a	n/a	5.0E-03	1.4E-04	7.0E-05	n/a	n/a	n/a	n/a	n/a	n/a	4.0E-02	2.0E-02	n/a	60	8.8	n/a	10	0.06	0.03
Background Concentration	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	0.0E+00	1.0E-05	5.3E-05	0.0E+00	2.6E-04	-	-	6.5E-05	0.0E+00	1.8E-02	1.6E-04	2.8E-04	0.0E+00	1.7E-03	1.7E-03	4.2E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04
Maximum of Modelled Mine Boundary	0.6	8.7E-04	1.6E-03	3.7E-05	0.4	3.0E-07	1.0E-05	5.4E-05	2.3E-07	2.6E-04	1.5E-08	5.0E-09	6.5E-05	2.6E-08	4.4E-02	1.7E-04	3.2E-04	4.7E-08	6.2E-03	3.0E-03	6.0E-04	32	6.9	1.5E-04	0.4	2.6E-04	2.6E-04
Max % of Criteria	28%	N/A	N/A	N/A	83%	N/A	102%	N/A	N/A	5%	0%	0%	N/A	N/A	N/A	N/A	N/A	N/A	16%	15%	N/A	54%	79%	N/A	4%	0%	1%

Year 7 - Operations, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone
Refined Method - with Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Maximum of Modelled Mine Boundary Receptors	2.0
Max % of Criteria	N/A

Year 7 - Operations, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative
Refined Method - with Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Background Concentration	0.2
Maximum of Modelled Mine Boundary Receptors	2.2
% of Criteria	N/A

Year 7 - Operations, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Refined Method - with Plume Depletion

| COPC | ALUMINUM | ANTIMONY | ARSENIC | BARIUM | BERYLLIUM | BIOTITE | BISMUTH | BORON | CADMIUM | CALCIUM | CHLORITE | CHROMIUM | CHROMIUM VI | CHROMIUM VI (IN PM10) | CHRYSOTILE ASBESTOS (units are fibres/cm³) | COBALT | COPPER | ELEMENTAL CARBON (FROM DIESEL EXHAUST) | FLUORIDE | HEMATITE | IRON | LEAD | LITHIUM | MAGNESIUM | MAGNETITE | MANGANESE | MANGANESE (IN PM10) | MANGANESE (IN PM2.5) | MERCURY | MOLYBDENUM | MUSCOVITE | NICKEL | NICKEL (IN PM10) | PALLADIUM | PHOSPHORUS | PLATINUM | PM | PM10 | PM2.5 | POTASSIUM | POTASSIUM AMYL XANTHATE | PYRITE | QUARTZ (IN PM10) | SELENIUM | SILICON | SILVER | SODIUM | SODIUM HEXAMETAPHOSPHATE | STRONTIUM | TALC (FIBROUS) | THALLIUM | THORIUM | TIN | TITANIUM | TUNGSTEN | URANIUM | URANIUM (IN PM10) | VANADIUM | YTTRIUM | ZINC |
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Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Refined Method - with Plume Depletion

COPC	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)	NICKEL	NICKEL (IN PM10)	PM	$PM_{2.5}$	URANIUM	URANIUM (IN PM10)
Criteria	5.0E-03	1.4E-04	7.0E-05	N/A	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
Maximum of Modelled Mine Boundary Receptors	1.1E-06	1.5E-08	4.9E-09	3.0E-02	4.6E-03	1.3E-03	19	0.7	3.2E-06	1.0E-06
Max % of Criteria	0%	0%	0%	N/A	11%	6%	31%	8%	0%	0%

Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Refined Method - with Plume Depletion

COPC	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)	NICKEL	NICKEL (IN PM10)	PM	$PM_{2.5}$	URANIUM	URANIUM (IN PM10)
AAQC / Schedule 3	5.0E-03	1.4E-04	7.0E-05	N/A	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
Background Concentration	2.6E-04	-	-	1.8E-02	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
Maximum of Modelled Mine Boundary Receptors	2.6E-04	1.5E-08	4.9E-09	4.8E-02	6.2E-03	2.9E-03	30	6.9	2.6E-04	2.6E-04
Max % of Criteria	5%	0%	0%	N/A	16%	15%	50%	78%	0%	1%

Year 7 - Operations, Maximum 0.5-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	ACETALDEHYDE	CO
Criteria	500	6,000
Maximum of Modelled Mine Boundary Receptors	2.8	3,932
Maximum % of Criteria	0.6%	66%

Year 7 - Operations, Maximum 0.5-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	ACETALDEHYDE	CO
Criteria	500	6,000
Background Concentration	-	1,170
Maximum of Modelled Mine Boundary Receptors	2.8	5,102
Maximum % of Criteria	0.6%	85%

Year 7 - Operations, Maximum 1-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	ACROLEIN	CO	SO_2
Criteria	4.5	36,200	100
Maximum of Modelled Mine Boundary Receptors	0.3	3,238	73
Maximum % of Criteria	7%	9%	73%

Year 7 - Operations, Maximum 1-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	ACROLEIN	CO	SO_2
Criteria	4.5	36,200	100
Background Concentration	0	965	5.2
Maximum of Modelled Mine Boundary Receptors	0.3	4,203	78
Maximum % of Criteria	7%	12%	78%

Year 7 - Operations, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Maximum of Modelled Mine Boundary Receptors	3.7
Max % of Criteria	N/A

Year 7 - Operations, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
Criteria	N/A
Background Concentration	0.2
Max Property Boundary Receptor Concentration	3.9
Max % of Criteria	N/A

Year 7 - Operations, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Base Method - without Plume Depletion

| COPC | 1,3-BUTADIENE | ACENAPHTHENE | ACENAPHTYLENE | ACETALDEHYDE | ACROLEIN | ALUMINIUM | ANTHRACENE | ANTIMONY | ARSENIC | BARIUM | BENZENE | BENZO(a)ANTHRACENE | BENZO(a)PYRENE | BENZO(b+k)FLUORANTHENE | BENZO(c,k,i)PERYLENE | BERYLLIUM | BIOTITE | BISMUTH | BORON | CADMIUM | CALCIUM | CHLORITE | CHROMIUM | CHROMIUM VI | CHROMIUM VI (98 PPLL) | CHRYSENE | CHRYSOTILE ASBESTOS (units are fibres/cm³) | COBALT | COPPER | DIBENZ(a,h)ANTHRACENE | ELEMENTAL CARBON (PM2M DIESEL EXHAUST) | FLUORANTHENE | FLUORENE | FLUORIDE | FORMALDEHYDE | HEMATITE | HYDROCARBONS | INDENO(1,2,3-CD)PYRENE | IRON | LEAD | LITHIUM | MAGNESIUM | MAGNETITE | MANGANESE | MANGANESE (IN PM10) | MANGANESE (IN PM2.5) | MERCURY | MOLYBDENUM | MUSCOVITE | NAPTHALENE | NICKEL | NICKEL (IN PM10) | PALLADIUM | PERMANITHRENE | PHOSPHORUS | PLATINUM | PM | PM10 | PM2.5 | POTASSIUM | POTASSIUM ARPS - KAINITE/SYLVITE | PYRENE | PYRITE | QUARTZ (IN PM10) | SELENIUM | SILICON | SILVER | SOOT | SODIUM | SODIUM HEXAMETAPHOSPHATE | STRONTIUM | TALC (FIBROUS) | THALLIUM | THORIUM | TIN | TITANIUM | TUNGSTEN | URANIUM | VANADIUM (IN PM2.5) | VANADIUM | YTTRIUM | ZINC |
|---|---|---

Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Base Method - without Plume Depletion

COPC	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM_{10})	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM_{10})	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM_{10})
Criteria	2	n/a	n/a	n/a	0.45	n/a	1.0E-05	n/a	n/a	5.0E-03	1.4E-04	7.0E-05	n/a	n/a	n/a	n/a	n/a	n/a	4.0E-02	2.0E-02	n/a	60	8.8	n/a	10	6.0E-02	3.0E-02
Maximum of Modelled Mine Boundary Receptors	3.3E-04	2.2E-05	4.2E-05	1.4E-05	5.4E-03	3.1E-07	2.2E-07	1.9E-07	2.3E-07	2.7E-06	3.0E-08	9.6E-09	3.8E-07	8.8E-08	6.5E-02	2.2E-05	8.5E-05	5.0E-08	1.1E-02	3.0E-03	5.2E-04	46	1.6	2.6E-05	1.2E-02	6.5E-06	2.1E-06
Max % of Criteria	0%	N/A	N/A	N/A	1%	N/A	2%	N/A	N/A	0%	0%	0%	N/A	N/A	N/A	N/A	N/A	N/A	27%	15%	N/A	76%	19%	N/A	0%	0%	0%

Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Base Method - without Plume Depletion

COPC	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM_{10})	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM_{10})	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM_{10})
Criteria	2	n/a	n/a	n/a	0.45	n/a	1.0E-05	n/a	n/a	5.0E-03	1.4E-04	7.0E-05	n/a	n/a	n/a	n/a	n/a	n/a	4.0E-02	2.0E-02	n/a	60	8.8	n/a	10	6.0E-02	3.0E-02
Background Concentration	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	0	1.0E-05	5.3E-05	0.0E+00	2.6E-04	-	-	6.5E-05	0	1.8E-02	1.6E-04	2.8E-04	0.0E+00	1.7E-03	1.7E-03	4.2E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04
Maximum of Modelled Mine Boundary Receptors	0.6	8.7E-04	1.6E-03	4.5E-05	0.4	3.1E-07	1.0E-05	5.4E-05	2.3E-07	2.6E-04	3.0E-08	9.6E-09	6.5E-05	8.8E-08	8.3E-02	1.8E-04	3.7E-04	5.0E-08	1.3E-02	4.7E-03	9.4E-04	57	7.8	1.6E-04	0.4	2.7E-04	2.6E-04
Max % of Criteria	28%	N/A	N/A	N/A	83%	N/A	103%	N/A	N/A	5%	0%	0%	N/A	N/A	N/A	N/A	N/A	N/A	31%	23%	N/A	95%	89%	N/A	4%	0%	1%

Year -1 - Construction, Maximum 1-Hour Average Concentrations (µg/m^3) - Project Alone Refined Method - With Plume Depletion

			Criteria	**4.5**	**36200**	**100**	**400**	**83**
			Max Receptor Concentration (inside pb)	**0.1**	**769**	**17**	**130**	**104**
			Special Receptor ID (inside pb)	**R3**	**R3**	**R3**	**R3**	**R3**
			Max Receptor Concentration (outside pb)	**5.8E-02**	**381**	**7.9**	**87**	**19**
			Special Receptor ID (outside pb)	**R1**	**R9**	**R9**	**R9**	**R9**
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**5.8E-02**	**381**	**7.9**	**87**	**19**
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**ACROLEIN**	**CO**	**SO2**	**NO2 ARM2 method**	**NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	5.8E-02	161	3.3	39	18
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.8E-02	91	1.7	23	5.7
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.6E-02	54	1.1	13	5.1
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.6E-02	57	1.2	13	5.4
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.5E-02	58	1.2	13	5.1
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	9.6E-02	362	6.8	84	39
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.1	769	17	130	104
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	5.0E-02	263	5.5	60	34
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	2.4E-02	71	1.3	21	9.3
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	2.1E-02	122	2.5	29	5.6
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	5.5E-02	282	5.4	59	16
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.1E-02	151	3.2	32	18
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	5.8E-02	381	7.9	87	19

Year -1 - Construction, Maximum 1-Hour Average Concentrations (µg/m^3) - Cumulative Refined Method - With Plume Depletion

			Criteria	4.5	36200	100	400	83
			Background Concentration	0	965	5.2	5.4	5.4
			Max Receptor Concentration (inside pb)	0.1	1,734	22	135	109
			Max Receptor Concentration (outside pb)	5.8E-02	1,346	13	92	24
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	5.8E-02	1,346	13	92	24

Rec #	Receptor Description	Receptor Location	Receptor Type	ACROLEIN	CO	SO2	NO2 ARM2 method	NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	5.8E-02	1,126	8.5	44	23
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.8E-02	1,056	7.0	28	11
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.6E-02	1,019	6.3	19	10
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.6E-02	1,022	6.4	19	11
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.5E-02	1,023	6.4	19	10
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	9.6E-02	1,327	12	89	44
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.1	1,734	22	135	109
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	5.0E-02	1,228	11	66	39
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	2.4E-02	1,036	6.5	27	15
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	2.1E-02	1,087	7.7	34	11
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	5.5E-02	1,247	11	64	22
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.1E-02	1,116	8.4	38	24
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	5.8E-02	1,346	13	92	24

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone Refined Method - With Plume Depletion

Criteria	**n/a**
Max Receptor Concentration (inside pb)	**1.5**
Special Receptor ID (inside pb)	**R3**
Max Receptor Concentration (outside pb)	**0.6**
Special Receptor ID (outside pb)	**R9**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**0.6**

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.4
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	9.7E-02
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	8.7E-02
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	9.9E-02
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	9.8E-02
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.7
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.5
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.6
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.2
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.1
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.3
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.3
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6

Year -1 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative Refined Method - With Plume Depletion

		Criteria	**n/a**
		Background Concentration	**0.2**
		Max Receptor Concentration (inside pb)	**1.7**
		Max Receptor Concentration (outside pb)	**0.8**
		Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**0.8**

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.6
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.3
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.3
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.3
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.3
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.9
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.7
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.8
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.4
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.3
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.5
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.5
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.8

Year -1 - Construction, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Refined Method - With Plume Depletion

	Criteria	1B	n/a	n/a	500	0.4	12	n/a	25	0.3	10	1.0E-02	n/a	2.5	120	2.5E-02	n/a	120	0.5	7.0E-04	5.5E-04	4.0E-02	0.1	50	15	n/a	25	n/a	0.5	20	72	25	0.4	0.2	0.4	2.0	120	1.5	0.2	0.1	120	50	27	10	n/a	5.0	10	27	1.0	n/a	120	2.0	0.5	n/a	10	120	5.0	0.3	0.2	2.0	5.0	120
	Max Receptor Concentration (inside plt)	1.1E-03	7.7E-05	1.2E-04	9.6E-02	1.4E-02	6.4	4.7E-05	3.8E-05	2.1E-04	1.9E-02	1.4E-05	0.5	5.9E-06	1.0E-03	5.4E-06	7.5	9.7	4.7E-02	7.5E-08	2.9E-08	1.5E-03	4.1E-03	8.8E-03	0.2	9.0E-06	2.4E-02	4.0	9.0E-05	1.1E-03	6.2	0.6	8.5E-02	2.7E-02	2.8E-03	1.1E-03	5.0E-05	2.5	2.1E-02	7.2E-03	90	29	3.1	0.3	2.4E-05	1.4	2.6E-05	0.5	2.2E-05	0.9	1.1E-02	0.1	3.0E-06	8.3E-05	2.9E-04	0.1	1.9E-05	9.3E-06	3.4E-06	1.0E-02	5.2E-04	3.6E-03
	Special Receptor ID (inside plt)	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Max Receptor Concentration (outside plt)	2.4E-04	1.6E-05	2.6E-05	2.1E-02	3.0E-03	2.2	1.0E-05	8.3E-06	4.5E-05	3.6E-03	3.1E-06	0.2	1.3E-06	2.2E-04	1.2E-06	2.6	3.4	1.7E-02	1.6E-08	6.3E-09	3.3E-04	9.0E-04	1.9E-03	0.1	2.0E-06	5.3E-03	0.8	2.0E-05	2.4E-04	2.2	0.2	3.0E-02	9.3E-03	9.6E-04	2.5E-04	1.7E-05	0.7	7.5E-03	2.4E-03	31	9.91E+00	1.1	0.1	5.3E-06	0.3	9.2E-06	0.2	7.8E-06	0.3	4.0E-03	2.6E-02	1.0E-06	2.6E-05	1.2E-04	4.3E-02	5.6E-06	2.8E-06	1.0E-06	3.5E-03	1.7E-04	1.2E-03
	Special Receptor ID (outside plt)	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	93
	Max Concentration (Sensitive Receptor - Indigenous - outside plt)	2.4E-04	1.6E-05	2.6E-05	2.1E-02	3.0E-03	2.2	1.0E-05	8.3E-06	3.5E-03	4.1E-06	0.2	1.9E-06	3.2E-04	1.8E-06	2.6	3.4	1.7E-02	1.8E-08	7.0E-09	1.9E-04	3.7E-06	5.8E-03	1.4	2.8E-05	3.8E-04	2.2	0.2	3.6E-02	9.3E-03	9.6E-04	2.5E-04	1.7E-05	0.7	7.5E-03	2.4E-03	31	9.91E+00	1.1	0.1	5.3E-06	0.3	9.2E-06	0.2	7.8E-06	0.3	4.0E-03	2.6E-02	1.0E-06	2.6E-05	1.2E-04	4.3E-02	5.6E-06	2.8E-06	1.0E-06	3.5E-03	1.7E-04	1.2E-03

Rec #	Receptor Description	Receptor Location	Receptor Type	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ACETALDEHYDE	ACROLEIN	ALUMINUM	ANTHRACENE	ANTIMONY	ARSENIC	BARIUM	BENZ(A)ANT	BENZENE	BENZO(A)PYR	BENZO(B)FLU	BENZO(E)PYR	BENZO(G,H,I)	BENZO(K)FLU	BERYLLIUM	BISMUTH	BORON	CADMIUM	CALCIUM	CHLORIDE	CHROMIUM	CHROMIUM VI (IN PM10)	CHRYSOTILE ASBESTOS (units are fibres/cm³)	COBALT	COPPER	ELEMENTAL CARBON (FROM DIESEL EXHAUST)	FLUORIDE	FLUORENE	HEXANE(N)	IRON	LEAD	LITHIUM	MANGANESE	MAGNESIUM	MANGANESE	MANGANESE (IN PM10)	MANGANESE (IN PM2.5)	MERCURY	MOLYBDENUM	MUSCOVITE	NICKEL	NICKEL (IN PM10)	PAH	PHOS	PHE/1	POTASSIUM	PYRITE	QUARTZ (IN PM10)	SELENIUM	SILICON	SILVER	SODIUM	STRONTIUM	TALC (FIBROUS)	THALLIUM	THORIUM	TIN	TITANIUM	TOLUENE	URANIUM	URANIUM (IN PM10)	VANADIUM	VITREOUS	ZINC
R1	House South of Site, At Lake 30km East of Highway 655	outside plt	Sensitive Receptor - Non-Indigenous	1.7E-04	1.1E-05	2.2E-05	1.5E-02	2.2E-03	1.7	7.2E-06	9.5E-06	5.5E-05	2.4E-03	2.0E-06	0.1	1.2E-06	1.9E-04	1.2E-06	2.0	2.5	1.2E-02	8.5E-09	3.2E-09	1.5E-04	4.1E-04	8.8E-04	0.1	9.1E-06	1.2E-03	4.0	9.2E-05	1.1E-03	6.2	0.6	8.5E-02	2.7E-02	2.8E-03	1.1E-03	5.0E-05	2.5	2.1E-02	7.2E-03	90	29	3.1	0.3	2.4E-05	1.4	2.6E-05	0.5	2.2E-05	0.9	1.1E-02	0.1	3.0E-06	8.3E-05	2.9E-04	0.1	1.9E-05	9.3E-06	3.4E-06	1.0E-02	5.2E-04	3.6E-03
R10	Overnight Indigenous Habitation Location	outside plt	Sensitive Receptor - Indigenous	4.9E-05	3.2E-06	5.4E-06	4.3E-03	6.2E-04	0.4	2.1E-06	2.5E-06	1.5E-05	6.3E-04	5.6E-07	0.0	3.1E-07	5.4E-05	3.2E-07	0.5	0.6	3.4E-03	2.4E-09	9.1E-10	4.3E-05	1.2E-04	2.5E-04	0.0	2.6E-06	3.4E-04	1.1	2.6E-05	3.2E-04	1.8	0.2	2.4E-02	7.7E-03	8.0E-04	3.2E-04	1.4E-05	0.7	6.0E-03	2.1E-03	26	8.2	0.9	0.1	6.8E-06	0.4	7.4E-06	0.1	6.3E-06	0.3	3.2E-03	0.0	8.5E-07	2.4E-05	8.3E-05	0.0	5.4E-06	2.7E-06	9.8E-07	2.9E-03	1.5E-04	1.0E-03
R11	Overnight Indigenous Habitation Location	outside plt	Sensitive Receptor - Indigenous	5.3E-05	3.5E-06	5.8E-06	4.6E-03	6.6E-04	0.4	2.3E-06	2.4E-06	1.4E-05	6.1E-04	5.4E-07	0.0	3.0E-07	5.2E-05	3.1E-07	0.5	0.6	3.2E-03	2.3E-09	8.8E-10	4.1E-05	1.1E-04	2.4E-04	0.0	2.5E-06	3.2E-04	1.0	2.5E-05	3.1E-04	1.7	0.2	2.3E-02	7.4E-03	7.7E-04	3.1E-04	1.3E-05	0.7	5.8E-03	2.0E-03	25	7.9	0.8	0.1	6.5E-06	0.4	7.1E-06	0.1	6.0E-06	0.3	3.1E-03	0.0	8.2E-07	2.3E-05	8.0E-05	0.0	5.2E-06	2.6E-06	9.4E-07	2.8E-03	1.4E-04	9.8E-04
R12	Camp/Cottage North of Existing Rail Corridor	outside plt	Sensitive Receptor - Non-Indigenous	6.0E-05	4.0E-06	6.6E-06	5.2E-03	7.4E-04	0.4	2.5E-06	2.4E-06	1.5E-05	6.3E-04	7.5E-07	2.8E-02	3.4E-07	5.5E-05	3.2E-07	0.5	0.6	3.0E-03	3.2E-09	1.2E-09	5.4E-05	1.5E-04	3.2E-04	0.0	3.3E-06	4.3E-04	1.4	3.3E-05	4.2E-04	2.3	0.2	3.0E-02	9.8E-03	1.0E-03	4.2E-04	1.7E-05	0.9	7.7E-03	2.7E-03	33	10.5	1.1	0.1	8.6E-06	0.5	9.4E-06	0.2	8.0E-06	0.3	4.1E-03	0.0	1.1E-06	3.0E-05	1.1E-04	0.0	6.9E-06	3.5E-06	1.2E-06	3.7E-03	1.8E-04	1.3E-03
R13	Camp/Cottage North of Existing Rail Corridor	outside plt	Sensitive Receptor - Non-Indigenous	5.6E-05	3.8E-06	6.1E-06	4.9E-03	7.0E-04	0.4	2.4E-06	2.2E-06	1.4E-05	5.8E-04	7.1E-07	2.6E-02	3.1E-07	5.1E-05	3.0E-07	0.4	0.6	2.7E-03	3.1E-09	1.2E-09	5.1E-05	1.4E-04	3.0E-04	0.0	3.1E-06	4.0E-04	1.3	3.1E-05	3.9E-04	2.1	0.2	2.8E-02	9.1E-03	9.6E-04	3.9E-04	1.6E-05	0.8	7.2E-03	2.5E-03	31	9.8	1.0	0.1	8.0E-06	0.4	8.8E-06	0.2	7.4E-06	0.3	3.8E-03	0.0	1.0E-06	2.8E-05	1.0E-04	0.0	6.4E-06	3.2E-06	1.1E-06	3.4E-03	1.7E-04	1.2E-03
R2	Camp/Cottage on Davis Lake	inside plt	Sensitive Receptor - Non-Indigenous	1.1E-03	7.3E-05	1.2E-04	9.6E-02	1.4E-02	6.4	4.7E-05	3.8E-05	2.1E-04	1.0E-02	1.4E-05	0.5	5.9E-06	1.0E-03	5.4E-06	7.5	9.7	4.7E-02	7.5E-08	2.9E-08	1.5E-03	4.1E-03	8.8E-03	0.2	9.0E-06	2.6E-02	4.0	9.0E-05	1.1E-03	6.2	0.6	8.5E-02	2.7E-02	2.8E-03	1.1E-03	5.0E-05	2.5	2.1E-02	7.3E-03	90	29	3.1	0.3	2.4E-05	1.4	2.6E-05	0.5	2.2E-05	0.9	1.1E-02	0.1	3.0E-06	8.3E-05	2.9E-04	0.1	1.9E-05	9.3E-06	3.4E-06	1.0E-02	5.2E-04	3.6E-03
R3	Camp on the West Burdegala River	inside plt	Sensitive Receptor - Non-Indigenous	4.3E-04	2.9E-05	4.6E-05	3.7E-02	5.4E-03	3.3	1.8E-05	1.9E-05	1.1E-04	4.7E-03	4.7E-06	0.2	2.4E-06	4.0E-04	2.5E-06	4.0	5.0	2.4E-02	2.5E-08	9.4E-09	4.3E-04	2.1E-03	4.6E-03	0.1	6.1E-05	9.4E-03	3.3	0.3	4.3E-02	1.3E-02	1.3E-03	5.1E-04	2.3E-05	1.2	1.0E-02	3.5E-03	46	14	1.5	0.1	7.0E-06	0.4	1.3E-05	0.2	1.1E-05	0.4	5.8E-03	3.5E-02	1.4E-06	3.3E-05	1.5E-04	5.7E-02	6.5E-06	3.5E-06	1.2E-06	5.1E-03	2.2E-04	1.6E-03
R4	Camp/Cottage East of Site	outside plt	Sensitive Receptor - Non-Indigenous	4.3E-04	2.9E-05	4.6E-05	3.7E-02	5.4E-03	3.3	1.8E-05	1.9E-05	1.1E-04	4.7E-03	4.7E-06	0.2	2.4E-06	4.0E-04	2.5E-06	4.0	5.0	2.4E-02	2.5E-08	9.4E-09	4.3E-04	2.1E-03	4.6E-03	0.1	6.1E-05	9.4E-03	3.3	0.3	4.3E-02	1.3E-02	1.3E-03	5.1E-04	2.3E-05	1.2	1.0E-02	3.5E-03	46	14	1.5	0.1	7.0E-06	0.4	1.3E-05	0.2	1.1E-05	0.4	5.8E-03	3.5E-02	1.4E-06	3.3E-05	1.5E-04	5.7E-02	6.5E-06	3.5E-06	1.2E-06	5.1E-03	2.2E-04	1.6E-03
R5	Camp/Cottage Near Highway 655 South of Site	outside plt	Sensitive Receptor - Non-Indigenous	9.4E-05	7.5E-06	1.3E-05	8.0E-03	1.2E-03	0.9	4.0E-06	5.0E-06	2.9E-05	1.2E-03	1.2E-06	0.0	6.1E-07	1.1E-04	6.5E-07	1.0	1.3	6.2E-03	4.4E-09	1.6E-09	1.1E-04	3.2E-04	6.5E-04	0.0	6.5E-06	1.0E-03	0.8	6.5E-05	8.5E-04	1.5E-04	0.8	6.0E-02	1.1E-02	3.3E-03	9.4E-04	3.7E-04	0.2	1.5E-02	5.3E-03	1.2E-01	4.3E-02	2.6E-03	0.2	1.4E-05	1.0E-03	1.4E-05	1.1E-03	1.2E-05	0.9	4.8E-06	2.5E-04	1.0E-03	0.0	1.1E-05	5.2E-06	1.8E-06	5.4E-03	2.7E-04	1.9E-03
R6	Campground at Bigwater Lake	outside plt	Sensitive Receptor - Indigenous	5.1E-05	3.6E-06	5.9E-06	4.4E-03	6.4E-04	0.4	2.2E-06	2.4E-06	1.4E-05	6.1E-04	7.1E-07	2.8E-02	3.2E-07	5.2E-05	3.2E-07	0.5	0.6	2.9E-03	2.9E-09	1.1E-09	6.7E-05	2.5E-04	5.5E-04	0.0	5.0E-06	6.9E-05	0.4	3.4E-02	5.1E-03	1.6E-03	7.4E-02	1.4E-02	4.1E-03	1.2E-03	4.7E-04	0.2	1.9E-02	6.7E-03	1.5E-01	5.4E-02	3.2E-03	0.2	1.7E-05	1.3E-03	1.7E-05	1.4E-03	1.5E-05	1.1E-03	5.9E-03	3.2E-02	1.7E-06	4.1E-05	1.9E-04	7.1E-02	8.1E-06	4.3E-06	1.5E-06	6.4E-03	3.4E-04	2.0E-03
R7	Watagaan River - Indigenous Site	outside plt	Sensitive Receptor - Indigenous	1.8E-04	1.3E-05	2.2E-05	1.6E-02	2.3E-03	1.1	7.7E-06	6.2E-06	3.7E-05	1.6E-03	1.9E-06	7.4E-02	8.4E-07	1.3E-04	8.4E-07	1.3	1.6	7.6E-03	1.0E-08	3.7E-09	1.2E-04	6.6E-04	1.5E-03	0.0	2.1E-05	2.8E-03	1.0	8.6E-02	1.4E-02	4.2E-03	1.9E-01	3.6E-02	1.1E-02	3.1E-03	1.2E-03	0.5	4.9E-02	1.7E-02	3.9E-01	1.4E-01	8.3E-03	0.5	4.4E-05	3.3E-03	4.4E-05	3.6E-03	3.9E-05	2.8E-03	1.5E-02	8.2E-02	4.4E-06	1.1E-04	4.9E-04	1.8E-01	2.1E-05	1.1E-05	3.9E-06	1.7E-02	8.8E-04	5.2E-03
R8	Overnight Indigenous Habitation Location	outside plt	Sensitive Receptor - Indigenous	2.4E-04	1.6E-05	2.6E-05	2.1E-02	3.0E-03	2.2	1.0E-05	1.3E-05	8.3E-05	3.5E-03	4.1E-06	0.2	1.9E-06	3.2E-04	1.8E-06	2.6	3.4	1.7E-02	1.8E-08	7.0E-09	1.9E-04	1.4E-03	3.2E-03	0.1	4.5E-05	6.1E-03	2.2	1.8E-01	3.0E-02	9.1E-03	4.1E-01	7.8E-02	2.4E-02	6.8E-03	2.6E-03	1.1	1.0E-01	3.7E-02	8.4E-01	3.0E-01	1.8E-02	1.1	9.5E-05	7.1E-03	9.5E-05	7.8E-03	8.4E-05	6.1E-03	3.2E-02	1.8E-01	9.5E-06	2.4E-04	1.1E-03	3.9E-01	4.5E-05	2.4E-05	8.4E-06	3.7E-02	1.9E-03	1.1E-02
R9	Overnight Indigenous Habitation Location	outside plt	Sensitive Receptor - Indigenous	2.4E-04	1.6E-05	2.6E-05	2.1E-02	3.0E-03	2.2	1.0E-05	1.3E-05	8.3E-05	3.5E-03	4.1E-06	0.2	1.9E-06	3.2E-04	1.8E-06	2.6	3.4	1.7E-02	1.8E-08	7.0E-09	1.9E-04	1.4E-03	3.2E-03	0.1	4.5E-05	6.1E-03	2.2	1.8E-01	3.0E-02	9.1E-03	4.1E-01	7.8E-02	2.4E-02	6.8E-03	2.6E-03	1.1	1.0E-01	3.7E-02	8.4E-01	3.0E-01	1.8E-02	1.1	9.5E-05	7.1E-03	9.5E-05	7.8E-03	8.4E-05	6.1E-03	3.2E-02	1.8E-01	9.5E-06	2.4E-04	1.1E-03	3.9E-01	4.5E-05	2.4E-05	8.4E-06	3.7E-02	1.9E-03	1.1E-02

Year -1 - Construction, Maximum 24-Hour Average Concentrations (µg/m³) - Cumulative Refined Method - With Plume Depletion

Criteria	10	n/a	n/a	500	0.4	13	n/a	35	0.3	10	1.00.02	n/a	2.5	120	2.50.02	n/a	120	0.5	7.00.04	3.50.04	4.00.02	0.1	50	15	5.00.02	n/a	25	n/a	0.5	20	72	15	0.4	0.2	0.4	2.0	100	1.5	0.2	0.1	120	50	27	10	n/a	5.0	10	27	1.0	n/a	120	2.0	0.5	n/a	10	150	5.0	0.3	0.2	2.0	5.0	120
Background Concentration	0.6	4.40.03	8.20.03	0.00.00	0.00.00	0.4	1.60.04	1.30.03	1.30.03	9.20.03	7.60.04	0.00.00	1.30.03	2.60.02	2.60.04	0.7	ND	6.00.03	7.60.04	3.50.04	4.00.02	2.90.03	1.00.02	0.2	ND	8.60.03	0.00.00	1.90.02	0.2	3.40.03	1.60.03	1.60.03

Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Refined Method - With Plume Depletion

Criteria	**2.0**	**0.5**	**1.0E-05**	**5.0E-03**	**1.4E-04**	**7.0E-05**	**4.0E-02**	**2.0E-02**	**60**	**8.8**	**6.0E-02**	**3.0E-02**
Max Receptor Concentration (inside pb)	**1.4E-04**	**2.2E-03**	**7.9E-08**	**7.7E-07**	**5.4E-09**	**2.0E-09**	**3.7E-03**	**1.2E-03**	**14**	**0.5**	**1.0E-06**	**3.4E-07**
Special Receptor ID (inside pb)	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**
Max Receptor Concentration (outside pb)	**1.6E-05**	**3.2E-04**	**1.0E-08**	**7.0E-08**	**4.7E-10**	**1.7E-10**	**3.1E-04**	**9.5E-05**	**1.3**	**4.3E-02**	**1.1E-07**	**3.4E-08**
Special Receptor ID (outside pb)	**R1**	**R1**	**R1**	**R8**	**R9**	**R9**	**R9**	**R9**	**R8**	**R9**	**R8**	**R8**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**1.5E-05**	**2.6E-04**	**8.6E-09**	**7.0E-08**	**4.7E-10**	**1.7E-10**	**3.1E-04**	**9.5E-05**	**1.3**	**4.3E-02**	**1.1E-07**	**3.4E-08**

Rec #	Receptor Description	Receptor Location	Receptor Type	1,3-BUTADIENE	BENZENE	BENZO(A)PYRENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	NICKEL	NICKEL (IN PM10)	PM	PM2.5	URANIUM	URANIUM (IN PM10)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.6E-05	3.2E-04	1.0E-08	6.7E-08	4.4E-10	1.6E-10	3.0E-04	9.2E-05	1.2	4.2E-02	1.0E-07	3.2E-08
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.2E-06	5.4E-05	1.8E-09	1.7E-08	1.2E-10	4.2E-11	7.2E-05	2.3E-05	0.3	1.0E-02	2.6E-08	8.4E-09
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.0E-06	5.1E-05	1.7E-09	1.6E-08	1.1E-10	4.0E-11	6.9E-05	2.1E-05	0.3	9.7E-03	2.5E-08	8.0E-09
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	3.4E-06	5.6E-05	1.9E-09	1.8E-08	1.3E-10	4.7E-11	7.9E-05	2.5E-05	0.3	1.1E-02	2.8E-08	9.2E-09
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	3.3E-06	5.4E-05	1.9E-09	1.8E-08	1.3E-10	4.6E-11	7.7E-05	2.4E-05	0.3	1.1E-02	2.7E-08	9.0E-09
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	4.3E-05	7.7E-04	2.5E-08	1.6E-07	1.2E-09	4.0E-10	7.2E-04	2.2E-04	2.9	0.1	2.7E-07	8.6E-08
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.4E-04	2.2E-03	7.9E-08	7.7E-07	5.4E-09	2.0E-09	3.7E-03	1.2E-03	14	0.5	1.0E-06	3.4E-07
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	3.8E-05	6.2E-04	2.2E-08	1.9E-07	1.3E-09	4.6E-10	9.3E-04	2.9E-04	3.5	0.1	2.7E-07	8.6E-08
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	5.0E-06	9.5E-05	3.0E-09	2.1E-08	1.5E-10	5.3E-11	9.2E-05	2.9E-05	0.4	1.3E-02	3.3E-08	1.1E-08
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	3.3E-06	5.6E-05	1.9E-09	1.7E-08	1.2E-10	4.3E-11	7.6E-05	2.4E-05	0.3	1.1E-02	2.7E-08	8.7E-09
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	8.1E-06	1.4E-04	4.6E-09	4.4E-08	2.6E-10	9.3E-11	1.9E-04	5.6E-05	0.8	2.7E-02	6.4E-08	2.1E-08
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.4E-05	2.4E-04	8.0E-09	7.0E-08	4.5E-10	1.6E-10	3.0E-04	9.0E-05	1.3	4.2E-02	1.1E-07	3.4E-08
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.5E-05	2.6E-04	8.6E-09	6.9E-08	4.7E-10	1.7E-10	3.1E-04	9.5E-05	1.2	4.3E-02	1.0E-07	3.4E-08

Year -1 - Construction, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Refinde Method - With Plume Depletion

Criteria			**2.0**	**0.5**	**1.0E-05**	**5.0E-03**	**1.4E-04**	**7.0E-05**	**4.0E-02**	**2.0E-02**	**60**	**8.8**	**6.0E-02**	**3.0E-02**
Background Concentration			**0.6**	**0.4**	**1.0E-05**	**2.6E-04**	**-**	**-**	**1.7E-03**	**1.7E-03**	**12**	**6.2**	**2.6E-04**	**2.6E-04**
Max Receptor Concentration (inside pb)			**0.6**	**0.4**	**1.0E-05**	**2.6E-04**	**5.4E-09**	**2.0E-09**	**5.4E-03**	**2.9E-03**	**26**	**6.7**	**2.6E-04**	**2.6E-04**
Max Receptor Concentration (outside pb)			**0.6**	**0.4**	**1.0E-05**	**2.6E-04**	**4.7E-10**	**1.7E-10**	**2.0E-03**	**1.8E-03**	**13**	**6.2**	**2.6E-04**	**2.6E-04**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)			**0.6**	**0.4**	**1.0E-05**	**2.6E-04**	**4.7E-10**	**1.7E-10**	**2.0E-03**	**1.8E-03**	**13**	**6.2**	**2.6E-04**	**2.6E-04**
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**1,3-BUTADIENE**	**BENZENE**	**BENZO(A)PYRENE**	**CADMIUM**	**CHROMIUM VI**	**CHROMIUM VI (IN PM10)**	**NICKEL**	**NICKEL (IN PM10)**	**PM**	**PM2.5**	**URANIUM**	**URANIUM (IN PM10)**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	4.4E-10	1.6E-10	2.0E-03	1.8E-03	13	6.2	2.6E-04	2.6E-04
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.2E-10	4.2E-11	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.1E-10	4.0E-11	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.3E-10	4.7E-11	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.3E-10	4.6E-11	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.2E-09	4.0E-10	2.4E-03	1.9E-03	15	6.3	2.6E-04	2.6E-04
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	5.4E-09	2.0E-09	5.4E-03	2.9E-03	26	6.7	2.6E-04	2.6E-04
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.3E-09	4.6E-10	2.6E-03	2.0E-03	15	6.3	2.6E-04	2.6E-04
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.5E-10	5.3E-11	1.8E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.6	0.4	1.0E-05	2.6E-04	1.2E-10	4.3E-11	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.6	0.4	1.0E-05	2.6E-04	2.6E-10	9.3E-11	1.8E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	0.4	1.0E-05	2.6E-04	4.5E-10	1.6E-10	2.0E-03	1.8E-03	13	6.2	2.6E-04	2.6E-04
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	0.4	1.0E-05	2.6E-04	4.7E-10	1.7E-10	2.0E-03	1.8E-03	13	6.2	2.6E-04	2.6E-04

Year -1 - Construction, Maximum 1-Hour Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m^3)

			Criteria	4.5	36,200	100	400	83
			Max Receptor Concentration (inside pb)	0.2	1,215	25	154	135
			Special Receptor ID (inside pb)	R3	R3	R3	R3	R3
			Max Receptor Concentration (outside pb)	0.1	928	19	139	39
			Special Receptor ID (outside pb)	R9	R9	R9	R9	R8
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	0.1	928	19	139	39

Rec #	Receptor Description	Receptor Location	Receptor Type	ACROLEIN	CO	SO2	NO2 ARM2 method	NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.1	317	6.1	90	37
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.7E-02	188	3.2	55	13
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.3E-02	120	2.2	35	13
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	110	2.1	31	14
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	109	2.1	31	13
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.2	663	12	129	79
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.2	1,215	25	154	135
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.1	439	8.7	108	72
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	6.1E-02	136	2.3	51	23
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	5.5E-02	264	4.9	70	12
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.1	552	9.9	110	38
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.5E-02	279	5.4	65	39
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.1	928	19	139	38

Year -1 - Construction, Maximum 1-Hour Average Concentrations - Cumulative Base Method - without Plume Depletion (µg/m^3)

			Criteria	4.5	36,200	100	400	83
			Background Concentration	0	965	5.2	5.4	5.4
			Max Receptor Concentration (inside pb)	0.2	2,180	31	160	140
			Max Receptor Concentration (outside pb)	0.1	1,893	24	145	44
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	0.1	1,893	24	145	44

Rec #	Receptor Description	Receptor Location	Receptor Type	ACROLEIN	CO	SO2	NO2 ARM2 method	NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.1	1,282	11	96	42
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.7E-02	1,153	8.4	60	18
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.3E-02	1,085	7.4	40	18
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	1,075	7.4	36	19
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	1,074	7.3	37	19
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.2	1,628	17	134	85
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.2	2,180	31	160	140
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.1	1,404	14	114	78
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	6.1E-02	1,101	7.5	56	28
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	5.5E-02	1,229	10	76	17
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.1	1,517	15.1	115	44
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.5E-02	1,244	11	70	44
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.1	1,893	24	145	43

Year -1 - Construction, Maximum 2-Hour Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m^3)

Criteria	n/a
Max Receptor Concentration (inside pb)	3.0
Special Receptor ID (inside pb)	R3
Max Receptor Concentration (outside pb)	2.2
Special Receptor ID (outside pb)	R9
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	2.2

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.6
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.7
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	2.1
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	3.0
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.4
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.8
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.8
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.5
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.9
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.2

Year -1 - Construction, Maximum 2-Hour Average Concentrations - Cumulative Base Method - without Plume Depletion (µg/m^3)

Criteria	**n/a**
Background Concentration	**0.2**
Max Receptor Concentration (inside pb)	**3.2**
Max Receptor Concentration (outside pb)	**2.4**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**2.4**

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.8
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.9
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.7
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.7
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.7
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	2.3
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	3.2
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.6
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	1.0
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	1.0
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.7
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.1
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.4

Year 0 - Construction, Maximum 24 Hour Average Concentrations - Project Alone: Base Method - without Ozone Depletion (µg/m³)

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Year -1 - Construction, Maximum 24 Hour Average Concentrations - Cumulative Base Method - without Plume Depletion (ug/m³).

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Year -1 - Construction, Maximum Annual Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m^3)

		Criteria		2	n/a	n/a	n/a	0.45	n/a	1.0E-05	n/a	n/a	5.0E-03	1.4E-04	7.0E-05	n/a	n/a	n/a	n/a	n/a	4.0E-02	2.0E-02	n/a	60	8.8	n/a	10	6.0E-02	3.0E-02	24
		Max Receptor Concentration (inside pb)		2.6E-04	1.8E-05	2.9E-05	1.1E-05	4.2E-03	1.7E-07	1.5E-07	1.3E-07	8.6E-08	1.6E-06	1.1E-08	4.0E-09	3.0E-07	4.4E-08	4.4E-02	1.7E-05	6.6E-05	3.9E-08	7.4E-03	2.3E-03	2.9E-04	29	1.0	1.5E-05	9.4E-03	2.2E-06	7.1E-07	4.9
		Special Receptor ID (inside pb)		R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3	R3
		Max Receptor Concentration (outside pb)		3.2E-05	3.7E-06	6.8E-06	1.4E-06	6.0E-04	5.1E-08	2.0E-08	2.6E-08	3.3E-08	1.5E-07	1.2E-09	4.1E-10	6.5E-08	4.8E-09	4.8E-03	2.2E-06	9.2E-06	1.1E-08	6.6E-04	2.0E-04	3.4E-05	2.7	9.6E-02	1.9E-06	1.1E-03	2.6E-07	8.4E-08	0.6
		Special Receptor ID (outside pb)		R1	R1	R1	R1	R1	R1	R1	R1	R1	R9	R9	R9	R1	R1	R1	R1	R1	R1	R9	R9	R1	R9	R9	R1	R1	R9	R9	R1
		Max Concentration (Sensitive Receptor - Indigenous - outside pb)		3.1E-05	2.8E-06	5.0E-06	1.3E-06	5.4E-04	3.6E-08	1.9E-08	2.0E-08	2.1E-08	1.5E-07	1.2E-09	4.1E-10	4.9E-08	4.8E-09	4.8E-03	2.1E-06	8.4E-06	8.6E-09	6.6E-04	2.0E-04	3.4E-05	2.7	9.6E-02	1.8E-06	1.0E-03	2.6E-07	8.4E-08	0.5
Rec #	Receptor Description	Receptor Location	Receptor Type	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM10)	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM10)	NO2 ARM2 method
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	3.2E-05	3.7E-06	6.8E-06	1.4E-06	6.0E-04	5.1E-08	2.0E-08	2.6E-08	3.3E-08	1.4E-07	1.1E-09	3.9E-10	6.5E-08	4.8E-09	4.8E-03	2.2E-06	9.2E-06	1.1E-08	6.2E-04	1.9E-04	3.4E-05	2.5	9.1E-02	1.9E-06	1.1E-03	2.5E-07	7.9E-08	0.6
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.9E-06	6.2E-07	1.1E-06	3.4E-07	1.3E-04	7.3E-09	4.7E-09	4.4E-09	3.9E-09	4.3E-08	3.4E-10	1.2E-10	1.1E-08	1.3E-09	1.3E-03	5.2E-07	2.1E-06	1.8E-09	1.9E-04	5.7E-05	8.8E-06	0.8	2.8E-02	4.5E-07	2.8E-04	7.7E-08	2.5E-08	0.1
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.5E-06	5.8E-07	1.0E-06	3.2E-07	1.3E-04	6.9E-09	4.5E-09	4.2E-09	3.7E-09	4.2E-08	3.3E-10	1.1E-10	1.0E-08	1.2E-09	1.2E-03	5.0E-07	2.0E-06	1.7E-09	1.8E-04	5.4E-05	8.3E-06	0.7	2.6E-02	4.3E-07	2.6E-04	7.3E-08	2.4E-08	0.1
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	8.5E-06	6.3E-07	1.1E-06	3.6E-07	1.4E-04	7.1E-09	5.0E-09	4.5E-09	3.7E-09	4.9E-08	3.9E-10	1.4E-10	1.1E-08	1.4E-09	1.4E-03	5.6E-07	2.2E-06	1.7E-09	2.1E-04	6.4E-05	9.4E-06	0.9	3.1E-02	4.8E-07	3.0E-04	8.6E-08	2.8E-08	0.1
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	8.3E-06	6.1E-07	1.0E-06	3.5E-07	1.4E-04	6.9E-09	4.9E-09	4.4E-09	3.6E-09	4.8E-08	3.8E-10	1.4E-10	1.1E-08	1.3E-09	1.3E-03	5.5E-07	2.1E-06	1.7E-09	2.1E-04	6.3E-05	9.2E-06	0.9	3.0E-02	4.7E-07	2.9E-04	8.4E-08	2.7E-08	0.1
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	8.2E-05	7.7E-06	1.4E-05	3.5E-06	1.4E-03	1.1E-07	5.1E-08	5.4E-08	6.1E-08	3.0E-07	2.7E-09	9.1E-10	1.4E-07	1.2E-08	1.2E-02	5.5E-06	2.2E-05	2.9E-08	1.3E-03	3.9E-04	8.7E-05	5.3	0.2	4.7E-06	2.6E-03	6.0E-07	1.9E-07	1.3
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	1.8E-05	2.9E-05	1.1E-05	4.2E-03	1.7E-07	1.5E-07	1.3E-07	8.6E-08	1.6E-06	1.1E-08	4.0E-09	3.0E-07	4.4E-08	4.4E-02	1.7E-05	6.6E-05	3.9E-08	7.4E-03	2.3E-03	2.9E-04	29	1.0	1.5E-05	9.4E-03	2.2E-06	7.1E-07	4.9
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	7.6E-05	5.5E-06	9.1E-06	3.2E-06	1.2E-03	6.3E-08	4.6E-08	4.0E-08	3.1E-08	4.0E-07	2.9E-09	1.0E-09	9.6E-08	1.2E-08	1.2E-02	5.0E-06	2.0E-05	1.6E-08	1.9E-03	5.9E-04	8.5E-05	7.3	0.3	4.3E-06	2.6E-03	6.2E-07	2.0E-07	1.2
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	1.1E-05	1.1E-06	1.9E-06	4.6E-07	1.9E-04	1.4E-08	6.5E-09	7.4E-09	8.5E-09	5.3E-08	4.2E-10	1.5E-10	1.8E-08	1.6E-09	1.6E-03	7.2E-07	2.9E-06	2.9E-09	2.3E-04	6.9E-05	1.1E-05	1.0	3.4E-02	6.2E-07	3.6E-04	9.4E-08	3.0E-08	0.2
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	8.1E-06	6.3E-07	1.1E-06	3.5E-07	1.4E-04	7.4E-09	4.9E-09	4.5E-09	4.0E-09	4.5E-08	3.5E-10	1.2E-10	1.1E-08	1.3E-09	1.3E-03	5.4E-07	2.1E-06	1.8E-09	1.9E-04	5.9E-05	9.0E-06	0.8	2.8E-02	4.6E-07	2.9E-04	7.9E-08	2.6E-08	0.1
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.6E-05	1.2E-06	2.1E-06	6.9E-07	2.7E-04	1.5E-08	9.7E-09	8.8E-09	7.7E-09	8.6E-08	7.0E-10	2.5E-10	2.2E-08	2.5E-09	2.5E-03	1.1E-06	4.2E-06	4.0E-09	3.6E-04	1.1E-04	1.8E-05	1.5	5.4E-02	9.1E-07	5.6E-04	1.6E-07	5.1E-08	0.3
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.8E-05	2.1E-06	3.7E-06	1.2E-06	4.6E-04	2.7E-08	1.7E-08	1.5E-08	1.4E-08	1.3E-07	1.1E-09	4.0E-10	3.8E-08	4.3E-09	4.3E-03	1.8E-06	7.2E-06	7.2E-09	5.5E-04	1.7E-04	3.1E-05	2.3	8.3E-02	1.6E-06	9.2E-04	2.5E-07	8.2E-08	0.4
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.1E-05	2.8E-06	5.0E-06	1.3E-06	5.4E-04	3.6E-08	1.9E-08	2.0E-08	2.1E-08	1.5E-07	1.2E-09	4.1E-10	4.9E-08	4.8E-09	4.8E-03	2.1E-06	8.4E-06	8.6E-09	6.6E-04	2.0E-04	3.4E-05	2.7	9.6E-02	1.8E-06	1.0E-03	2.6E-07	8.4E-08	0.5

Year -1 - Construction, Maximum Annual Average Concentrations - Cumulative Base Method - without Plume Depletion (µg/m^3)

Criteria				2	n/a	n/a	n/a	0.45	n/a	1.00E-05	n/a	n/a	0.005	0.00014	0.00007	n/a	n/a	n/a	n/a	n/a	n/a	0.04	0.02	n/a	60	8.8	n/a	10	0.06	0.03	n/a
Background Concentration				0.6	8.5E-04	1.6E-03	3.1E-05	0.4	0.0E+00	1.0E-05	5.3E-05	0.0E+00	2.6E-04	-	-	6.5E-05		1.8E-02	1.6E-04	2.8E-04		1.7E-03	1.7E-03	4.2E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.3
Max Receptor Concentration (inside pb)				0.6	8.6E-04	1.6E-03	4.2E-05	0.4	1.7E-07	1.0E-05	5.4E-05	8.6E-08	2.6E-04	1.1E-08	4.0E-09	6.5E-05	4.4E-08	6.2E-02	1.7E-04	3.5E-04	3.9E-08	9.1E-03	4.0E-03	7.2E-04	40	7.2	1.5E-04	0.4	2.6E-04	2.6E-04	5.2
Max Receptor Concentration (outside pb)				0.6	8.5E-04	1.6E-03	3.2E-05	0.4	5.1E-08	1.0E-05	5.3E-05	3.3E-08	2.6E-04	1.2E-09	4.1E-10	6.5E-05	4.8E-09	2.3E-02	1.6E-04	2.9E-04	1.1E-08	2.3E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	1.0
Max Concentration (Sensitive Receptor - Indigenous - outside pb)				0.6	8.5E-04	1.6E-03	3.2E-05	0.4	3.6E-08	1.0E-05	5.3E-05	2.1E-08	2.6E-04	1.2E-09	4.1E-10	6.5E-05	4.8E-09	2.3E-02	1.6E-04	2.9E-04	8.6E-09	2.3E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.9
Rec #	Receptor Description	Receptor Location	Receptor Type	1,3-BUTADIENE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZENE	BENZO(A)ANTHRACENE	BENZO(A)PYRENE	BENZO(B+K)FLUORANTHENE	BENZO(G,H,I)PERYLENE	CADMIUM	CHROMIUM VI	CHROMIUM VI (IN PM10)	CHRYSENE	DIBENZ(A,H)ANTHRACENE	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)	FLUORANTHENE	FLUORENE	INDENO(1,2,3-CD)PYRENE	NICKEL	NICKEL (IN PM10)	PHENANTHRENE	PM	PM2.5	PYRENE	SO2	URANIUM	URANIUM (IN PM10)	NO2 ARM2 method
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	5.1E-08	1.0E-05	5.3E-05	3.3E-08	2.6E-04	1.1E-09	3.9E-10	6.5E-05	4.8E-09	2.3E-02	1.6E-04	2.9E-04	1.1E-08	2.3E-03	1.8E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	1.0
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	7.3E-09	1.0E-05	5.3E-05	3.9E-09	2.6E-04	3.4E-10	1.2E-10	6.5E-05	1.3E-09	1.9E-02	1.6E-04	2.8E-04	1.8E-09	1.8E-03	1.7E-03	4.3E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.5
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	6.9E-09	1.0E-05	5.3E-05	3.7E-09	2.6E-04	3.3E-10	1.1E-10	6.5E-05	1.2E-09	1.9E-02	1.6E-04	2.8E-04	1.7E-09	1.8E-03	1.7E-03	4.3E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.4
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	7.1E-09	1.0E-05	5.3E-05	3.7E-09	2.6E-04	3.9E-10	1.4E-10	6.5E-05	1.4E-09	1.9E-02	1.6E-04	2.8E-04	1.7E-09	1.9E-03	1.7E-03	4.3E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.5
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	6.9E-09	1.0E-05	5.3E-05	3.6E-09	2.6E-04	3.8E-10	1.4E-10	6.5E-05	1.3E-09	1.9E-02	1.6E-04	2.8E-04	1.7E-09	1.9E-03	1.7E-03	4.3E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.5
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.4E-05	0.4	1.1E-07	1.0E-05	5.4E-05	6.1E-08	2.6E-04	2.7E-09	9.1E-10	6.5E-05	1.2E-08	3.0E-02	1.6E-04	3.0E-04	2.9E-08	3.0E-03	2.0E-03	5.1E-04	17	6.4	1.4E-04	0.4	2.6E-04	2.6E-04	1.6
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.6E-04	1.6E-03	4.2E-05	0.4	1.7E-07	1.0E-05	5.4E-05	8.6E-08	2.6E-04	1.1E-08	4.0E-09	6.5E-05	4.4E-08	6.2E-02	1.7E-04	3.5E-04	3.9E-08	9.1E-03	4.0E-03	7.2E-04	40	7.2	1.5E-04	0.4	2.6E-04	2.6E-04	5.2
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.4E-05	0.4	6.3E-08	1.0E-05	5.3E-05	3.1E-08	2.6E-04	2.9E-09	1.0E-09	6.5E-05	1.2E-08	3.0E-02	1.6E-04	3.0E-04	1.6E-08	3.6E-03	2.3E-03	5.1E-04	19	6.5	1.4E-04	0.4	2.6E-04	2.6E-04	1.6
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	1.4E-08	1.0E-05	5.3E-05	8.5E-09	2.6E-04	4.2E-10	1.5E-10	6.5E-05	1.6E-09	2.0E-02	1.6E-04	2.9E-04	2.9E-09	1.9E-03	1.7E-03	4.4E-04	13	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.5
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.1E-05	0.4	7.4E-09	1.0E-05	5.3E-05	4.0E-09	2.6E-04	3.5E-10	1.2E-10	6.5E-05	1.3E-09	1.9E-02	1.6E-04	2.8E-04	1.8E-09	1.9E-03	1.7E-03	4.3E-04	12	6.2	1.4E-04	0.4	2.6E-04	2.6E-04	0.5
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.5E-08	1.0E-05	5.3E-05	7.7E-09	2.6E-04	7.0E-10	2.5E-10	6.5E-05	2.5E-09	2.1E-02	1.6E-04	2.9E-04	4.0E-09	2.0E-03	1.8E-03	4.4E-04	13	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.6
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	2.7E-08	1.0E-05	5.3E-05	1.4E-08	2.6E-04	1.1E-09	4.0E-10	6.5E-05	4.3E-09	2.2E-02	1.6E-04	2.9E-04	7.2E-09	2.2E-03	1.8E-03	4.5E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.8
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	3.6E-08	1.0E-05	5.3E-05	2.1E-08	2.6E-04	1.2E-09	4.1E-10	6.5E-05	4.8E-09	2.3E-02	1.6E-04	2.9E-04	8.6E-09	2.3E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.9

Year 7 - Operations, Maximum 1-Hour Average Concentrations (µg/m^3) - Project Alone Refined Method - With Plume Depletion

Criteria			**4.5**	**36,200**	**100**	**400**	**83**
Max Receptor Concentration (inside pb)			**0.1**	**1,357**	**31**	**140**	**112**
Special Receptor ID (inside pb)			**R4**	**R4**	**R4**	**R4**	**R4**
Max Receptor Concentration (outside pb)			**6.9E-02**	**895**	**21**	**124**	**48**
Special Receptor ID (outside pb)			**R1**	**R1**	**R1**	**R1**	**R1**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)			**6.9E-02**	**812**	**19**	**119**	**43**

Rec #	Receptor Description	Receptor Location	Receptor Type	ACROLEIN	CO	SO2	NO2 ARM2 method	NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	6.9E-02	895	21	124	48
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.6E-02	322	7.3	56	19
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.3E-02	299	6.8	53	16
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.7E-02	538	12	90	16
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	514	12	86	17
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.0E-01	1,205	28	137	96
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	9.5E-02	1,070	25	134	107
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.1	1,357	31	140	112
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	4.9E-02	543	12	92	21
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	4.6E-02	334	7.6	58	18
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	6.4E-02	778	18	117	31
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	6.1E-02	620	14	106	42
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	6.9E-02	812	19	119	43

Year 7 - Operations, Maximum 1-Hour Average Concentrations (µg/m^3) - Cumulative Refined Method - With Plume Depletion

			Criteria	**4.5**	**36,200**	**100**	**400**	**83**
			Background Concentration	**0**	**965**	**5.2**	**5.4**	**5.4**
			Max Receptor Concentration (inside pb)	**0.1**	**2,322**	**37**	**145**	**117**
			Max Receptor Concentration (outside pb)	**6.9E-02**	**1,860**	**26**	**129**	**54**
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**6.9E-02**	**1,777**	**24**	**125**	**48**

Rec #	Receptor Description	Receptor Location	Receptor Type	ACROLEIN	CO	SO2	NO2 ARM2 method	NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	6.9E-02	1,860	26	129	54
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	4.6E-02	1,287	13	61	24
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	3.3E-02	1,264	12	58	22
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.7E-02	1,503	18	95	22
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	4.5E-02	1,479	17	91	22
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.0E-01	2,170	33	142	101
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	9.5E-02	2,035	30	139	112
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.1	2,322	37	145	117
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	4.9E-02	1,508	18	97	26
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	4.6E-02	1,299	13	64	23
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	6.4E-02	1,743	23	122	36
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	6.1E-02	1,585	19	111	48
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	6.9E-02	1,777	24	125	48

Year 7 - Operations, Maximum 2-Hour Average Concentrations (µg/m^3) - Project Alone Refined Method - With Plume Depletion

Criteria	N/A
Max Receptor Concentration (inside pb)	1.4
Special Receptor ID (inside pb)	R4
Max Receptor Concentration (outside pb)	1.0
Special Receptor ID (outside pb)	R1
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	0.6

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.0
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.4
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.3
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.4
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.4
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.3
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.3
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.4
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.3
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.4
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.4
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.5
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6

Year 7 - Construction, Maximum 2-Hour Average Concentrations (µg/m^3) - Cumulative Refined Method - With Plume Depletion

			Criteria	**N/A**
			Background Concentration	**0.2**
			Max Receptor Concentration (inside pb)	**1.6**
			Max Receptor Concentration (outside pb)	**1.2**
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**0.8**
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.2
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.5
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.5
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.5
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.5
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.6
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.5
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.5
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.6
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.7
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.8

Year 7 - Operations, Maximum 24-Hour Average Concentrations (µg/m³) - Project Alone Refined Method - With Plume Depletion

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Year 7 - Operations, Maximum 24-Hour Average Concentrations (µg/m³) - Cumulative Refined Method - With Plume Depletion

Criteria	10	n/a	n/a	100	0.4	12	n/a	25	0.2	10	0.01	n/a	2.5	120	0.025	n/a	120	0.3	0.0007	0.00035	0.04	0.1	50	11	n/a	25	n/a	0.3	20	72	25	0.4	0.2	0.4	2	120	1.5	0.2	0.1	10	0.5	0.2	120	50	27	10	n/a	n/a	5	10	27	1.0	n/a	11	120	2.0	0.2	n/a	1.00E+01	120	5.0	0.2	0.2	2.0	5.0	120
Background Concentration	0.6	4.4E-03	8.2E-03	0.0E+00	0.0E+00	0.4	1.6E-04	1.3E-03	1.3E-03	8.6E-03	7.6E-04	0.0E+00	1.3E-03	2.6E-02	2.6E-04	0.7	ND	6.0E-03			2.9E-03	7.6E-04	5.8E-03	9.4E-02	0.0E+00	ND	0.2	3.4E-03		0.2	ND	8.6E-03	8.6E-03	8.6E-03	6.4E-05	7.6E-04	ND	2.6E-03	2.6E-03				2E	13	12	0.1	ND																															
Max Receptor Concentration (inside pb)	0.6	4.5E-03	8.3E-03	0.1	1.8E-02	17	2.2E-04	1.4E-03	2.0E-03	3.6E-02	8.0E-04	1.1	1.3E-03	2.9E-02	2.7E-04	16	35	0.1	2.4E-07	6.8E-08	2.1E-02	1.1E-02	2.6E-02	0.3	2.7E-05	8.3E-02	10	3.6E-03	2.5E-03	15	2.3	0.2	6.9E-02	1.5E-02	5.5E-05	8.9E-04	6.9	6.5E-02	3.2E-02	2.6E-03	7.3E-11	7.2E-08	2.1E-11	241	75	19	0.9	2.6E-02	3.5E-04	4.4	2.7E-03	1.4	3.1E-04	2.3	4.3E-02	2.8E-02	0.6	2.7E-04	2.2E-04	1.1E-03	0.3	5.4E-05	2.9E-04	2.7E-04	2.4E-02	1.4E-03	2.5E-02
Max Receptor Concentration (outside pb)	0.6	4.4E-03	8.2E-03	4.3E-02	6.2E-03	6.4	1.8E-04	1.3E-03	1.5E-03	1.8E-02	7.7E-04	0.4	1.3E-03	2.7E-02	2.6E-04	6.5	7.9	4.8E-02	7.9E-08	2.3E-08	4.9E-03	4.4E-03	1.3E-02	0.2	9.5E-06	2.9E-02	3.9	3.5E-03	9.1E-04	5.5	0.7	8.2E-02	3.0E-02	1.1E-02	6.4E-05	8.5E-04	6.9	6.5E-02	3.2E-02	8.5E-03	2.0E-11	1.9E-08	5.7E-12	104	36	15	0.4	9.4E-03	2.6E-05	2.3	2.6E-03	0.5	2.8E-04	1.4	1.1E-02	1.1E-02	0.1	2.6E-04	8.0E-05	2.6E-03	0.1	1.9E-05	2.7E-04	2.6E-04	5.4E-03	2.6E-03	9.3E-02
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	0.6	4.4E-03	8.2E-03	3.5E-02	5.0E-03	5.1	1.8E-04	1.3E-03	1.5E-03	1.7E-02	7.7E-04	0.3	1.3E-03	2.7E-02	2.6E-04	5.5	6.3	3.8E-02	5.6E-08	1.6E-08	4.7E-03	3.5E-03	1.2E-02	0.2	6.7E-06	2.0E-02	3.0	3.5E-03	7.1E-04	4.4	0.7	6.5E-02	2.5E-02	1.0E-02	6.4E-05	7.9E-04	5.6	2.1E-02	7.1E-03	2.0E-11	1.9E-08	5.7E-12	86	31	14	0.3	9.4E-03	2.6E-05	1.8	2.6E-03	0.4	2.7E-04	1.1	1.5E-02	9.0E-03	9.0E-02	2.6E-04	5.4E-05	2.6E-03	9.3E-02	1.2E-05	2.7E-04	2.6E-04	7.4E-03	3.4E-04	1.7E-02

| Rec # | Receptor Description | Receptor Location | Receptor Type | 1,3-BUTADIENE | ACENAPHTHENE | ACENAPHTHYLENE | ACETALDEHYDE | ACROLEIN | ALUMINUM | ANTHRACENE | ANTIMONY | ARSENIC | BARIUM | BERYLLIUM | BIOTITE | BISMUTH | BORON | CADMIUM | CALCIUM | CHLORITE | CHROMIUM | CHROMIUM VI | CHROMIUM VI (IN PM10) | CHRYSOTILE ASBESTOS (units are fibres/cm³) | COBALT | COPPER | ELEMENTAL CARBON (FROM DIESEL EXHAUST) | FLUORIDE | HEMATITE | IRON | LEAD | LITHIUM | MAGNESIUM | MAGNETITE | MANGANESE | MANGANESE (IN PM10) | MANGANESE (IN PM2.5) | MERCURY | MOLYBDENUM | MUSCOVITE | NICKEL | NICKEL (IN PM10) | PALLADIUM | PHOSPHORUS | PLATINUM | PM | PM10 | PM2.5 | POTASSIUM | POTASSIUM AMPL KANTHATE | PYRITE | QUARTZ (IN PM10) | SELENIUM | SILICON | SILVER | SODIUM | SODIUM HEXANITZAPHOSPHATE | STRONTIUM | TALC (FIBROUS) | THALLIUM | THORIUM | TIN | TITANIUM | TUNGSTEN | URANIUM | URANIUM (IN PM10) | VANADIUM | YTTRIUM | ZINC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---

Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Project Alone Refined Method - with Plume Depletion

			Criteria	5.0E-03	1.4E-04	7.0E-05	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
			Max Receptor Concentration (inside pb)	1.5E-06	1.5E-08	4.4E-09	7.9E-03	2.2E-03	26	0.9	2.2E-06	6.7E-07
			Special Receptor ID (inside pb)	R3	R3	R3	R3	R3	R3	R3	R3	R3
			Max Receptor Concentration (outside pb)	2.7E-07	1.9E-09	5.4E-10	1.4E-03	3.7E-04	5.0	0.2	3.3E-07	1.0E-07
			Special Receptor ID (outside pb)	R8	R9	R9	R8	R8	R8	R8	R8	R8
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	2.7E-07	1.9E-09	5.4E-10	1.4E-03	3.7E-04	5.0	0.2	3.3E-07	1.0E-07
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**CADMIUM**	**CHROMIUM VI**	**CHROMIUM VI (IN PM10)**	**NICKEL**	**NICKEL (IN PM10)**	**PM**	**PM2.5**	**URANIUM**	**URANIUM (IN PM10)**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	2.3E-07	1.8E-09	5.1E-10	1.2E-03	3.2E-04	4.1	0.1	3.0E-07	9.0E-08
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	5.5E-08	4.8E-10	1.4E-10	2.8E-04	7.4E-05	1.0	3.2E-02	7.9E-08	2.5E-08
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	5.2E-08	4.5E-10	1.3E-10	2.7E-04	7.1E-05	0.9	3.1E-02	7.5E-08	2.3E-08
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	5.5E-08	5.1E-10	1.5E-10	2.8E-04	7.5E-05	1.0	3.2E-02	8.2E-08	2.5E-08
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	5.4E-08	5.0E-10	1.5E-10	2.7E-04	7.3E-05	0.9	3.1E-02	8.0E-08	2.5E-08
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	7.5E-07	5.2E-09	1.5E-09	4.1E-03	1.1E-03	14	0.5	9.0E-07	2.7E-07
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.5E-06	1.5E-08	4.4E-09	7.9E-03	2.2E-03	26	0.9	2.2E-06	6.7E-07
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	6.9E-07	5.6E-09	1.6E-09	4.0E-03	1.1E-03	13	0.4	8.9E-07	2.7E-07
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	6.8E-08	5.7E-10	1.6E-10	3.5E-04	9.2E-05	1.2	4.0E-02	9.5E-08	2.9E-08
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	5.7E-08	5.0E-10	1.4E-10	2.9E-04	7.7E-05	1.0	3.3E-02	8.2E-08	2.5E-08
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.6E-07	1.0E-09	2.9E-10	8.1E-04	2.1E-04	2.9	9.5E-02	1.9E-07	5.9E-08
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.7E-07	1.7E-09	4.9E-10	1.4E-03	3.7E-04	5.0	0.2	3.3E-07	1.0E-07
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.4E-07	1.9E-09	5.4E-10	1.3E-03	3.4E-04	4.3	0.1	3.1E-07	9.5E-08

Year 7 - Operations, Maximum Annual Average Concentrations (µg/m^3) - Cumulative Refined Method - with Plume Depletion

			Criteria	5.0E-03	1.4E-04	7.0E-05	4.0E-02	2.0E-02	60	8.8	6.0E-02	3.0E-02
			Background Concentration	2.6E-04	-	-	1.7E-03	1.7E-03	12	6.2	2.6E-04	2.6E-04
			Max Receptor Concentration (inside pb)	2.6E-04	1.5E-08	4.4E-09	9.6E-03	3.8E-03	38	7.1	2.6E-04	2.6E-04
			Max Receptor Concentration (outside pb)	2.6E-04	1.9E-09	5.4E-10	3.1E-03	2.0E-03	17	6.4	2.6E-04	2.6E-04
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	2.6E-04	1.9E-09	5.4E-10	3.1E-03	2.0E-03	17	6.4	2.6E-04	2.6E-04
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**CADMIUM**	**CHROMIUM VI**	**CHROMIUM VI (IN PM10)**	**NICKEL**	**NICKEL (IN PM10)**	**PM**	**PM2.5**	**URANIUM**	**URANIUM (IN PM10)**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	1.8E-09	5.1E-10	2.9E-03	2.0E-03	16	6.3	2.6E-04	2.6E-04
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.6E-04	4.8E-10	1.4E-10	1.9E-03	1.7E-03	13	6.2	2.6E-04	2.6E-04
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.6E-04	4.5E-10	1.3E-10	1.9E-03	1.7E-03	13	6.2	2.6E-04	2.6E-04
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	5.1E-10	1.5E-10	1.9E-03	1.7E-03	13	6.2	2.6E-04	2.6E-04
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	5.0E-10	1.5E-10	1.9E-03	1.7E-03	13	6.2	2.6E-04	2.6E-04
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	5.2E-09	1.5E-09	5.7E-03	2.7E-03	25	6.7	2.6E-04	2.6E-04
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	1.5E-08	4.4E-09	9.6E-03	3.8E-03	38	7.1	2.6E-04	2.6E-04
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	5.6E-09	1.6E-09	5.7E-03	2.8E-03	24	6.6	2.6E-04	2.6E-04
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	2.6E-04	5.7E-10	1.6E-10	2.0E-03	1.8E-03	13	6.2	2.6E-04	2.6E-04
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	2.6E-04	5.0E-10	1.4E-10	1.9E-03	1.7E-03	13	6.2	2.6E-04	2.6E-04
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	2.6E-04	1.0E-09	2.9E-10	2.5E-03	1.9E-03	15	6.3	2.6E-04	2.6E-04
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.6E-04	1.7E-09	4.9E-10	3.1E-03	2.0E-03	17	6.4	2.6E-04	2.6E-04
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.6E-04	1.9E-09	5.4E-10	2.9E-03	2.0E-03	16	6.3	2.6E-04	2.6E-04

Year 7 - Operations, Maximum 1-Hour Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m^3)

			Criteria	n/a	4.5	36,200	n/a	100	400	83
			Max Receptor Concentration (inside pb)	1.9	0.3	2,372	0.4	53	245	142
			Special Receptor ID (inside pb)	R3	R4	R4	R4	R4	R4	R3
			Max Receptor Concentration (outside pb)	1.3	0.2	1,516	0.2	34	153	117
			Special Receptor ID (outside pb)	R8	R9	R9	R9	R9	R9	R9
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	1.3	0.2	1,516	0.2	34	153	117
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**ACETALDEHYDE**	**ACROLEIN**	**CO**	**NAPTHALENE**	**SO2**	**NO2 ARM2 method**	**NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.2	0.1	1,347	0.2	30	141	117
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.0	0.1	637	0.2	14	126	46
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.8	9.7E-02	569	0.2	12	117	43
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.0	0.1	1,226	0.2	27	141	49
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.0	0.1	1,175	0.2	26	140	49
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.8	0.2	1,685	0.4	37	180	141
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.9	0.2	1,851	0.3	40	213	142
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.8	0.3	2,372	0.4	53	245	141
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.8	0.1	1,088	0.2	24	138	60
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	1.0	0.1	723	0.2	16	126	42
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.3	0.1	1,515	0.2	33	148	82
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.3	0.1	1,307	0.2	29	141	113
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.2	0.2	1,516	0.2	34	153	117

Year 7 - Operations, Maximum 1-Hour Average Concentrations - Cumulative Base Method - without Plume Depletion ($\mu g/m^3$)

			Criteria	**n/a**	**4.5**	**36,200**	**n/a**	**100**	**400**	**83**
			Background Concentration	**0**	**0**	**965**	**-**	**5.2**	**5.4**	**5.4**
			Max Receptor Concentration (inside pb)	**1.9**	**0.3**	**3,337**	**0.4**	**58**	**250**	**148**
			Max Receptor Concentration (outside pb)	**1.3**	**0.2**	**2,481**	**0.2**	**39**	**158**	**122**
			Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**1.3**	**0.2**	**2,481**	**0.2**	**39**	**158**	**122**
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**ACETALDEHYDE**	**ACROLEIN**	**CO**	**NAPTHALENE**	**SO2**	**NO2 ARM2 method**	**NO2 ARM2 method 8th highest max daily 1-hr averaged over 3 years**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	1.2	0.1	2,312	0.2	35	147	122
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.0	0.1	1,602	0.2	19	131	52
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.8	9.7E-02	1,534	0.2	17	122	48
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.0	0.1	2,191	0.2	32	146	54
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.0	0.1	2,140	0.2	31	146	54
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	1.8	0.2	2,650	0.4	42	185	146
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	1.9	0.2	2,816	0.3	46	219	148
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	1.8	0.3	3,337	0.4	58	250	146
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.8	0.1	2,053	0.2	29	143	65
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	1.0	0.1	1,688	0.2	21	131	47
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.3	0.1	2,480	0.2	38	153	87
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.3	0.1	2,272	0.2	35	146	118
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.2	0.2	2,481	0.2	39	158	122

Year 7 - Operations, Maximum 2-Hour Average Concentrations - Project Alone Base Method - without Plume Depletion ($\mu g/m^3$)

Criteria	**n/a**
Max Receptor Concentration (inside pb)	**3.4**
Special Receptor ID (inside pb)	**R3**
Max Receptor Concentration (outside pb)	**2.1**
Special Receptor ID (outside pb)	**R1**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**1.8**

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	2.1
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.0
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.9
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.3
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.2
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	3.3
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	3.4
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	3.1
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	1.0
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	1.0
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.3
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.5
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.8

Year 7 - Construction, Maximum 2-Hour Average Concentrations - Cumulative Base Method - without Plume Depletion ($\mu g/m^3$)

Criteria	**n/a**
Background Concentration	**0.2**
Max Receptor Concentration (inside pb)	**3.6**
Max Receptor Concentration (outside pb)	**2.3**
Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**2.0**

Rec #	Receptor Description	Receptor Location	Receptor Type	DIESEL PARTICULATE MATTER ($PM_{2.5}$ FROM DIESEL COMBUSTION)
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	2.3
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.2
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.1
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.5
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	1.4
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	3.4
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	3.6
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	3.3
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	1.2
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	1.2
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	1.5
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.7
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	2.0

Year 7 - Operations, Maximum 24-Hour Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m³)

| Criteria | 10 | n/a | n/a | 500 | 0.4 | 12 | n/a | 25 | 0.3 | 12 | 2.0 | n/a | 5.0E-05 | n/a | n/a | 1.0E-02 | n/a | 2.5 | 120 | 0.5 | 7.0E-04 | 3.5E-04 | n/a | 4.0E-02 | 0.1 | 55 | n/a | 2.5 | 120 | 0.5 | 7.0E-04 | 3.5E-04 | n/a | 4.0E-02 | 0.1 | 55 | n/a | 0.7 | 1.0E-04 | 5.0E-05 | n/a | 6.0E-03 | 0.1 | 8 | n/a | 0.5 | 120 | 0.5 | 7.0E-04 | 3.5E-04 | n/a | 4.0E-02 | 0.1 | 55 | n/a | 0.5 | 120 | 2.0 | 0.5 | n/a | 15 | 120 | 2.0 | 0.5 | n/a | 10 | 120 | 0.5 | 0.3 | 0.2 | 2.0 | 0.3 | 120 | 266 |
|---|---|---

Year 7 - Operations, Maximum 24-Hour Average Concentrations - Cumulative without Base Method - without Plume Depletion (µg/m³)

| Rec # | Receptor Description | Receptor Location | Receptor Type | 1,3-BUTADIENE | ACENAPHTHENE | ACENAPHTHYLENE | ACETALDEHYDE | ACROLEIN | ALUMINUM | ANTHRACENE | ANTIMONY | ARSENIC | BARIUM | BENZENE | BENZO(a)ANTHRACENE | BENZO(a)PYRENE | BENZO(b+j)FLUORANTHENE | BENZO(c,e,)PERYLENE | BERYLLIUM | BIOTITE | BISPHEN | BORON | CADMIUM | CALCIUM | CHLORITE | CHROMIUM | CHROMIUM VI (ALPHA) | CHRYSENE | CHRYSOTILE ASBESTOS (only on Kanaaris*) | COBALT | COPPER | DIBENZ(a,h)ANTHRACENE | ELEMENTAL CARBON (PDP/CSSS; DRAGAS) | FLUORANTHENE | FLUORENE | FLUORIDE | FORMALDEHYDE | HEPATITE | HYDROCARBONS | INDENO(1,2,3-CD)PYRENE | IRON | LEAD | LITHIUM | MAGNESIUM | MAGNETITE | MANGANESE | MANGANESE (ALPHA) | MANGANESE (ALPHA2) | MERCURY | MOLYBDENUM | MUSCOVITE | NAPTHALENE | NICKEL | NICKEL (ALPHA) | PALLADIUM | PHENANTHRENE | PHOSPHORUS | PLATINUM | PM | PM10 | PM2.5 | POTASSIUM | POTASSIUM NITRATE | PYRENE | PYRITE | QUARTZ (ALPHA) | SELENIUM | SILICON | SILVER | SODIUM | SODIUM HEXAFLUOROSILICATE | STRONTIUM | TALC (FIBROUS) | THALLIUM | THORIUM | TIN | TITANIUM | TOLUENE | URANIUM | URANIUM (ALPHA2) | VANADIUM | YTTRIUM | ZINC | MOE (with method |
|---|---|---

Year 7 - Operations, Maximum Annual Average Concentrations - Project Alone Base Method - without Plume Depletion (µg/m^3)

		Criteria	**2.0**	**n/a**	**n/a**	**n/a**	**0.45**	**n/a**	**1.0E-05**	**n/a**	**n/a**	**5.0E-03**	**1.4E-04**	**7.0E-05**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**0.04**	**0.02**	**n/a**	**60**	**8.8**	**n/a**	**10**	**6.0E-02**	**3.0E-02**	**24**
		Max Receptor Concentration (inside pb)	**4.4E-04**	**2.9E-05**	**4.8E-05**	**1.9E-05**	**7.1E-03**	**2.6E-07**	**2.8E-07**	**2.4E-07**	**1.4E-07**	**3.2E-06**	**2.9E-08**	**8.5E-09**	**5.0E-07**	**1.3E-07**	**8.4E-02**	**2.9E-05**	**1.1E-04**	**7.7E-08**	**1.6E-02**	**4.4E-03**	**8.0E-04**	**57**	**1.9**	**4.0E-05**	**1.7E-02**	**4.6E-06**	**1.4E-06**	**9.4**
		Special Receptor ID (inside pb)	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**	**R3**
		Max Receptor Concentration (outside pb)	**7.5E-05**	**6.4E-06**	**1.1E-05**	**3.2E-06**	**1.3E-03**	**7.0E-08**	**4.9E-08**	**4.9E-08**	**4.5E-08**	**5.2E-07**	**4.1E-09**	**1.2E-09**	**1.1E-07**	**2.0E-08**	**1.4E-02**	**5.0E-06**	**2.0E-05**	**1.6E-08**	**2.7E-03**	**7.1E-04**	**1.2E-04**	**9.2**	**0.3**	**6.0E-06**	**2.8E-03**	**7.0E-07**	**2.1E-07**	**1.7**
		Special Receptor ID (outside pb)	**R9**	**R1**	**R1**	**R9**	**R1**	**R1**	**R9**	**R1**	**R1**	**R9**	**R9**	**R9**	**R1**	**R9**	**R9**	**R9**	**R1**	**R1**	**R9**	**R9**	**R9**	**R9**	**R9**	**R9**	**R9**	**R9**	**R9**	**R9**	**R8**
		Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**7.5E-05**	**5.7E-06**	**9.6E-06**	**3.2E-06**	**1.2E-03**	**5.7E-08**	**4.9E-08**	**4.5E-08**	**3.4E-08**	**5.2E-07**	**4.1E-09**	**1.2E-09**	**9.8E-08**	**2.0E-08**	**1.4E-02**	**5.0E-06**	**2.0E-05**	**1.4E-08**	**2.7E-03**	**7.1E-04**	**1.2E-04**	**9.2**	**0.3**	**6.0E-06**	**2.8E-03**	**7.0E-07**	**2.1E-07**	**1.7**

Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**1,3-BUTADIENE**	**ACENAPHTHENE**	**ACENAPHTHYLENE**	**ANTHRACENE**	**BENZENE**	**BENZO(A)ANTHRACENE**	**BENZO(A)PYRENE**	**BENZO(B+K)FLUORANTHENE**	**BENZO(G,H,I)PERYLENE**	**CADMIUM**	**CHROMIUM VI**	**CHROMIUM VI (IN PM10)**	**CHRYSENE**	**DIBENZ(A,H)ANTHRACENE**	**DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)**	**FLUORANTHENE**	**FLUORENE**	**INDENO(1,2,3-CD)PYRENE**	**NICKEL**	**NICKEL (IN PM10)**	**PHENANTHRENE**	**PM**	**PM2.5**	**PYRENE**	**SO2**	**URANIUM**	**URANIUM (IN PM10)**	**NO2 ARM2 method**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	7.3E-05	6.4E-06	1.1E-05	3.2E-06	1.3E-03	7.0E-08	4.8E-08	4.9E-08	4.5E-08	4.8E-07	3.8E-09	1.1E-09	1.1E-07	1.9E-08	1.3E-02	4.9E-06	2.0E-05	1.6E-08	2.5E-03	6.6E-04	1.1E-04	8.6	0.3	5.8E-06	2.6E-03	6.6E-07	2.0E-07	1.6
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.9E-05	1.4E-06	2.3E-06	8.4E-07	3.2E-04	1.3E-08	1.3E-08	1.1E-08	7.3E-09	1.4E-07	1.3E-09	3.7E-10	2.4E-08	5.2E-09	3.7E-03	1.3E-06	5.0E-06	3.3E-09	6.9E-04	1.9E-04	3.1E-05	2.5	8.3E-02	1.5E-06	8.3E-04	2.1E-07	6.5E-08	0.4
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	1.8E-05	1.3E-06	2.2E-06	7.9E-07	3.0E-04	1.2E-08	1.2E-08	1.1E-08	7.0E-09	1.4E-07	1.2E-09	3.5E-10	2.2E-08	5.0E-09	3.5E-03	1.2E-06	4.7E-06	3.2E-09	6.6E-04	1.8E-04	3.0E-05	2.4	7.9E-02	1.5E-06	7.8E-04	2.0E-07	6.1E-08	0.4
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	2.0E-05	1.4E-06	2.3E-06	8.7E-07	3.3E-04	1.3E-08	1.3E-08	1.1E-08	7.2E-09	1.5E-07	1.4E-09	4.0E-10	2.4E-08	5.5E-09	3.9E-03	1.3E-06	5.2E-06	3.4E-09	7.2E-04	2.0E-04	3.3E-05	2.6	8.7E-02	1.6E-06	8.6E-04	2.3E-07	7.0E-08	0.4
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	2.0E-05	1.4E-06	2.2E-06	8.5E-07	3.2E-04	1.2E-08	1.3E-08	1.1E-08	7.0E-09	1.5E-07	1.3E-09	4.0E-10	2.3E-08	5.4E-09	3.8E-03	1.3E-06	5.1E-06	3.3E-09	7.1E-04	1.9E-04	3.2E-05	2.6	8.6E-02	1.6E-06	8.4E-04	2.2E-07	6.8E-08	0.4
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	2.0E-04	1.6E-05	2.7E-05	8.8E-06	3.4E-03	1.6E-07	1.3E-07	1.2E-07	9.8E-08	1.4E-06	1.0E-08	2.9E-09	2.7E-07	5.2E-08	3.7E-02	1.4E-05	5.3E-05	4.1E-08	7.1E-03	1.9E-03	3.2E-04	24	0.8	1.6E-05	7.7E-03	1.7E-06	5.2E-07	4.1
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	4.4E-04	2.9E-05	4.8E-05	1.9E-05	7.1E-03	2.6E-07	2.8E-07	2.4E-07	1.4E-07	3.2E-06	2.9E-08	8.5E-09	5.0E-07	1.3E-07	8.4E-02	2.9E-05	1.1E-04	7.7E-08	1.6E-02	4.4E-03	8.0E-04	57	1.9	4.0E-05	1.7E-02	4.6E-06	1.4E-06	9.4
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	2.0E-04	1.4E-05	2.2E-05	8.5E-06	3.2E-03	1.2E-07	1.2E-07	1.1E-07	6.8E-08	1.4E-06	1.1E-08	3.3E-09	2.3E-07	5.4E-08	3.6E-02	1.3E-05	5.1E-05	3.3E-08	7.7E-03	2.1E-03	3.3E-04	25	0.8	1.6E-05	7.7E-03	1.9E-06	5.6E-07	3.4
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	2.4E-05	2.0E-06	3.4E-06	1.0E-06	4.1E-04	2.0E-08	1.6E-08	1.6E-08	1.3E-08	1.7E-07	1.4E-09	4.1E-10	3.4E-08	6.4E-09	4.5E-03	1.6E-06	6.4E-06	4.8E-09	8.2E-04	2.2E-04	3.8E-05	3.0	9.9E-02	1.9E-06	9.9E-04	2.4E-07	7.4E-08	0.5
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	2.0E-05	1.4E-06	2.3E-06	8.6E-07	3.3E-04	1.3E-08	1.3E-08	1.1E-08	7.5E-09	1.5E-07	1.3E-09	3.8E-10	2.4E-08	5.3E-09	3.8E-03	1.3E-06	5.1E-06	3.4E-09	7.1E-04	1.9E-04	3.2E-05	2.6	8.5E-02	1.6E-06	8.6E-04	2.2E-07	6.6E-08	0.4
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	4.2E-05	2.9E-06	4.8E-06	1.8E-06	6.8E-04	2.7E-08	2.7E-08	2.4E-08	1.5E-08	3.0E-07	2.3E-09	6.8E-10	5.0E-08	1.1E-08	8.0E-03	2.8E-06	1.1E-05	7.2E-09	1.5E-03	3.9E-04	6.7E-05	5.4	0.2	3.3E-06	1.6E-03	4.1E-07	1.3E-07	1.1
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.3E-05	5.1E-06	8.5E-06	3.1E-06	1.2E-03	4.8E-08	4.8E-08	4.2E-08	2.7E-08	5.0E-07	3.8E-09	1.1E-09	8.9E-08	1.9E-08	1.4E-02	4.9E-06	1.9E-05	1.3E-08	2.5E-03	6.6E-04	1.2E-04	9.0	0.3	5.8E-06	2.8E-03	6.7E-07	2.0E-07	1.7
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	7.5E-05	5.7E-06	9.6E-06	3.2E-06	1.2E-03	5.7E-08	4.9E-08	4.5E-08	3.4E-08	5.2E-07	4.1E-09	1.2E-09	9.8E-08	2.0E-08	1.4E-02	5.0E-06	2.0E-05	1.4E-08	2.7E-03	7.1E-04	1.2E-04	9.2	0.3	6.0E-06	2.8E-03	7.0E-07	2.1E-07	1.5

Year 7 - Operations, Maximum Annual Average Concentrations - Cumulative Base Method - without Plume Depletion (µg/m^3)

		Criteria	**2**	**n/a**	**n/a**	**n/a**	**0.45**	**n/a**	**0.00001**	**n/a**	**n/a**	**0.005**	**0.00014**	**0.00007**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**0.04**	**0.02**	**n/a**	**60**	**8.8**	**n/a**	**10**	**0.06**	**0.03**	**24**
		Background Concentration	**0.6**	**8.5E-04**	**1.6E-03**	**3.1E-05**	**0.4**	**0.0E+00**	**1.0E-05**	**5.3E-05**	**0.0E+00**	**2.6E-04**	**-**	**-**	**6.5E-05**	**0.0E+00**	**1.8E-02**	**1.6E-04**	**2.8E-04**	**0.0E+00**	**1.7E-03**	**1.7E-03**	**4.2E-04**	**12**	**6.2**	**1.4E-04**	**0.4**	**2.6E-04**	**2.6E-04**	**0.3**
		Max Receptor Concentration (inside pb)	**0.6**	**8.8E-04**	**1.6E-03**	**5.0E-05**	**0.4**	**2.6E-07**	**1.0E-05**	**5.4E-05**	**1.4E-07**	**2.6E-04**	**2.9E-08**	**8.5E-09**	**6.5E-05**	**1.3E-07**	**0.1**	**1.9E-04**	**3.9E-04**	**7.7E-08**	**1.8E-02**	**6.0E-03**	**1.2E-03**	**68**	**8.1**	**1.8E-04**	**0.4**	**2.6E-04**	**2.6E-04**	**9.7**
		Max Receptor Concentration (outside pb)	**0.6**	**8.5E-04**	**1.6E-03**	**3.4E-05**	**0.4**	**7.0E-08**	**1.0E-05**	**5.4E-05**	**4.5E-08**	**2.6E-04**	**4.1E-09**	**1.2E-09**	**6.5E-05**	**2.0E-08**	**3.2E-02**	**1.6E-04**	**3.0E-04**	**1.6E-08**	**4.3E-03**	**2.4E-03**	**5.4E-04**	**21**	**6.5**	**1.4E-04**	**0.4**	**2.6E-04**	**2.6E-04**	**2.0**
		Max Concentration (Sensitive Receptor - Indigenous - outside pb)	**0.6**	**8.5E-04**	**1.6E-03**	**3.4E-05**	**0.4**	**5.7E-08**	**1.0E-05**	**5.4E-05**	**3.4E-08**	**2.6E-04**	**4.1E-09**	**1.2E-09**	**6.5E-05**	**2.0E-08**	**3.2E-02**	**1.6E-04**	**3.0E-04**	**1.4E-08**	**4.3E-03**	**2.4E-03**	**5.4E-04**	**21**	**6.5**	**1.4E-04**	**0.4**	**2.6E-04**	**2.6E-04**	**2.0**
Rec #	**Receptor Description**	**Receptor Location**	**Receptor Type**	**1,3-BUTADIENE**	**ACENAPHTHENE**	**ACENAPHTHYLENE**	**ANTHRACENE**	**BENZENE**	**BENZO(A)ANTHRACENE**	**BENZO(A)PYRENE**	**BENZO(B+K)FLUORANTHENE**	**BENZO(G,H,I)PERYLENE**	**CADMIUM**	**CHROMIUM VI**	**CHROMIUM VI (IN PM10)**	**CHRYSENE**	**DIBENZ(A,H)ANTHRACENE**	**DIESEL PARTICULATE MATTER (PM2.5 FROM DIESEL COMBUSTION)**	**FLUORANTHENE**	**FLUORENE**	**INDENO(1,2,3-CD)PYRENE**	**NICKEL**	**NICKEL (IN PM10)**	**PHENANTHRENE**	**PM**	**PM2.5**	**PYRENE**	**SO2**	**URANIUM**	**URANIUM (IN PM10)**	**NO2 ARM2 method**
R1	House South of Site, At Lake 300m East of Highway 655	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.4E-05	0.4	7.0E-08	1.0E-05	5.4E-05	4.5E-08	2.6E-04	3.8E-09	1.1E-09	6.5E-05	1.9E-08	3.1E-02	1.6E-04	3.0E-04	1.6E-08	4.1E-03	2.3E-03	5.4E-04	20	6.5	1.4E-04	0.4	2.6E-04	2.6E-04	1.9
R10	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.3E-08	1.0E-05	5.3E-05	7.3E-09	2.6E-04	1.3E-09	3.7E-10	6.5E-05	5.2E-09	2.2E-02	1.6E-04	2.9E-04	3.3E-09	2.3E-03	1.8E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.7
R11	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.2E-08	1.0E-05	5.3E-05	7.0E-09	2.6E-04	1.2E-09	3.5E-10	6.5E-05	5.0E-09	2.2E-02	1.6E-04	2.9E-04	3.2E-09	2.3E-03	1.8E-03	4.5E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.7
R12	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.3E-08	1.0E-05	5.3E-05	7.2E-09	2.6E-04	1.4E-09	4.0E-10	6.5E-05	5.5E-09	2.2E-02	1.6E-04	2.9E-04	3.4E-09	2.4E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.7
R13	Camp/Cottage North of Existing Rail Corridor	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.2E-08	1.0E-05	5.3E-05	7.0E-09	2.6E-04	1.3E-09	4.0E-10	6.5E-05	5.4E-09	2.2E-02	1.6E-04	2.9E-04	3.3E-09	2.4E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.7
R2	Camp/Cottage on Davis Lake	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.6E-04	1.6E-03	4.0E-05	0.4	1.6E-07	1.0E-05	5.4E-05	9.8E-08	2.6E-04	1.0E-08	2.9E-09	6.5E-05	5.2E-08	5.5E-02	1.7E-04	3.4E-04	4.1E-08	8.7E-03	3.5E-03	7.4E-04	36	7.0	1.5E-04	0.4	2.6E-04	2.6E-04	4.4
R3	Camp on the West Buskegeau River	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.8E-04	1.6E-03	5.0E-05	0.4	2.6E-07	1.0E-05	5.4E-05	1.4E-07	2.6E-04	2.9E-08	8.5E-09	6.5E-05	1.3E-07	0.1	1.9E-04	3.9E-04	7.7E-08	1.8E-02	6.0E-03	1.2E-03	68	8.1	1.8E-04	0.4	2.6E-04	2.6E-04	9.7
R4	Camp/Cottage East of Site	inside pb	Sensitive Receptor - Non-Indigenous	0.6	8.6E-04	1.6E-03	3.9E-05	0.4	1.2E-07	1.0E-05	5.4E-05	6.8E-08	2.6E-04	1.1E-08	3.3E-09	6.5E-05	5.4E-08	5.4E-02	1.7E-04	3.3E-04	3.3E-08	9.3E-03	3.8E-03	7.5E-04	37	7.0	1.5E-04	0.4	2.6E-04	2.6E-04	3.7
R5	Camp/Cottage Near Highway 655 South of Site	outside pb	Sensitive Receptor - Non-Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	2.0E-08	1.0E-05	5.3E-05	1.3E-08	2.6E-04	1.4E-09	4.1E-10	6.5E-05	6.4E-09	2.3E-02	1.6E-04	2.9E-04	4.8E-09	2.5E-03	1.9E-03	4.6E-04	15	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.8
R6	Campground at Bigwater Lake	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.2E-05	0.4	1.3E-08	1.0E-05	5.3E-05	7.5E-09	2.6E-04	1.3E-09	3.8E-10	6.5E-05	5.3E-09	2.2E-02	1.6E-04	2.9E-04	3.4E-09	2.4E-03	1.9E-03	4.6E-04	14	6.3	1.4E-04	0.4	2.6E-04	2.6E-04	0.8
R7	Mattagami River - Indigenous Site	outside pb	Sensitive Receptor - Indigenous/Non-Indigenous	0.6	8.5E-04	1.6E-03	3.3E-05	0.4	2.7E-08	1.0E-05	5.3E-05	1.5E-08	2.6E-04	2.3E-09	6.8E-10	6.5E-05	1.1E-08	2.6E-02	1.6E-04	2.9E-04	7.2E-09	3.1E-03	2.1E-03	4.9E-04	17	6.4	1.4E-04	0.4	2.6E-04	2.6E-04	1.4
R8	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.4E-05	0.4	4.8E-08	1.0E-05	5.3E-05	2.7E-08	2.6E-04	3.8E-09	1.1E-09	6.5E-05	1.9E-08	3.2E-02	1.6E-04	3.0E-04	1.3E-08	4.2E-03	2.3E-03	5.4E-04	21	6.5	1.4E-04	0.4	2.6E-04	2.6E-04	2.0
R9	Overnight Indigenous Habitation Location	outside pb	Sensitive Receptor - Indigenous	0.6	8.5E-04	1.6E-03	3.4E-05	0.4	5.7E-08	1.0E-05	5.4E-05	3.4E-08	2.6E-04	4.1E-09	1.2E-09	6.5E-05	2.0E-08	3.2E-02	1.6E-04	3.0E-04	1.4E-08	4.3E-03	2.4E-03	5.4E-04	21	6.5	1.4E-04	0.4	2.6E-04	2.6E-04	1.8

Appendix E Highway 655 Realignment Predicted Concentrations at Special Receptors

Maximum Predicted Concentrations at Special Receptor Locations
Canada Nickel - Highway 655 Realignment Study

Project Alone

CoPC	CAS No.	Averaging Period (hours)	Criteria (µg/m^3)	Maximum Predicted Concentration - Hwy 655 Realignment Project Alone (µg/m³)			% of Criteria			Maximum Sensitive Receptor #		
				Existing (2024)	Future (2040) No Build	Future (2040) Build	Existing (2024)	Future (2040) No Build	Future (2040) Build	Existing (2024)	Future (2040) No Build	Future (2040) Build
Inhalable Particulate Matter (PM_{10})	<<PM10>>	24	50	0.9	0.9	0.5	2%	2%	<1%	R1	R1	R1
Fine Particulate Matter ($PM_{2.5}$)	<<PM2.5>>	24	27	0.3	0.2	0.1	1%	<1%	<1%	R1	R1	R1
		8760	8.8	3.6E-02	2.9E-02	3.2E-02	<1%	<1%	<1%	R1	R1	R1
Carbon Monoxide (CO)	630-08-0	0.5	6000	208	278	297	3%	5%	5%	R1	R1	R5
		1	36200	172	229	244	<1%	<1%	<1%	R1	R1	R5
		8	15700	71	89	92	<1%	<1%	<1%	R1	R1	R1
Nitrogen Dioxide (NO_2)	10102-44-0	1	400	28	11	13	7%	3%	3%	R1	R1	R5
		1	83	18	7.5	11	21%	9%	13%	R5	R5	R5
		24	200	3.0	1.1	0.7	2%	<1%	<1%	R1	R1	R5
		8760	24	1.2	0.5	0.7	5%	2%	3%	R1	R1	R1
1,3-butadiene	106-99-0	24	10	4.1E-04	4.2E-05	9.5E-05	<1%	<1%	<1%	R1	R5	R5
		8760	2	5.3E-05	5.7E-06	1.2E-05	<1%	<1%	<1%	R1	R5	R5
Acetaldehyde	75-07-0	0.5	500	0.4	0.5	0.6	<1%	<1%	<1%	R1	R1	R5
		24	500	3.6E-02	4.2E-02	2.3E-02	<1%	<1%	<1%	R1	R1	R1
Acrolein	107-02-8	1	4.5	9.0E-03	5.7E-03	1.7E-02	<1%	<1%	<1%	R5	R5	R5
		24	0.4	9.3E-04	4.3E-04	9.6E-04	<1%	<1%	<1%	R1	R5	R5
Benzene	71-43-2	24	2.3	2.8E-03	1.6E-03	2.9E-03	<1%	<1%	<1%	R1	R1	R5
		8760	0.45	5.6E-07	4.4E-08	3.8E-04	<1%	<1%	<1%	R1	R1	R5
Benzo(a)pyrene	50-32-8	24	5.00E-05	4.4E-06	3.4E-07	2.0E-07	9%	<1%	<1%	R1	R1	R1
		8760	1.00E-05	5.6E-07	4.4E-08	5.1E-08	6%	<1%	<1%	R1	R1	R1
Formaldehyde	50-00-0	24	65	4.7E-02	5.0E-02	2.8E-02	<1%	<1%	<1%	R1	R1	R1

Notes:

1. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
2. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
3. Maximum Special Receptor Concentrations exclude surface water receptors.

Maximum Predicted Concentrations at Special Receptor Locations
Canada Nickel - Highway 655 Realignment Study - Existing (2024) Scenario

EXISTING (2024) SCENARIO																														
Rec #	Receptor Description	UTM E (m)	UTM N (m)	Receptor Location	Maximum Predicted Project Alone Concentrations (µg/m^3)																									
					CO	CO	CO	NO2 ARM2 maximum [1]	NO_2 met years 2018-2020	NO_2 met years 2019-2021	NO_2 met years 2020-2022	NO_2 ARM2 98th percentile [2]	NO_2	NO_2	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	B(a)P	B(a)P	Benzene	Benzene	1,3-Butadiene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
					0.5-hr	1-hr	8-hr	1-hr	1-hr	1-hr	1-hr	1-hr	24-hr	annual	24-hr	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	0.5-hr	1-hr	24-hr	1-hr	24-hr
R1	House South of Site, At Lake 300m East of Highway 655	473500.1	5398566.0	outside pb	208	172	71	28	17	17	17	17	3.0	1.2	0.9	0.3	3.6E-02	4.4E-06	5.6E-07	2.8E-03	4.0E-04	4.1E-04	5.3E-05	4.7E-02	0.4	0.3	3.6E-02	8.6E-03	9.3E-04
R2	Camp/Cottage on Davis Lake	471449.9	5403929.0	inside pb	76	62	23	10	5.4	5.4	5.4	5.4	1.0	0.3	0.3	9.4E-02	1.0E-02	1.5E-06	1.6E-07	9.8E-04	1.2E-04	1.4E-04	1.5E-05	1.6E-02	0.1	0.1	1.2E-02	3.1E-03	3.2E-04
R3	Camp on the West Buskegeau River	477544.4	5408361.0	inside pb	30	24	12	4.0	2.3	2.2	2.3	2.3	0.4	0.2	0.1	3.6E-02	7.1E-03	5.6E-07	1.1E-07	3.9E-04	8.2E-05	5.3E-05	1.1E-05	6.2E-03	5.9E-02	4.8E-02	4.7E-03	1.9E-03	1.3E-04
R4	Camp/Cottage East of Site	477052.3	5403390.0	inside pb	26	22	13	3.7	2.9	2.9	2.9	2.9	0.5	0.3	0.1	4.1E-02	8.4E-03	6.5E-07	1.3E-07	4.7E-04	1.0E-04	6.2E-05	1.3E-05	7.2E-03	5.2E-02	4.3E-02	5.4E-03	1.7E-03	1.6E-04
R5	Camp/Cottage Near Highway 655 South of Site	475946.3	5387777.0	outside pb	181	149	41	26	18	17	15	18	1.0	0.4	0.3	8.2E-02	6.0E-03	1.3E-06	8.5E-08	1.6E-03	2.1E-04	1.3E-04	1.3E-05	1.6E-02	0.4	0.3	1.1E-02	9.0E-03	5.3E-04
R6	Campground at Bigwater Lake	479442.0	5384068.0	outside pb	43	36	8.2	6.0	3.7	3.7	3.7	3.7	0.3	0.1	6.8E-02	2.3E-02	1.9E-03	3.4E-07	2.8E-08	4.7E-04	5.3E-05	3.9E-05	3.7E-06	4.8E-03	8.7E-02	7.2E-02	3.2E-03	3.2E-03	1.6E-04
R7	Mattagami River - Indigenous Site			outside pb	18	15	6.5	3.0	1.4	1.4	1.5	1.4	0.2	6.4E-02	6.6E-02	2.1E-02	1.8E-03	3.3E-07	2.8E-08	4.5E-04	2.6E-05	3.2E-05	2.9E-06	4.1E-03	3.6E-02	3.0E-02	2.8E-03	2.3E-03	1.5E-04
R8	Overnight Indigenous Habitation Location			outside pb	20	17	7.1	3.5	1.6	1.7	1.8	1.6	0.3	8.3E-02	8.5E-02	2.7E-02	2.4E-03	4.3E-07	3.8E-08	3.1E-04	3.2E-05	4.1E-05	3.8E-06	4.8E-03	4.6E-02	3.8E-02	3.6E-03	2.0E-03	1.0E-04
R9	Overnight Indigenous Habitation Location			outside pb	78	65	38	11	8.6	8.7	8.6	8.6	1.2	0.9	0.3	0.1	2.7E-02	1.7E-06	4.2E-07	1.3E-03	3.1E-04	1.7E-04	4.1E-05	1.9E-02	0.2	0.1	1.4E-02	3.3E-03	4.4E-04
R10	Overnight Indigenous Habitation Location			outside pb	45	37	8.6	6.3	4.0	4.0	4.0	4.0	0.3	9.4E-02	7.1E-02	2.4E-02	1.8E-03	3.6E-07	2.7E-08	4.5E-04	4.9E-05	4.0E-05	3.5E-06	4.9E-03	9.1E-02	7.5E-02	3.3E-03	2.6E-03	1.5E-04
R11	Overnight Indigenous Habitation Location			outside pb	52	43	9.8	7.2	4.7	4.7	4.7	4.7	0.3	8.4E-02	7.4E-02	2.5E-02	1.7E-03	3.7E-07	2.5E-08	4.7E-04	4.3E-05	4.2E-05	3.2E-06	5.2E-03	0.1	8.6E-02	3.5E-03	2.4E-03	1.6E-04
R12	Camp/Cottage North of Existing Rail Corridor	484949.9	5384101.0	outside pb	24	20	5.7	3.3	1.9	1.9	1.9	1.9	0.2	0.1	4.4E-02	1.5E-02	1.7E-03	2.2E-07	2.3E-08	3.8E-04	8.3E-05	2.5E-05	4.3E-06	3.1E-03	4.8E-02	4.0E-02	2.0E-03	2.0E-03	1.3E-04
R13	Camp/Cottage North of Existing Rail Corridor	485094.5	5383767.0	outside pb	24	20	5.6	3.3	1.8	1.8	1.9	1.8	0.2	0.1	4.3E-02	1.4E-02	1.7E-03	2.2E-07	2.2E-08	3.9E-04	8.7E-05	2.5E-05	4.3E-06	3.2E-03	4.8E-02	4.0E-02	2.0E-03	2.0E-03	1.4E-04
Maximum Special Receptor					208	172	71	28	18	17	17	18	3.0	1.2	0.9	0.3	3.6E-02	4.4E-06	5.6E-07	2.8E-03	4.0E-04	4.1E-04	5.3E-05	4.7E-02	0.4	0.3	3.6E-02	9.0E-03	9.3E-04
Special Receptor ID (outside pb)					**R1**	**R1**	**R1**	**R1**	**R5**	**R1**	**R1**	**R5**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R5**	**R1**

Notes:

1. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
2. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
3. Maximum Special Receptor Concentrations exclude surface water receptors.

Maximum Predicted Concentrations at Special Receptor Locations
Canada Nickel - Highway 655 Realignment Study - Future (2040) No Build Scenario

FUTURE (2040) NO BUILD SCENARIO																												
					Maximum Predicted Project Alone Concentrations ($\mu g/m^3$)																							
Rec #	Receptor Description	UTM E (m)	UTM N (m)	Receptor Location	CO	CO	CO	NO2 ARM2 maximum [1]	NO_2 met years 2018-2020	NO_2 met years 2019-2021	NO_2 met years 2020-2022	NO_2 ARM2 98th percentile [2]	NO_2	NO_2	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	B(a)P	B(a)P	Benzene	Benzene	1,3-Butadiene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
					0.5-hr	1-hr	8-hr	1-hr	1-hr	1-hr	1-hr	1-hr	24-hr	annual	24-hr	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	0.5-hr	1-hr	24-hr	1-hr	24-hr
R1	House South of Site, At Lake 300m East of Highway 655	473500.1	5398566.0	outside pb	278	229	89	11	6.5	6.6	6.6	6.5	1.1	0.5	0.9	0.2	2.9E-02	3.4E-07	4.4E-08	1.6E-03	2.4E-04	1.2E-05	1.7E-06	5.0E-02	0.5	0.4	4.2E-02	1.8E-03	1.6E-04
R2	Camp/Cottage on Davis Lake	471449.9	5403929.0	inside pb	97	80	29	3.8	2.2	2.2	2.2	2.2	0.4	0.1	0.3	7.3E-02	8.1E-03	1.1E-07	1.3E-08	5.4E-04	7.2E-05	5.7E-06	6.5E-07	1.6E-02	0.2	0.2	1.4E-02	1.2E-03	7.4E-05
R3	Camp on the West Buskegeau River	477544.4	5408361.0	inside pb	41	33	15	1.9	0.9	0.9	0.9	0.9	0.1	9.6E-02	0.1	2.9E-02	5.7E-03	4.4E-08	8.9E-09	2.6E-04	5.0E-05	4.1E-06	4.5E-07	6.5E-03	7.3E-02	6.0E-02	5.5E-03	1.2E-03	5.0E-05
R4	Camp/Cottage East of Site	477052.3	5403390.0	inside pb	38	31	16	1.8	1.3	1.3	1.3	1.3	0.2	0.1	0.1	3.3E-02	6.7E-03	5.1E-08	1.1E-08	2.9E-04	6.4E-05	4.7E-06	6.7E-07	7.5E-03	6.5E-02	5.3E-02	6.2E-03	9.2E-04	5.4E-05
R5	Camp/Cottage Near Highway 655 South of Site	475946.3	5387777.0	outside pb	227	187	53	11	7.5	7.1	6.5	7.5	0.5	0.3	0.3	6.6E-02	5.0E-03	1.2E-07	1.3E-08	1.4E-03	1.9E-04	4.2E-05	5.7E-06	1.6E-02	0.5	0.4	1.3E-02	5.7E-03	4.3E-04
R6	Campground at Bigwater Lake	479442.0	5384066.0	outside pb	61	50	10	2.9	2.0	2.0	2.1	2.0	0.2	6.8E-02	6.9E-02	1.9E-02	1.6E-03	3.5E-08	3.5E-09	3.9E-04	4.6E-05	9.9E-06	1.3E-06	5.0E-03	0.1	8.9E-02	3.7E-03	3.0E-03	1.1E-04
R7	Mattagami River - Indigenous Site	463153.0	5402182.0	outside pb	23	19	8.2	2.2	0.8	0.8	0.8	0.8	0.1	2.9E-02	6.8E-02	1.7E-02	1.5E-03	3.0E-08	2.5E-09	3.8E-04	1.8E-05	1.1E-05	2.9E-07	4.2E-03	4.5E-02	3.7E-02	3.3E-03	2.0E-03	1.1E-04
R8	Overnight Indigenous Habitation Location	464609.8	5406478.0	outside pb	25	21	8.9	1.9	0.8	0.8	0.8	0.8	0.1	3.6E-02	8.4E-02	2.2E-02	2.0E-03	3.4E-08	3.2E-09	2.0E-04	2.1E-05	3.7E-06	2.7E-07	4.9E-03	5.5E-02	4.6E-02	4.1E-03	1.5E-03	4.1E-05
R9	Overnight Indigenous Habitation Location	474773.4	5398595.0	outside pb	92	76	47	4.0	3.6	3.6	3.6	3.6	0.5	0.4	0.3	8.9E-02	2.2E-02	1.4E-07	3.4E-08	8.6E-04	1.9E-04	1.1E-05	1.5E-06	2.0E-02	0.2	0.2	1.7E-02	1.6E-03	1.5E-04
R10	Overnight Indigenous Habitation Location	479265.5	5383804.0	outside pb	60	50	11	2.5	2.0	2.1	2.2	2.0	0.2	6.2E-02	7.1E-02	1.9E-02	1.5E-03	3.5E-08	3.3E-09	3.7E-04	4.2E-05	9.6E-06	1.1E-06	5.1E-03	0.1	9.3E-02	3.8E-03	2.3E-03	1.0E-04
R11	Overnight Indigenous Habitation Location	478802.1	5383303.0	outside pb	64	52	12	2.8	2.1	2.1	2.1	2.1	0.2	5.3E-02	7.2E-02	2.0E-02	1.4E-03	3.7E-08	3.0E-09	3.6E-04	3.6E-05	8.8E-06	9.6E-07	5.3E-03	0.1	0.1	3.9E-03	2.1E-03	9.4E-05
R12	Camp/Cottage North of Existing Rail Corridor	484849.9	5384101.0	outside pb	27	22	7.1	2.0	1.2	1.2	1.2	1.2	0.1	0.1	4.4E-02	1.2E-02	1.4E-03	2.3E-08	4.4E-09	3.7E-04	7.8E-05	1.3E-05	2.4E-06	3.3E-03	6.0E-02	4.9E-02	2.3E-03	1.6E-03	1.3E-04
R13	Camp/Cottage North of Existing Rail Corridor	485094.5	5383767.0	outside pb	27	22	7.0	2.0	1.2	1.2	1.2	1.2	0.1	0.1	4.3E-02	1.2E-02	1.4E-03	2.3E-08	4.5E-09	3.9E-04	8.1E-05	1.3E-05	2.6E-06	3.3E-03	6.0E-02	4.9E-02	2.3E-03	1.6E-03	1.3E-04
Maximum Special Receptor					**278**	**229**	**89**	**11**	**7.5**	**7.1**	**6.6**	**7.5**	**1.1**	**0.5**	**0.9**	**0.2**	**2.9E-02**	**3.4E-07**	**4.4E-08**	**1.6E-03**	**2.4E-04**	**4.2E-05**	**5.7E-06**	**5.0E-02**	**0.5**	**0.4**	**4.2E-02**	**5.7E-03**	**4.3E-04**
Special Receptor ID (outside pb)					**R1**	**R1**	**R1**	**R1**	**R5**	**R5**	**R1**	**R5**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R5**	**R5**	**R1**	**R1**	**R1**	**R1**	**R5**	**R5**

Notes:
1. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
2. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
3. Maximum Special Receptor Concentrations exclude surface water receptors.

Maximum Predicted Concentrations at Special Receptor Locations
Canada Nickel - Highway 655 Realignment Study

FUTURE (2040) BUILD SCENARIO																											
Rec #	Receptor Description	UTM E (m)	UTM N (m)	Receptor Location	Maximum Predicted Project Alone Concentrations ($\mu g/m^3$)																						
					CO	CO	CO	NO2 ARM2 maximum [1]	NO_2 met years 2018-2020	NO_2 met years 2019-2021	NO_2 met years 2020-2022	NO_2 ARM2 98th percentile [2]	NO_2	NO_2	PM_{10}	$PM_{2.5}$	$PM_{2.5}$	B(a)P	B(a)P	Benzene	Benzene	1,3-Butadiene	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acetaldehyde	Acetaldehyde	Acrolein	Acrolein
					0.5-hr	1-hr	8-hr	1-hr	1-hr	1-hr	1-hr	1-hr	24-hr	annual	24-hr	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	annual	24-hr	0.5-hr	1-hr	24-hr	1-hr	24-hr
R1	House South of Site, At Lake 300m East of Highway 655	473500.1	5398566.0	outside pb	145.2	119.6	91.8	6.1	5.9	6.0	5.9	6.0	6.77E-01	7.09E-01	4.92E-01	1.25E-01	3.18E-02	2.03E-07	5.10E-08	1.18E-03	2.65E-04	1.40E-05	2.00E-06	2.80E-02	2.75E-01	2.26E-01	2.31E-02	2.26E-03	1.84E-04
R2	Camp/Cottage on Davis Lake	471449.9	5403929.0	inside pb	147.2	121.2	76.0	6.5	5.1	5.1	5.1	5.1	5.44E-01	5.79E-01	4.23E-01	1.08E-01	2.67E-02	1.73E-07	4.20E-08	8.94E-04	1.98E-04	7.74E-06	8.18E-07	2.38E-02	2.93E-01	2.42E-01	2.00E-02	1.89E-03	1.14E-04
R3	Camp on the West Buskegeau River	477544.4	5408361.0	inside pb	64.6	53.2	18.8	2.6	1.4	1.4	1.4	1.4	1.28E-01	1.22E-01	9.78E-02	2.50E-02	5.08E-03	4.00E-08	8.41E-09	2.71E-04	5.10E-05	5.08E-06	6.42E-07	5.51E-03	1.26E-01	1.04E-01	4.62E-03	1.17E-03	5.80E-05
R4	Camp/Cottage East of Site	477052.3	5403390.0	inside pb	56.9	46.8	20.7	2.4	1.6	1.5	1.5	1.5	1.49E-01	1.49E-01	1.07E-01	2.79E-02	6.03E-03	4.51E-08	1.01E-08	3.08E-04	6.60E-05	7.20E-06	9.32E-07	6.20E-03	1.11E-01	9.12E-02	5.12E-03	1.44E-03	7.80E-05
R5	Camp/Cottage Near Highway 655 South of Site	475946.3	5387777.0	outside pb	296.8	244.4	73.7	13.4	11.2	10.7	10.1	10.7	7.13E-01	4.90E-01	2.75E-01	7.54E-02	6.58E-03	1.56E-07	1.90E-08	2.91E-03	3.75E-04	9.46E-05	1.18E-05	2.21E-02	5.92E-01	4.87E-01	1.52E-02	1.72E-02	9.61E-04
R6	Campground at Bigwater Lake	479442.0	5384066.0	outside pb	144.9	119.4	23.4	6.3	3.6	3.7	3.7	3.7	2.08E-01	1.22E-01	9.25E-02	2.45E-02	2.05E-03	4.71E-08	5.20E-09	6.76E-04	9.00E-05	2.31E-05	2.73E-06	6.94E-03	2.88E-01	2.37E-01	4.77E-03	4.23E-03	2.32E-04
R7	Mattagami River - Indigenous Site	463153.0	5402182.0	outside pb	48.8	40.2	18.0	3.2	1.3	1.4	1.4	1.4	1.85E-01	5.62E-02	1.08E-01	2.75E-02	2.23E-03	4.34E-08	3.79E-09	5.45E-04	2.60E-05	1.53E-05	4.02E-07	5.98E-03	9.54E-02	7.86E-02	5.07E-03	3.59E-03	1.60E-04
R8	Overnight Indigenous Habitation Location	464609.8	5406478.0	outside pb	60.7	50.0	25.3	3.9	1.7	1.8	1.8	1.8	1.92E-01	7.98E-02	1.51E-01	3.84E-02	3.37E-03	6.14E-08	5.54E-09	3.18E-04	3.30E-05	5.26E-06	3.77E-07	8.47E-03	1.31E-01	1.08E-01	7.11E-03	2.93E-03	5.70E-05
R9	Overnight Indigenous Habitation Location	474773.4	5398595.0	outside pb	100.9	83.1	48.9	4.5	3.4	3.5	3.5	3.5	3.80E-01	3.57E-01	2.39E-01	6.22E-02	1.51E-02	1.08E-07	2.50E-08	7.79E-04	1.51E-04	1.36E-05	1.85E-06	1.49E-02	2.01E-01	1.65E-01	1.18E-02	1.99E-03	1.57E-04
R10	Overnight Indigenous Habitation Location	479265.5	5383804.0	outside pb	155.9	128.4	23.4	6.7	3.8	3.8	3.9	3.8	1.97E-01	1.11E-01	1.02E-01	2.67E-02	1.97E-03	4.74E-08	4.85E-09	6.29E-04	8.10E-05	2.08E-05	2.42E-06	6.71E-03	3.10E-01	2.55E-01	5.13E-03	4.59E-03	2.09E-04
R11	Overnight Indigenous Habitation Location	478802.1	5383303.0	outside pb	135.7	111.8	22.5	6.3	4.1	4.1	4.3	4.1	1.93E-01	9.35E-02	1.16E-01	3.03E-02	1.82E-03	5.34E-08	4.29E-09	5.53E-04	6.70E-05	1.72E-05	1.94E-06	7.48E-03	2.73E-01	2.25E-01	5.79E-03	4.60E-03	1.73E-04
R12	Camp/Cottage North of Existing Rail Corridor	484849.9	5384101.0	outside pb	73.7	60.7	14.1	3.0	1.9	2.0	2.0	2.0	2.02E-01	2.20E-01	5.91E-02	1.62E-02	2.06E-03	3.59E-08	7.52E-09	9.21E-04	1.82E-04	3.14E-05	5.99E-06	5.41E-03	1.44E-01	1.19E-01	3.35E-03	3.13E-03	3.16E-04
R13	Camp/Cottage North of Existing Rail Corridor	485094.5	5383767.0	outside pb	73.9	60.8	13.8	3.0	2.0	2.0	2.0	2.0	2.11E-01	2.31E-01	5.70E-02	1.58E-02	2.07E-03	3.61E-08	7.78E-09	9.63E-04	1.92E-04	3.28E-05	6.33E-06	5.47E-03	1.45E-01	1.19E-01	3.31E-03	3.68E-03	3.30E-04
Maximum Special Receptor					**297**	**244**	**92**	**13**	**11**	**11**	**10**	**11**	**0.7**	**0.5**	**0.1**	**3.2E-02**	**2.0E-07**	**5.1E-08**	**2.9E-03**	**3.8E-04**	**9.5E-05**	**1.2E-05**	**2.8E-02**	**0.6**	**0.5**	**2.3E-02**	**1.7E-02**	**9.6E-04**
Special Receptor ID (outside pb)					**R5**	**R5**	**R1**	**R5**	**R5**	**R5**	**R5**	**R5**	**R5**	**R1**	**R1**	**R1**	**R1**	**R1**	**R1**	**R5**	**R5**	**R5**	**R5**	**R1**	**R5**	**R5**	**R1**	**R5**	**R5**

Notes:

1. Maximum predicted 1-hr NO2 concentration using the ARM2 method for comparison to the 1-hr AAQC.
2. Maximum predicted 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations using the ARM2 method for comparison to the 2020 and 2025 1-hr CAAQS.
3. Maximum Special Receptor Concentrations exclude surface water receptors.

Appendix F Predicted Dustfall Deposition at Special Receptors

Year -1 - Construction, Monthly Average Dry Deposition (g/m^2/month)

	PM	Fluoride	Chromium VI	Mercury	Aluminum	Silver	Arsenic	Barium	Beryllium	Boron	Bismuth	Calcium	Cadmium	Cobalt	Chromium	Copper	Iron	Potassium	Lithium	Magnesium	Manganese	Molybdenum	Silicon	Sodium	Nickel	Lead	Antimony	Selenium	Tin	Strontium	Titanium	Thallium	Uranium	Vanadium	Tungsten	Yttrium	Zinc	Thorium	Quartz	Pyrite	Biotite	Magnetite	Hematite	Chlorite	Muscovite	Talc (fibrous)	Phosphorus	Platinum	Palladium	Chrysotile Asbestos
	<<PM>>	7664-39-3	18540-29-9	7439-97-6	7429-90-5	7440-22-4	7440-38-2	7440-39-3	7440-41-7	7440-42-8	7440-69-9	7440-70-2	7440-43-9	7440-48-4	7440-47-3	7440-50-8	7439-89-6	7440-09-7	7439-93-2	7439-95-4	7439-96-5	7439-98-7	7440-21-3	7440-23-5	7440-02-0	7439-92-1	7440-36-0	7782-49-2	7440-31-5	7440-24-6	7440-32-6	7440-28-0	7440-61-1	7440-62-2	7440-33-7	7440-65-5	7440-66-6	7440-29-1	14808-60-7	12068-85-8	1302-27-8	1309-38-2	1317-60-8	1310-59-0	1318-94-1	14807-96-6	7723-14-0	7440-06-4	7440-05-3	132207-32-0
	N/A	2.16E-07	1.99E-09	3.06E-11	7.41E-02	2.50E-07	4.32E-06	1.40E-04	2.91E-07	1.99E-05	9.70E-08	9.07E-02	7.66E-08	1.21E-04	1.34E-03	1.03E-04	6.63E-02	4.94E-03	1.24E-05	2.12E-01	1.01E-03	6.48E-07	8.13E-03	1.46E-02	2.12E-03	1.73E-06	4.30E-07	2.98E-07	3.27E-06	1.28E-04	1.94E-03	4.55E-08	1.91E-07	1.14E-04	3.65E-07	8.06E-06	5.35E-05	1.36E-06	9.98E-02	6.50E-07	5.78E-03	1.02E-01	7.16E-04	1.12E-01	4.60E-02	3.25E-03	0.00E+00	0.00E+00	0.00E+00	1.37E-02
Rec #	**Receptor Description**																																																	
R1	House South of Site, At Lake 300m East of Highway 655	0.8	1.7E-07	1.5E-09	2.8E-11	5.7E-02	1.9E-07	3.4E-06	1.1E-04	2.3E-07	1.5E-05	7.5E-08	7.0E-02	5.9E-08	9.4E-05	1.0E-03	8.0E-05	5.1E-02	3.8E-03	9.6E-06	0.2	7.8E-04	5.0E-07	6.3E-03	1.1E-02	1.6E-03	1.3E-06	3.4E-07	2.3E-07	2.5E-06	9.9E-05	1.5E-03	3.5E-08	1.5E-07	8.8E-05	2.8E-07	6.2E-06	4.2E-05	1.1E-06	7.7E-02	5.0E-07	4.5E-03	7.9E-02	5.6E-04	8.7E-02	3.6E-02	2.5E-03	0.0E+00	0.0E+00	0.0E+00	1.1E-02
R2	Camp/Cottage on Davis Lake	1.4	3.1E-07	2.6E-09	5.2E-11	0.1	3.6E-07	6.3E-06	2.0E-04	4.2E-07	2.9E-05	1.4E-07	0.1	1.1E-07	1.8E-04	1.9E-03	1.5E-04	9.6E-02	7.0E-03	1.8E-05	0.3	1.5E-03	9.4E-07	1.2E-02	2.1E-02	3.1E-03	2.5E-06	6.3E-07	4.3E-07	4.7E-06	1.9E-04	2.8E-03	6.6E-08	2.8E-07	1.6E-04	5.3E-07	1.2E-05	7.7E-05	2.0E-06	0.1	9.4E-07	8.4E-03	0.1	1.0E-03	0.2	6.7E-02	4.7E-03	0.0E+00	0.0E+00	0.0E+00	2.0E-02
R3	Camp on the West Buskegeau River	5.2	1.1E-06	1.0E-08	1.8E-10	0.4	1.3E-06	2.2E-05	7.2E-04	1.5E-06	1.0E-04	5.0E-07	0.5	4.0E-07	6.3E-04	6.9E-03	5.3E-04	0.3	2.5E-02	6.4E-05	1.1	5.2E-03	3.3E-06	4.2E-02	7.5E-02	1.1E-02	8.9E-06	2.2E-06	1.5E-06	1.7E-05	6.6E-04	1.0E-02	2.4E-07	9.9E-07	5.9E-04	1.9E-06	4.2E-05	2.8E-04	7.0E-06	0.5	3.4E-06	3.0E-02	0.5	3.7E-03	0.6	0.2	1.7E-02	0.0E+00	0.0E+00	0.0E+00	7.1E-02
R4	Camp/Cottage East of Site	1.8	3.8E-07	3.5E-09	6.2E-11	0.1	4.4E-07	7.6E-06	2.5E-04	5.1E-07	3.5E-05	1.7E-07	0.2	1.3E-07	2.1E-04	2.4E-03	1.8E-04	0.1	8.5E-03	2.2E-05	0.4	1.8E-03	1.1E-06	1.4E-02	2.6E-02	3.7E-03	3.0E-06	7.6E-07	5.2E-07	5.7E-06	2.2E-04	3.4E-03	8.0E-08	3.3E-07	2.0E-04	6.4E-07	1.4E-05	9.4E-05	2.4E-06	0.2	1.1E-06	1.0E-02	0.2	1.3E-03	0.2	8.1E-02	5.7E-03	0.0E+00	0.0E+00	0.0E+00	2.4E-02
R5	Camp/Cottage Near Highway 655 South of Site	0.3	6.3E-08	5.8E-10	1.0E-11	2.2E-02	7.3E-08	1.3E-06	4.1E-05	8.5E-08	5.8E-06	2.8E-08	2.7E-02	2.2E-08	3.5E-05	3.9E-04	3.0E-05	1.9E-02	1.4E-03	3.6E-06	6.2E-02	3.0E-04	1.9E-07	2.4E-03	4.3E-03	6.2E-04	5.1E-07	1.3E-07	9.7E-08	9.6E-07	3.7E-05	5.7E-04	1.3E-08	5.6E-08	3.3E-05	1.1E-07	2.4E-06	1.6E-05	4.0E-07	2.9E-02	1.9E-07	1.7E-03	3.0E-02	2.1E-04	3.3E-02	1.3E-02	9.5E-04	0.0E+00	0.0E+00	0.0E+00	4.0E-03
R6	Campground at Bigwater Lake	0.3	5.6E-08	5.1E-10	9.2E-12	1.9E-02	6.4E-08	1.1E-06	3.6E-05	7.5E-08	5.1E-06	2.5E-08	2.3E-02	2.0E-08	3.1E-05	3.4E-04	2.7E-05	1.7E-02	1.2E-03	3.2E-06	5.5E-02	2.6E-04	1.7E-07	2.1E-03	3.7E-03	5.4E-04	4.5E-07	1.1E-07	7.7E-08	8.4E-07	3.3E-05	5.0E-04	1.2E-08	4.9E-08	2.9E-05	9.4E-08	2.1E-06	1.4E-05	3.5E-07	2.6E-02	1.7E-07	1.5E-03	2.6E-02	1.8E-04	2.9E-02	1.2E-02	8.4E-04	0.0E+00	0.0E+00	0.0E+00	3.5E-03
R7	Mattagami River - Indigenous Site	0.4	9.6E-08	8.9E-10	1.6E-11	3.3E-02	1.1E-07	1.9E-06	6.2E-05	1.3E-07	8.9E-06	4.3E-08	4.0E-02	3.4E-08	5.4E-05	6.0E-04	4.6E-05	3.0E-02	2.2E-03	5.5E-06	9.5E-02	4.5E-04	2.9E-07	3.6E-03	6.5E-03	9.4E-04	7.7E-07	1.9E-07	1.3E-07	1.5E-06	5.7E-05	8.7E-04	2.0E-08	8.5E-08	5.1E-05	1.6E-07	3.6E-06	2.4E-05	6.1E-07	4.5E-02	2.9E-07	2.6E-03	4.6E-02	3.2E-04	5.0E-02	2.1E-02	1.4E-03	0.0E+00	0.0E+00	0.0E+00	6.1E-03
R8	Overnight Indigenous Habitation Location	0.7	1.4E-07	1.3E-09	2.4E-11	4.9E-02	1.7E-07	2.9E-06	9.3E-05	1.9E-07	1.3E-05	6.4E-08	6.0E-02	5.1E-08	8.0E-05	8.9E-04	6.9E-05	4.4E-02	3.2E-03	8.2E-06	0.1	6.7E-04	4.3E-07	5.4E-03	9.7E-03	1.4E-03	1.2E-06	2.9E-07	2.0E-07	2.2E-06	8.5E-05	1.3E-03	3.0E-08	1.3E-07	7.6E-05	2.4E-07	5.3E-06	3.6E-05	9.1E-07	6.6E-02	4.3E-07	3.8E-03	6.8E-02	4.8E-04	7.4E-02	3.1E-02	2.2E-03	0.0E+00	0.0E+00	0.0E+00	9.1E-03
R9	Overnight Indigenous Habitation Location	0.7	1.6E-07	1.5E-09	2.6E-11	5.5E-02	1.9E-07	3.2E-06	1.0E-04	2.2E-07	1.5E-05	7.2E-08	6.7E-02	5.7E-08	9.0E-05	9.9E-04	7.7E-05	4.9E-02	3.6E-03	9.2E-06	0.2	7.5E-04	4.8E-07	6.0E-03	1.1E-02	1.6E-03	1.3E-06	3.2E-07	2.2E-07	2.4E-06	9.5E-05	1.4E-03	3.4E-08	1.4E-07	8.4E-05	2.7E-07	6.0E-06	4.0E-05	1.0E-06	7.4E-02	4.8E-07	4.3E-03	7.6E-02	5.3E-04	8.3E-02	3.4E-02	2.4E-03	0.0E+00	0.0E+00	0.0E+00	1.0E-02
R10	Overnight Indigenous Habitation Location	0.3	5.5E-08	5.1E-10	9.1E-12	1.9E-02	6.4E-08	1.1E-06	3.6E-05	7.5E-08	5.1E-06	2.5E-08	2.3E-02	2.0E-08	3.1E-05	3.4E-04	2.6E-05	1.7E-02	1.2E-03	3.2E-06	5.4E-02	2.6E-04	1.7E-07	2.1E-03	3.7E-03	5.4E-04	4.4E-07	1.1E-07	7.6E-08	8.4E-07	3.3E-05	5.0E-04	1.2E-08	4.9E-08	2.9E-05	9.4E-08	2.1E-06	1.4E-05	3.5E-07	2.6E-02	1.7E-07	1.5E-03	2.6E-02	1.8E-04	2.9E-02	1.2E-02	8.3E-04	0.0E+00	0.0E+00	0.0E+00	3.5E-03
R11	Overnight Indigenous Habitation Location	0.2	5.3E-08	4.9E-10	8.8E-12	1.8E-02	6.2E-08	1.1E-06	3.5E-05	7.2E-08	4.9E-06	2.4E-08	2.2E-02	1.9E-08	3.0E-05	3.3E-04	2.6E-05	1.6E-02	1.2E-03	3.1E-06	5.3E-02	2.5E-04	1.6E-07	2.0E-03	3.6E-03	5.2E-04	4.3E-07	1.1E-07	7.4E-08	8.1E-07	3.2E-05	4.8E-04	1.1E-08	4.7E-08	2.8E-05	9.0E-08	2.0E-06	1.3E-05	3.4E-07	2.5E-02	1.6E-07	1.4E-03	2.5E-02	1.8E-04	2.8E-02	1.1E-02	8.0E-04	0.0E+00	0.0E+00	0.0E+00	3.4E-03
R12	Camp/Cottage North of Existing Rail Corridor	0.2	5.3E-08	4.9E-10	8.8E-12	1.8E-02	6.2E-08	1.1E-06	3.5E-05	7.2E-08	4.9E-06	2.4E-08	2.2E-02	1.9E-08	3.0E-05	3.3E-04	2.6E-05	1.6E-02	1.2E-03	3.1E-06	5.3E-02	2.5E-04	1.6E-07	2.0E-03	3.6E-03	5.2E-04	4.3E-07	1.1E-07	7.4E-08	8.1E-07	3.2E-05	4.8E-04	1.1E-08	4.7E-08	2.8E-05	9.0E-08	2.0E-06	1.3E-05	3.4E-07	2.5E-02	1.6E-07	1.4E-03	2.5E-02	1.8E-04	2.8E-02	1.1E-02	8.0E-04	0.0E+00	0.0E+00	0.0E+00	3.4E-03
R13	Camp/Cottage North of Existing Rail Corridor	0.2	5.1E-08	4.7E-10	8.4E-12	1.7E-02	5.9E-08	1.0E-06	3.3E-05	6.9E-08	4.7E-06	2.3E-08	2.1E-02	1.8E-08	2.9E-05	3.2E-04	2.4E-05	1.6E-02	1.1E-03	2.9E-06	5.0E-02	2.4E-04	1.5E-07	1.9E-03	3.4E-03	5.0E-04	4.1E-07	1.0E-07	7.0E-08	7.7E-07	3.0E-05	4.6E-04	1.1E-08	4.5E-08	2.7E-05	8.6E-08	1.9E-06	1.3E-05	3.2E-07	2.4E-02	1.5E-07	1.4E-03	2.4E-02	1.7E-04	2.6E-02	1.1E-02	7.7E-04	0.0E+00	0.0E+00	0.0E+00	3.2E-03
	Maximum Total Deposition at Special Receptor (outside pb)	0.8	1.7E-07	1.5E-09	2.8E-11	5.7E-02	1.9E-07	3.4E-06	1.1E-04	2.3E-07	1.5E-05	7.5E-08	7.0E-02	5.9E-08	9.4E-05	1.0E-03	8.0E-05	5.1E-02	3.8E-03	9.6E-06	0.2	7.8E-04	5.0E-07	6.3E-03	1.1E-02	1.6E-03	1.3E-06	3.4E-07	2.3E-07	2.5E-06	9.9E-05	1.5E-03	3.5E-08	1.5E-07	8.8E-05	2.8E-07	6.2E-06	4.2E-05	1.1E-06	7.7E-02	5.0E-07	4.5E-03	7.9E-02	5.6E-04	8.7E-02	3.6E-02	2.5E-03	0.0E+00	0.0E+00	0.0E+00	1.1E-02
	Maximum Special Receptor Location (outside pb)	R1																																															

Year -1 - Construction, Annual Average Dry Deposition (g/m^2/year)

Rec #	Receptor Description	PM	Fluoride	Chromium VI	Mercury	Aluminum	Silver	Arsenic	Barium	Beryllium	Boron	Bismuth	Calcium	Cadmium	Cobalt	Chromium	Copper	Iron	Potassium	Lithium	Magnesium	Manganese	Molybdenum	Silicon	Sodium	Nickel	Lead	Antimony	Selenium	Tin	Strontium	Titanium	Thallium	Uranium	Vanadium	Tungsten	Yttrium	Zinc	Thorium	Quartz	Pyrite	Biotite	Magnetite	Hematite	Chlorite	Muscovite	Talc (fibrous)	Phosphorus	Platinum	Palladium	Chrysotile Asbestos
		<<PM>>	7664-39-3	18540-29-9	7439-97-6	7429-90-5	7440-22-4	7440-38-2	7440-39-3	7440-41-7	7440-42-8	7440-69-9	7440-70-2	7440-43-9	7440-48-4	7440-47-3	7440-50-8	7439-89-6	7440-09-7	7439-93-2	7439-95-4	7439-96-5	7439-98-7	7440-21-3	7440-23-5	7440-02-0	7439-92-1	7440-36-0	7782-49-2	7440-31-5	7440-24-6	7440-32-6	7440-28-0	7440-61-1	7440-62-2	7440-33-7	7440-65-5	7440-66-6	7440-29-1	14808-60-7	12068-85-8	1302-27-8	1309-38-2	1317-60-8	1318-59-8	1318-94-1	14807-96-6	7723-14-0	7440-06-4	7440-05-3	132207-32-0
		N/A	2.16E-07	1.99E-09	3.56E-11	7.41E-02	2.50E-07	4.32E-06	1.40E-04	2.91E-07	1.99E-05	9.70E-08	9.07E-02	7.66E-08	1.21E-04	1.34E-03	1.03E-04	6.63E-02	4.84E-03	1.24E-05	2.12E-01	1.01E-03	6.48E-07	8.13E-03	1.48E-02	2.12E-03	1.73E-06	4.35E-07	2.98E-07	3.27E-06	1.28E-04	1.94E-03	4.50E-08	1.91E-07	1.14E-04	3.65E-07	8.06E-06	5.35E-05	1.36E-06	9.98E-02	6.50E-07	5.78E-03	1.02E-01	7.16E-04	1.12E-01	4.60E-02	3.25E-03	0.00E+00	0.00E+00	0.00E+00	1.37E-02
R1	House South of Site, At Lake 300m East of Highway 655	3.8	8.3E-07	7.6E-09	1.4E-10	0.3	9.6E-07	1.7E-05	5.4E-04	1.1E-06	7.6E-05	3.7E-07	0.3	2.9E-07	4.6E-04	5.1E-03	4.0E-04	0.3	1.9E-02	4.7E-05	0.8	3.9E-03	2.5E-06	3.1E-02	5.6E-02	8.1E-03	6.6E-06	1.7E-06	1.1E-06	1.3E-05	4.9E-04	7.4E-03	1.7E-07	7.3E-07	4.4E-04	1.4E-06	3.1E-05	2.0E-04	5.2E-06	0.4	2.5E-06	2.2E-02	0.4	2.7E-03	0.4	0.2	1.2E-02	0.0E+00	0.0E+00	0.0E+00	5.3E-02
R2	Camp/Cottage on Davis Lake	7.5	1.6E-06	1.5E-08	2.7E-10	0.6	1.9E-06	3.2E-05	1.1E-03	2.2E-06	1.5E-04	7.3E-07	0.7	5.8E-07	9.1E-04	1.0E-02	7.8E-04	0.5	3.6E-02	9.3E-05	1.6	7.6E-03	4.8E-06	6.1E-02	0.1	1.6E-02	1.3E-05	3.3E-06	2.2E-06	2.5E-05	9.6E-04	1.5E-02	3.4E-07	1.4E-06	8.6E-04	2.7E-06	6.0E-05	4.0E-04	1.0E-05	0.7	4.9E-06	4.3E-02	0.8	5.4E-03	0.8	0.3	2.4E-02	0.0E+00	0.0E+00	0.0E+00	0.1
R3	Camp on the West Buskegeau River	34	7.3E-06	6.7E-08	1.2E-09	2.5	8.4E-06	1.5E-04	4.7E-03	9.8E-06	6.7E-04	3.3E-06	3.1	2.6E-06	4.1E-03	4.5E-02	3.5E-03	2.2	0.2	4.2E-04	7.2	3.4E-02	2.2E-05	0.3	0.5	7.1E-02	5.8E-05	1.5E-05	1.0E-05	1.1E-04	4.3E-03	6.6E-02	1.5E-06	6.4E-06	3.8E-03	1.2E-05	2.7E-04	1.8E-03	4.6E-05	3.4	2.2E-05	0.2	3.4	2.4E-02	3.8	1.6	0.1	0.0E+00	0.0E+00	0.0E+00	0.5
R4	Camp/Cottage East of Site	11	2.3E-06	2.1E-08	3.8E-10	0.8	2.7E-06	4.7E-05	1.5E-03	3.1E-06	2.1E-04	1.0E-06	1.0	8.3E-07	1.3E-03	1.4E-02	1.1E-03	0.7	5.2E-02	1.3E-04	2.3	1.1E-02	7.0E-06	8.8E-02	0.2	2.3E-02	1.9E-05	4.7E-06	3.2E-06	3.5E-05	1.4E-03	2.1E-02	4.9E-07	2.1E-06	1.2E-03	3.9E-06	8.7E-05	5.8E-04	1.5E-05	1.1	7.0E-06	6.2E-02	1.1	7.7E-03	1.2	0.5	3.5E-02	0.0E+00	0.0E+00	0.0E+00	0.1
R5	Camp/Cottage Near Highway 655 South of Site	1.5	3.2E-07	3.0E-09	5.3E-11	0.1	3.7E-07	6.5E-06	2.1E-04	4.4E-07	3.0E-05	1.5E-07	0.1	1.1E-07	1.8E-04	2.0E-03	1.5E-04	9.9E-02	7.2E-03	1.8E-05	0.3	1.5E-03	9.6E-07	1.2E-02	2.2E-02	3.2E-03	2.6E-06	6.5E-07	4.5E-07	4.9E-06	1.9E-04	2.9E-03	6.8E-08	2.9E-07	1.7E-04	5.5E-07	1.2E-05	8.0E-05	2.0E-06	0.1	9.7E-07	8.6E-03	0.2	1.1E-03	0.2	6.9E-02	4.9E-03	0.0E+00	0.0E+00	0.0E+00	2.1E-02
R6	Campground at Bigwater Lake	1.3	2.9E-07	2.6E-09	4.7E-11	9.8E-02	3.3E-07	5.7E-06	1.9E-04	3.9E-07	2.6E-05	1.3E-07	0.1	1.0E-07	1.6E-04	1.8E-03	1.4E-04	8.8E-02	6.4E-03	1.6E-05	0.3	1.3E-03	8.6E-07	1.1E-02	1.9E-02	2.8E-03	2.3E-06	5.8E-07	4.0E-07	4.3E-06	1.7E-04	2.6E-03	6.0E-08	2.5E-07	1.5E-04	4.8E-07	1.1E-05	7.1E-05	1.8E-06	0.1	8.6E-07	7.7E-03	0.1	9.5E-04	0.1	6.1E-02	4.3E-03	0.0E+00	0.0E+00	0.0E+00	1.8E-02
R7	Mattagami River – Indigenous Site	2.2	4.7E-07	4.3E-09	7.8E-11	0.2	5.5E-07	9.4E-06	3.1E-04	6.4E-07	4.3E-05	2.1E-07	0.2	1.7E-07	2.6E-04	2.9E-03	2.3E-04	0.1	1.1E-02	2.7E-05	0.5	2.2E-03	1.4E-06	1.8E-02	3.2E-02	4.6E-03	3.8E-06	9.5E-07	6.5E-07	7.1E-06	2.8E-04	4.2E-03	9.9E-08	4.2E-07	2.5E-04	8.0E-07	1.8E-05	1.2E-04	3.0E-06	0.2	1.4E-06	1.3E-02	0.2	1.6E-03	0.2	0.1	7.1E-03	0.0E+00	0.0E+00	0.0E+00	3.0E-02
R8	Overnight Indigenous Habitation Location	3.3	7.1E-07	6.5E-09	1.2E-10	0.2	8.2E-07	1.4E-05	4.6E-04	9.6E-07	6.5E-05	3.2E-07	0.3	2.5E-07	4.0E-04	4.4E-03	3.4E-04	0.2	1.6E-02	4.1E-05	0.7	3.3E-03	2.1E-06	2.7E-02	4.8E-02	7.0E-03	5.7E-06	1.4E-06	9.8E-07	1.1E-05	4.2E-04	6.4E-03	1.5E-07	6.3E-07	3.7E-04	1.2E-06	2.6E-05	1.8E-04	4.5E-06	0.3	2.1E-06	1.9E-02	0.3	2.3E-03	0.4	0.2	1.1E-02	0.0E+00	0.0E+00	0.0E+00	4.5E-02
R9	Overnight Indigenous Habitation Location	4.0	8.7E-07	8.0E-09	1.4E-10	0.3	1.0E-06	1.7E-05	5.6E-04	1.2E-06	8.0E-05	3.9E-07	0.4	3.1E-07	4.9E-04	5.4E-03	4.2E-04	0.3	1.9E-02	5.0E-05	0.9	4.1E-03	2.6E-06	3.3E-02	5.9E-02	8.5E-03	7.0E-06	1.8E-06	1.2E-06	1.3E-05	5.2E-04	7.8E-03	1.8E-07	7.7E-07	4.6E-04	1.5E-06	3.2E-05	2.2E-04	5.5E-06	0.4	2.6E-06	2.3E-02	0.4	2.9E-03	0.5	0.2	1.3E-02	0.0E+00	0.0E+00	0.0E+00	5.5E-02
R10	Overnight Indigenous Habitation Location	1.3	2.8E-07	2.6E-09	4.6E-11	9.6E-02	3.2E-07	5.6E-06	1.8E-04	3.8E-07	2.6E-05	1.3E-07	0.1	9.9E-08	1.6E-04	1.7E-03	1.3E-04	8.5E-02	6.2E-03	1.6E-05	0.3	1.3E-03	8.3E-07	1.0E-02	1.9E-02	2.7E-03	2.2E-06	5.6E-07	3.8E-07	4.2E-06	1.7E-04	2.5E-03	5.9E-08	2.5E-07	1.5E-04	4.7E-07	1.0E-05	6.9E-05	1.8E-06	0.1	8.4E-07	7.5E-03	0.1	9.2E-04	0.1	5.9E-02	4.2E-03	0.0E+00	0.0E+00	0.0E+00	1.8E-02
R11	Overnight Indigenous Habitation Location	1.2	2.7E-07	2.4E-09	4.4E-11	9.1E-02	3.1E-07	5.3E-06	1.7E-04	3.6E-07	2.5E-05	1.2E-07	0.1	9.4E-08	1.5E-04	1.7E-03	1.3E-04	8.2E-02	6.0E-03	1.5E-05	0.3	1.2E-03	7.9E-07	1.0E-02	1.8E-02	2.6E-03	2.1E-06	5.4E-07	3.7E-07	4.0E-06	1.6E-04	2.4E-03	5.6E-08	2.3E-07	1.4E-04	4.5E-07	9.9E-06	6.6E-05	1.7E-06	0.1	8.0E-07	7.1E-03	0.1	8.8E-04	0.1	5.7E-02	4.0E-03	0.0E+00	0.0E+00	0.0E+00	1.7E-02
R12	Camp/Cottage North of Existing Rail Corridor	1.4	2.9E-07	2.7E-09	4.8E-11	0.1	3.4E-07	5.8E-06	1.9E-04	3.9E-07	2.7E-05	1.3E-07	0.1	1.0E-07	1.6E-04	1.8E-03	1.4E-04	9.0E-02	6.5E-03	1.7E-05	0.3	1.4E-03	8.7E-07	1.1E-02	2.0E-02	2.9E-03	2.3E-06	5.9E-07	4.0E-07	4.4E-06	1.7E-04	2.6E-03	6.2E-08	2.6E-07	1.5E-04	4.9E-07	1.1E-05	7.2E-05	1.8E-06	0.1	8.8E-07	7.8E-03	0.1	9.7E-04	0.2	6.2E-02	4.4E-03	0.0E+00	0.0E+00	0.0E+00	1.9E-02
R13	Camp/Cottage North of Existing Rail Corridor	1.3	2.9E-07	2.6E-09	4.7E-11	9.8E-02	3.3E-07	5.7E-06	1.9E-04	3.9E-07	2.6E-05	1.3E-07	0.1	1.0E-07	1.6E-04	1.8E-03	1.4E-04	8.8E-02	6.4E-03	1.6E-05	0.3	1.3E-03	8.5E-07	1.1E-02	1.9E-02	2.8E-03	2.3E-06	5.8E-07	4.0E-07	4.3E-06	1.7E-04	2.6E-03	6.0E-08	2.5E-07	1.5E-04	4.8E-07	1.1E-05	7.1E-05	1.8E-06	0.1	8.6E-07	7.7E-03	0.1	9.5E-04	0.1	6.1E-02	4.3E-03	0.0E+00	0.0E+00	0.0E+00	1.8E-02
Annual Total Deposition at Special Receptor (outside pb)		4.0	8.7E-07	8.0E-09	1.4E-10	0.3	1.0E-06	1.7E-05	5.6E-04	1.2E-06	8.0E-05	3.9E-07	0.4	3.1E-07	4.9E-04	5.4E-03	4.2E-04	0.3	1.9E-02	5.0E-05	0.9	4.1E-03	2.6E-06	3.3E-02	5.9E-02	8.5E-03	7.0E-06	1.8E-06	1.2E-06	1.3E-05	5.2E-04	7.8E-03	1.8E-07	7.7E-07	4.6E-04	1.5E-06	3.2E-05	2.2E-04	5.5E-06	0.4	2.6E-06	2.3E-02	0.4	2.9E-03	0.5	0.2	1.3E-02	0.0E+00	0.0E+00	0.0E+00	5.5E-02
Maximum Special Receptor Location (outside pb)		R9																																																	

Year 7 - Operations, Monthly Average Dry Deposition (g/m²/month)

				COPC		PM	Fluoride	Chromium VI	Mercury	Aluminum	Silver	Arsenic	Barium	Beryllium	Boron	Bismuth	Calcium	Cadmium	Cobalt	Chromium	Copper	Iron	Potassium	Lithium	Magnesium	Manganese	Molybdenu m	Silicon	Sodium	Nickel	Lead	Antimony	Selenium	Tin	Strontium	Titanium	Thallium	Uranium	Vanadium	Tungsten	Yttrium	Zinc	Thorium	Quartz	Pyrite	Biotite	Magnetite	Hematite	Chlorite	Muscovite	Talc (Fibrous)	Phosphorus	Platinum	Palladium	Chrysotile Asbestos
				CAS		<<PM>>	7664-39-3	18540-29-9	7439-97-6	7429-90-5	7440-22-4	7440-38-2	7440-39-3	7440-41-7	7440-42-8	7440-69-9	7440-70-2	7440-43-9	7440-48-4	7440-47-3	7440-50-8	7439-89-6	7440-09-7	7439-93-2	7439-95-4	7439-96-5	7439-98-7	7440-21-3	7440-23-5	7440-02-0	7439-92-1	7440-36-0	7782-49-2	7440-31-5	7440-24-6	7440-32-6	7440-28-0	7440-61-1	7440-62-2	7440-33-7	7440-65-5	7440-66-6	7440-29-1	14808-60-7	12068-85-8	1302-27-8	1309-37-1	1317-60-8	1318-59-8	1318-94-1	14807-96-6	7723-14-0	7440-06-4	7440-05-3	132207-32-0
				Speciation Factor		N/A	2.10E-07	1.28E-09	3.52E-11	7.57E-02	2.50E-07	6.15E-06	2.27E-04	5.83E-07	2.61E-05	1.65E-07	9.07E-02	1.10E-07	1.19E-04	1.32E-03	1.03E-04	6.67E-02	8.51E-03	1.24E-05	2.07E-01	1.03E-03	9.27E-07	1.12E-02	2.58E-02	2.03E-03	3.42E-06	4.32E-07	3.04E-07	3.40E-06	1.51E-04	3.01E-03	7.51E-08	3.94E-07	1.14E-04	5.67E-07	1.30E-05	7.42E-05	2.18E-06	2.29E-01	1.52E-06	8.78E-03	9.66E-02	1.67E-03	1.12E-01	8.98E-02	7.58E-03	0.00E+00	0.00E+00	0.00E+00	1.29E-02
Rec #	Receptor Description	UTM E (m)	UTM N (m)	Receptor Location	Receptor Source																																																
R1	House South of Site; At Lake 300m East of Highway 655	473500	5395566	outside pb	non IK	2.3	4.6E-07	2.9E-09	8.0E-11	0.2	5.7E-07	1.4E-05	5.1E-04	1.3E-06	5.9E-06	3.7E-07	0.2	2.5E-07	2.7E-04	3.0E-03	2.3E-04	0.2	1.9E-02	2.8E-05	0.5	2.3E-03	2.1E-06	2.5E-02	5.8E-02	4.6E-03	7.7E-06	9.8E-07	6.9E-07	7.7E-06	3.4E-04	6.8E-03	1.7E-07	8.9E-07	2.6E-04	1.3E-06	3.0E-05	1.7E-04	4.9E-06	0.5	3.4E-06	2.2E-02	0.2	3.8E-03	0.3	0.2	1.7E-02	0.0E+00	0.0E+00	0.0E+00	2.9E-02
R2	Camp/Cottage on Davis Lake	471450	5403029	inside pb	non IK	6.5	1.4E-06	8.2E-09	2.3E-10	0.5	1.6E-06	4.0E-05	1.5E-03	3.8E-06	1.7E-04	1.1E-06	0.6	7.1E-07	7.7E-04	8.5E-03	6.7E-04	0.4	5.5E-02	8.0E-05	1.3	6.6E-03	6.0E-06	7.2E-02	0.2	1.3E-02	2.2E-05	2.8E-06	2.0E-06	2.2E-05	9.8E-04	1.9E-02	4.8E-07	2.5E-06	7.4E-04	3.7E-06	8.4E-05	4.8E-04	1.4E-05	1.5	9.8E-06	5.7E-02	0.6	1.1E-02	0.7	0.6	4.9E-02	0.0E+00	0.0E+00	0.0E+00	8.3E-02
R3	Camp on the West Buskegau River	477544	5408361	inside pb	non IK	8.6	1.8E-06	1.1E-08	3.0E-10	0.7	2.2E-06	5.3E-05	2.0E-03	5.0E-06	2.2E-04	1.4E-06	0.8	9.5E-07	1.0E-03	1.1E-02	8.9E-04	0.6	7.3E-02	1.1E-04	1.8	8.9E-03	8.0E-06	9.6E-02	0.2	1.7E-02	2.9E-05	3.7E-06	2.6E-06	2.9E-05	1.3E-03	2.6E-02	6.5E-07	3.4E-06	9.8E-04	4.9E-06	1.1E-04	6.4E-04	1.9E-05	2.0	1.3E-05	7.6E-02	0.8	1.4E-02	1.0	0.8	6.5E-02	0.0E+00	0.0E+00	0.0E+00	0.1
R4	Camp/Cottage East of Site	477552	5403390	inside pb	non IK	5.4	1.1E-06	6.9E-09	1.9E-10	0.4	1.4E-06	3.3E-05	1.2E-03	3.2E-06	1.4E-04	8.9E-07	0.5	6.0E-07	6.4E-04	7.2E-03	5.6E-04	0.4	4.6E-02	6.7E-05	1.1	5.6E-03	5.0E-06	6.1E-02	0.1	1.1E-02	1.9E-05	2.3E-06	1.6E-06	1.8E-05	8.2E-04	1.6E-02	4.1E-07	2.1E-06	6.2E-04	3.1E-06	7.1E-05	4.0E-04	1.2E-05	1.2	8.2E-06	4.8E-02	0.5	9.0E-03	0.6	0.5	4.1E-02	0.0E+00	0.0E+00	0.0E+00	7.0E-02
R5	Camp/Cottage Near Highway 655 South of Site	475945	5387777	outside pb	non IK	0.9	2.0E-07	1.2E-09	3.3E-11	7.0E-02	2.3E-07	5.7E-06	2.1E-04	5.4E-07	2.4E-05	1.5E-07	8.4E-02	1.0E-07	1.1E-04	1.2E-03	9.6E-05	6.2E-02	7.9E-03	1.1E-05	0.2	9.6E-04	8.6E-07	1.0E-02	2.4E-02	1.9E-03	3.2E-06	4.0E-07	2.8E-07	3.2E-06	1.4E-04	2.8E-03	7.0E-08	3.7E-07	1.1E-04	5.3E-07	1.2E-05	6.9E-05	2.0E-06	0.2	1.4E-06	8.1E-03	9.0E-02	1.5E-03	0.1	8.3E-02	7.0E-03	0.0E+00	0.0E+00	0.0E+00	1.2E-02
R6	Campground at Bigwater Lake	479442	5384066	outside pb	IK	0.8	1.6E-07	9.8E-10	2.7E-11	5.8E-02	1.9E-07	4.7E-06	1.7E-04	4.5E-07	2.0E-05	1.3E-07	6.9E-02	8.4E-08	9.1E-05	1.0E-03	7.9E-05	5.1E-02	6.5E-03	9.4E-06	0.2	7.9E-04	7.1E-07	8.5E-03	2.0E-02	1.5E-03	2.6E-06	3.3E-07	2.3E-07	2.6E-06	1.2E-04	2.3E-03	5.7E-08	3.0E-07	8.7E-05	4.3E-07	1.0E-05	5.7E-05	1.7E-06	0.2	1.2E-06	6.7E-03	7.4E-02	1.3E-03	8.6E-02	6.9E-02	5.8E-03	0.0E+00	0.0E+00	0.0E+00	9.9E-03
R7	Mathaganni River - Indigenous Site			outside pb	IK	1.5	3.2E-07	1.9E-09	5.3E-11	0.1	3.8E-07	9.3E-06	3.4E-04	8.9E-07	4.0E-05	2.5E-07	0.1	1.7E-07	1.8E-04	2.0E-03	1.6E-04	0.1	1.3E-02	1.9E-05	0.3	1.6E-03	1.4E-06	1.7E-02	3.9E-02	3.1E-03	5.2E-06	6.6E-07	4.6E-07	5.2E-06	2.3E-04	4.5E-03	1.1E-07	6.0E-07	1.7E-04	8.6E-07	2.0E-05	1.1E-04	3.3E-06	0.3	2.3E-06	1.3E-02	0.1	2.5E-03	0.2	0.1	1.2E-02	0.0E+00	0.0E+00	0.0E+00	2.0E-02
R8	Overnight Indigenous Habitation Location			outside pb	IK	2.6	5.4E-07	3.3E-09	9.0E-11	0.2	6.4E-07	1.6E-05	5.8E-04	1.5E-06	6.7E-05	4.2E-07	0.2	2.8E-07	3.1E-04	3.4E-03	2.7E-04	0.2	2.2E-02	3.2E-05	0.5	2.6E-03	2.4E-06	2.9E-02	6.6E-02	5.2E-03	8.8E-06	1.1E-06	7.8E-07	8.7E-06	3.9E-04	7.7E-03	1.9E-07	1.0E-06	2.9E-04	1.5E-06	3.3E-05	1.9E-04	5.6E-06	0.6	3.9E-06	2.2E-02	0.2	4.3E-03	0.3	0.2	1.9E-02	0.0E+00	0.0E+00	0.0E+00	3.3E-02
R9	Overnight Indigenous Habitation Location			outside pb	IK	2.4	5.0E-07	3.0E-09	8.3E-11	0.2	5.9E-07	1.5E-05	5.4E-04	1.4E-06	6.2E-05	3.9E-07	0.2	2.6E-07	2.8E-04	3.1E-03	2.5E-04	0.2	2.0E-02	2.9E-05	0.5	2.4E-03	2.2E-06	2.7E-02	6.1E-02	4.8E-03	8.1E-06	1.0E-06	7.2E-07	8.1E-06	3.6E-04	7.1E-03	1.8E-07	9.3E-07	2.7E-04	1.3E-06	3.1E-05	1.8E-04	5.2E-06	0.5	3.6E-06	2.1E-02	0.2	4.0E-03	0.3	0.2	1.8E-02	0.0E+00	0.0E+00	0.0E+00	3.1E-02
R10	Overnight Indigenous Habitation Location			outside pb	IK	0.8	1.6E-07	9.7E-10	2.7E-11	5.7E-02	1.9E-07	4.7E-06	1.7E-04	4.4E-07	2.0E-05	1.2E-07	6.9E-02	8.3E-08	9.0E-05	1.0E-03	7.8E-05	5.1E-02	6.5E-03	9.4E-06	0.2	7.8E-04	7.0E-07	8.5E-03	2.0E-02	1.5E-03	2.6E-06	3.3E-07	2.3E-07	2.6E-06	1.1E-04	2.3E-03	5.7E-08	3.0E-07	8.7E-05	4.3E-07	9.9E-06	5.6E-05	1.7E-06	0.2	1.2E-06	6.7E-03	7.3E-02	1.3E-03	8.5E-02	6.8E-02	5.8E-03	0.0E+00	0.0E+00	0.0E+00	9.8E-03
R11	Overnight Indigenous Habitation Location			outside pb	IK	0.8	1.6E-07	9.6E-10	2.6E-11	5.7E-02	1.9E-07	4.6E-06	1.7E-04	4.4E-07	2.0E-05	1.2E-07	6.8E-02	8.3E-08	8.9E-05	9.9E-04	7.8E-05	5.0E-02	6.4E-03	9.3E-06	0.2	7.7E-04	7.0E-07	8.4E-03	1.9E-02	1.5E-03	2.6E-06	3.2E-07	2.2E-07	2.6E-06	1.1E-04	2.3E-03	5.6E-08	3.0E-07	8.6E-05	4.3E-07	9.8E-06	5.6E-05	1.6E-06	0.2	1.1E-06	6.6E-03	7.2E-02	1.3E-03	8.4E-02	6.7E-02	5.7E-03	0.0E+00	0.0E+00	0.0E+00	9.7E-03
R12	Camp/Cottage North of Existing Rail Corridor	484850	5384101	outside pb	non IK	0.7	1.5E-07	9.3E-10	2.6E-11	5.5E-02	1.8E-07	4.5E-06	1.7E-04	4.3E-07	1.9E-05	1.2E-07	6.6E-02	8.0E-08	8.7E-05	9.6E-04	7.6E-05	4.9E-02	6.2E-03	9.0E-06	0.2	7.5E-04	6.8E-07	8.2E-03	1.9E-02	1.5E-03	2.5E-06	3.2E-07	2.2E-07	2.5E-06	1.1E-04	2.2E-03	5.4E-08	2.9E-07	8.3E-05	4.1E-07	9.5E-06	5.4E-05	1.6E-06	0.2	1.1E-06	6.4E-03	7.1E-02	1.2E-03	8.2E-02	6.6E-02	5.5E-03	0.0E+00	0.0E+00	0.0E+00	9.4E-03
R13	Camp/Cottage North of Existing Rail Corridor	485095	5383707	outside pb	non IK	0.7	1.5E-07	9.1E-10	2.5E-11	5.4E-02	1.8E-07	4.4E-06	1.6E-04	4.2E-07	1.9E-05	1.2E-07	6.5E-02	7.9E-08	8.5E-05	9.5E-04	7.4E-05	4.8E-02	6.1E-03	8.8E-06	0.1	7.4E-04	6.6E-07	8.0E-03	1.8E-02	1.4E-03	2.4E-06	3.1E-07	2.2E-07	2.4E-06	1.1E-04	2.2E-03	5.4E-08	2.8E-07	8.2E-05	4.1E-07	9.3E-06	5.3E-05	1.6E-06	0.2	1.1E-06	6.3E-03	6.9E-02	1.2E-03	8.0E-02	6.4E-02	5.4E-03	0.0E+00	0.0E+00	0.0E+00	9.2E-03
	Maximum Deposition at Special Receptor (outside pb)					2.6	5.4E-07	3.3E-09	9.0E-11	0.2	6.4E-07	1.6E-05	5.8E-04	1.5E-06	6.7E-05	4.2E-07	0.2	2.8E-07	3.1E-04	3.4E-03	2.7E-04	0.2	2.2E-02	3.2E-05	0.5	2.6E-03	2.4E-06	2.9E-02	6.6E-02	5.2E-03	8.8E-06	1.1E-06	7.8E-07	8.7E-06	3.9E-04	7.7E-03	1.9E-07	1.0E-06	2.9E-04	1.5E-06	3.3E-05	1.9E-04	5.6E-06	0.6	3.9E-06	2.2E-02	0.2	4.3E-03	0.3	0.2	1.9E-02	0.0E+00	0.0E+00	0.0E+00	3.3E-02
	Maximum Special Receptor Location (outside pb)					R8																																														

Year 7 - Operations, Annual Average Dry Deposition (g/m^2/year)

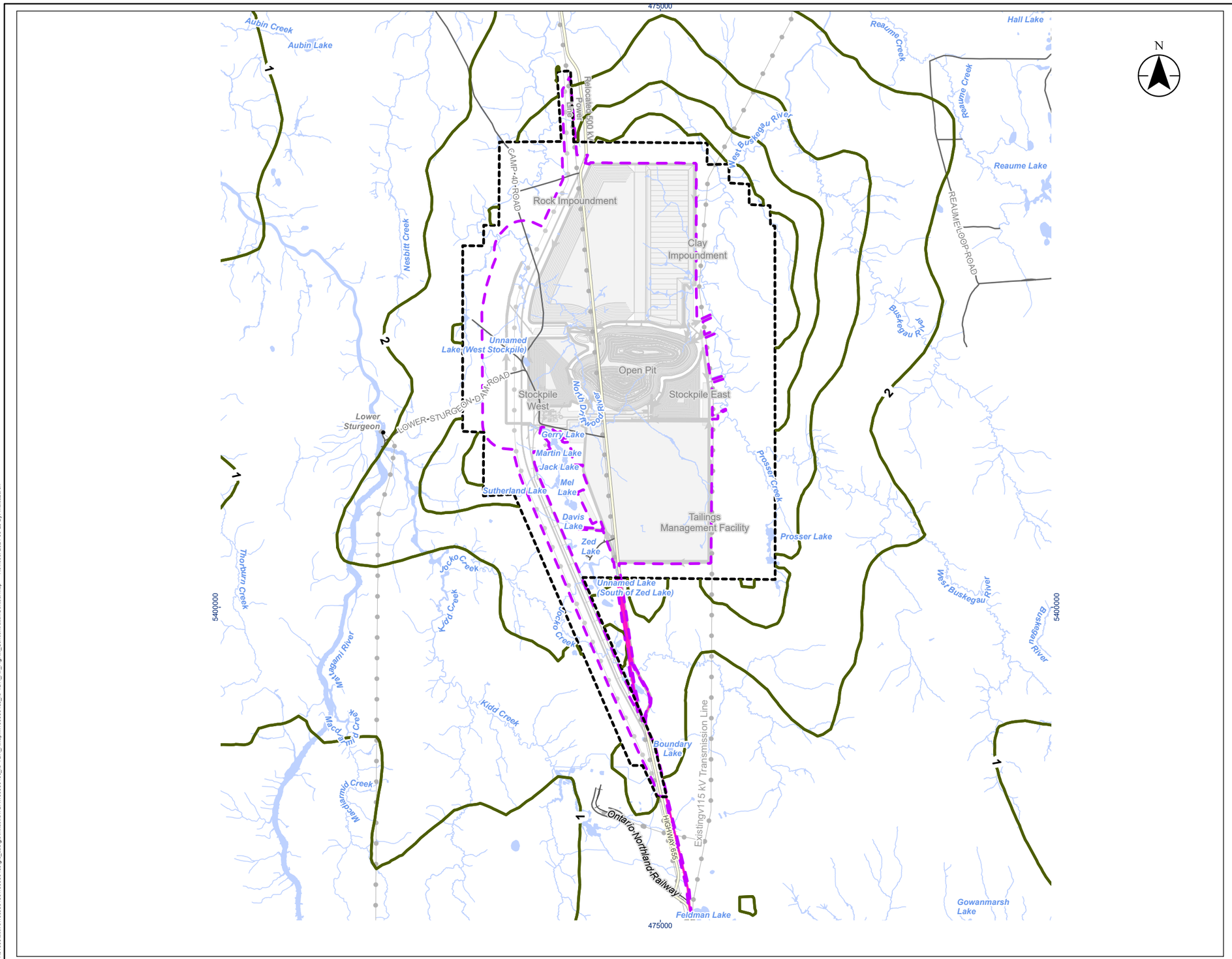
				COPC	PM	Fluoride	Chromium VI	Mercury	Aluminum	Silver	Arsenic	Barium	Beryllium	Boron	Bismuth	Calcium	Cadmium	Cobalt	Chromium	Copper	Iron	Potassium	Lithium	Magnesium	Manganese	Molybdenum	Silicon	Sodium	Nickel	Lead	Antimony	Selenium	Tin	Strontium	Titanium	Thallium	Uranium	Vanadium	Tungsten	Yttrium	Zinc	Thorium	Quartz	Pyrite	Biotite	Magnetite	Hematite	Chlorite	Muscovite	Talc (fibrous)	Phosphorus	Platinum	Palladium	Chrysotile Asbestos
				CAS	<<PM>>	7664-38-3	18540-29-9	7439-97-6	7429-90-5	7440-22-4	7440-38-2	7440-39-3	7440-41-7	7440-42-8	7440-69-9	7440-70-2	7440-43-9	7440-48-4	7440-47-3	7440-50-8	7439-89-6	7440-09-7	7439-93-2	7439-95-4	7439-96-5	7439-98-7	7440-21-3	7440-23-5	7440-02-0	7439-92-1	7440-36-0	7782-49-2	7440-31-5	7440-24-6	7440-32-6	7440-28-0	7440-61-1	7440-62-2	7440-33-7	7440-65-5	7440-66-6	7440-29-1	14808-60-7	12068-85-8	1302-27-8	1309-38-2	1317-60-8	1318-09-9	1318-94-1	14807-96-6	7723-14-0	7440-06-4	7440-05-3	132207-32-0
				Speciation Factor	N/A	2.10E-07	1.28E-09	3.52E-11	7.57E-02	2.50E-07	6.15E-06	2.27E-04	5.83E-07	2.61E-05	1.65E-07	9.07E-02	1.10E-07	1.19E-04	1.32E-03	1.03E-04	6.67E-02	8.51E-03	1.24E-05	2.07E-01	1.03E-03	9.27E-07	1.12E-02	2.58E-02	2.03E-03	3.42E-06	4.32E-07	3.04E-07	3.40E-06	1.51E-04	3.01E-03	7.51E-08	3.94E-07	1.14E-04	5.67E-07	1.30E-05	7.42E-05	2.18E-06	2.29E-01	1.52E-06	8.78E-03	9.66E-02	1.67E-03	1.12E-01	8.98E-02	7.58E-03	0.00E+00	0.00E+00	0.00E+00	1.29E-02
Rec #	Receptor Description	UTM E (m)	UTM N (m)	Receptor Location	Receptor Source																																																
R1	House South of Site, At Lake 300m East of Highway 655	475020	5398566	outside pb	non IK	13	2.7E-06	1.6E-08	4.4E-10	1.0	3.2E-06	7.8E-05	2.9E-03	7.4E-06	3.3E-04	2.1E-06	1.1	1.4E-06	1.5E-03	1.7E-02	1.3E-03	0.8	0.1	1.6E-04	2.6	1.3E-02	1.2E-05	0.1	0.3	2.6E-02	4.3E-05	5.4E-06	3.8E-06	4.3E-05	1.9E-03	3.8E-02	9.5E-07	5.0E-06	1.4E-03	7.1E-06	1.6E-04	9.4E-04	2.8E-05	2.9	1.9E-05	0.1	1.2	2.1E-02	1.4	1.1	9.6E-02	0.0E+00	0.0E+00	0.0E+00	0.2
R2	Camp/Cottage on Davis Lake	471450	5403929	inside pb	non IK	33	6.9E-06	4.2E-08	1.2E-09	2.5	8.2E-06	2.0E-04	7.5E-03	1.9E-05	8.6E-04	5.4E-06	3.0	3.6E-06	3.9E-03	4.3E-02	3.4E-03	2.2	0.3	4.1E-04	6.8	3.4E-02	3.0E-05	0.4	0.8	6.7E-02	1.1E-04	1.4E-05	1.0E-05	1.1E-04	5.0E-03	9.9E-02	2.5E-06	1.3E-05	3.8E-03	1.9E-05	4.3E-04	2.4E-03	7.2E-05	7.5	5.0E-05	0.3	3.2	5.5E-02	3.7	3.0	0.2	0.0E+00	0.0E+00	0.0E+00	0.4
R3	Camp on the West Bukkegeau River	477544	5408361	inside pb	non IK	59	1.2E-05	7.5E-08	2.1E-09	4.4	1.5E-05	3.6E-04	1.3E-02	3.4E-05	1.5E-03	9.7E-06	5.3	6.5E-06	7.0E-03	7.8E-02	6.1E-03	3.9	0.5	7.3E-04	12	6.1E-02	5.4E-05	0.7	1.5	0.1	2.0E-04	2.5E-05	1.8E-05	2.0E-04	8.9E-03	0.2	4.4E-06	2.3E-05	6.7E-03	3.3E-05	7.7E-04	4.4E-03	1.3E-04	13	8.9E-05	0.5	5.7	9.8E-02	6.6	5.3	0.4	0.0E+00	0.0E+00	0.0E+00	0.8
R4	Camp/Cottage East of Site	477052	5403390	inside pb	non IK	37	7.7E-06	4.7E-08	1.3E-09	2.8	9.2E-06	2.3E-04	8.3E-03	2.1E-05	9.6E-04	6.0E-06	3.3	4.0E-06	4.4E-03	4.9E-02	3.8E-03	2.4	0.3	4.5E-04	7.6	3.8E-02	3.4E-05	0.4	0.9	7.4E-02	1.2E-04	1.6E-05	1.1E-05	1.3E-04	5.6E-03	0.1	2.8E-06	1.4E-05	4.2E-03	2.1E-05	4.8E-04	2.7E-03	8.0E-05	8.4	5.6E-05	0.3	3.5	6.1E-02	4.1	3.3	0.3	0.0E+00	0.0E+00	0.0E+00	0.5
R5	Camp/Cottage Near Highway 655 South of Site	479346	5387777	outside pb	non IK	4.6	9.7E-07	5.9E-09	1.6E-10	0.3	1.2E-06	2.8E-05	1.0E-03	2.7E-06	1.2E-04	7.6E-07	0.4	5.1E-07	5.5E-04	6.1E-03	4.8E-04	0.3	3.9E-02	5.7E-05	1.0	4.8E-03	4.3E-06	5.2E-02	0.1	9.4E-03	1.6E-05	2.0E-06	1.4E-06	1.6E-05	7.0E-04	1.4E-02	3.5E-07	1.8E-06	5.3E-04	2.6E-06	6.0E-05	3.4E-04	1.0E-05	1.1	7.0E-06	4.1E-02	0.4	7.7E-03	0.5	0.4	3.5E-02	0.0E+00	0.0E+00	0.0E+00	6.0E-02
R6	Campground at Bigwater Lake	479442	5384066	outside pb	IK	4.1	8.5E-07	5.2E-09	1.4E-10	0.3	1.0E-06	2.5E-05	9.2E-04	2.4E-06	1.1E-04	6.7E-07	0.4	4.5E-07	4.8E-04	5.4E-03	4.2E-04	0.3	3.5E-02	5.0E-05	0.8	4.2E-03	3.8E-06	4.5E-02	0.1	8.2E-03	1.4E-05	1.8E-06	1.2E-06	1.4E-05	6.1E-04	1.2E-02	3.0E-07	1.6E-06	4.6E-04	2.3E-06	5.3E-05	3.0E-04	8.9E-06	0.9	6.2E-06	3.6E-02	0.4	6.8E-03	0.5	0.4	3.1E-02	0.0E+00	0.0E+00	0.0E+00	5.2E-02
R7	Mattagami River - Indigenous Site			outside pb	IK	7.3	1.5E-06	9.3E-09	2.6E-10	0.6	1.8E-06	4.5E-05	1.6E-03	4.2E-06	1.9E-04	1.2E-06	0.7	8.0E-07	8.6E-04	9.6E-03	7.5E-04	0.5	6.2E-02	9.0E-05	1.5	7.5E-03	6.7E-06	8.1E-02	0.2	1.5E-02	2.5E-05	3.1E-06	2.2E-06	2.5E-05	1.1E-03	2.2E-02	5.5E-07	2.9E-06	8.3E-04	4.1E-06	9.5E-05	5.4E-04	1.6E-05	1.7	1.1E-05	6.4E-02	0.7	1.2E-02	0.8	0.7	5.5E-02	0.0E+00	0.0E+00	0.0E+00	9.4E-02
R8	Overnight Indigenous Habitation Location			outside pb	IK	12	2.5E-06	1.5E-08	4.2E-10	0.9	3.0E-06	7.3E-05	2.7E-03	6.9E-06	3.1E-04	1.9E-06	1.1	1.3E-06	1.4E-03	1.6E-02	1.2E-03	0.8	0.1	1.5E-04	2.4	1.2E-02	1.1E-05	0.1	0.3	2.4E-02	4.0E-05	5.1E-06	3.6E-06	4.0E-05	1.8E-03	3.6E-02	8.9E-07	4.7E-06	1.4E-03	6.7E-06	1.5E-04	8.8E-04	2.6E-05	2.7	1.8E-05	0.1	1.1	2.0E-02	1.3	1.1	9.0E-02	0.0E+00	0.0E+00	0.0E+00	0.2
R9	Overnight Indigenous Habitation Location			outside pb	IK	14	2.9E-06	1.8E-08	4.8E-10	1.0	3.4E-06	8.4E-05	3.1E-03	8.0E-06	3.6E-04	2.3E-06	1.2	1.5E-06	1.6E-03	1.8E-02	1.4E-03	0.9	0.1	1.7E-04	2.8	1.4E-02	1.3E-05	0.2	0.4	2.8E-02	4.7E-05	5.9E-06	4.2E-06	4.7E-05	2.1E-03	4.1E-02	1.0E-06	5.4E-06	1.6E-03	7.8E-06	1.8E-04	1.0E-03	3.0E-05	3.1	2.1E-05	0.1	1.3	2.3E-02	1.5	1.2	0.1	0.0E+00	0.0E+00	0.0E+00	0.2
R10	Overnight Indigenous Habitation Location			outside pb	IK	4.0	8.4E-07	5.1E-09	1.4E-10	0.3	9.9E-07	2.4E-05	9.0E-04	2.3E-06	1.0E-04	6.5E-07	0.4	4.4E-07	4.7E-04	5.3E-03	4.1E-04	0.3	3.4E-02	4.9E-05	0.8	4.1E-03	3.7E-06	4.4E-02	0.1	8.0E-03	1.4E-05	1.7E-06	1.2E-06	1.4E-05	6.0E-04	1.2E-02	3.0E-07	1.6E-06	4.5E-04	2.3E-06	5.2E-05	2.9E-04	8.7E-06	0.9	6.0E-06	3.5E-02	0.4	6.6E-03	0.4	0.4	3.0E-02	0.0E+00	0.0E+00	0.0E+00	5.1E-02
R11	Overnight Indigenous Habitation Location			outside pb	IK	3.8	8.0E-07	4.9E-09	1.3E-10	0.3	9.5E-07	2.3E-05	8.6E-04	2.2E-06	9.9E-05	6.3E-07	0.3	4.2E-07	4.5E-04	5.0E-03	3.9E-04	0.3	3.2E-02	4.7E-05	0.8	3.9E-03	3.5E-06	4.3E-02	9.9E-02	7.7E-03	1.3E-05	1.6E-06	1.2E-06	1.3E-05	5.7E-04	1.1E-02	2.8E-07	1.5E-06	4.3E-04	2.2E-06	5.0E-05	2.8E-04	8.3E-06	0.9	5.8E-06	3.3E-02	0.4	6.3E-03	0.4	0.3	2.9E-02	0.0E+00	0.0E+00	0.0E+00	4.9E-02
R12	Camp/Cottage North of Existing Rail Corridor	484850	5384101	outside pb	non IK	3.8	8.1E-07	4.9E-09	1.3E-10	0.3	9.6E-07	2.4E-05	8.7E-04	2.2E-06	1.0E-04	6.3E-07	0.3	4.2E-07	4.6E-04	5.1E-03	4.0E-04	0.3	3.3E-02	4.7E-05	0.8	3.9E-03	3.6E-06	4.3E-02	9.9E-02	7.8E-03	1.3E-05	1.7E-06	1.2E-06	1.3E-05	5.8E-04	1.2E-02	2.9E-07	1.5E-06	4.4E-04	2.2E-06	5.0E-05	2.8E-04	8.4E-06	0.9	5.8E-06	3.4E-02	0.4	6.4E-03	0.4	0.3	2.9E-02	0.0E+00	0.0E+00	0.0E+00	5.0E-02
R13	Camp/Cottage North of Existing Rail Corridor	485095	5383767	outside pb	non IK	3.8	7.9E-07	4.8E-09	1.3E-10	0.3	9.4E-07	2.3E-05	8.5E-04	2.2E-06	9.8E-05	6.2E-07	0.3	4.1E-07	4.5E-04	5.0E-03	3.9E-04	0.3	3.2E-02	4.6E-05	0.8	3.9E-03	3.5E-06	4.2E-02	9.7E-02	7.6E-03	1.3E-05	1.6E-06	1.1E-06	1.3E-05	5.7E-04	1.1E-02	2.8E-07	1.5E-06	4.3E-04	2.1E-06	4.9E-05	2.8E-04	8.2E-06	0.9	5.7E-06	3.3E-02	0.4	6.3E-03	0.4	0.3	2.8E-02	0.0E+00	0.0E+00	0.0E+00	4.9E-02
Annual Total Deposition at Special Receptor (outside pb)						14	2.9E-06	1.8E-08	4.8E-10	1.0	3.4E-06	8.4E-05	3.1E-03	8.0E-06	3.6E-04	2.3E-06	1.2	1.5E-06	1.6E-03	1.8E-02	1.4E-03	0.9	0.1	1.7E-04	2.8	1.4E-02	1.3E-05	0.2	0.4	2.8E-02	4.7E-05	5.9E-06	4.2E-06	4.7E-05	2.1E-03	4.1E-02	1.0E-06	5.4E-06	1.6E-03	7.8E-06	1.8E-04	1.0E-03	3.0E-05	3.1	2.1E-05	0.1	1.3	2.3E-02	1.5	1.2	0.1	0.0E+00	0.0E+00	0.0E+00	0.2
Maximum Special Receptor Location (outside pb)						R9																																														

Appendix G Predicted Acid Deposition at Special Receptors

Summary of Construction and Operations Annual PAI, N Loading and S Loading

Rec #	Receptor Description	UTM E (m)	UTM N (m)	Construction			Operations		
				PAI (k_{eq} H^+/ha/year)	S Loading (kg/ha/year)	N Loading (kg/ha/year)	PAI (k_{eq} H^+/ha/year)	S Loading (kg/ha/year)	N Loading (kg/ha/year)
R1	House South of Site, At Lake 300m East of Highway 655	473500	5398566	8.4E-04	7.2E-05	2.3E-02	3.0E-03	1.8E-04	8.3E-02
R2	Camp/Cottage on Davis Lake	471450	5403929	1.8E-03	1.7E-04	5.1E-02	7.6E-03	4.9E-04	0.2
R3	Camp on the West Buskegeau River	477544	5408361	1.1E-02	8.2E-04	0.3	1.9E-02	1.2E-03	0.5
R4	Camp/Cottage East of Site	477052	5403390	2.8E-03	2.0E-04	7.8E-02	1.0E-02	6.8E-04	0.3
R5	Camp/Cottage Near Highway 655 South of Site	475946	5387777	2.8E-04	2.2E-05	7.8E-03	1.0E-03	6.7E-05	2.9E-02
R6	Campground at Bigwater Lake	479442	5384066	2.5E-04	2.0E-05	6.9E-03	9.0E-04	6.1E-05	2.5E-02
R7	Mattagami River - Indigenous Site			4.2E-04	3.4E-05	1.2E-02	1.6E-03	1.0E-04	4.6E-02
R8	Overnight Indigenous Habitation Location			7.2E-04	5.9E-05	2.0E-02	2.9E-03	1.8E-04	8.2E-02
R9	Overnight Indigenous Habitation Location			8.7E-04	7.0E-05	2.4E-02	3.3E-03	2.0E-04	9.1E-02
R10	Overnight Indigenous Habitation Location			2.4E-04	1.9E-05	6.7E-03	8.8E-04	5.9E-05	2.5E-02
R11	Overnight Indigenous Habitation Location			2.3E-04	1.8E-05	6.4E-03	8.3E-04	5.5E-05	2.3E-02
R12	Camp/Cottage North of Existing Rail Corridor	484850	5384101	2.9E-04	2.2E-05	8.0E-03	9.9E-04	6.6E-05	2.8E-02
R13	Camp/Cottage North of Existing Rail Corridor	485095	5383767	2.8E-04	2.2E-05	7.8E-03	9.7E-04	6.5E-05	2.7E-02
W1	Martin Lake - closest lake to PA; headwaters of proposed diversion channel	470919	5406466	5.3E-03	9.1E-04	0.1	1.7E-02	1.3E-03	0.5
W2	WB-P-142 - unnamed pond in tributary of West Buskegau River east of PA	477193	5412314	1.1E-02	7.1E-04	0.3	1.7E-02	9.4E-04	0.5
W3	Deception Lake - closest named lake north of PA	477710	5430535	8.8E-04	6.4E-05	2.5E-02	2.6E-03	1.6E-04	7.3E-02
W4	ND-P-045 - Unnamed Lake (West Stockpile)	469834	5409446	3.1E-03	3.2E-04	8.8E-02	2.1E-02	1.1E-03	0.6
Maximum PAI Over All Special Receptors				**1.1E-02**			**2.1E-02**		
Maximum Special Receptor Location				**R3**			**W4**		

Appendix H Sensitivity Analysis for Haul Road Dust Mitigation - Predicted Concentrations at Special Receptors



N

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.

Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.01

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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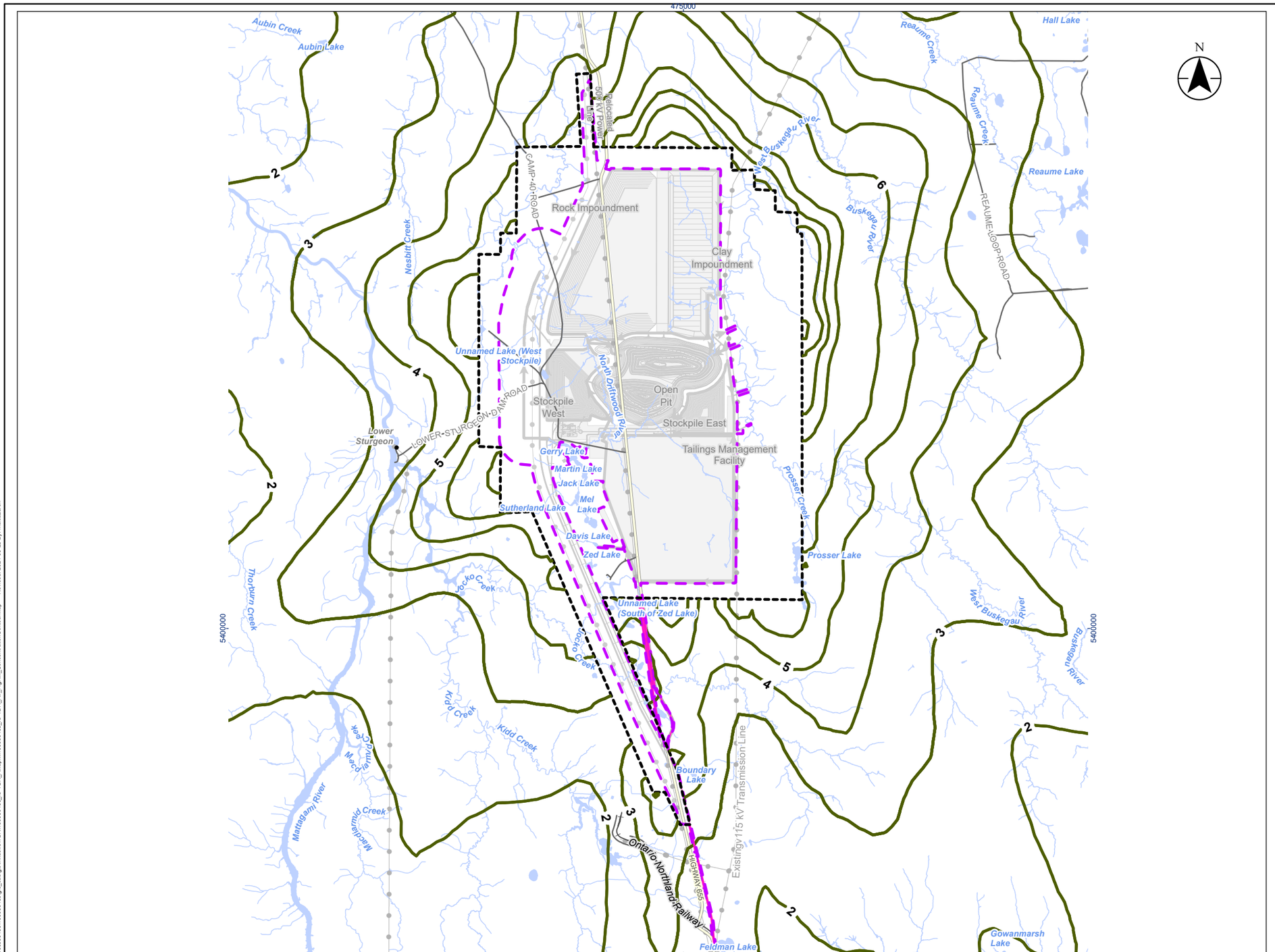

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC: 27 µg/m^3
Background Concentration (not included): 12.4 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.

Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.02

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average $PM_{2.5}$ (70% Control Efficiency on Haul Roads)

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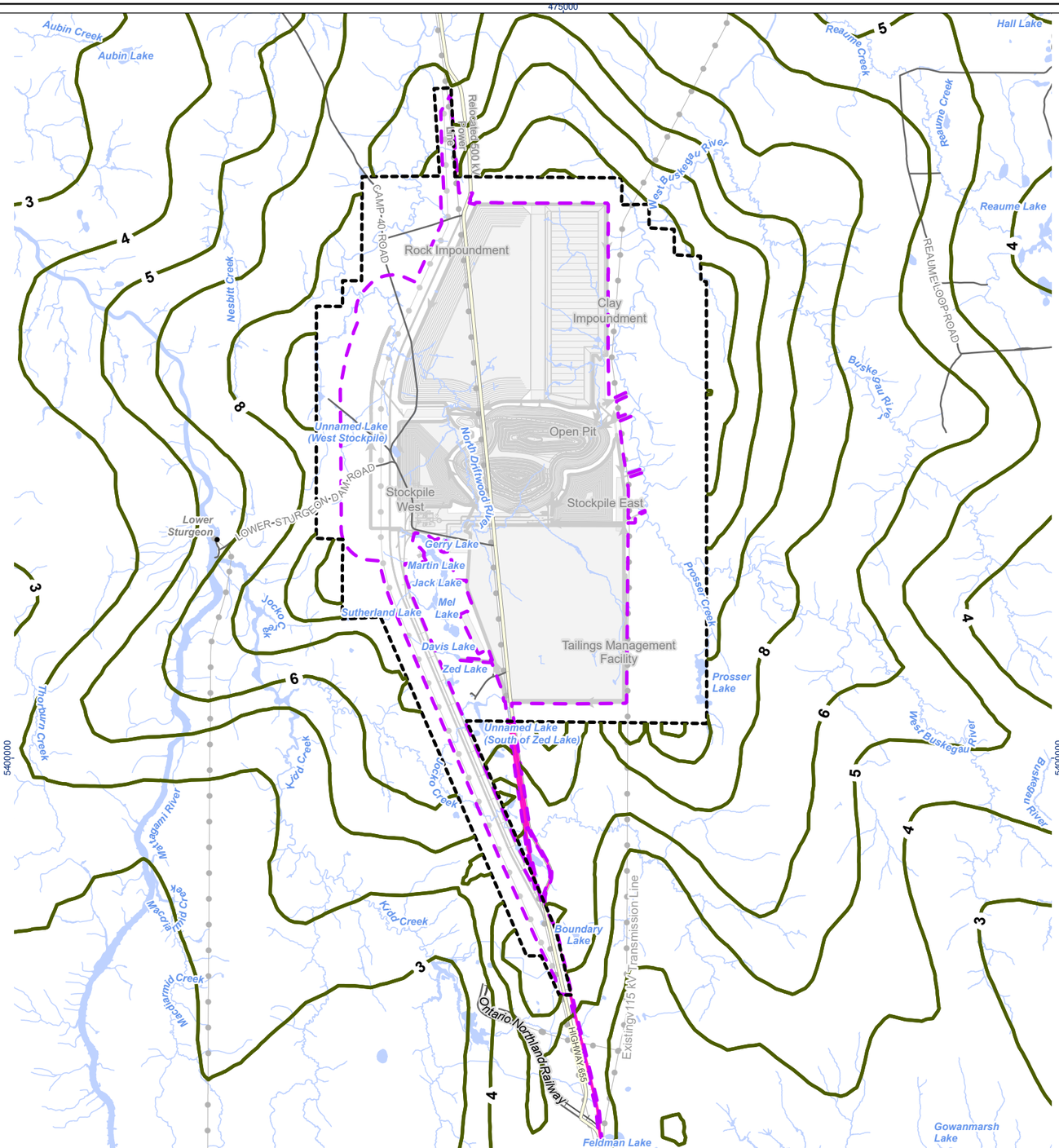

N

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2023.

Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.03

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average $PM_{2.5}$ (50% Control Efficiency on Haul Roads)

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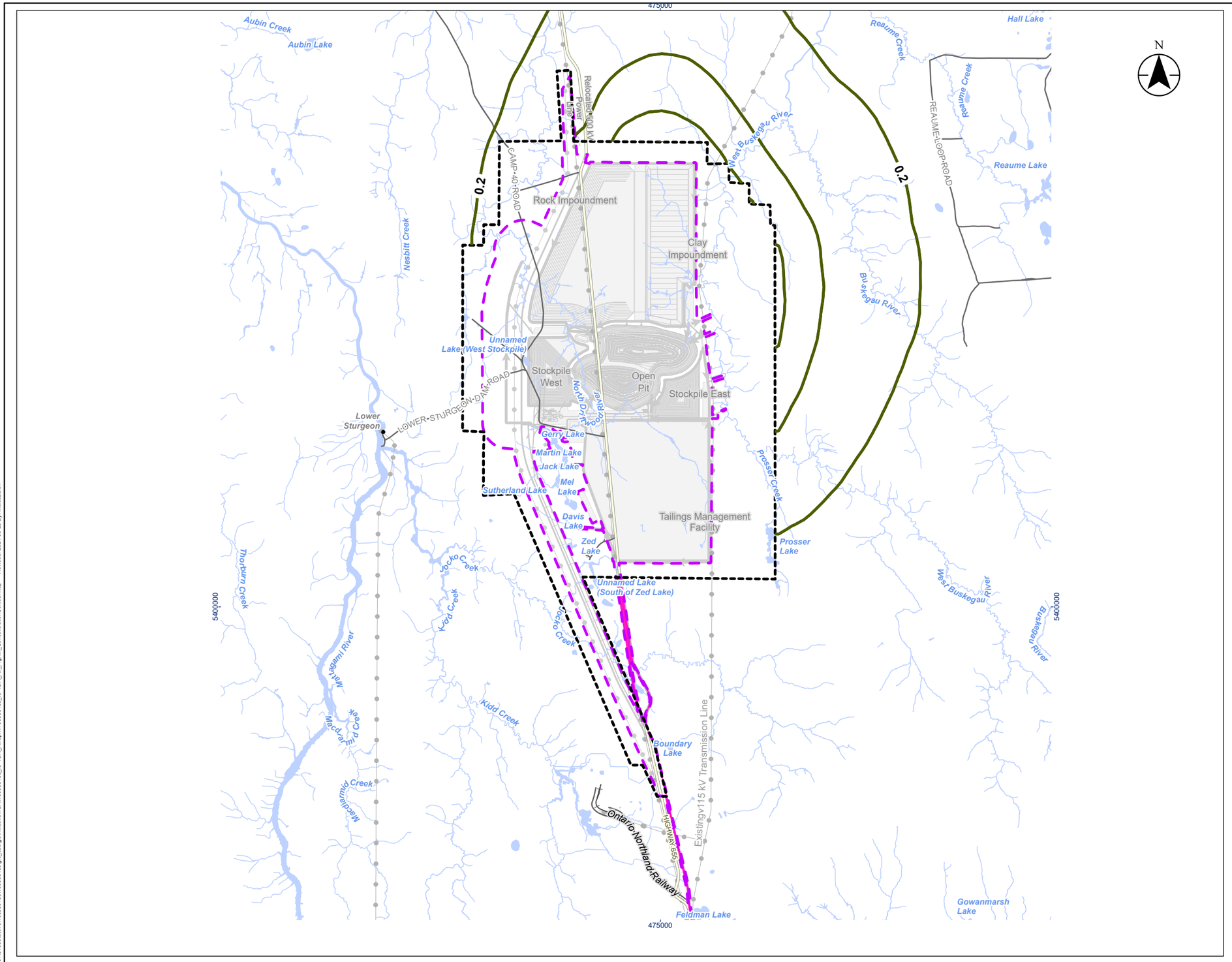

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.04

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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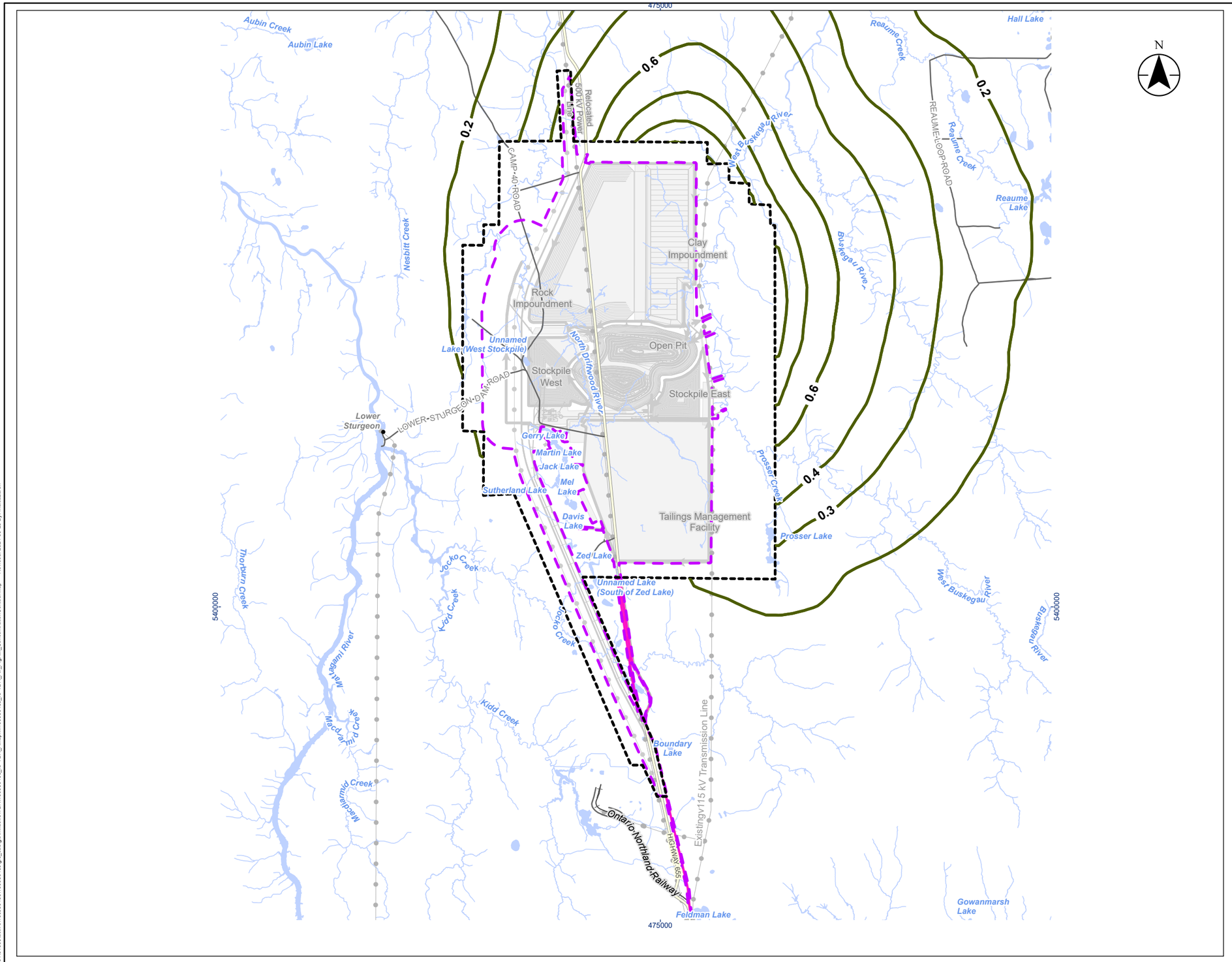

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2022
$PM_{2.5}$ Annual Average AAQC: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

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Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.05

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average $PM_{2.5}$ (70% Control Efficiency on Haul Roads)

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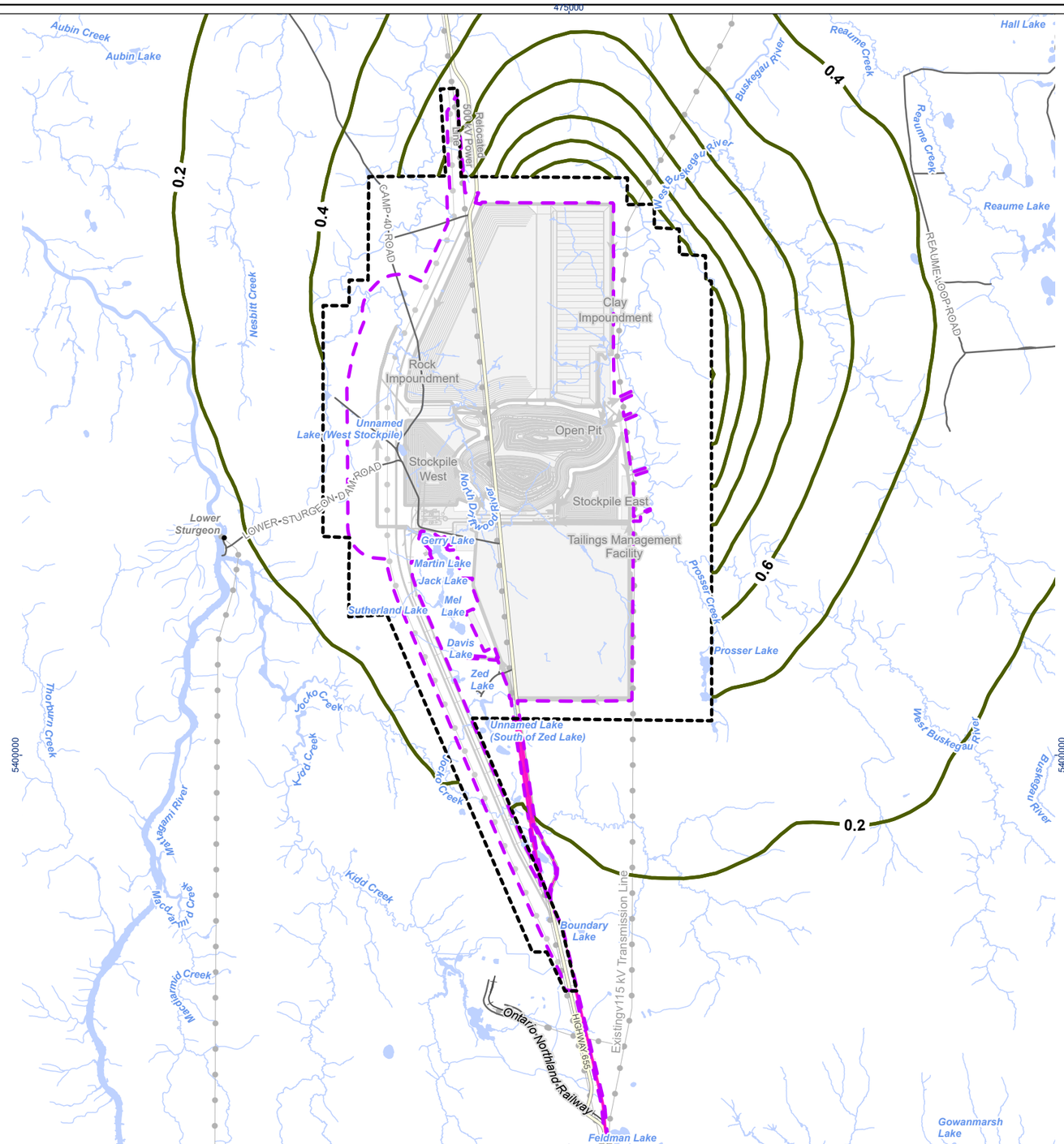

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.06

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average $PM_{2.5}$ (50% Control Efficiency on Haul Roads)

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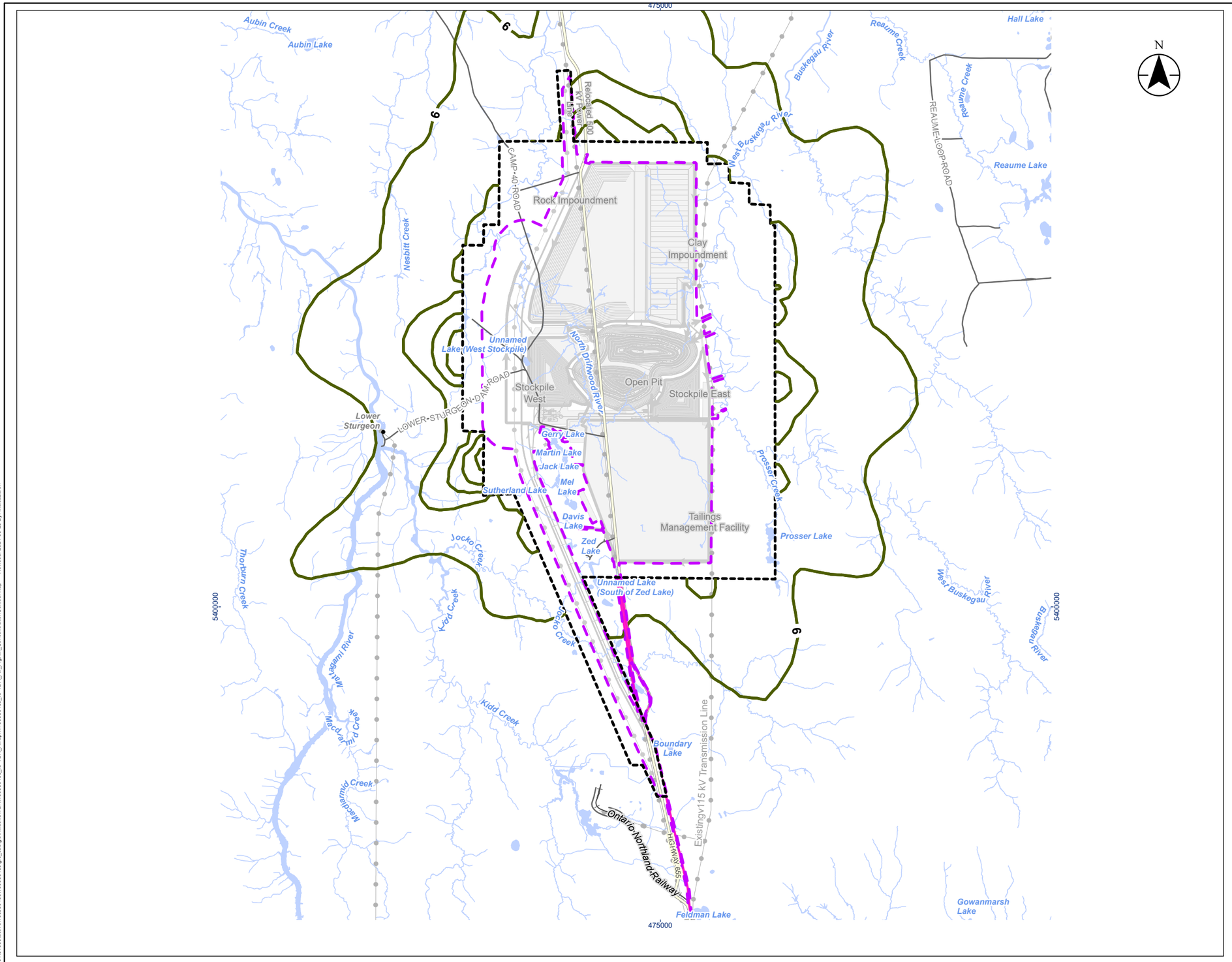

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.07

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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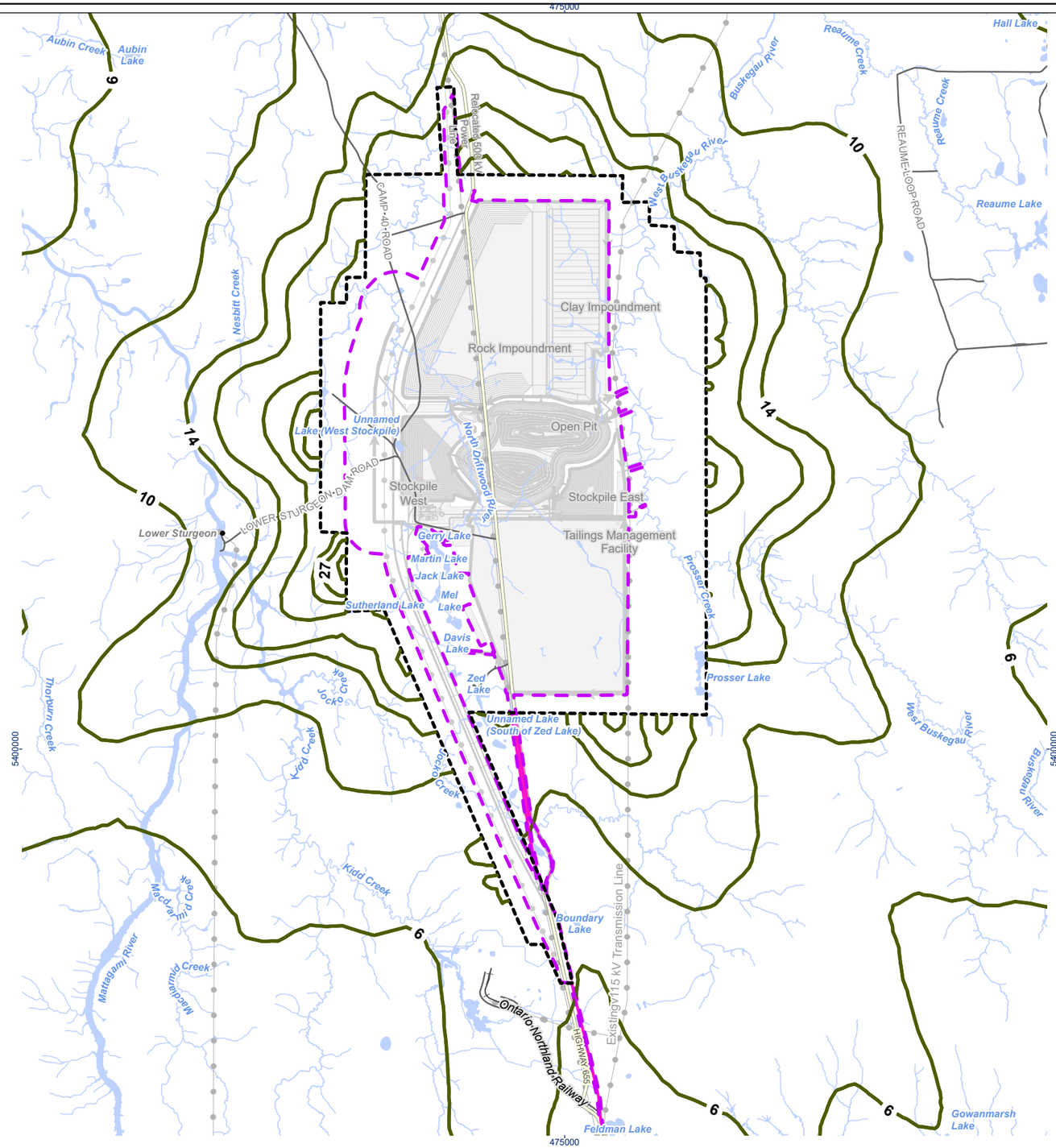

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.08

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average $PM_{2.5}$ (70% Control Efficiency on Haul Roads)

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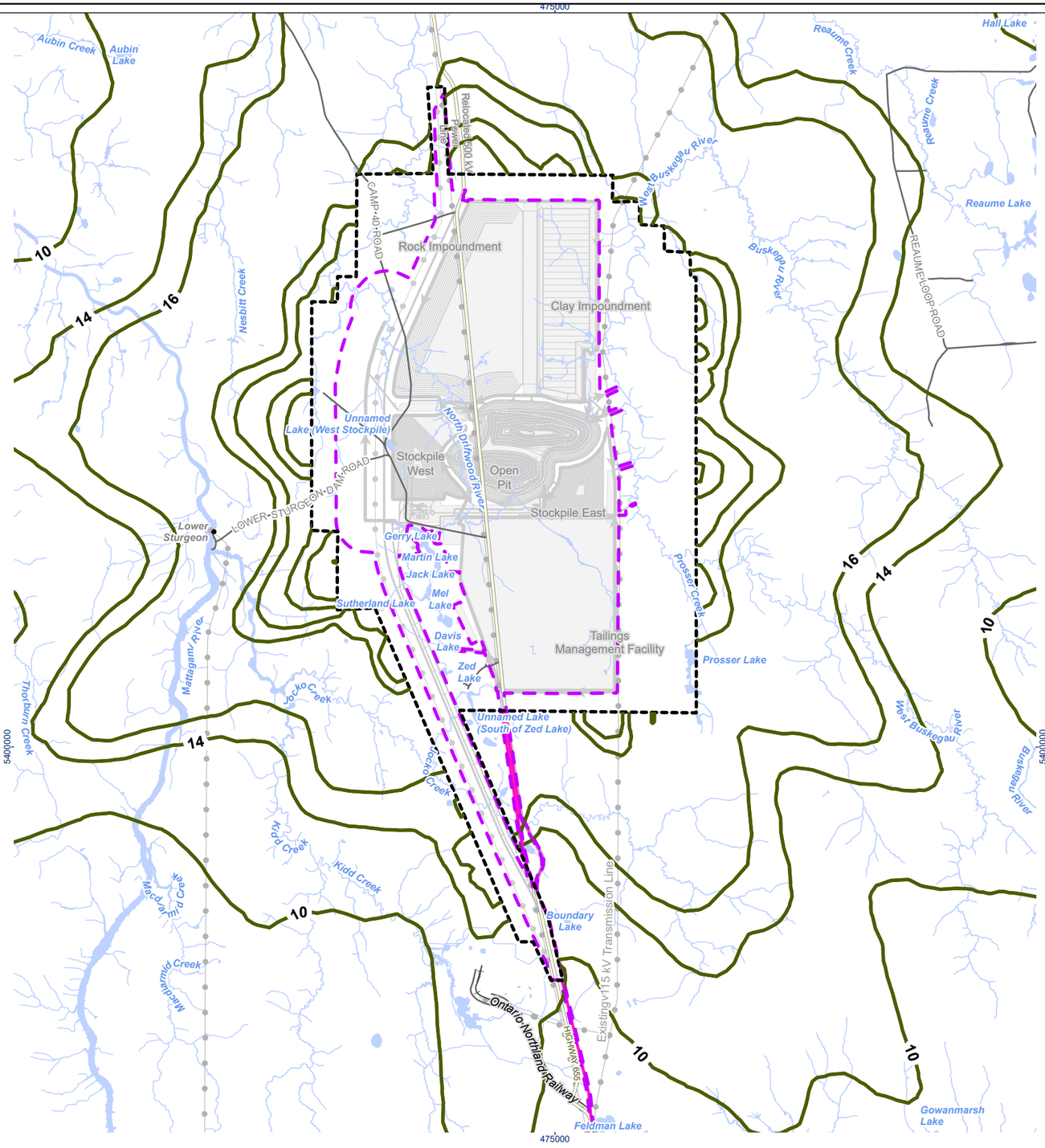

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.09

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average $PM_{2.5}$ (50% Control Efficiency on Haul Roads)

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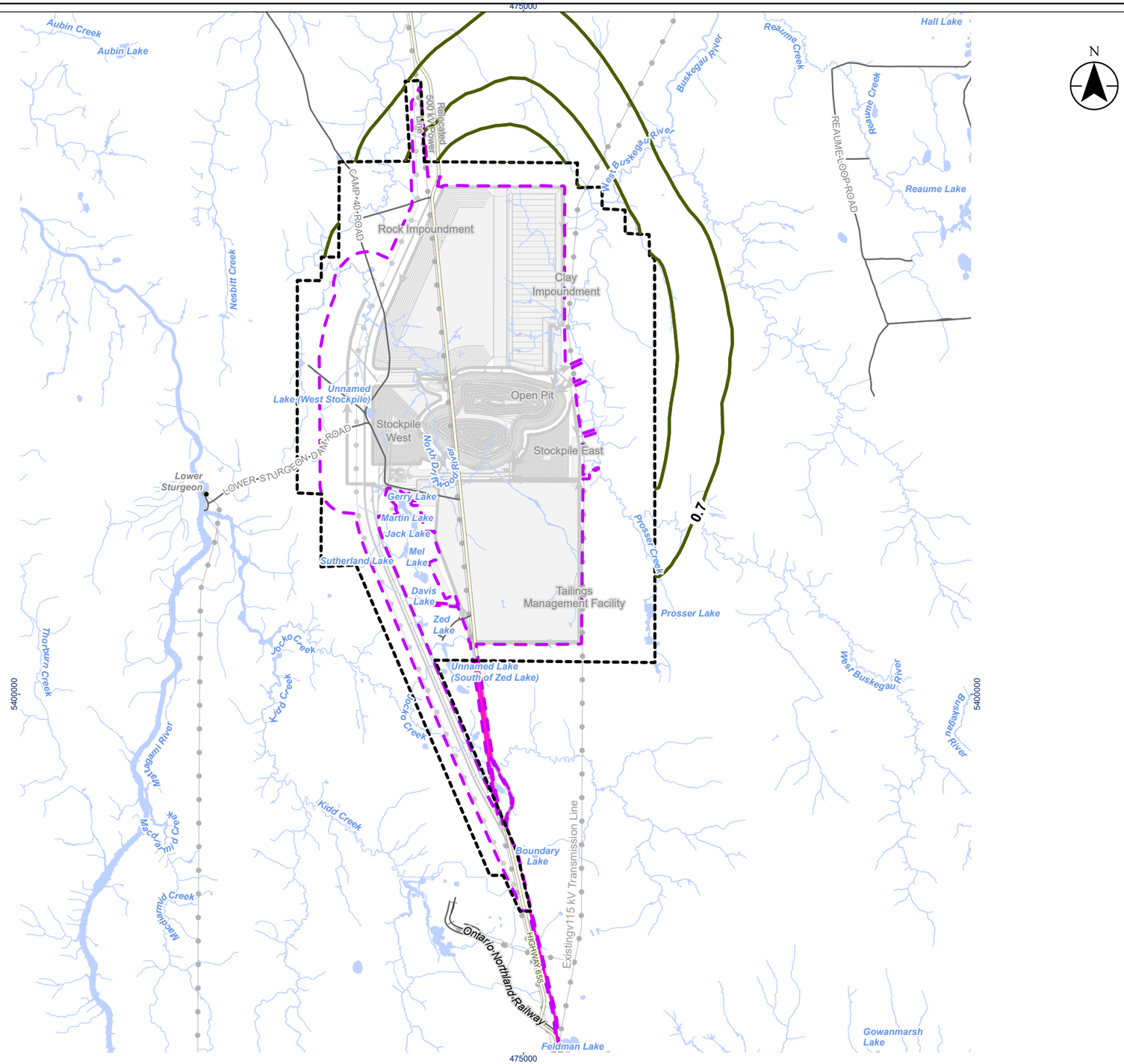

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2022
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.10

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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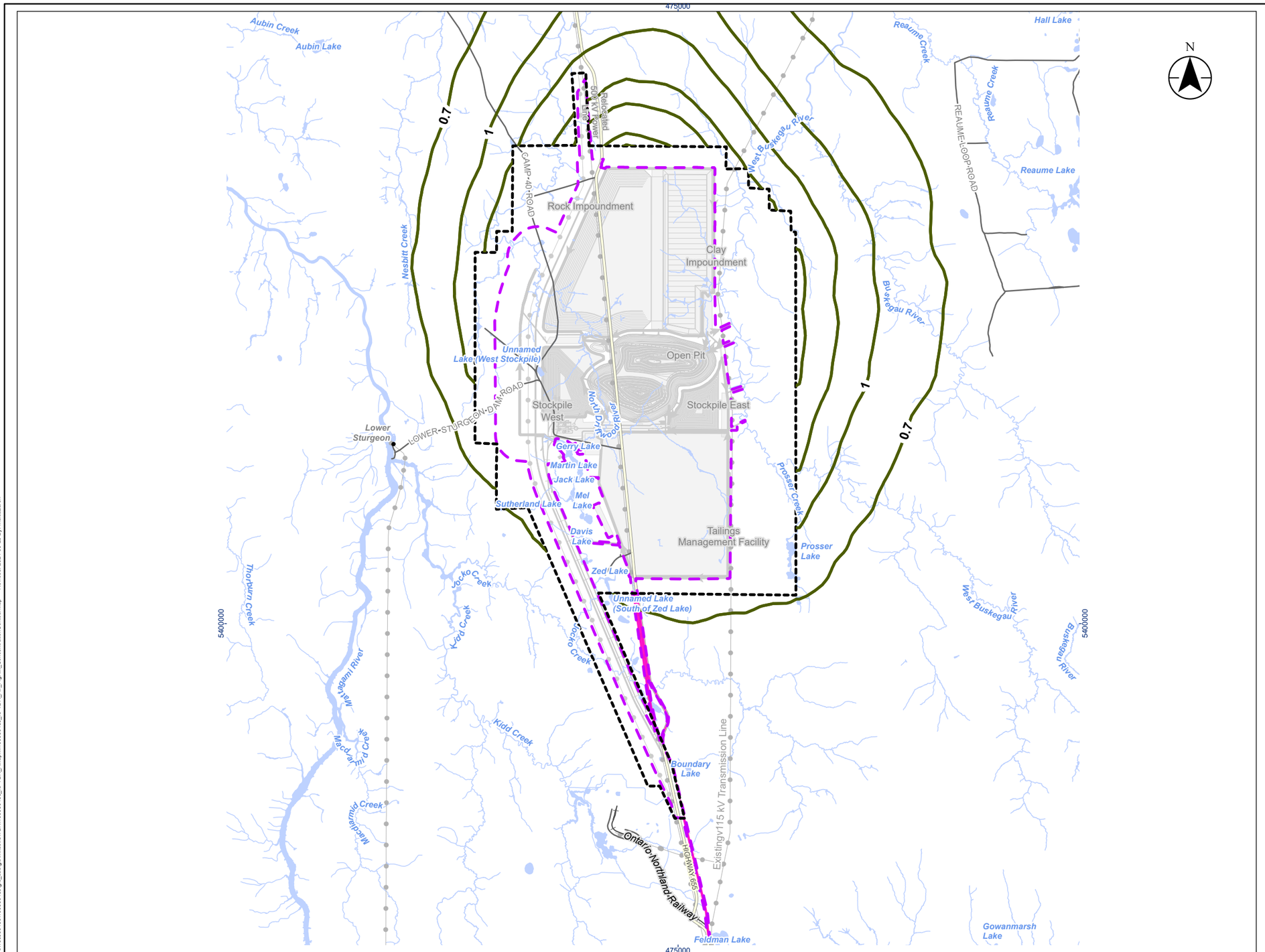

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.11

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average $PM_{2.5}$ (70% Control Efficiency on Haul Roads)

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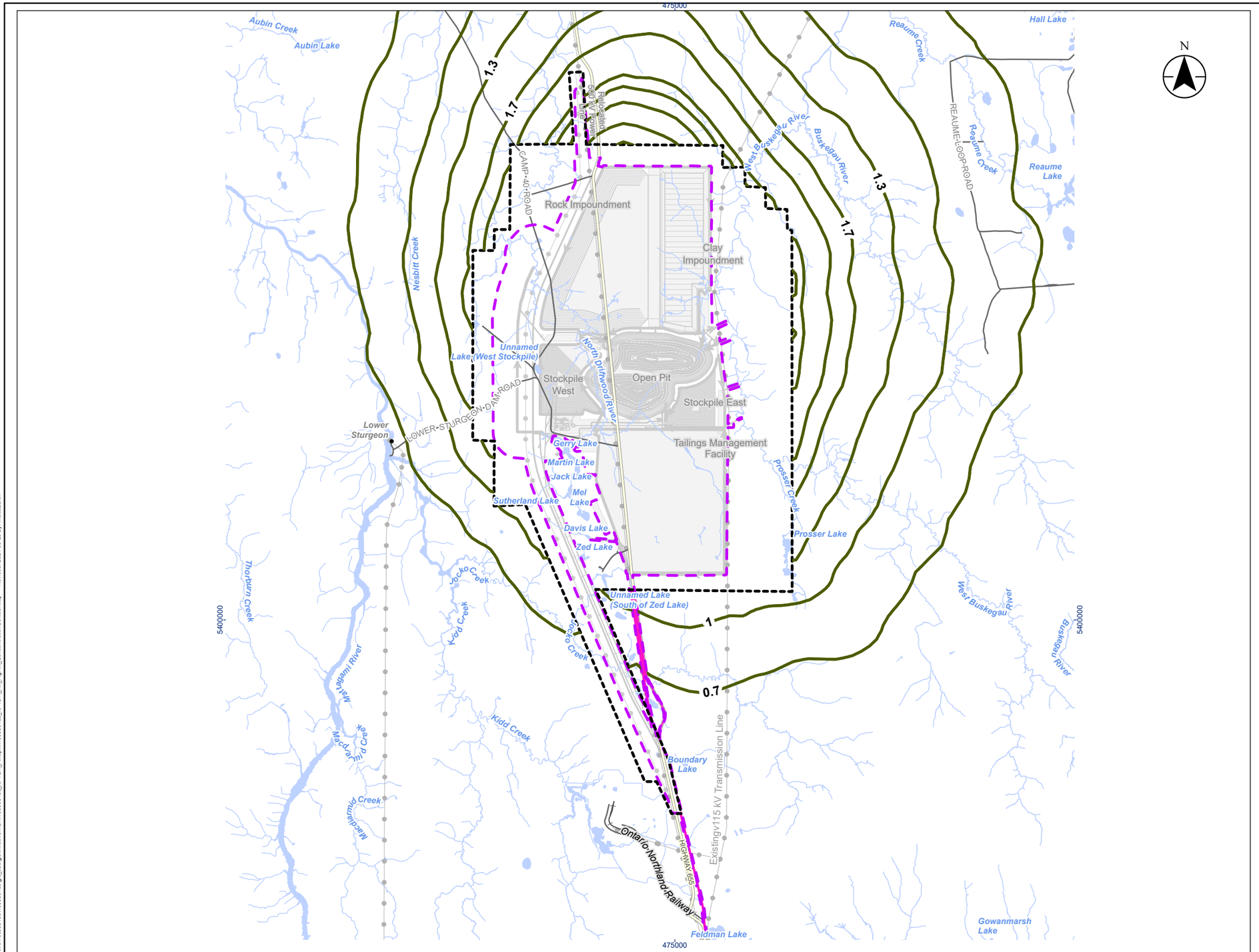

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody
- Proposed Project Components

Legend Notes:
$PM_{2.5}$ Annaual Average Concentrations fro Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
H.12

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average $PM_{2.5}$ (50% Control Efficiency on Haul Roads)

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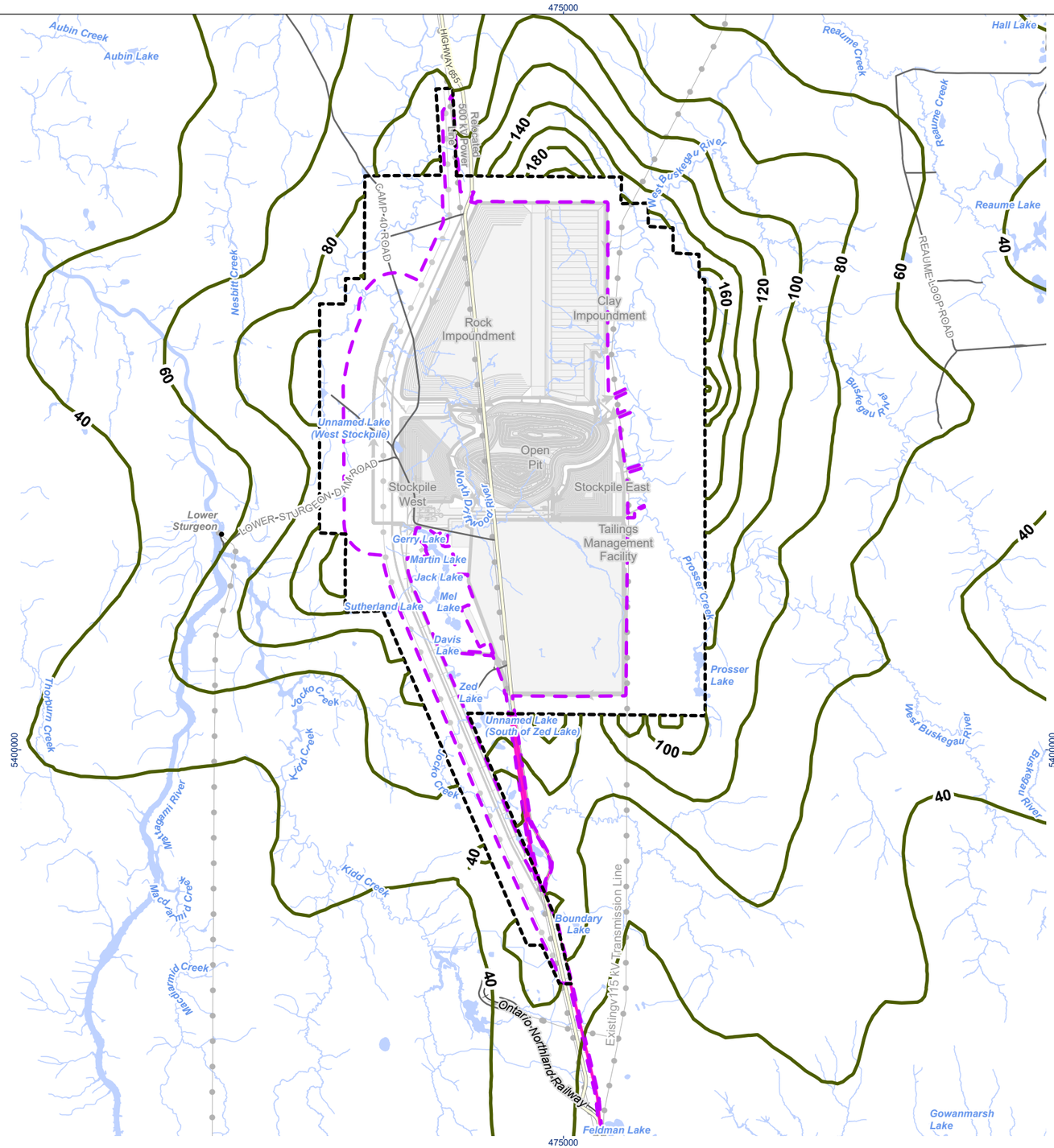
Appendix I Concentration Contour Plots



Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
SPM 24-Hour Average AAQC: 120 µg/m^3
Background Concentration (not included): 26.5 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.01

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average SPM (85% Control Efficiency on Haul Roads)

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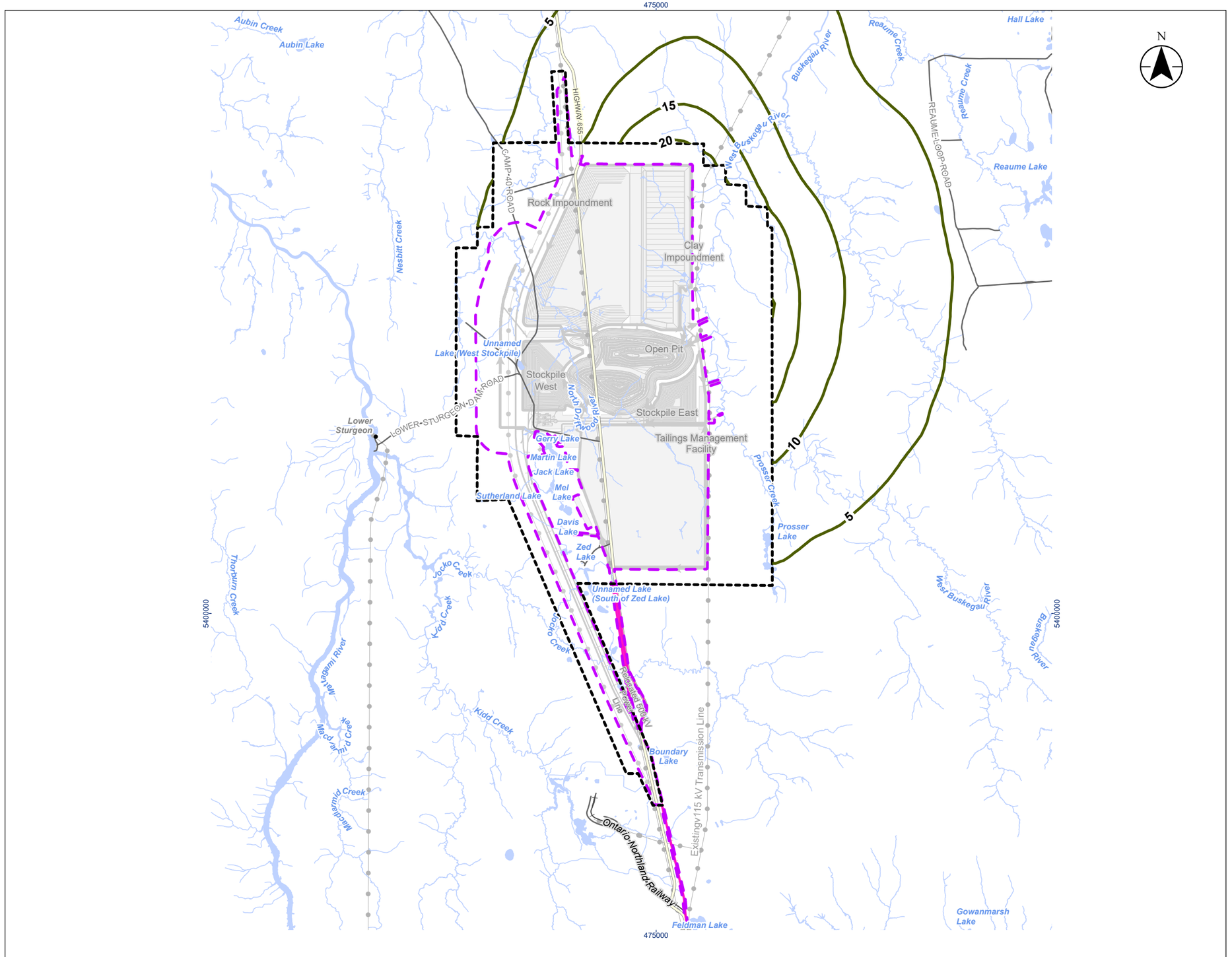

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
SPM Annual Average Concentrations for Meteorological Year 2022
SPM Annual Average AAQC: 60 µg/m^3
Background Concentration (not included): 11.6 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.02

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average SPM (85% Control Efficiency on Haul Roads)

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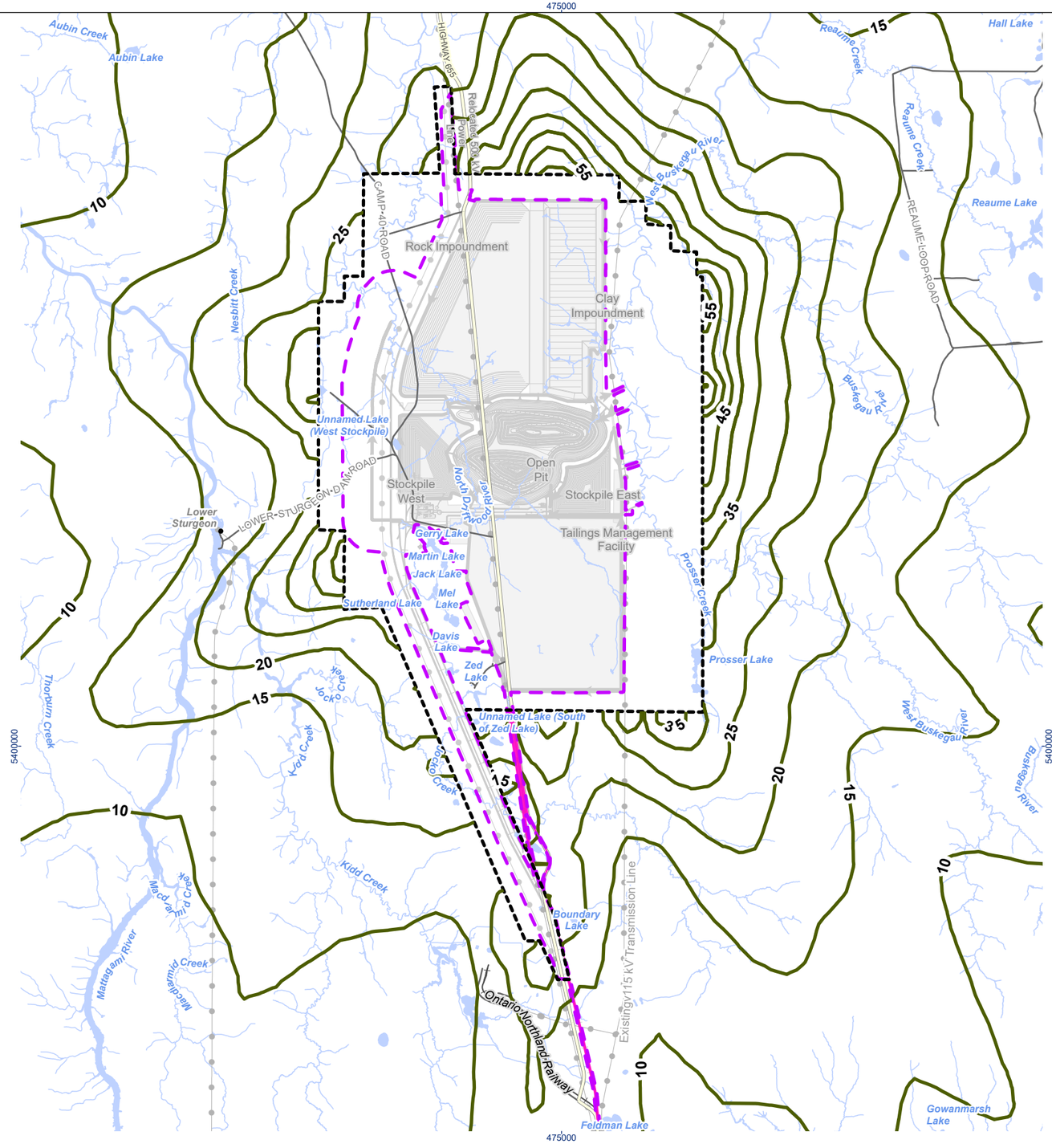

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
PM_{10} 24-Hour Average AAQC: 50 µg/m^3
Background Concentration (not included): 13.1 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.03

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average PM_{10} (85% Control Efficiency on Haul Roads)

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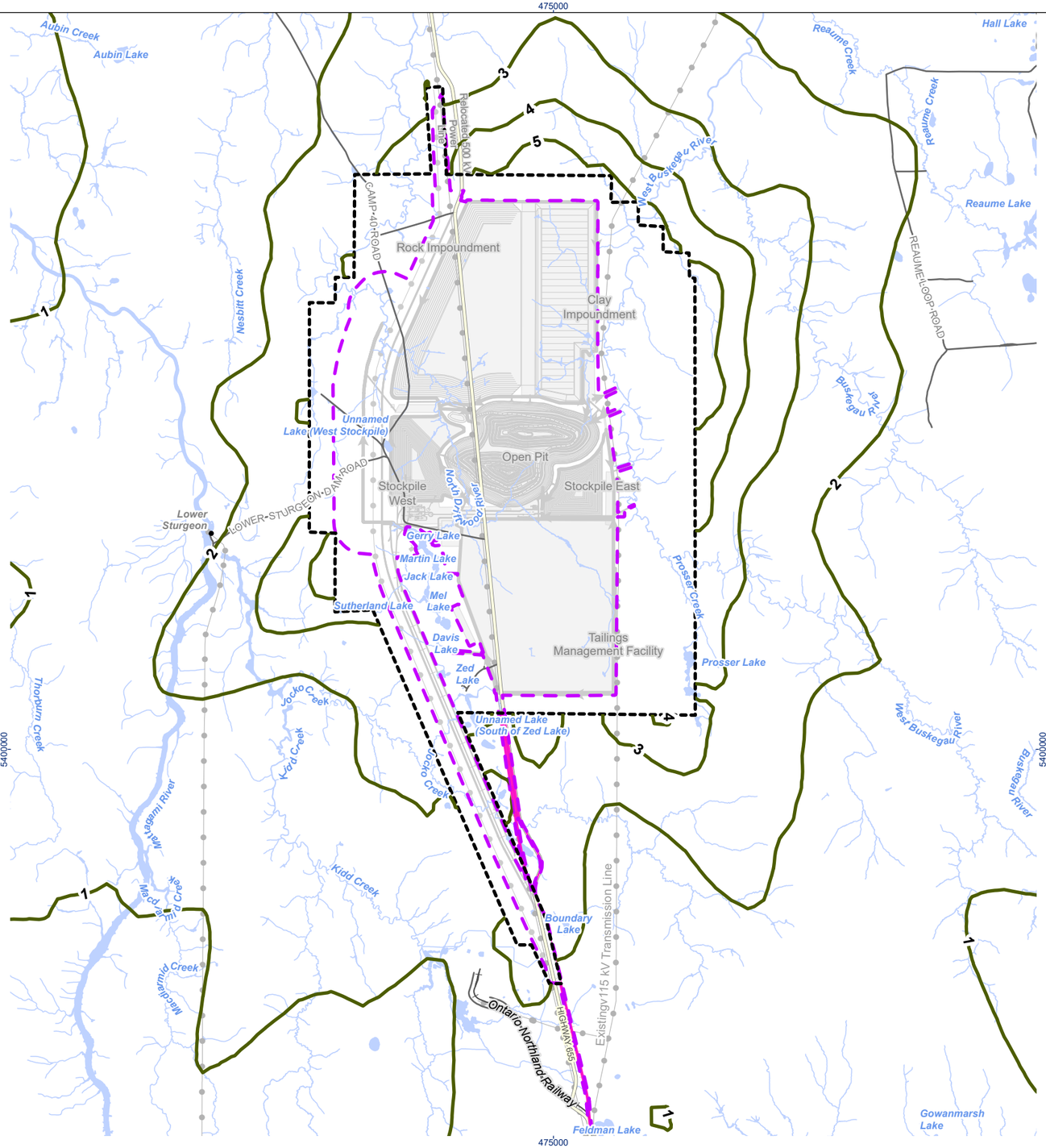

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CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.04

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-hour Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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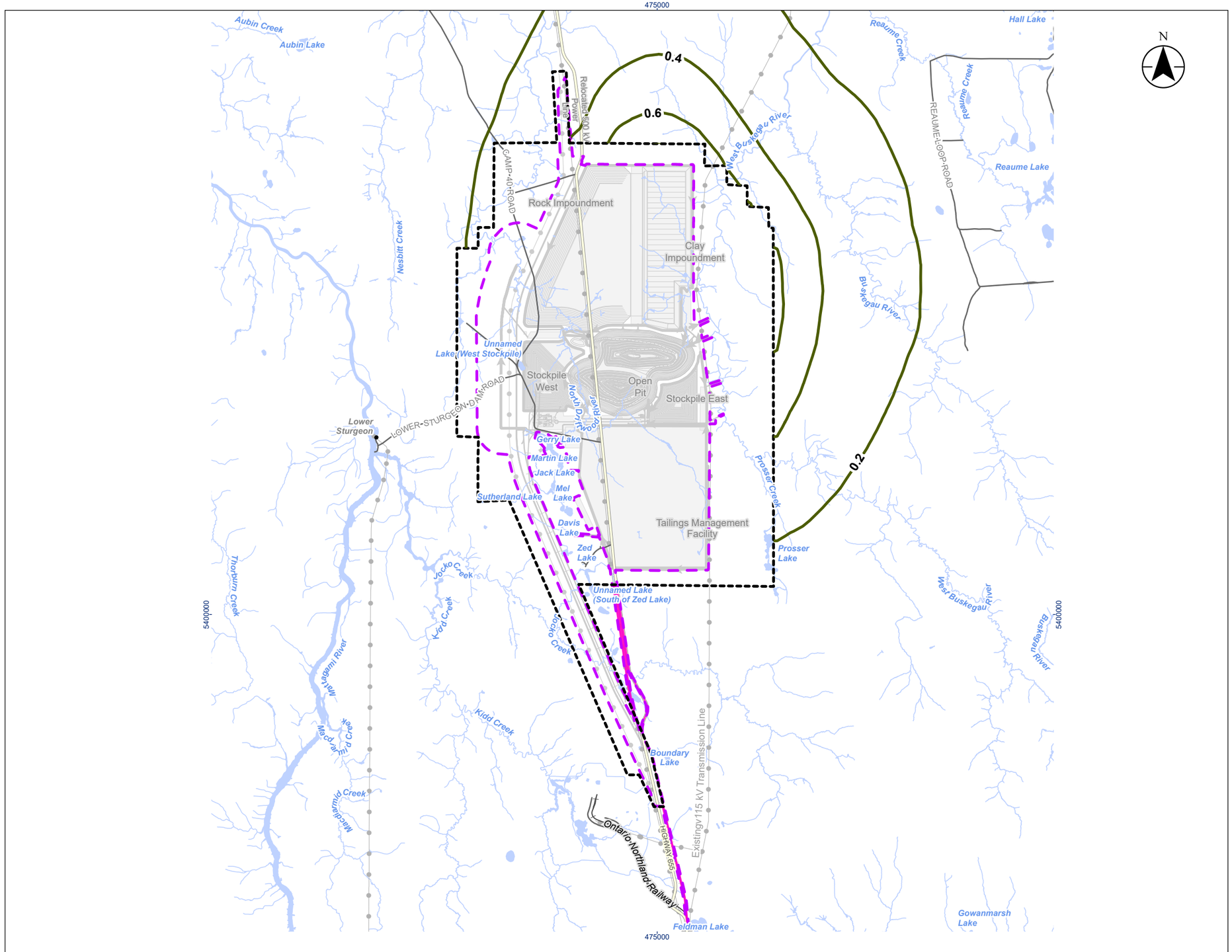

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Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.05

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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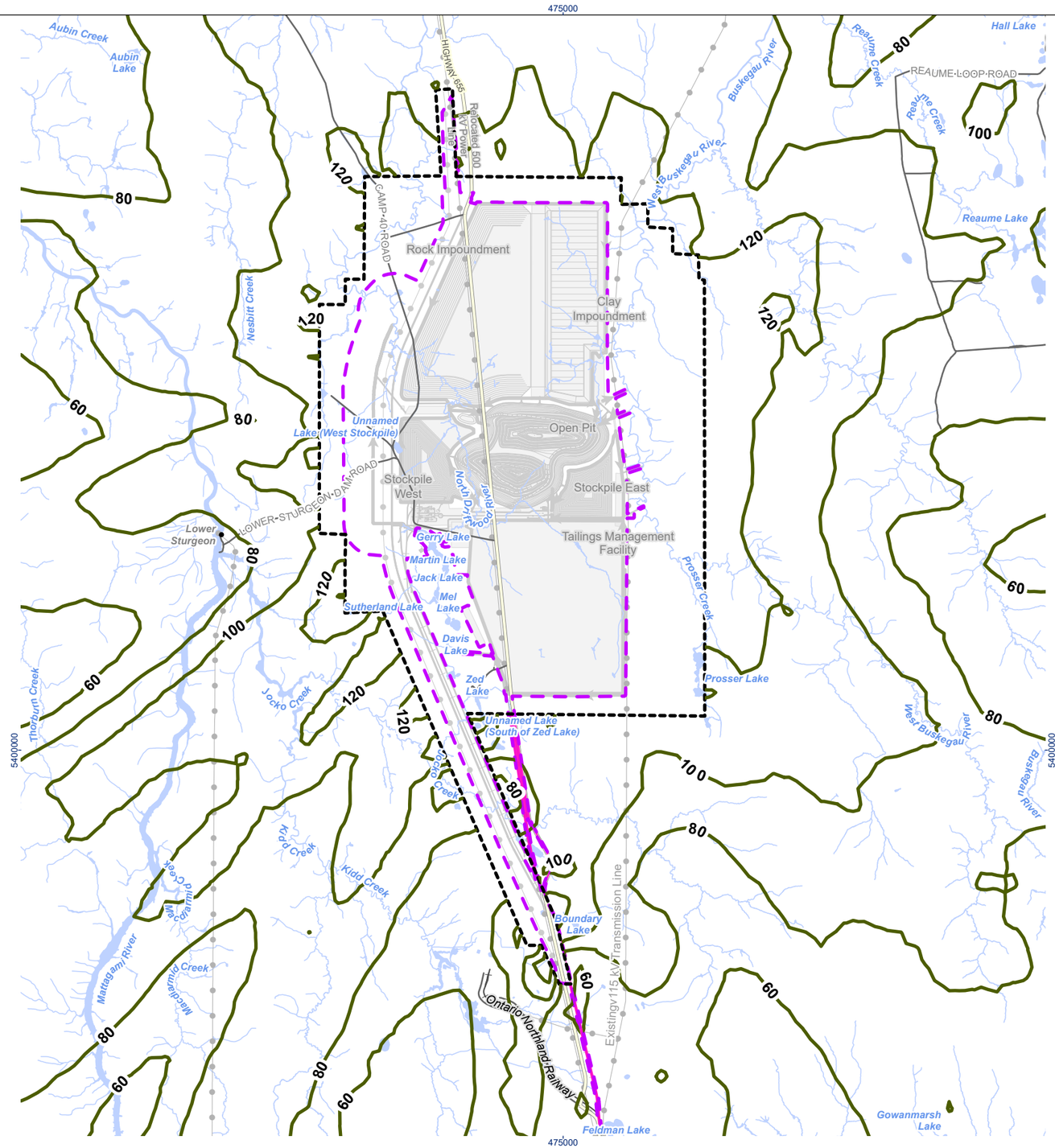

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 1-Hour Average AAQC: 400 µg/m^3
Background Concentration (not included): 5.4 µg/m^3

Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.10

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 1-Hour Average NO_2 (Using ARM2 method) Compared to AAQC

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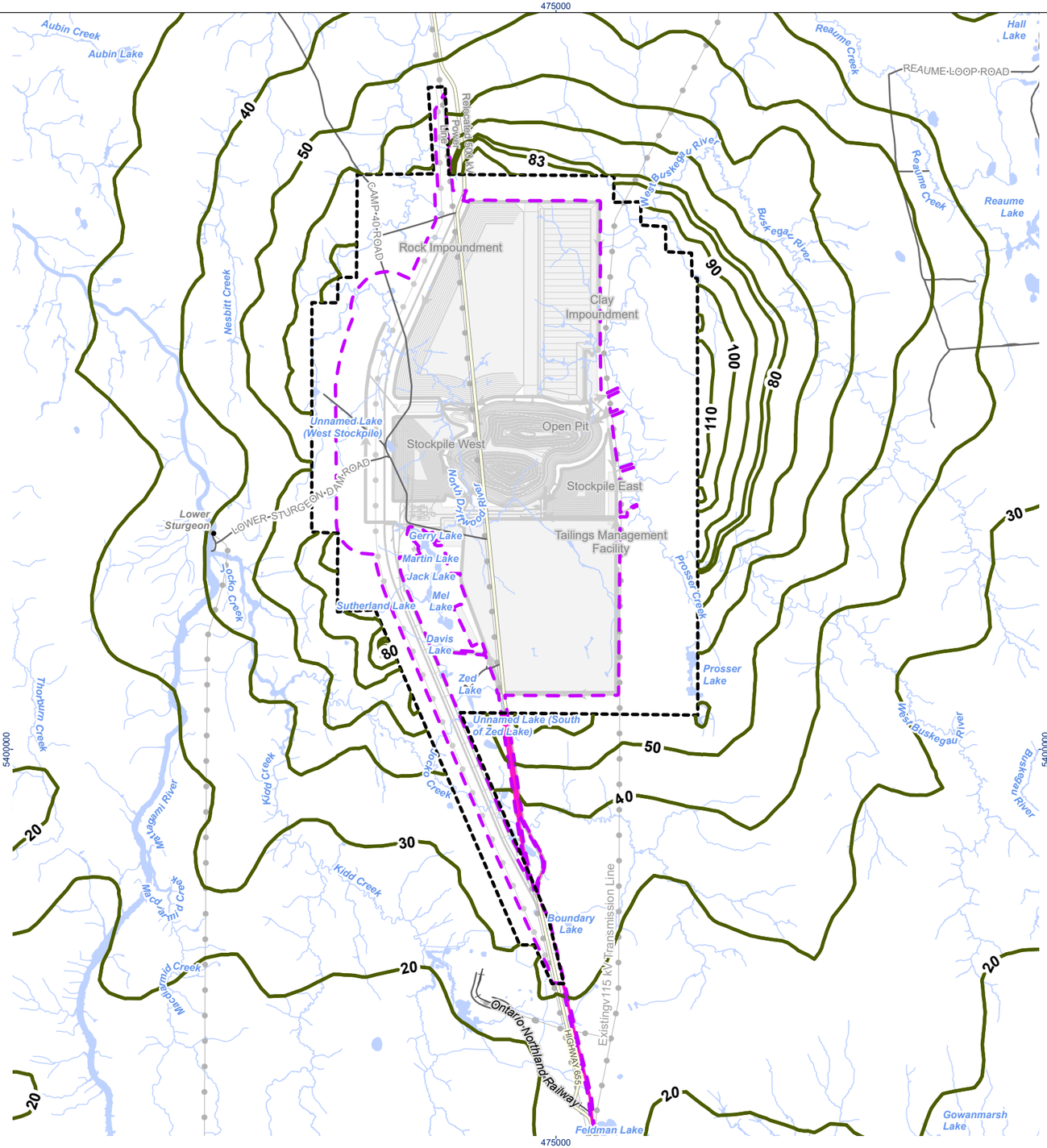

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 1-Hour Average Concentrations for Meteorological Years 2019-2021
NO_2 1-Hour Average 2025 CAAQS: 83 µg/m^3
Background Concentration (not included): 5.4 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.11

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 1-Hour Average NO_2 (Using ARM2 method) Compared to CAAQS

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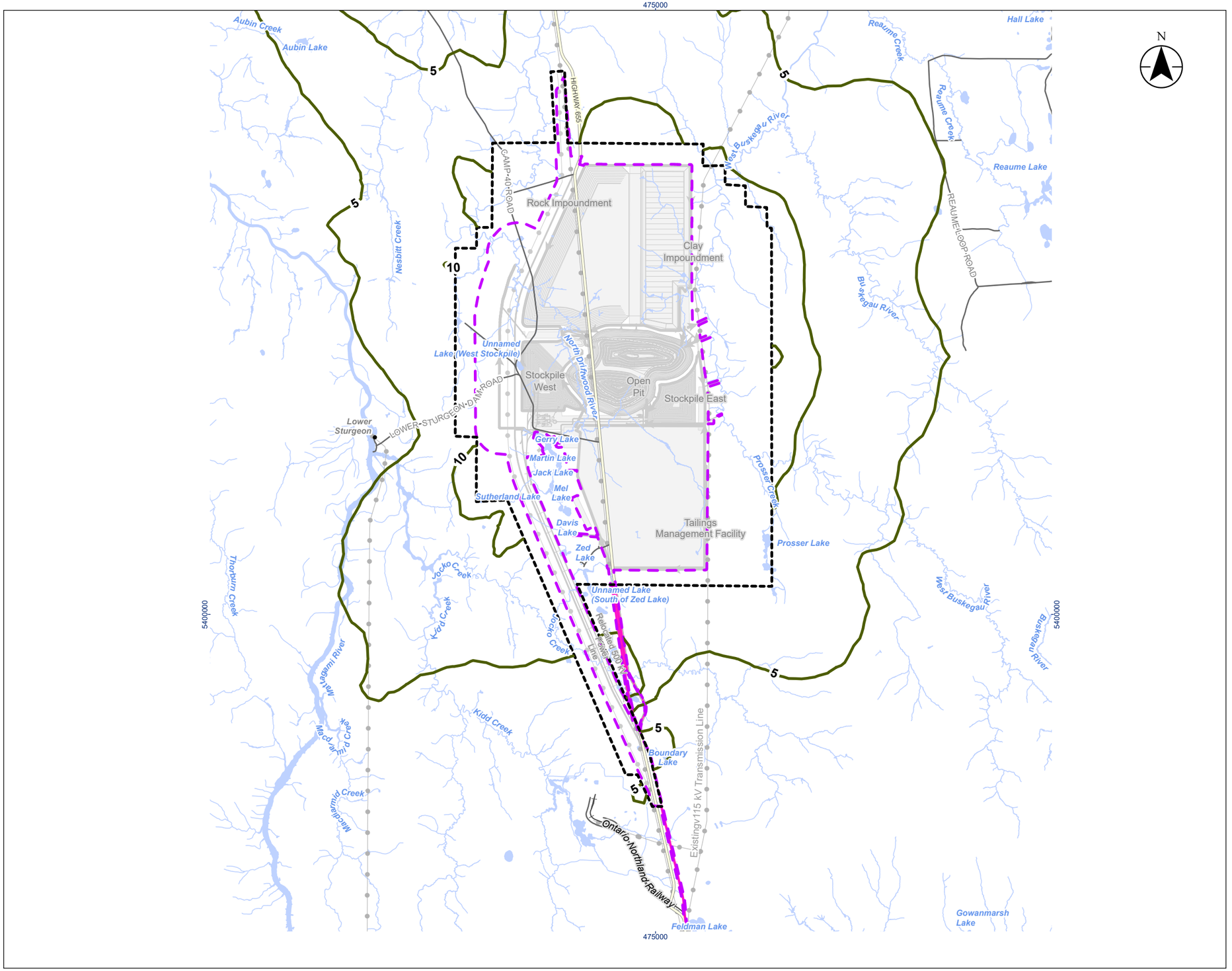

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 24-Hour Average AAQC: 200 µg/m^3
Background Concentration (not included): 2.2 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.12

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-Hour Average NO_2 (Using ARM2 method) Compared to AAQC

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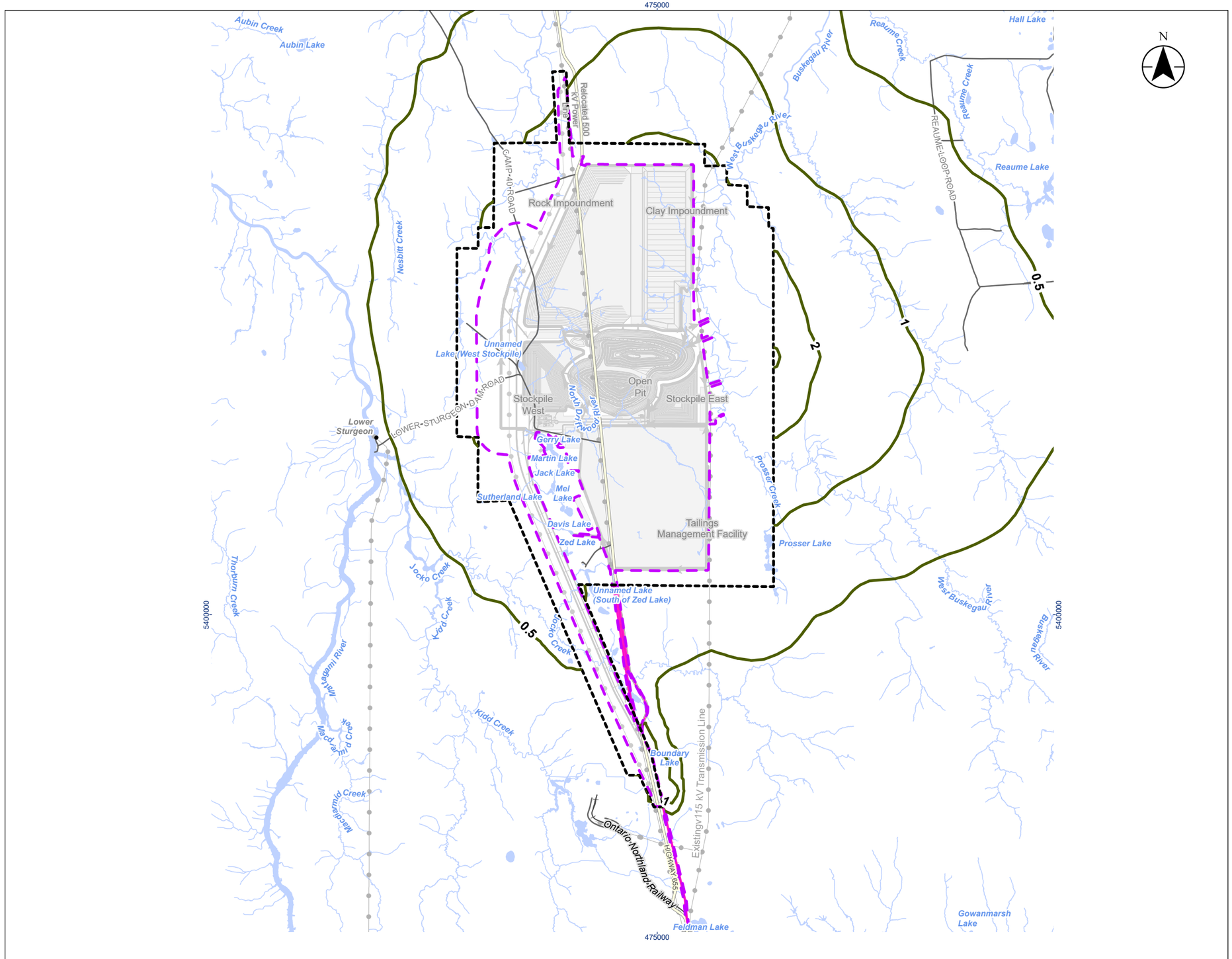

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 Annual Average Concentrations for Meteorological Year 2021
NO_2 Annual Average 2025 CAAQS: 24 µg/m^3
Background Concentration (not included): 0.3 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.13

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average NO_2 (Using ARM2 method) Compared to CAAQS

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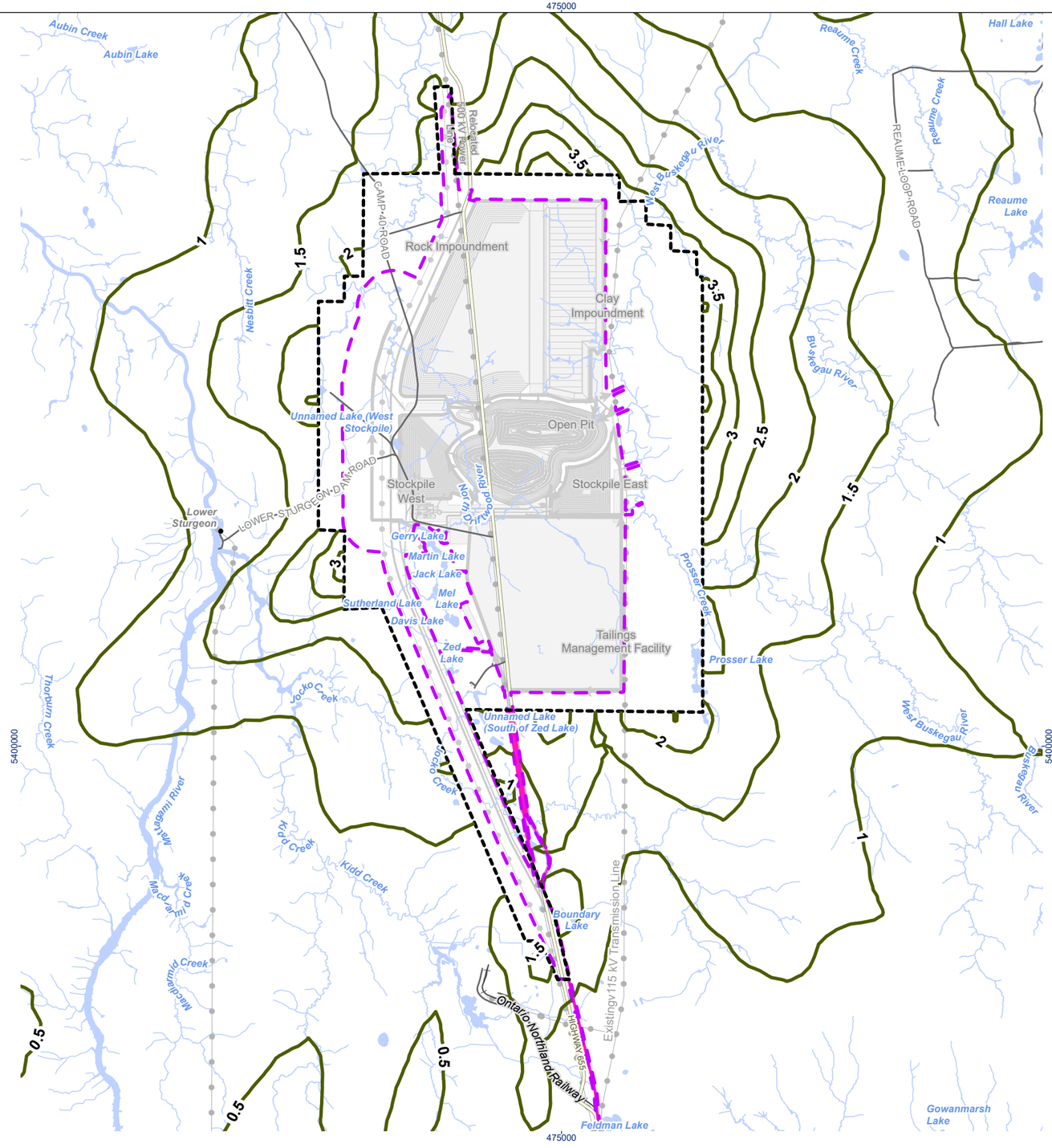

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CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Muscovite 24-Hour Average Screening Level: 1.5 µg/m^3
Background Concentration (not included): No data

0 5 10 km

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Notes
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.14

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-Hour Average Muscovite

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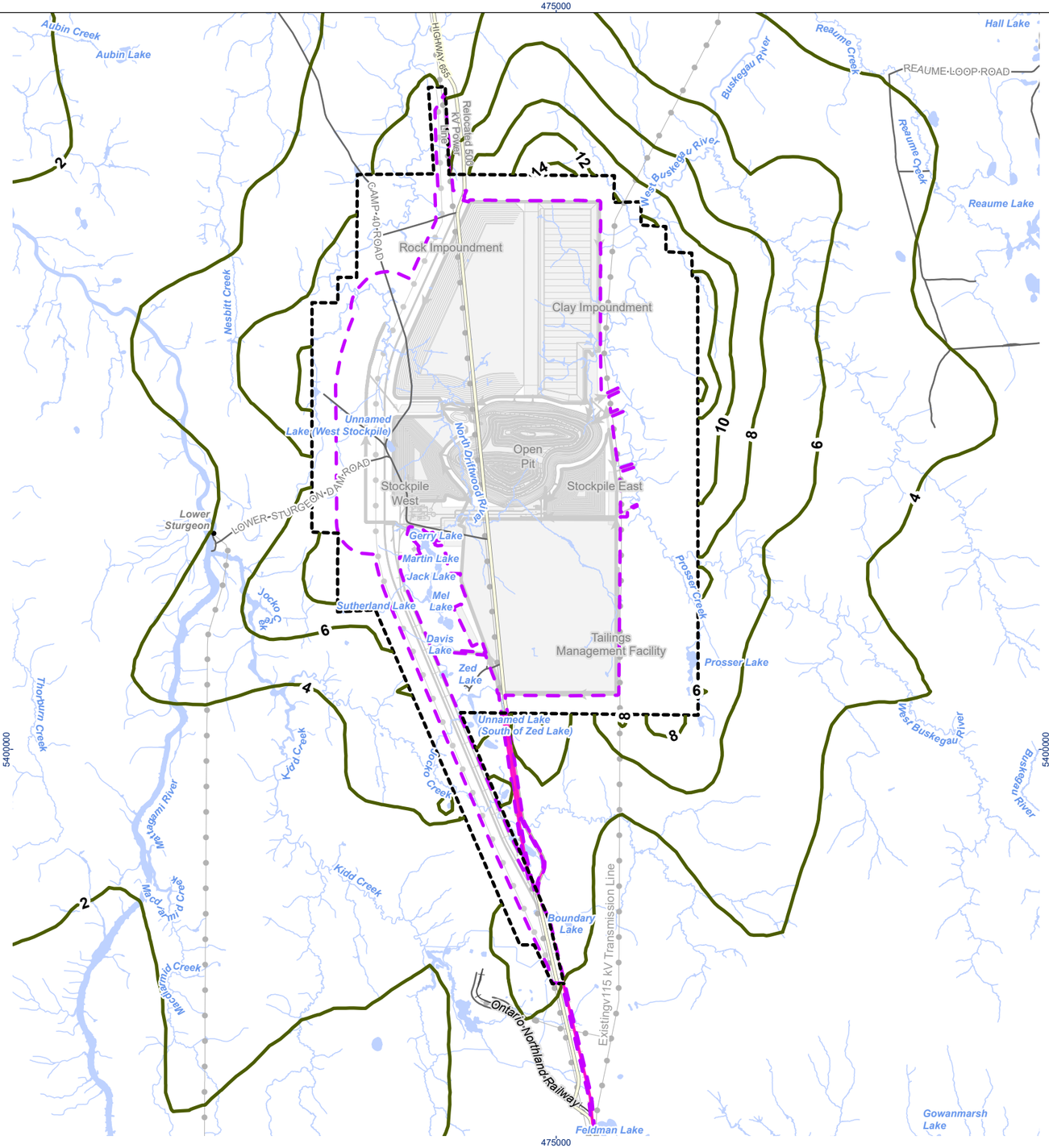

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Aluminum 24-Hour Average Screening Level: 12 µg/m^3
Background Concentration (not included): 0.42 µg/m^3

0 5 10 km

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Notes
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.15

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-Hour Average Aluminum

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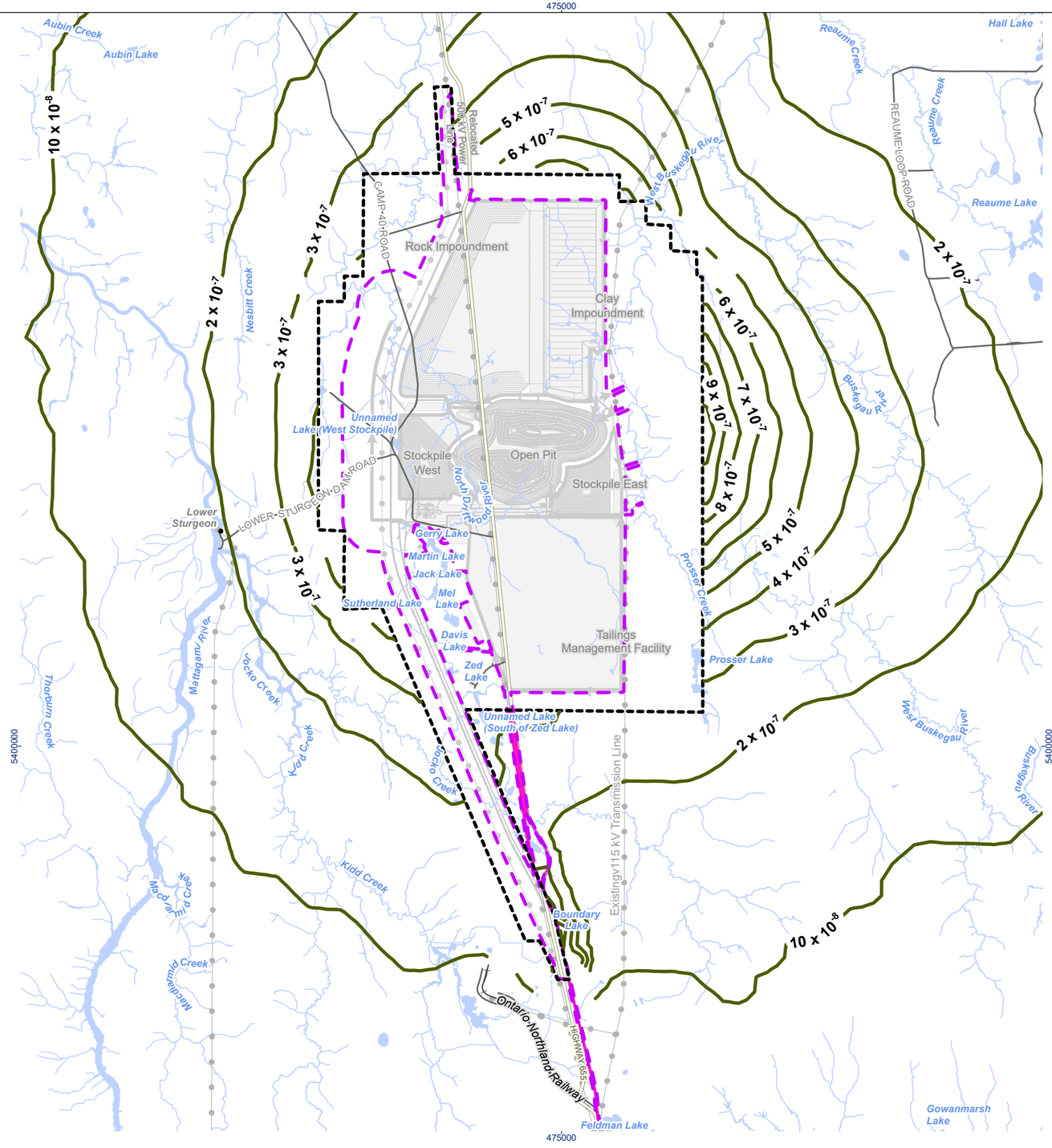

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Benzo(a)pyrene 24-Hour Average AAQC: 5.00E-05 µg/m^3
Background Concentration (not included): 5.29E-05 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.16

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - 24-Hour Average Benzo(a)pyrene

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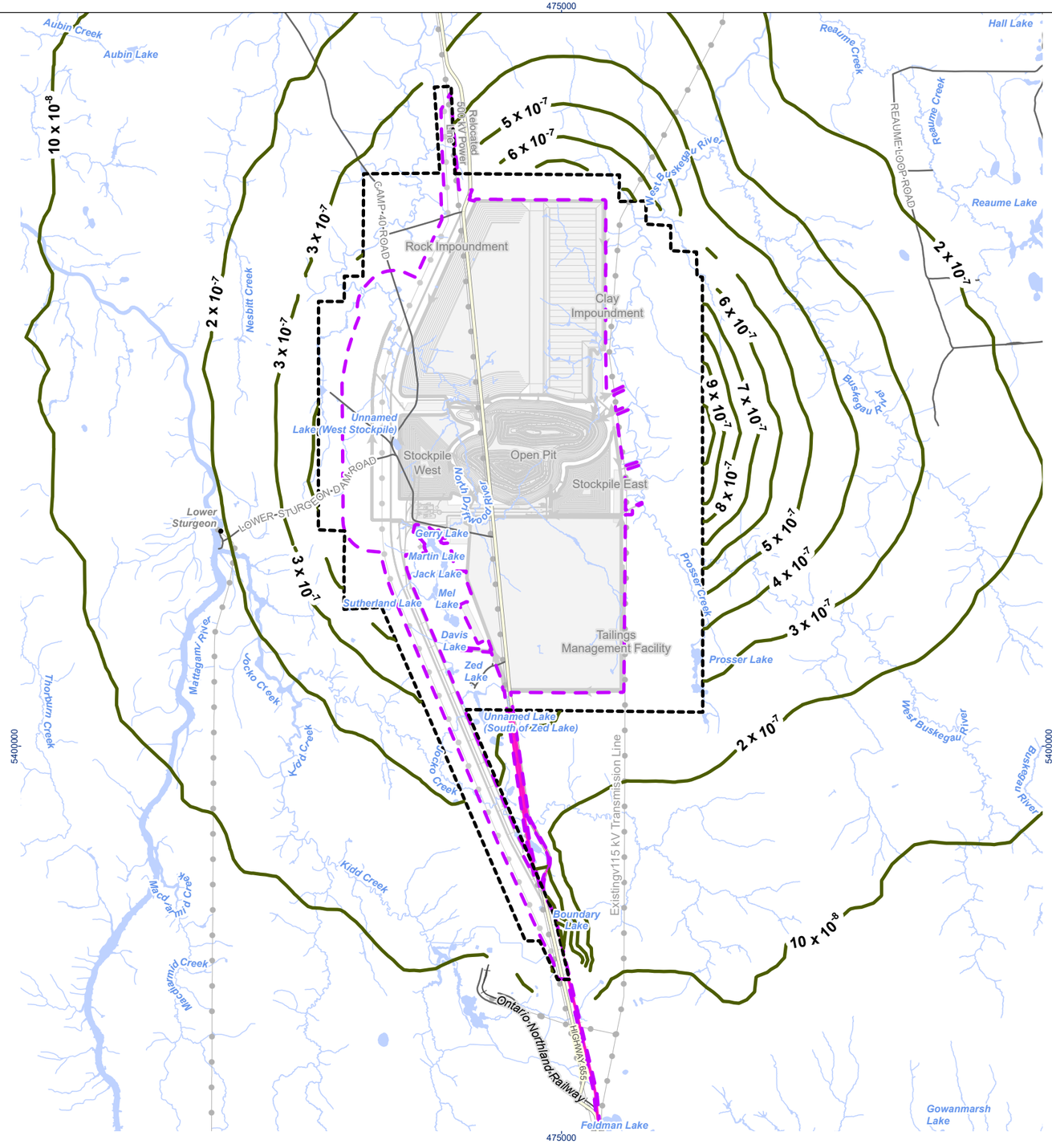

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Benzo(a)pyrene Annual Average AAQC: 1.00E-05 µg/m^3
Background Concentration (not included): 1.01E-05 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.17

Title
Concentration Contour Plot for the Project Alone, Construction Scenario - Annual Average Benzo(a)pyrene

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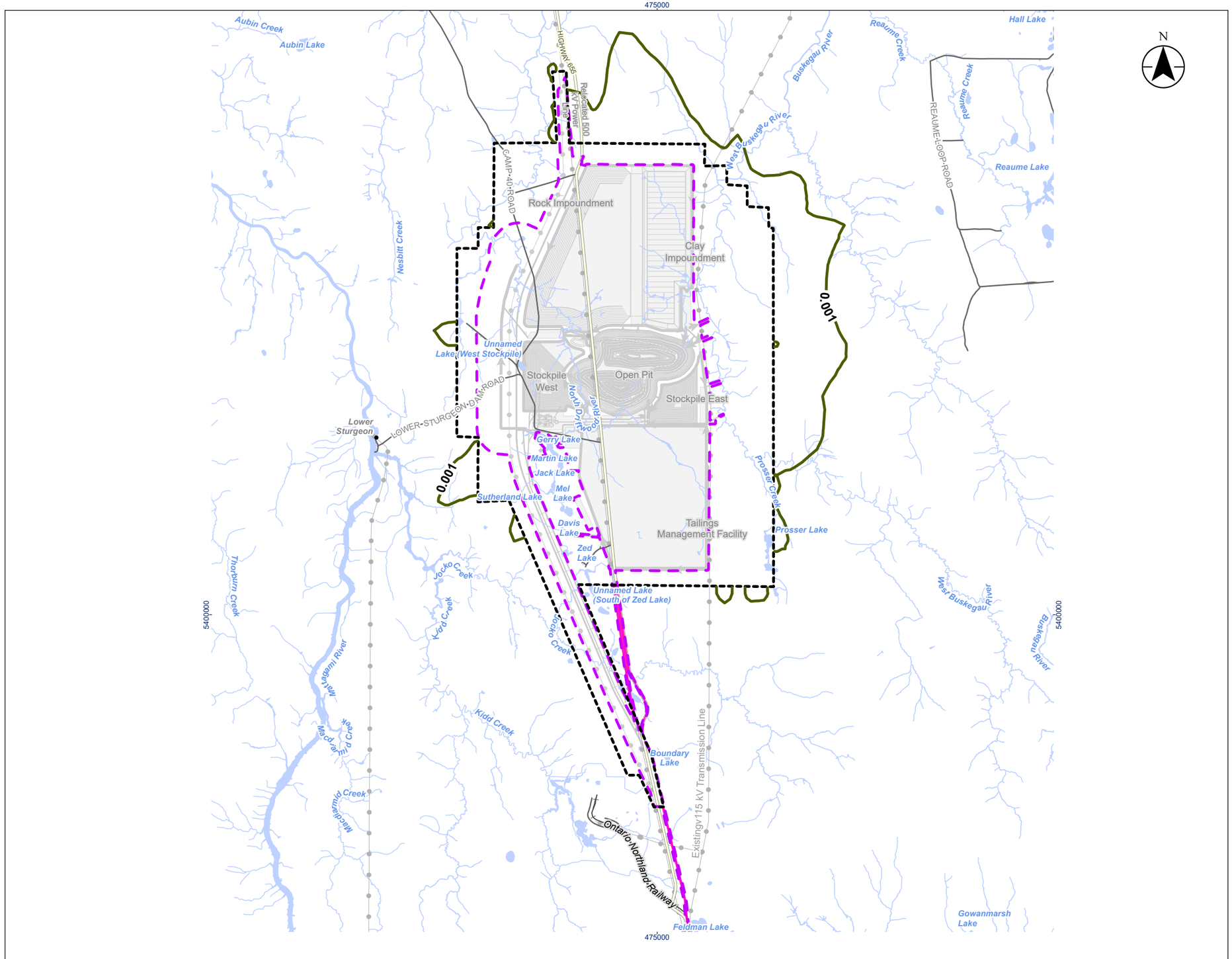

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Asbestos 24-Hour Average AAQC: 0.04 fibres/cm^3
Background Concentration (not included): 2.90E-03 fibres/cm3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.18

Title
Concentration Contour Plot for the Project Alone, Concentration Scenario - 24-Hour Average Chrysotile Asbestos

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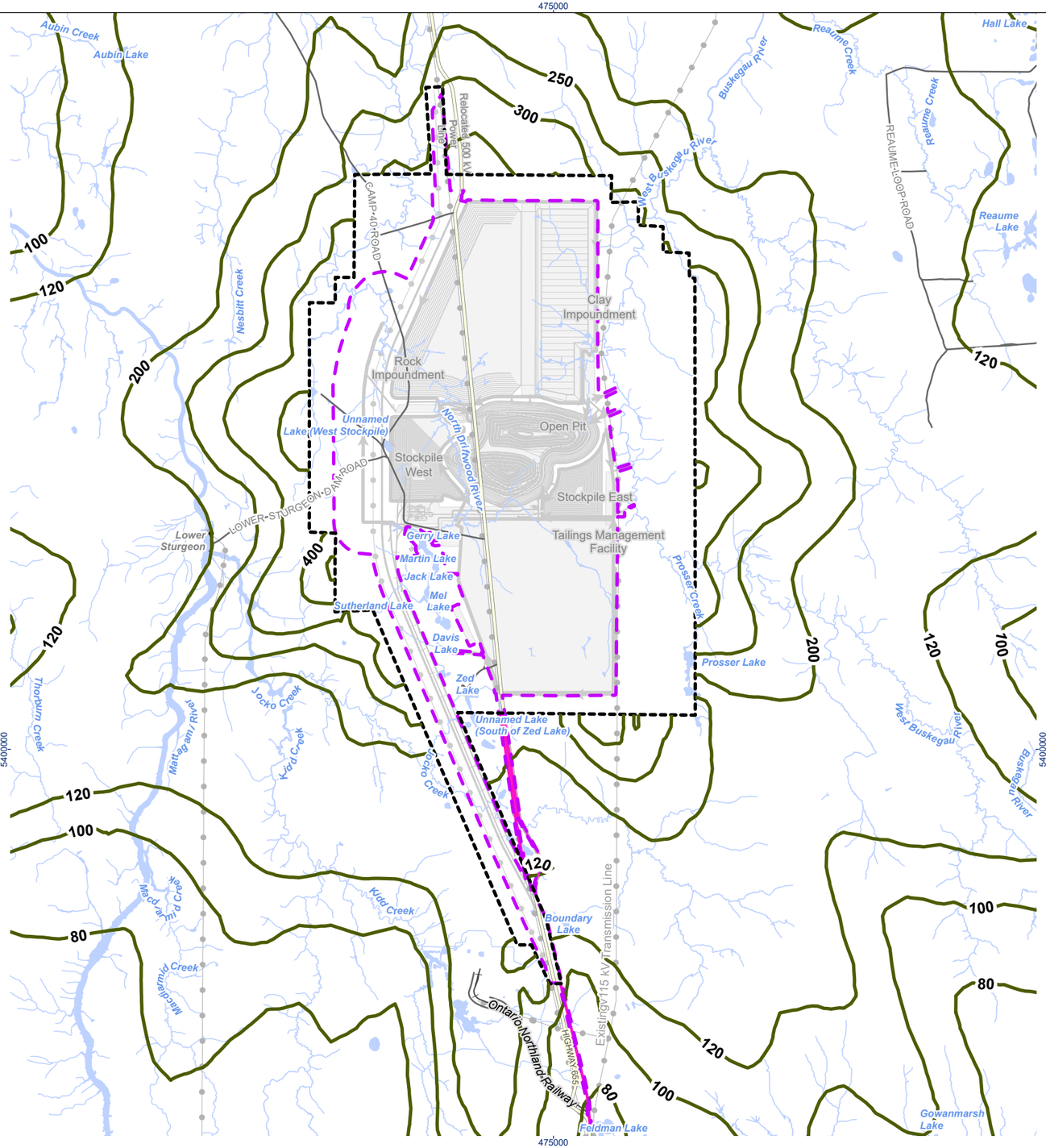

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
SPM 24-Hour Average AAQC: 120 µg/m^3
Background Concentration (not included): 26.5 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.19

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average SPM (85% Control Efficiency on Haul Roads)

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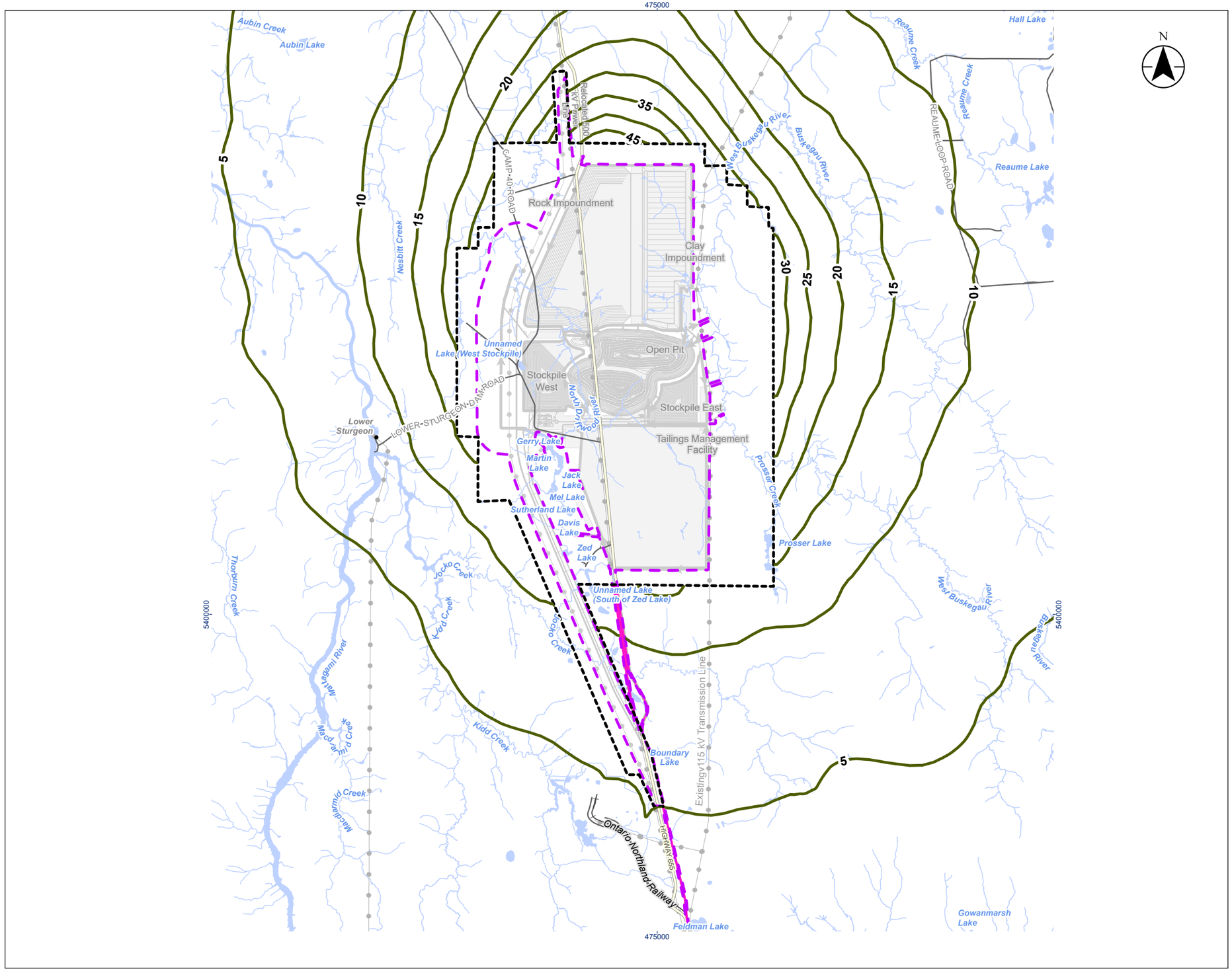

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
SPM Annual Average Concentrations for Meteorological Year 2019
SPM Annual Average AAQC: 60 µg/m^3
Background Concentration (not included): 11.6 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.20

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average SPM (85% Control Efficiency on Haul Roads)

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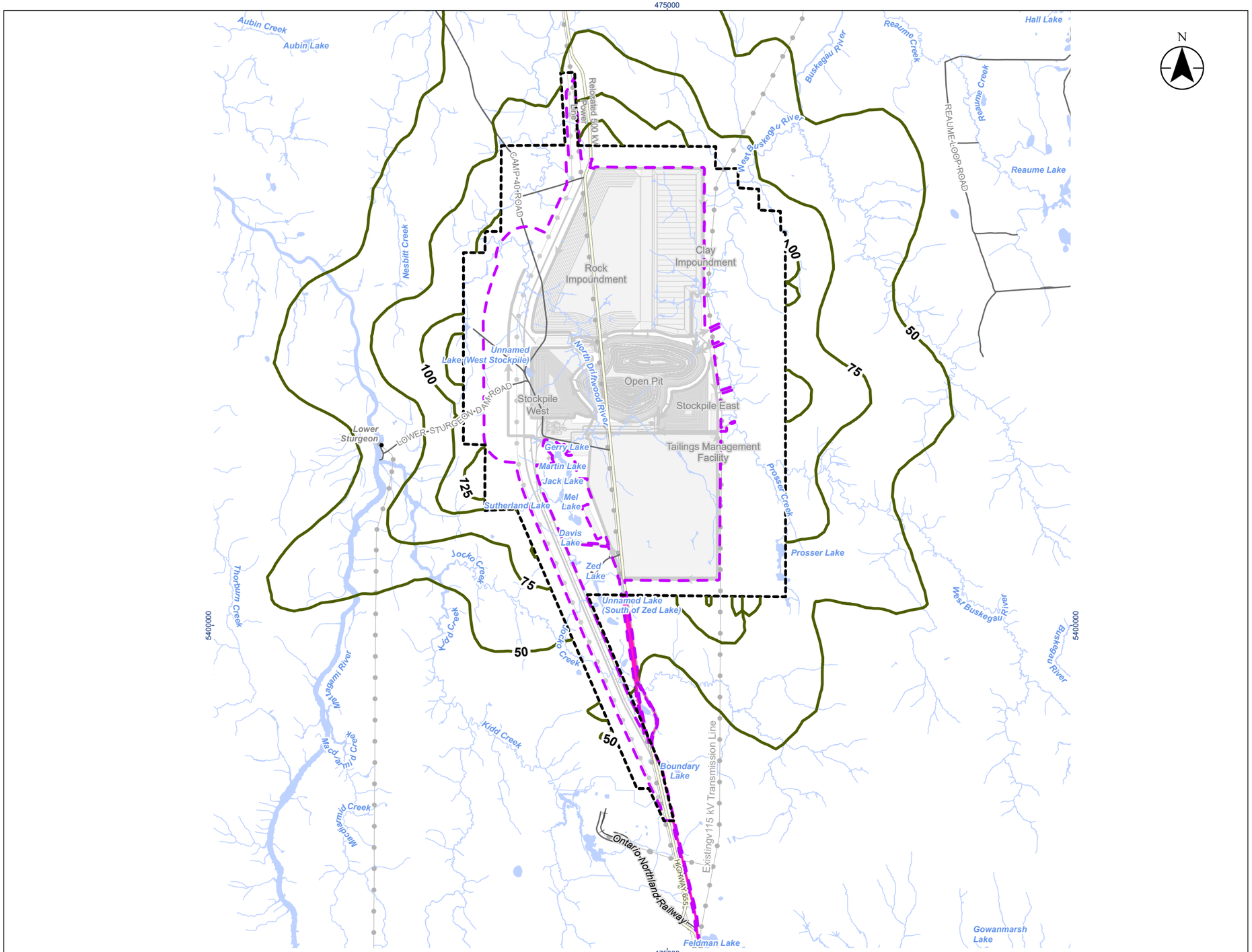

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
PM_{10} 24-Hour Average AAQC: 50 µg/m^3
Background Concentration (not included): 13.1 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
1. Coordinate System:NAD 1983 UTM Zone 17N
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.21

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average PM_{10} (85% Control Efficiency on Haul Roads)

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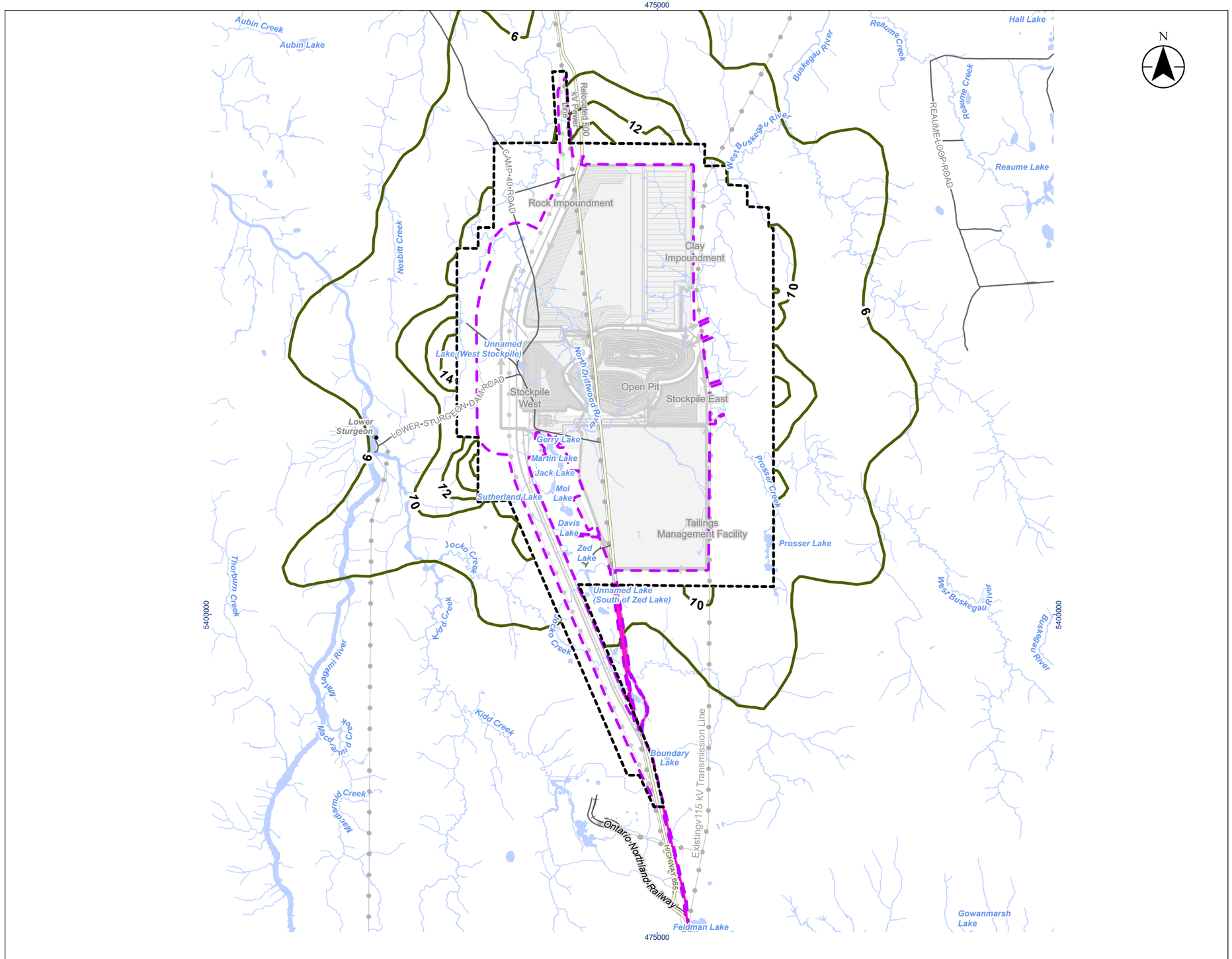

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
$PM_{2.5}$ 24-Hour Average AAQC/CAAQS: 27 µg/m³
Background Concentration (not included): 12.4 µg/m³

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.22

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-hour Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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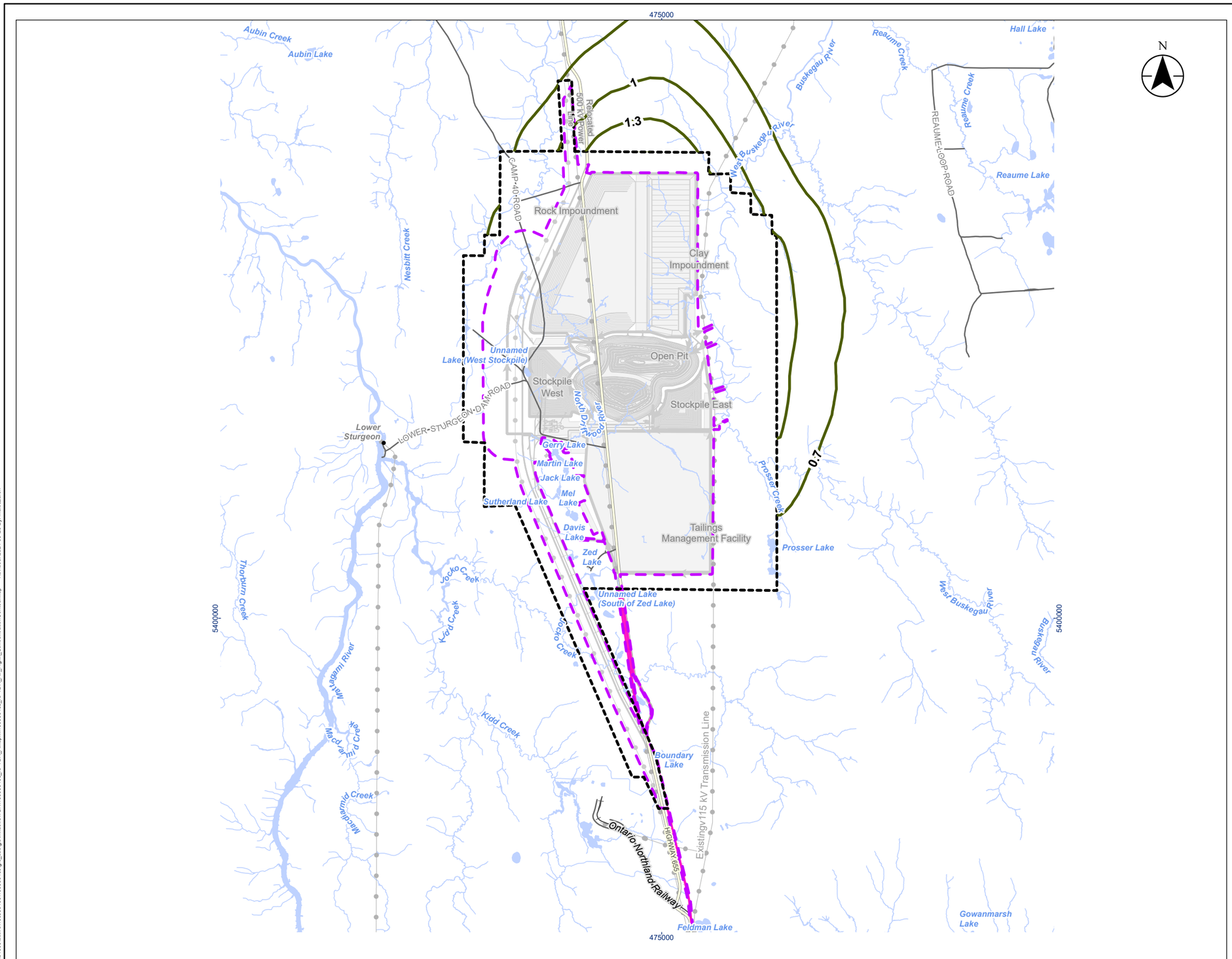

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Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
$PM_{2.5}$ Annual Average Concentrations for Meteorological Year 2022
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.23

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average $PM_{2.5}$ (85% Control Efficiency on Haul Roads)

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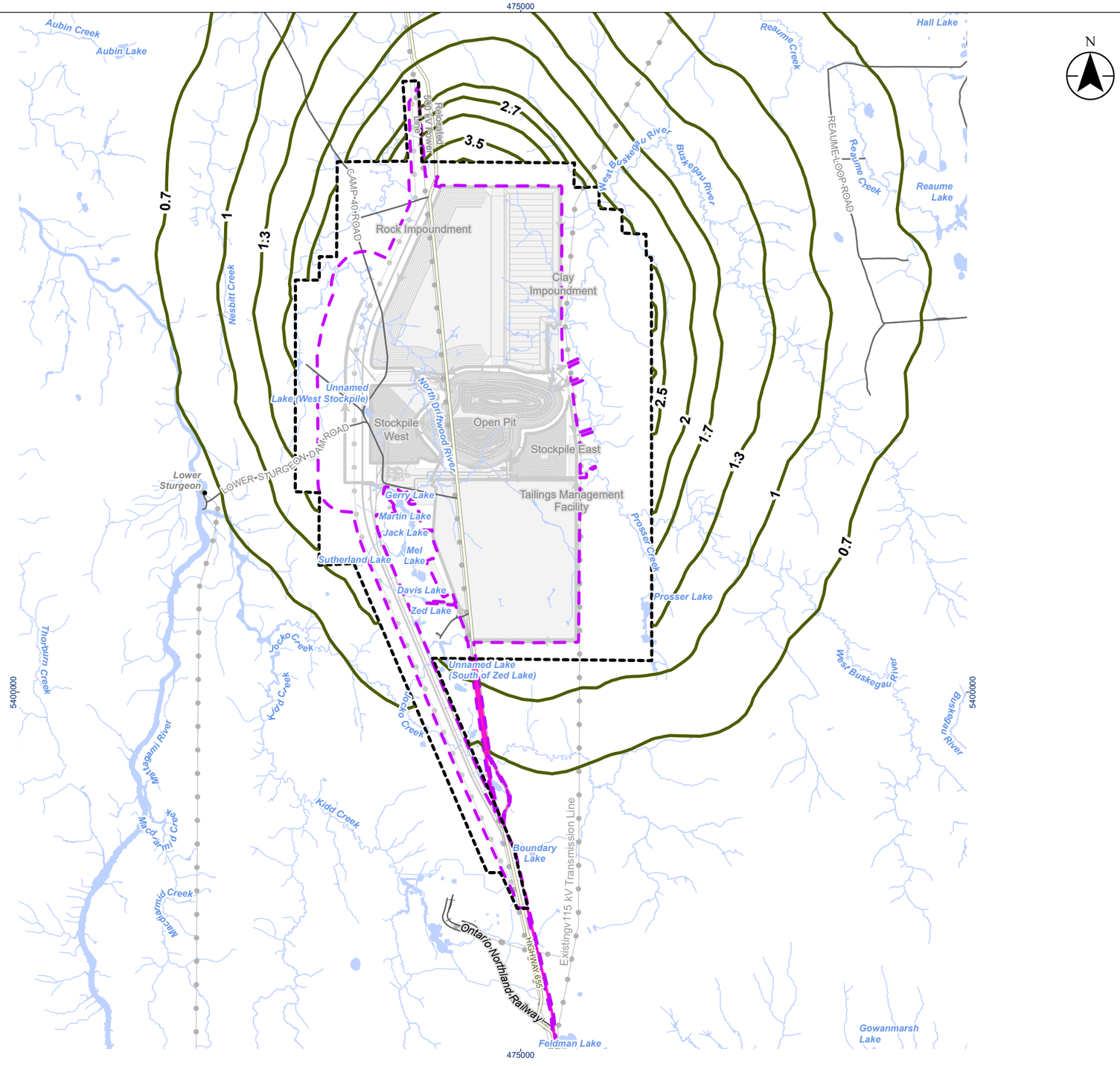

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
$PM_{2.5}$ Annaual Average Concentrations fro Meteorological Year 2019
$PM_{2.5}$ Annual Average AAQC/CAAQS: 8.8 µg/m^3
Background Concentration (not included): 6.2 µg/m^3

0 5 10 km

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Notes
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.27

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average $PM_{2.5}$ (50% Control Efficiency on Haul Roads)

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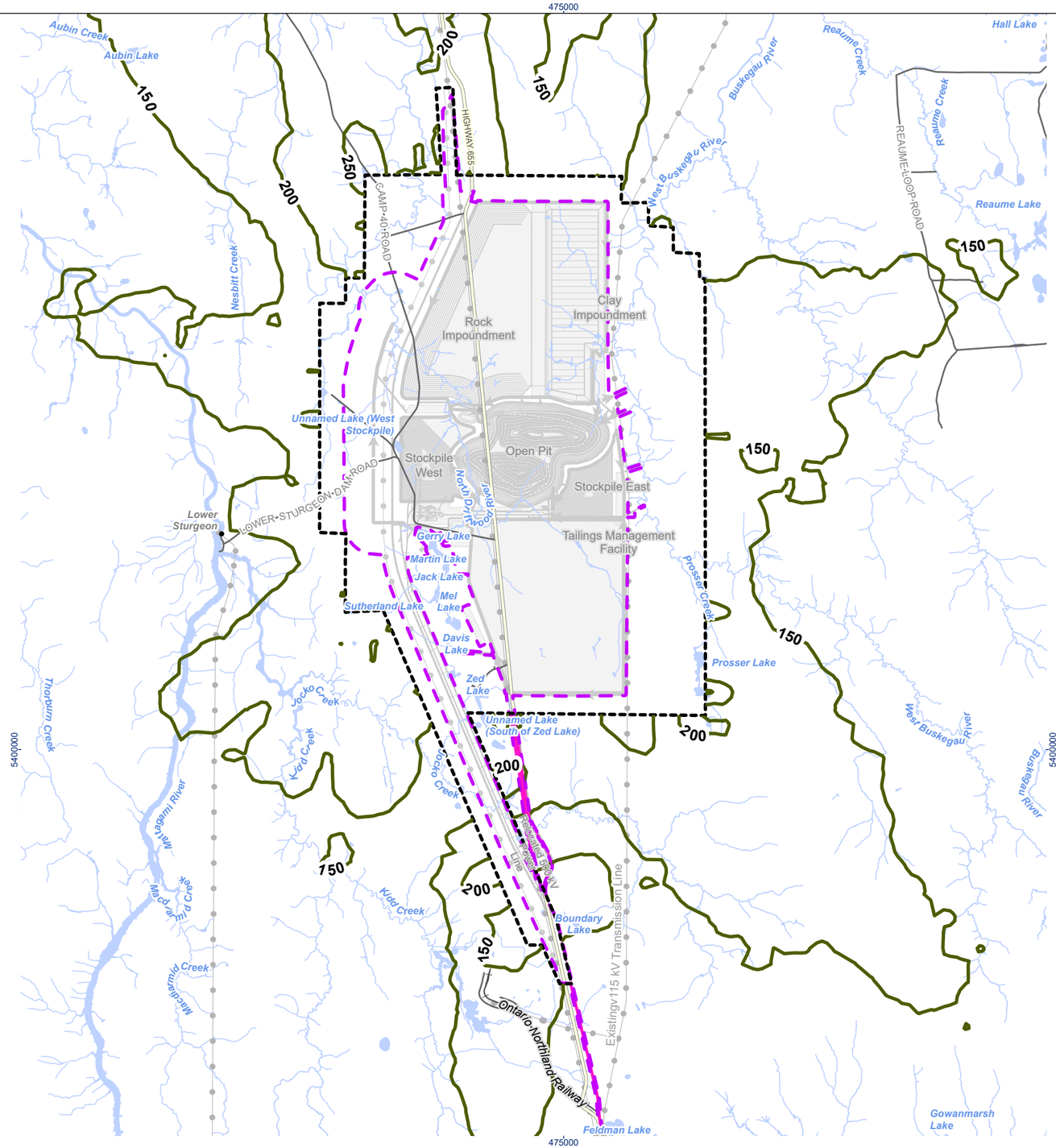

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 1-Hour Average AAQC: 400 µg/m^3
Background Concentration (not included): 5.4 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.28

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 1-Hour Average NO_2 (Using ARM2 method) Compared to AAQC

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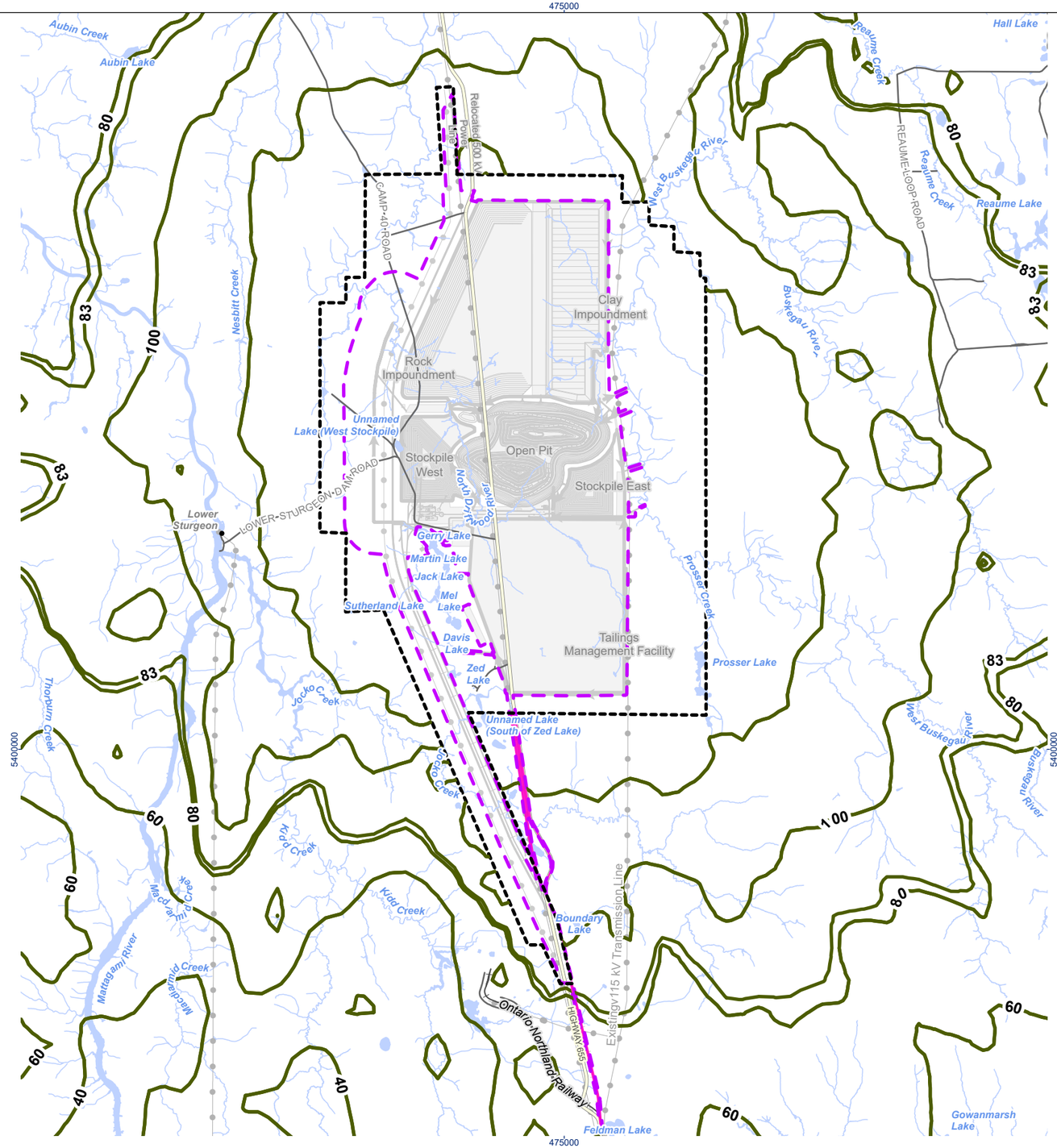

N

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
3-year average of the annual 98th percentile of the daily maximum 1-hour average NO2 concentrations for Meteorological Years 2018-2020
NO_2 1-Hour Average 2025 CAAQS: 83 µg/m^3
Background Concentration (not included): 5.4 µg/m^3

0 5 10 km

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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.29

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 1-Hour Average NO_2 (Using ARM2 method) Compared to CAAQS

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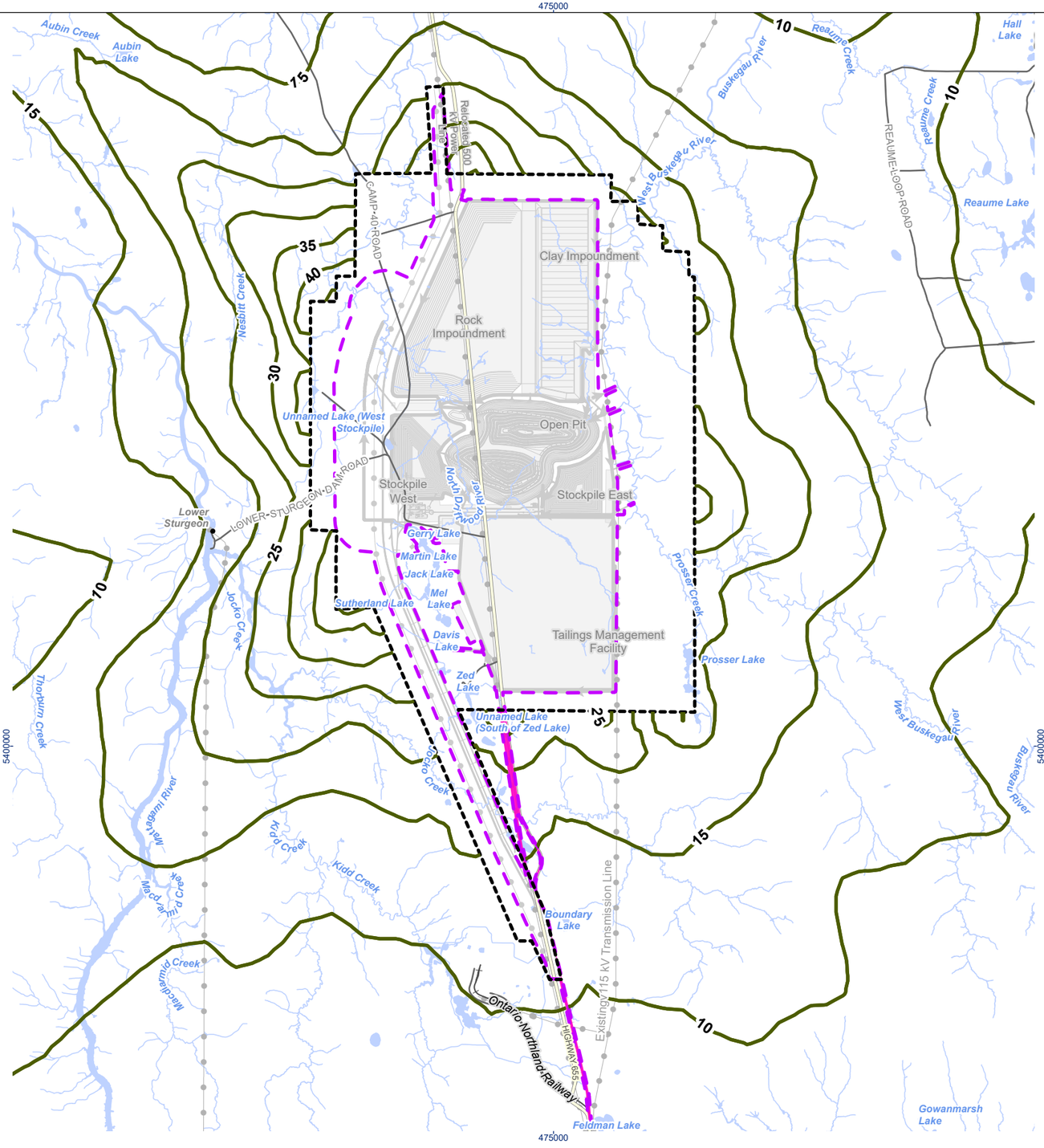

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 24-Hour Average AAQC: 200 µg/m^3
Background Concentration (not included): 2.2 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.30

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average NO_2 (Using ARM2 method) Compared to AAQC

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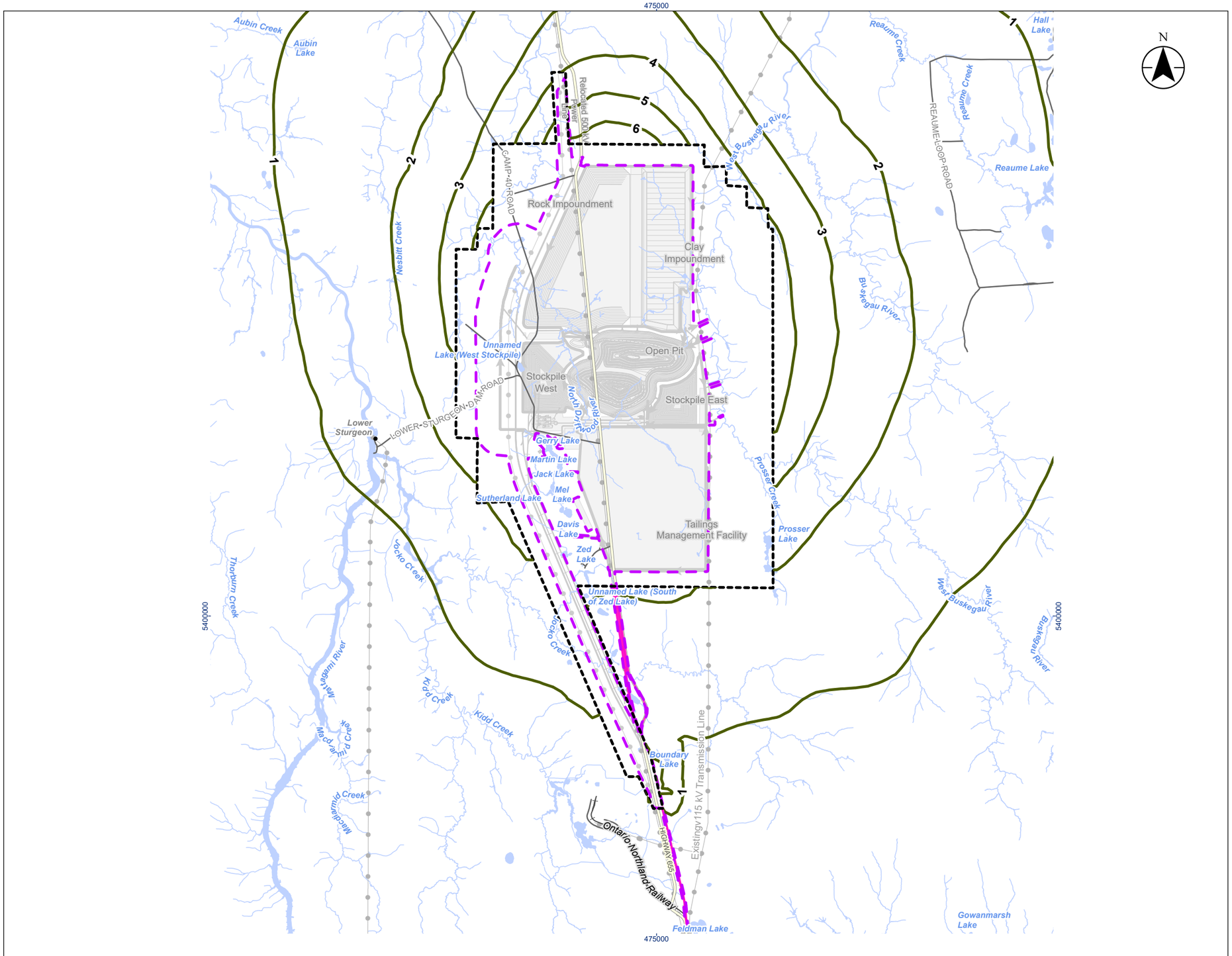

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
NO_2 Annual Average Concentrations for Meteorological Year: 2019
NO_2 Annual Average 2025 CAAQS: 24 µg/m^3
Background Concentration (not included): 0.3 µg/m^3

0 5 10 km

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.31

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average NO_2 (Using ARM2 method) Compared to CAAQS

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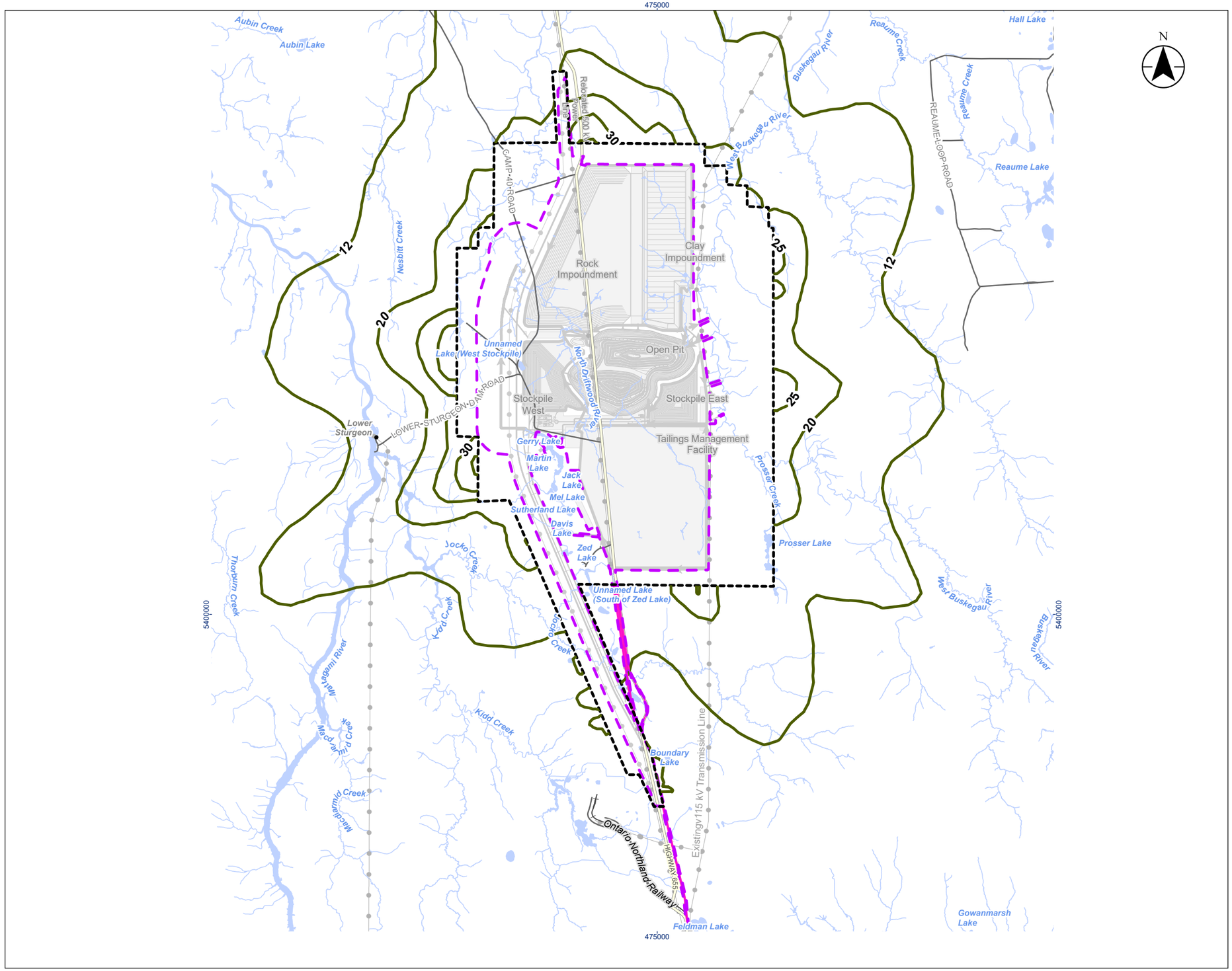

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Aluminum 24-Hour Average Screening Level: 12 µg/m^3
Background Concentration (not included): 0.42 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.32

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Aluminum

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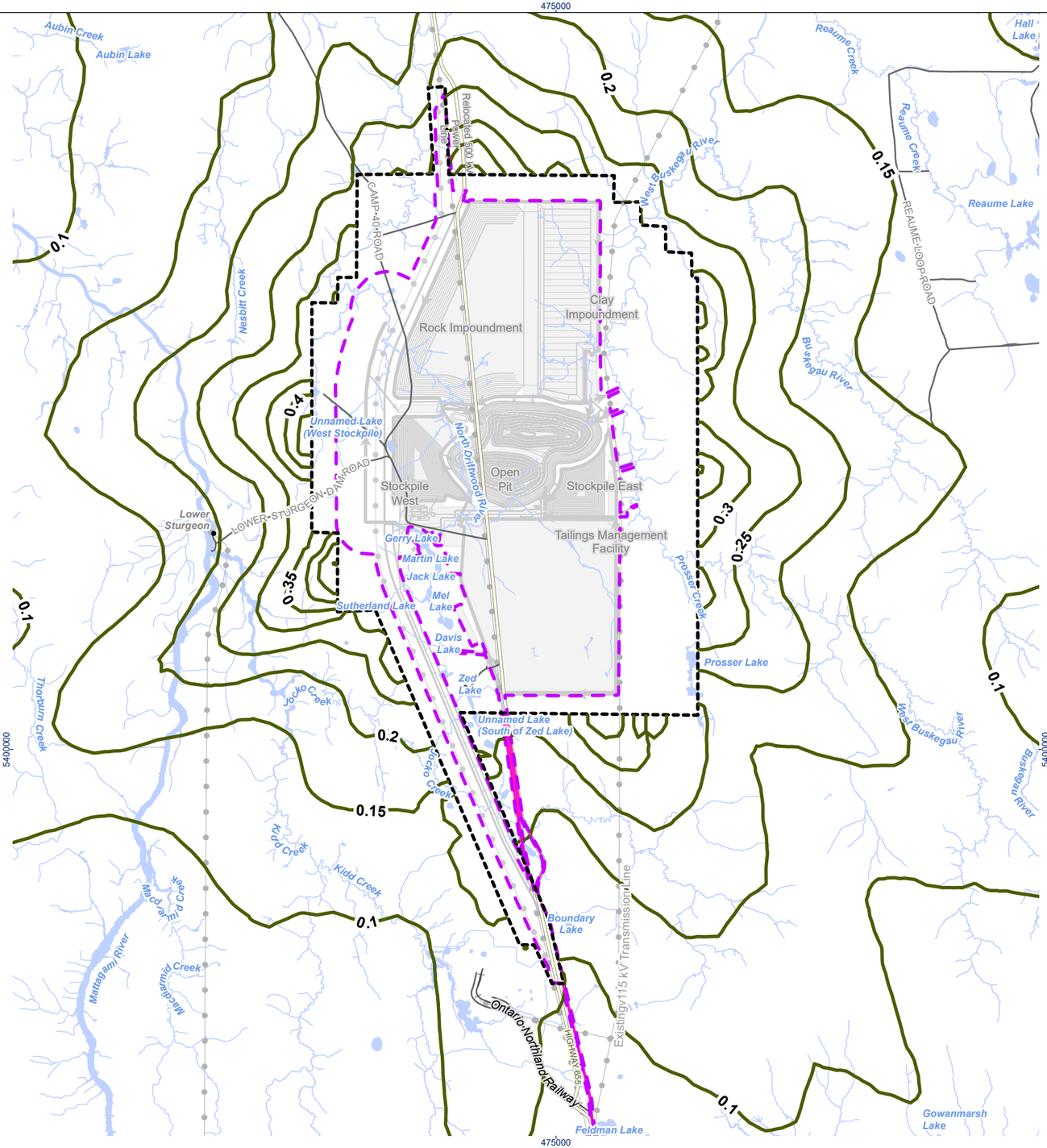

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Manganese 24-Hour Average AAQC: 0.4 µg/m^3
Background Concentration (not included): 0.0086 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.33

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Manganese

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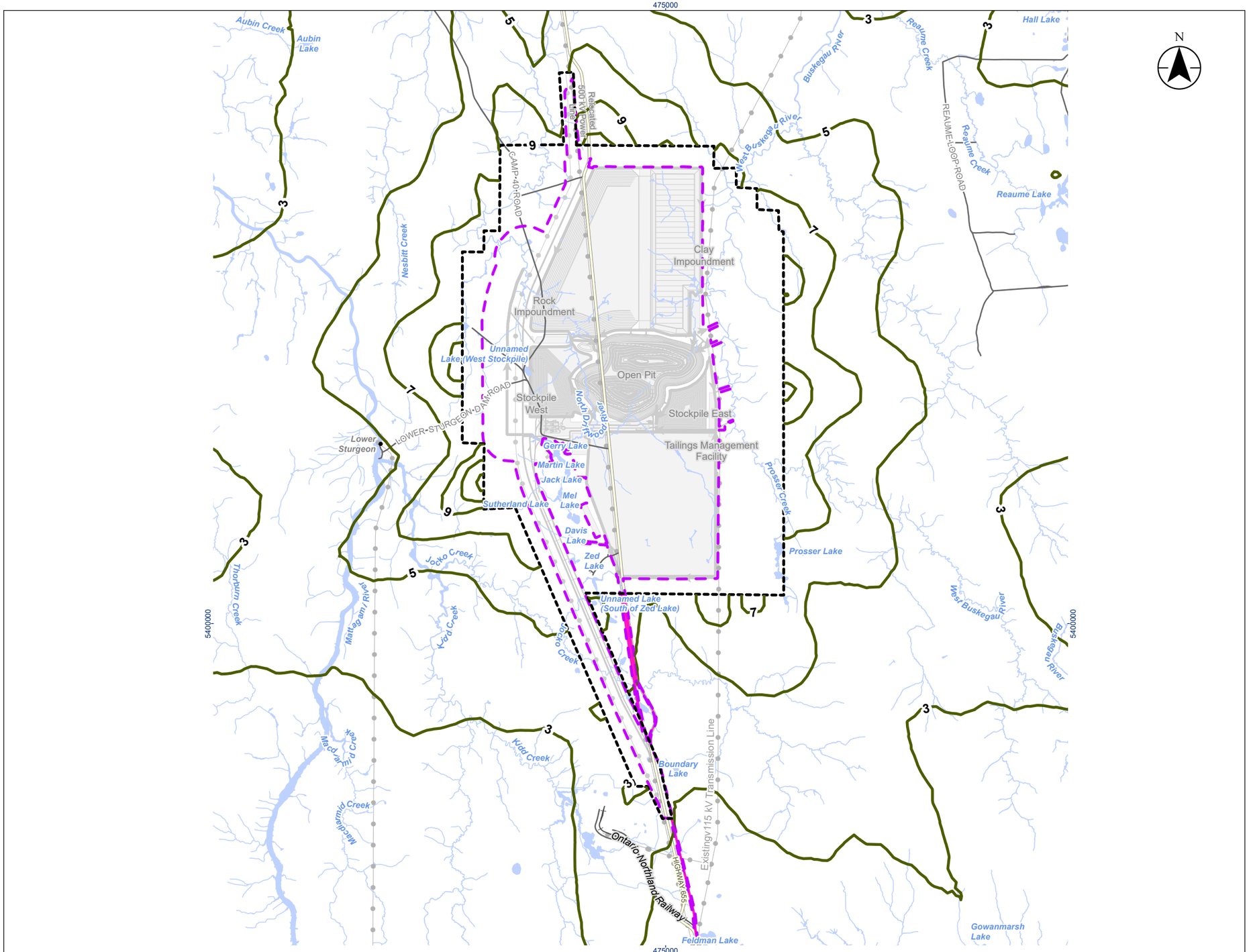

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Muscovite 24-Hour Average Screening Level: 1.5 µg/m^3
Background Concentration (not included): No data

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.34

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Muscovite

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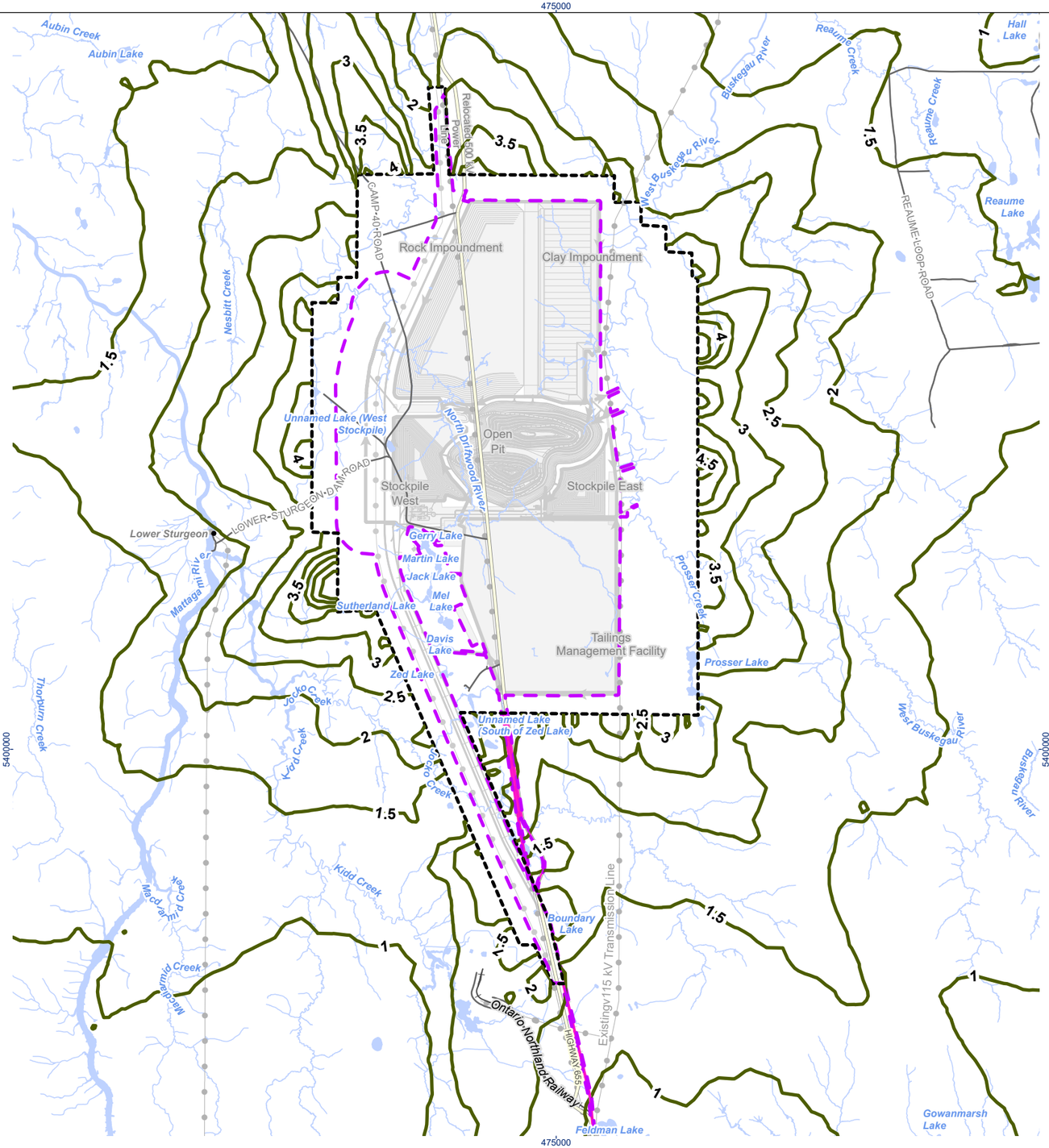

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CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Respirable Crystalline Silica (RCS) 24-Hour Average AAQC: 5 µg/m^3
Background Concentration (not included): 0.99 µg/m^3

0 5 10 km

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Notes
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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.35

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Respirable Crystalline Silica (RCS)

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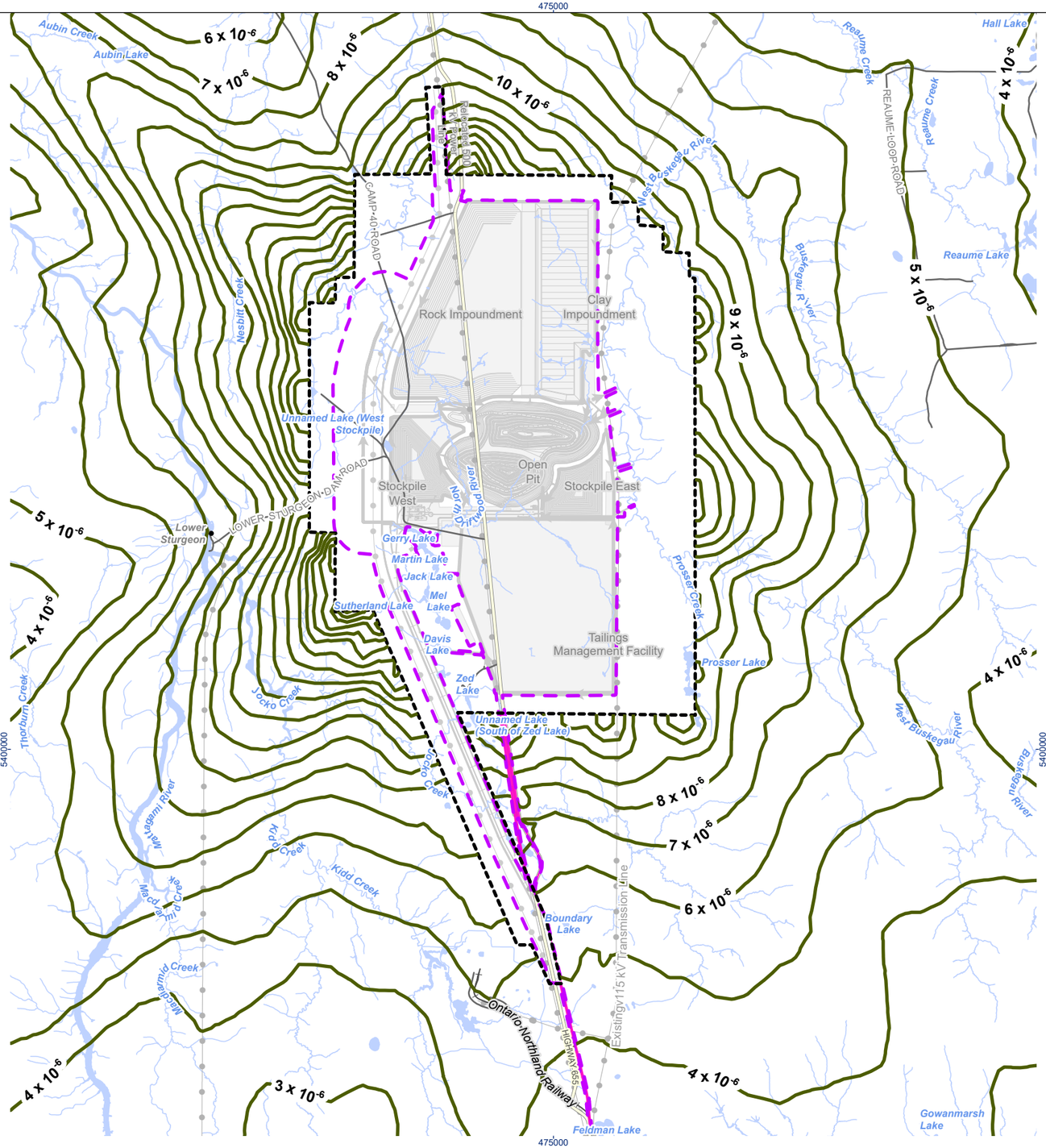

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Benzo(a)pyrene 24-Hour Average AAQC: 5.00E-05 µg/m^3
Background Concentration (not included): 5.29E-05 µg/m^3

0 5 10 km

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Project Location
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160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.36

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Benzo(a)pyrene

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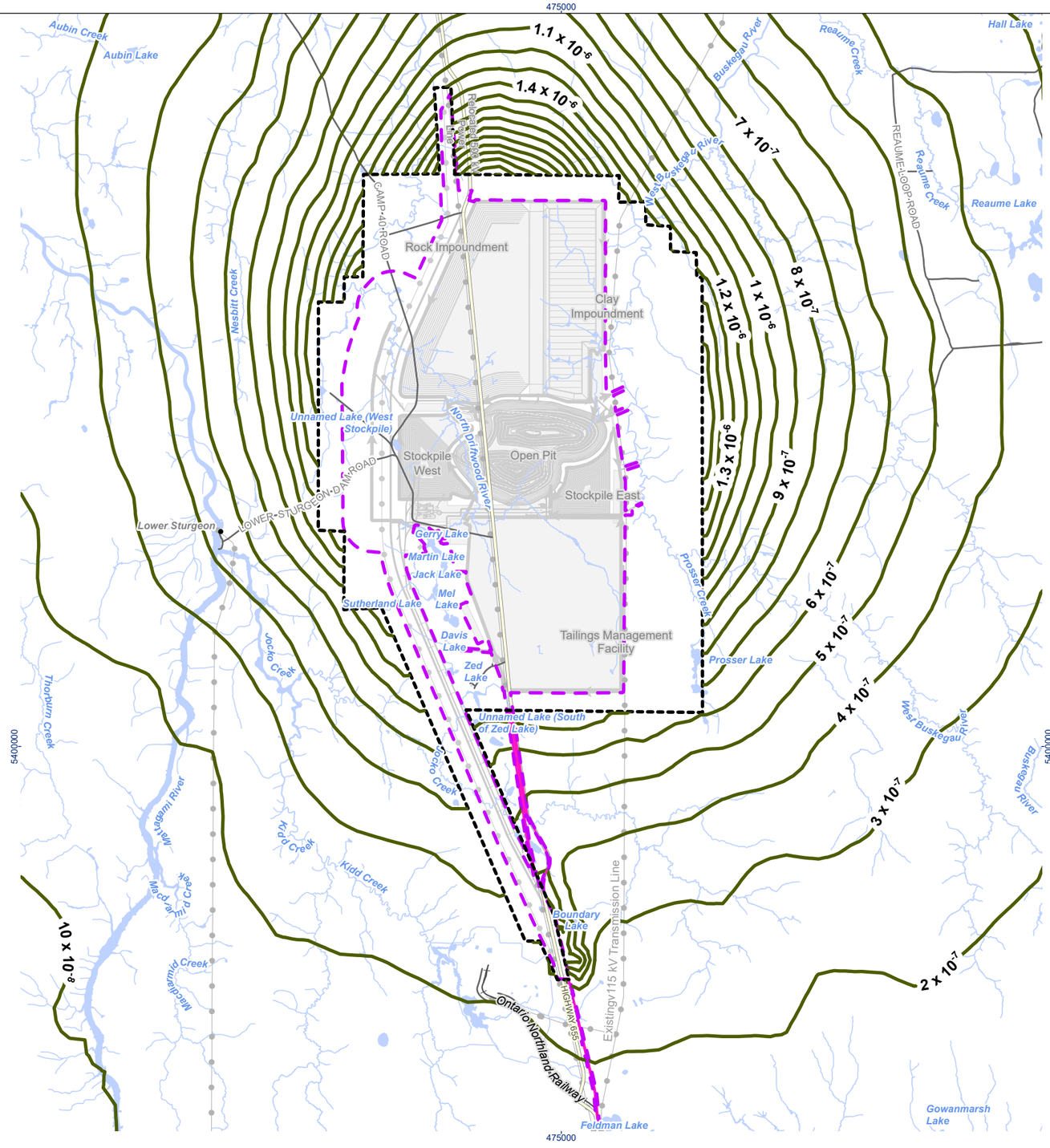

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CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Benzo(a)pyrene Annual Average AAQC: 1.00E-05 µg/m^3
Background Concentration (not included): 1.01E-05 µg/m^3

0 5 10 km

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Notes
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Project Location
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.37

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - Annual Average Benzo(a)pyrene

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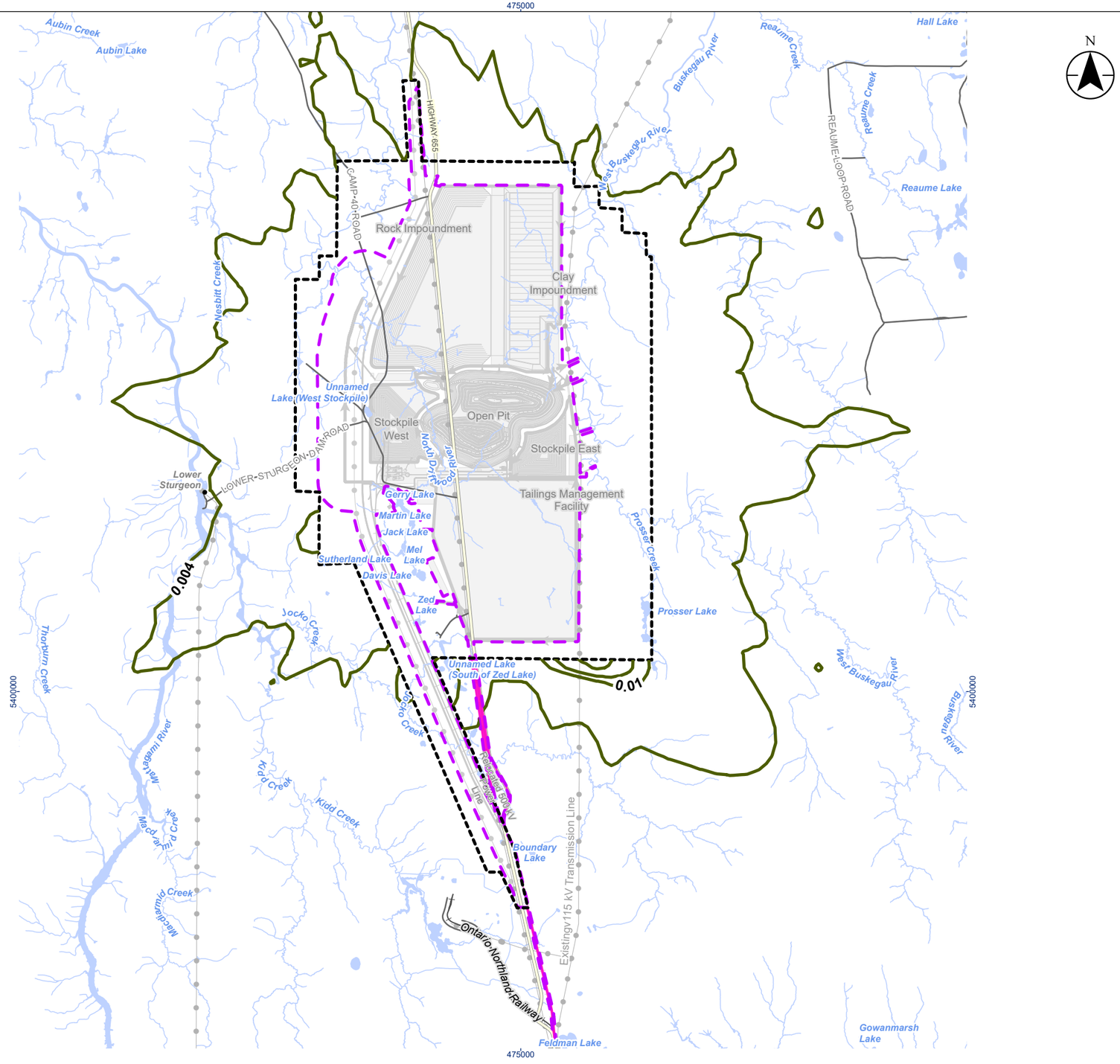

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes:
Asbestos 24-Hour Average AAQC: 0.04 fibres/cm^3
Background Concentration (not included): 2.90E-03 fibres/cm^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.38

Title
Concentration Contour Plot for the Project Alone, Operation Scenario - 24-Hour Average Asbestos

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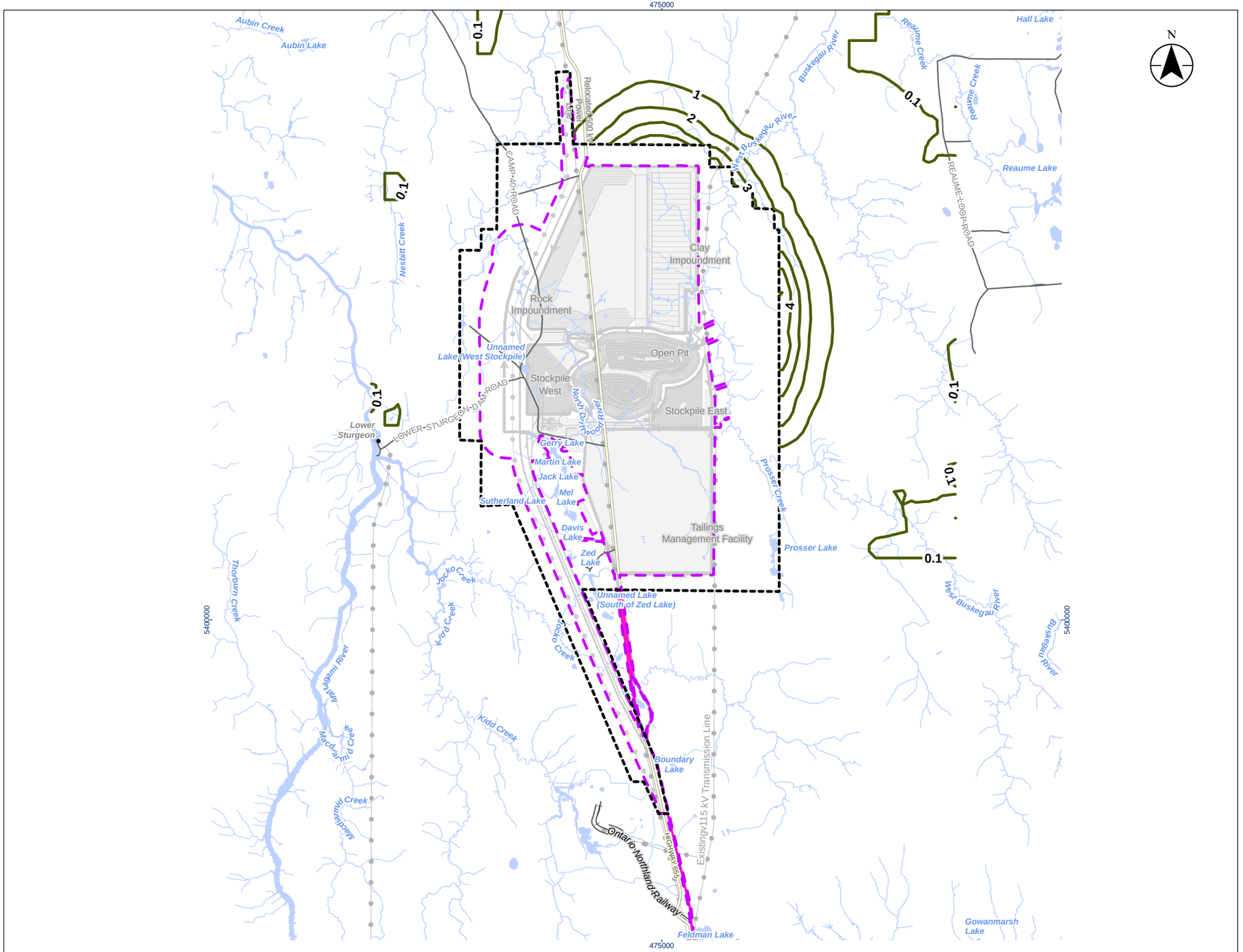

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CANADA NICKEL COMPANY

Legend

- Modelled Mine Boundary
- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Frequency of Exceedance (%)
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the Muscovite 24-Hour Screening Level of 1.5 µg/m^3 over a 5 year period.

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.39

Title
Frequency of Exceedance Plot for the Project Alone, Construction Scenario - 24-Hour Average Muscovite

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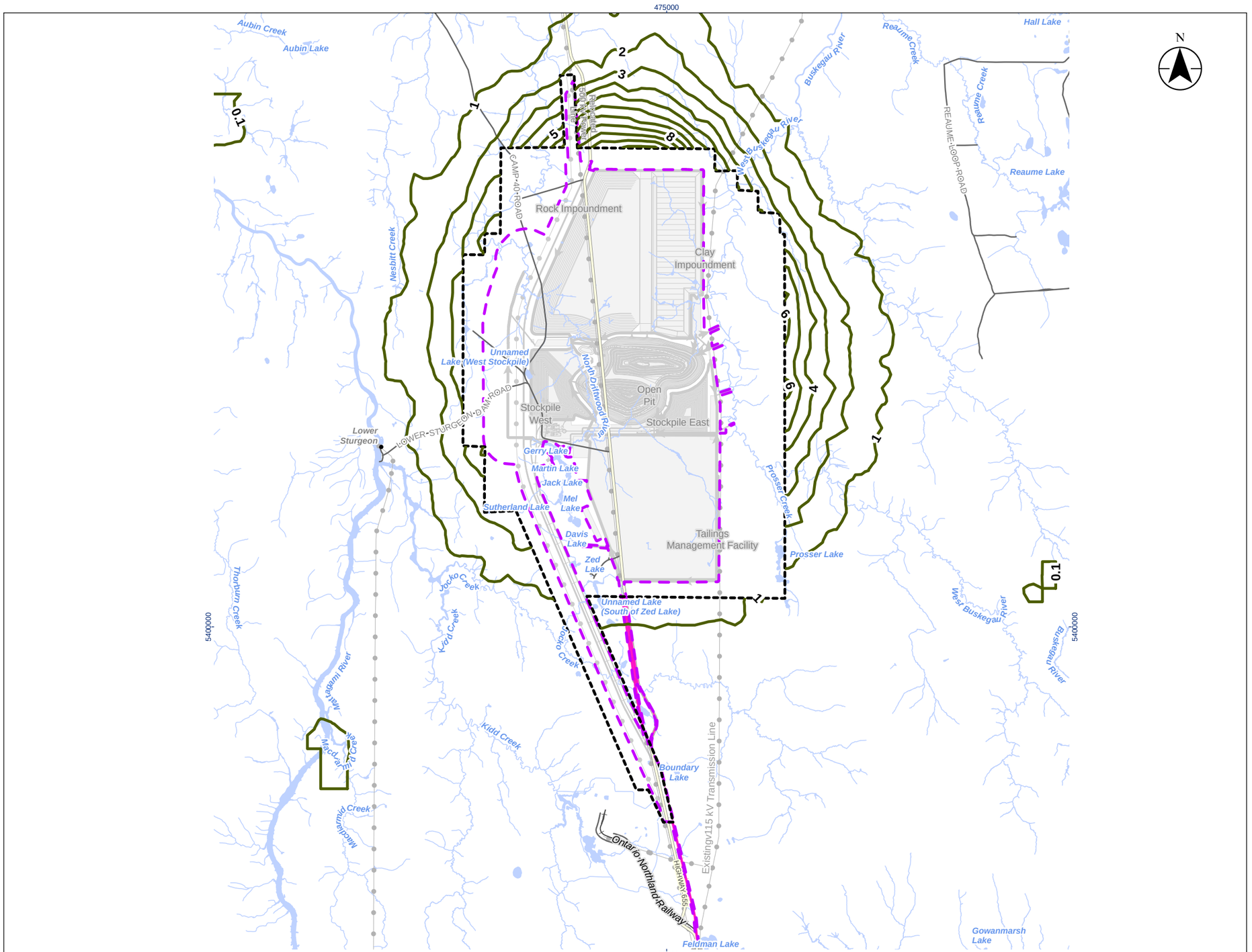

Stantec

CANADA NICKEL COMPANY

Legend

- Modelled Mine Boundary
- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Frequency of Exceedance (%)
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the SPM 24-Hour AAQC of 120 µg/m^3 over a 5 year period.

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.40

Title
Frequency of Exceedance Plot for the Project Alone, Operation Scenario - 24-Hour Average SPM (85% Control Efficiency on Haul Roads)

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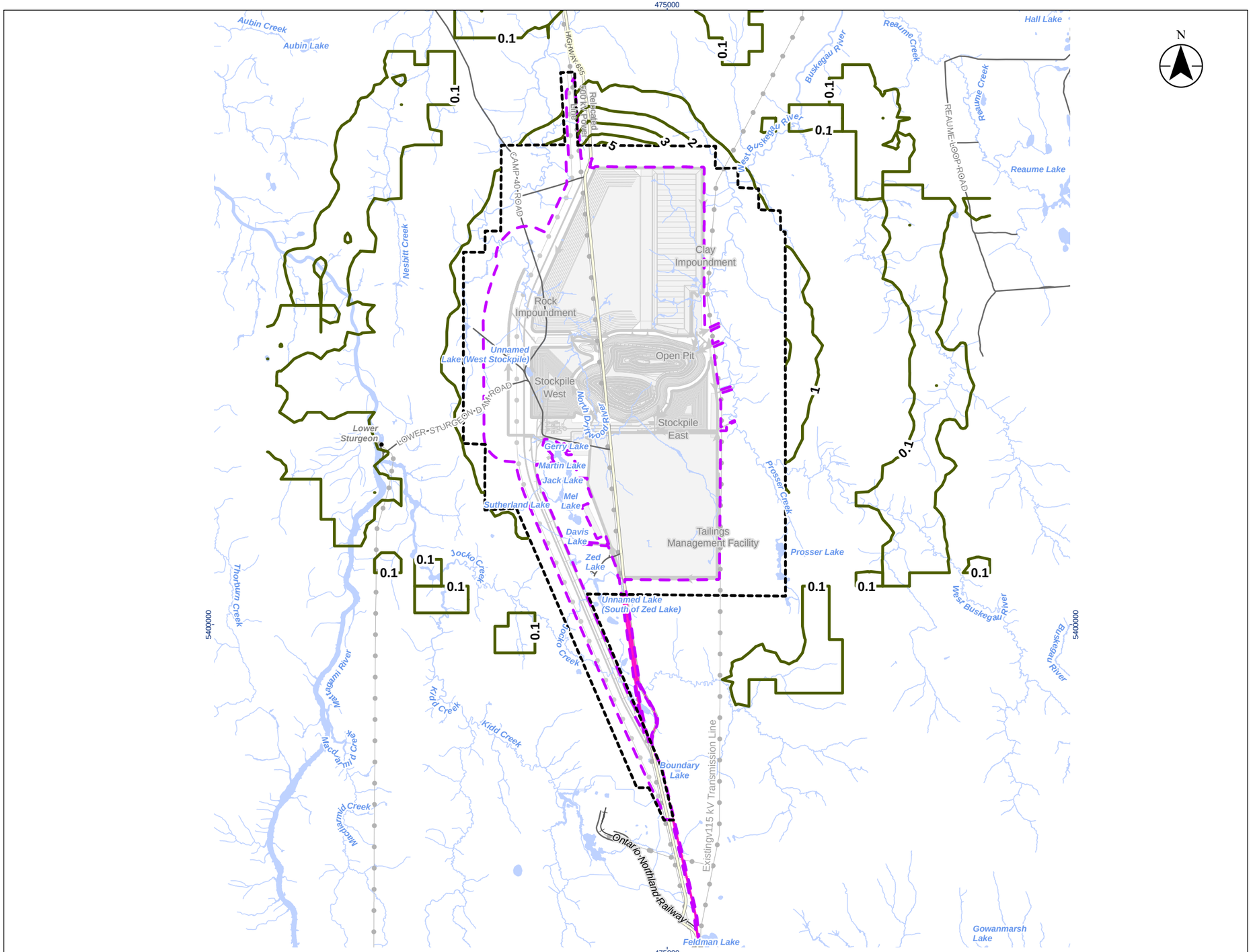

Stantec

CANADA NICKEL COMPANY

Legend

- Modelled Mine Boundary
- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Frequency of Exceedance (%)
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the PM_{10} 24-Hour AAQC of 50 $\mu g/m^3$ over a 5 year period.

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.41

Title
Frequency of Exceedance Plot for the Project Alone, Operation Scenario - 24-Hour Average PM_{10} (85% Control Efficiency on Haul Roads)

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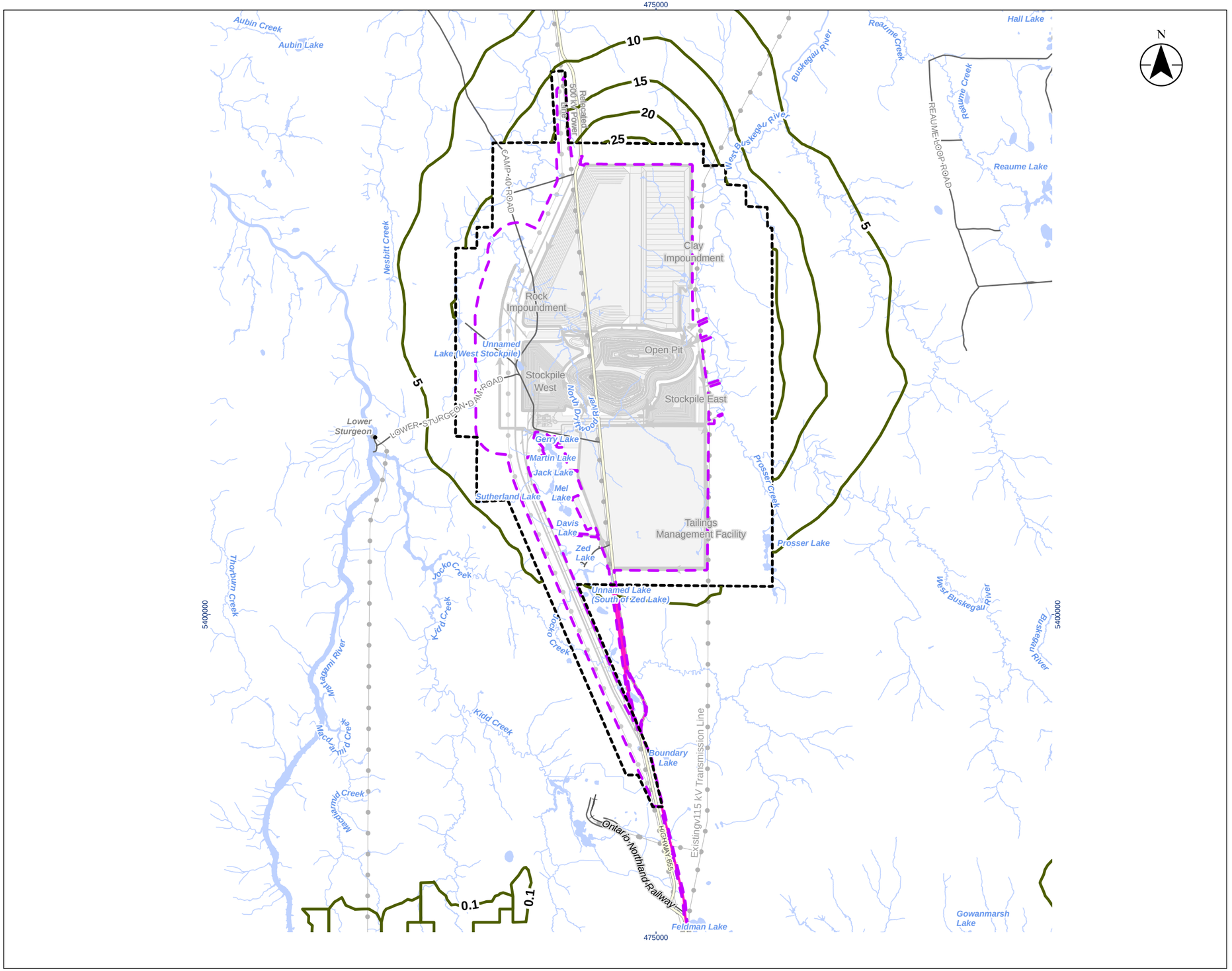

Stantec

CANADA NICKEL COMPANY

Legend

- Modelled Mine Boundary
- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Frequency of Exceedance (%)
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the Muscovite 24-Hour Screening Level of 1.5 µg/m^3 over a 5 year period.

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.42

Title
Frequency of Exceedance Plot for the Project Alone, Operation Scenario - 24-Hour Average Muscovite

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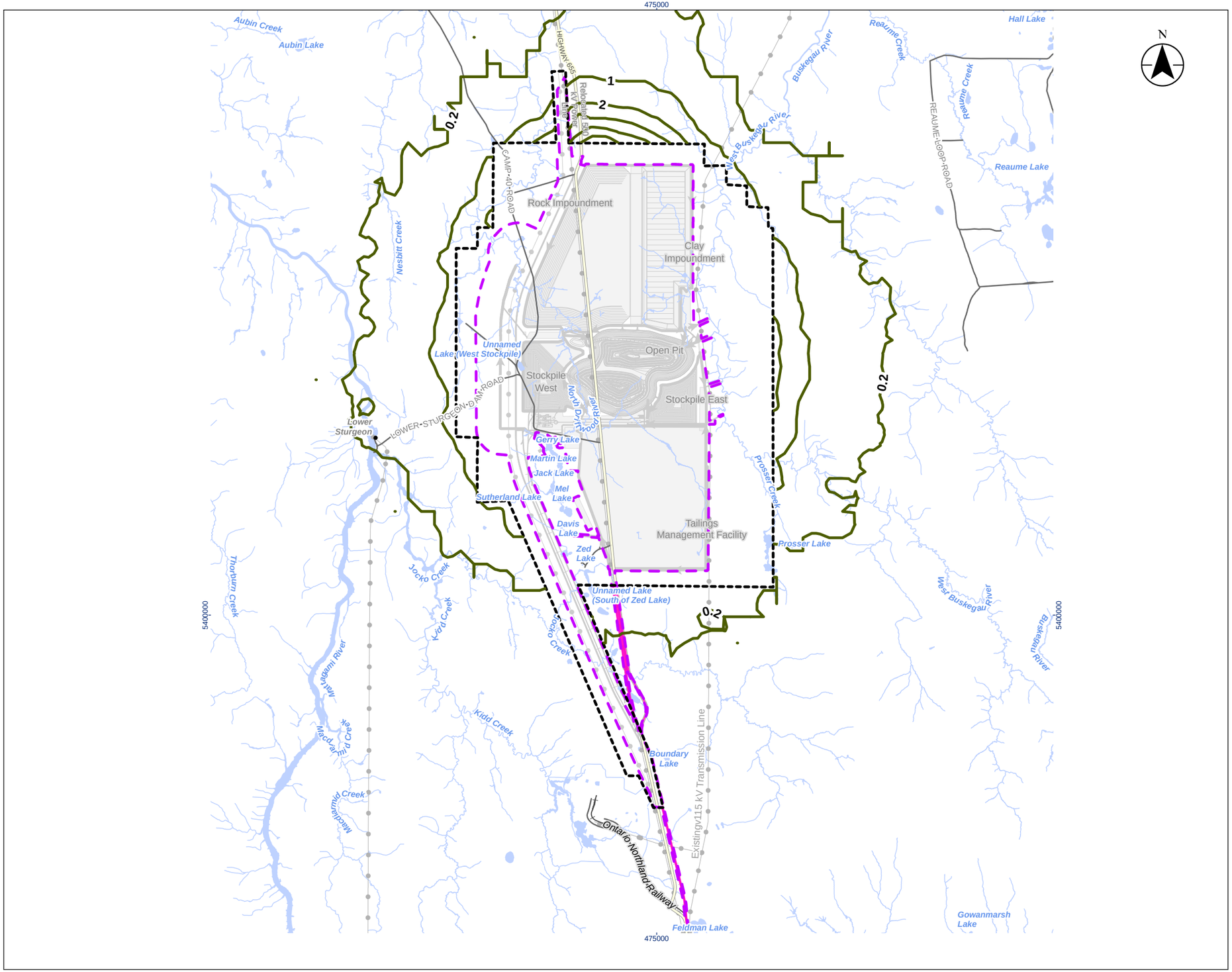

Stantec

CANADA NICKEL COMPANY

Legend

- Modelled Mine Boundary
- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Frequency of Exceedance (%)
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the Aluminum 24-Hour Screening Level of 12 µg/m^3 over a 5 year period.

0 5 10 km

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Notes
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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.43

Title
Frequency of Exceedance Plot for the Project Alone, Operation Scenario - 24-Hour Average Aluminum

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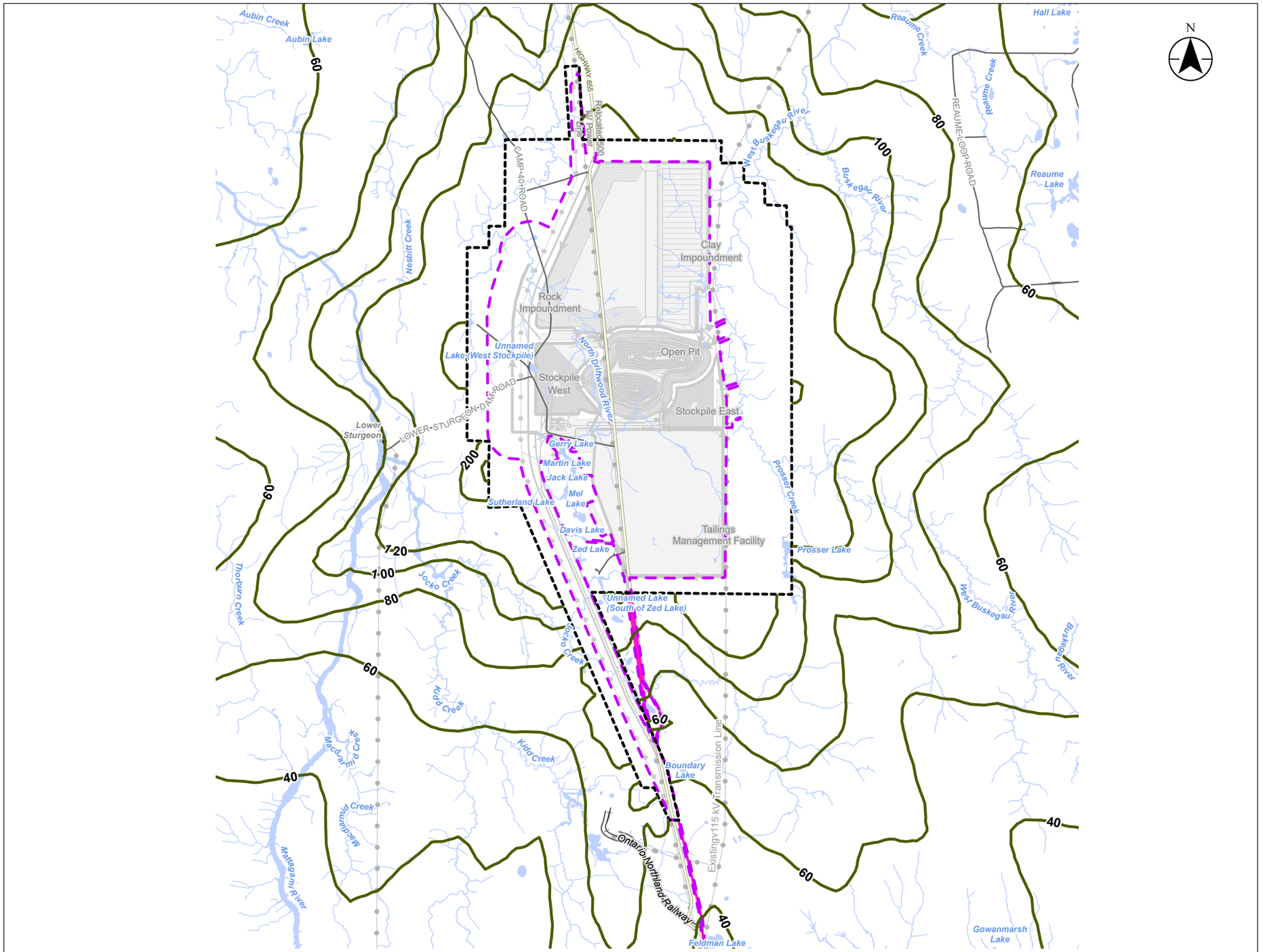

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CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
SPM 24-Hour Average AAQC: 120 µg/m^3
Background Concentration (not included): 26.5 µg/m^3

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.44

Title
Concentration Contour Plot for Project Alone, Operation Scenario - 24-Hour Average SPM (Additional Mitigation Measures)

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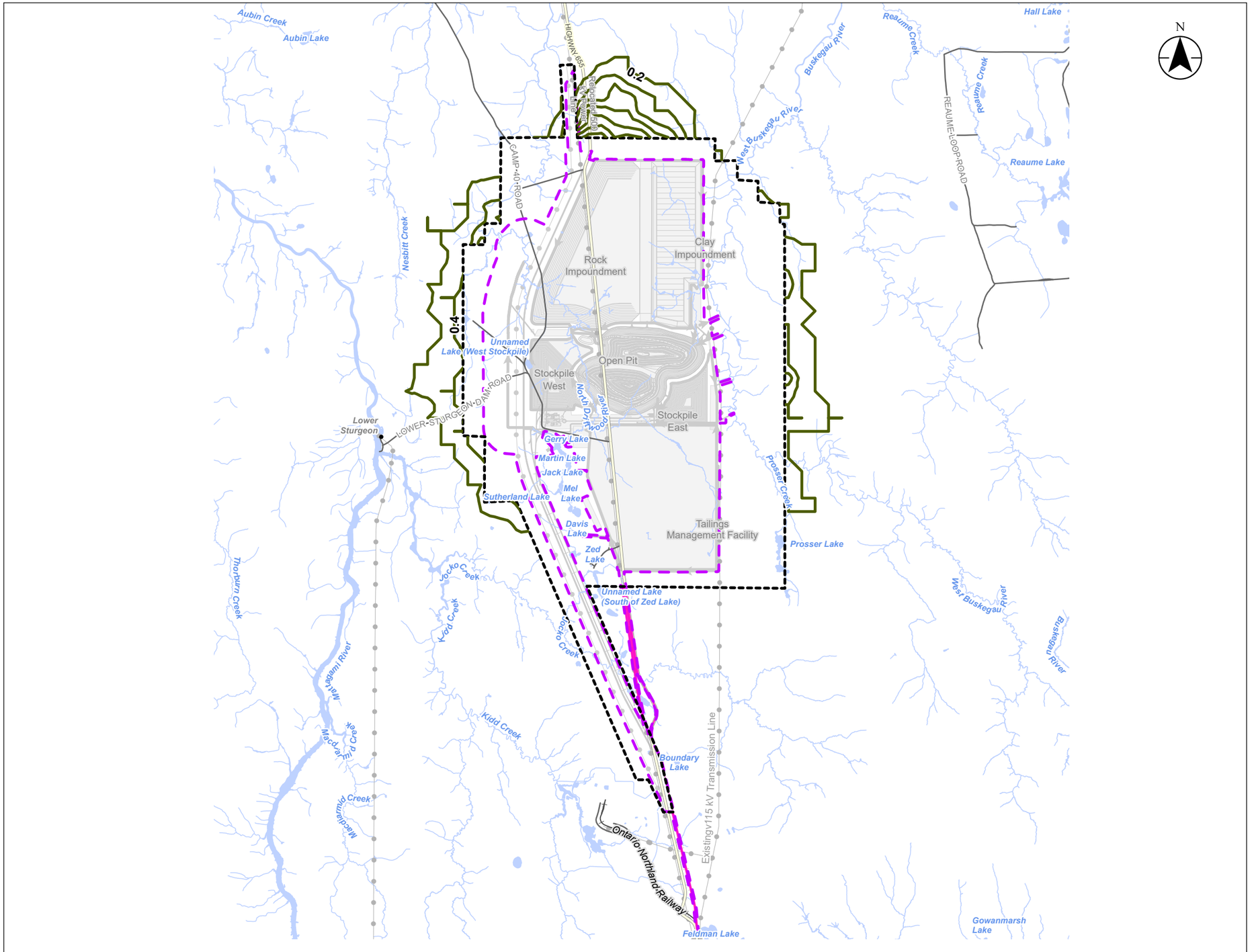

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the SPM 24-Hour AAQC of 120 µg/m^3 over a 5 year period.

0 5 10 km

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Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.45

Title
Frequency of Exceedance Plot for Project Alone, Operation Scenario - 24-Hour Average SPM (Additional Mitigation Measures)

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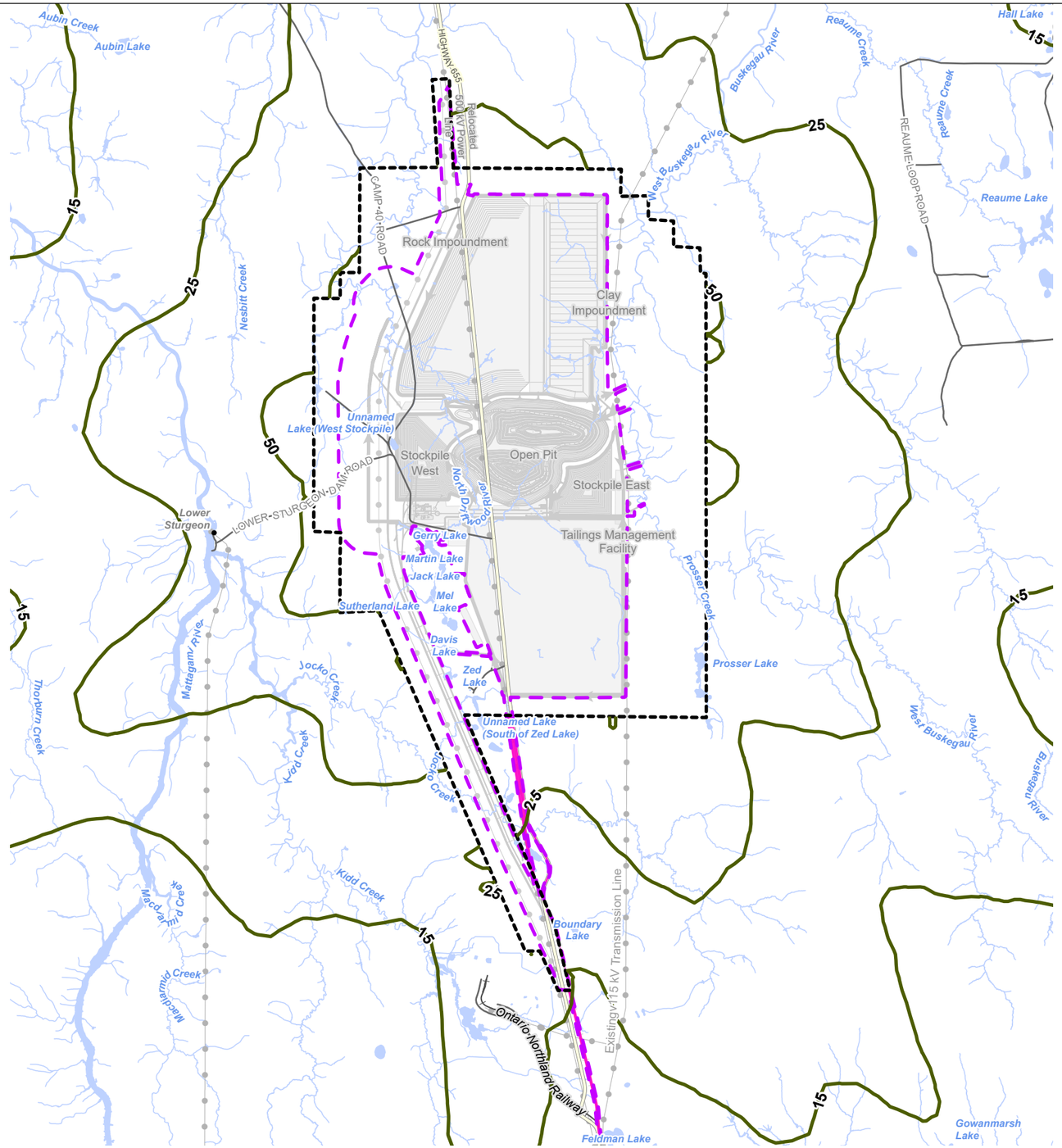

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
SPM 24-Hour Average AAQC: 120 µg/m^3
Background Concentration (not included): 26.5 µg/m^3

0 5 10 km

1:150,000 (At original document size of 11x17)

Notes
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Project Location
Timmins, Ontario

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Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.46

Title
Concentration Contour Plot for Project Alone, Operation Scenario - 24-Hour Average PM_{10} (Additional Mitigation Measures)

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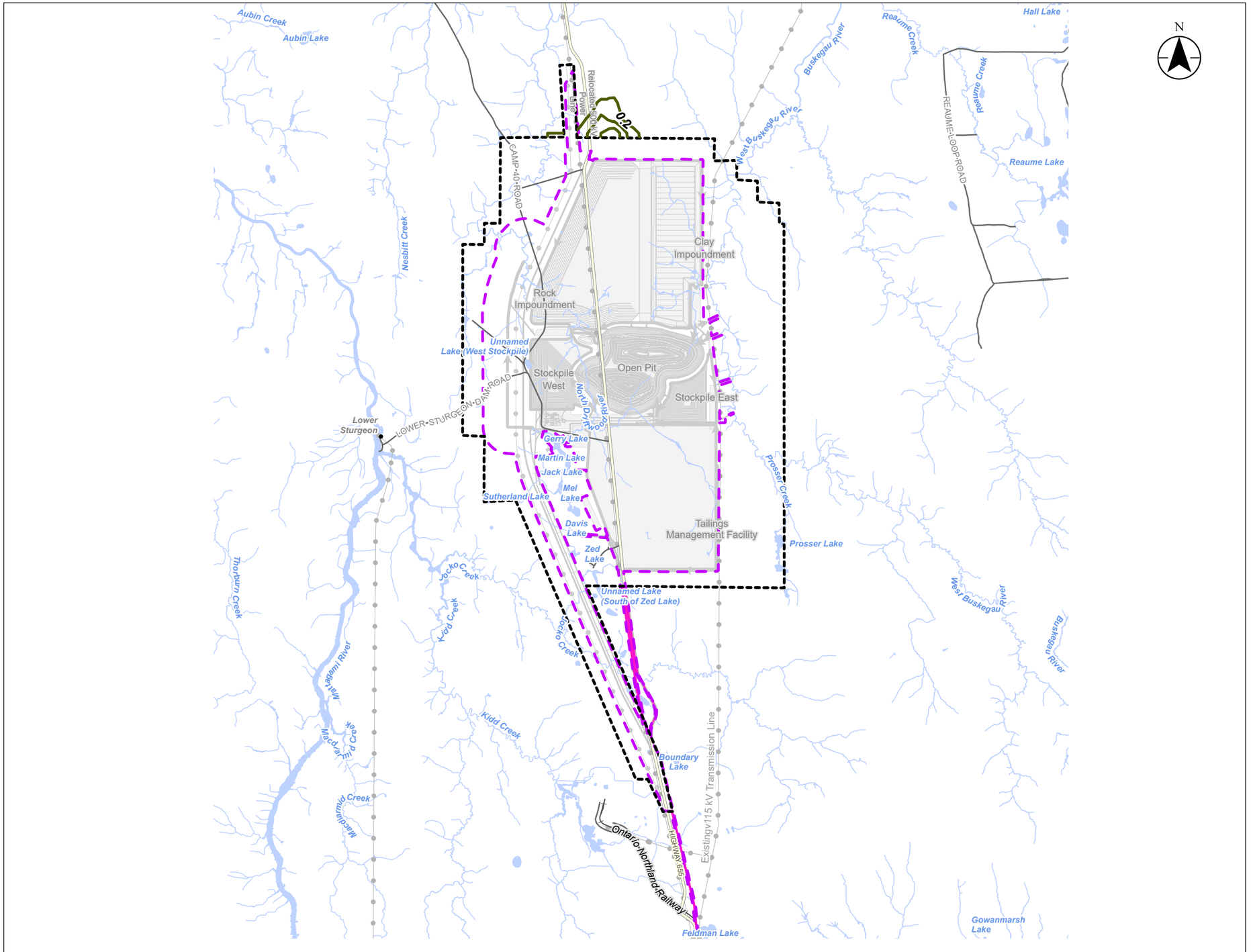

Stantec

CANADA NICKEL COMPANY

Legend

- Project Area
- Project Area - Existing Highway 655 and Transmission Line
- Modelled Mine Boundary
- Concentration Contours
- Proposed Project Components

Base Features

- Major Road
- Minor Road
- Railway
- Existing Transmission Line
- Watercourse
- Waterbody

Legend Notes
Frequency of Exceedance of the PM10 24-Hour AAQC of 50 µg/m^3 over a 5 year period.

0 5 10 km

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Notes
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Project Location
Timmins, Ontario

160930456 REVA
Prepared by malcazaren on 2024-09-26

Client/Project
Canada Nickel Company (CNC)
Crawford Nickel Project

Figure No.
I.47

Title
Frequency of Exceedance Plot for Project Alone, Operation Scenario - 24-Hour Average PM_{10} (Additional Mitigation Measures)

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