Air Quality Modelling Assessment for the Eagle Gold Project

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EXECUTIVE SUMMARY

Independent Environmental Consultants (IEC) was retained to complete an updated air dispersion modelling assessment of StrataGold Corporation's Eagle Gold Mine Project north of Mayo in the Yukon. This Air Quality Assessment has been completed to support of an Application for Air Emissions Permit pursuant to the Yukon *Air Emissions Regulations*. Following the guidance from the Yukon Environmental and Socio-economic Assessment Board (YESAB) [1] [2], the assessment evaluated the potential effects of the Project on ambient air quality during the planned nine (9) years of mine operations. The assessment was completed in accordance with the YESAB *Model Documentation Guide* [2], as well as specific guidance provided as part of the YESAB *Decision Document* [1] and relevant technical guidance for air dispersion modelling provided in the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4], which have been adopted by YESAB.

A single representative operating scenario was developed based on the expected maximum year of operations (i.e., Y4), which was determined based on the total annual tonnages of ore and waste rock that are planned to be extracted. Activities in Y4 will include routine mine operations and blasting as well as supporting activities like backup power generation. This operating scenario was considered a bounding case for Project operations and was expected to adequately capture the maximum potential air quality effects from any year of operations in the current mine schedule (i.e., Y1 to Y9). Local and regional study areas (LSA and RSA) were established to assess the extent of potential air quality effects. The LSA covered an area 15 km by 15 km centred on the Project footprint and was almost entirely contained within the boundaries of the StrataGold Corporation's Dublin Gulch mine claims. The RSA extended to an area 30 km by 30 km, also centred on the Project footprint.

Mining facilities including the open pit, haul roads, waste rock storage areas, crushers and conveyance systems, heap leach facility, processing plant (Adsorption/Desorption/Regeneration Plant (ADR)) and the standby diesel powerplant have the potential to emit various Constituents of Potential Concern (COPC). An inventory of COPC emissions from these activities was developed and included: particulate matter (TSP, PM_{10}, and $PM_{2.5}$), gaseous COPC (NOx, SO_2, CO, and NH_3), and metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel, and zinc). The emissions inventory was developed based on the maximum operating conditions established for the Y4 operating scenario, which included the conservative assumption that emission sources operate concurrently at their individual maximum rates of production. Published emission factors and mass balance calculation methods were used to develop the emissions inventories, which were based on accepted best practice calculation methods and guidance developed by the U.S. EPA, the Australian Department of Environment and Energy and published literature. Nonetheless, the emissions estimates used in this assessment are very conservative. In reality, production rates for individual activities will vary day-to-day and some activities may not actually occur simultaneously. Therefore, this approach provides an upper bound estimate of air emissions and helps to ensure that the predicted COPC concentrations reflect the concurrence of maximum emission rates with worst-case meteorological conditions.

The CALMET/CALPUFF modelling package was used to predict ground-level concentrations of the COPC generated by the mine operations. Site-specific meteorological data (for the year 2015) produced by the WRF-NMM mesoscale weather model were used as input to the CALMET model to develop a refined dataset (200 m by 200 m resolution) that covered the RSA. The CALPUFF model was used to predict concentrations for the COPC. The predicted COPC concentrations were compared to the Project Air Quality Criteria (Project AQC), which were based on the current Yukon Ambient Air Quality Standards (YAAQS) and the forthcoming Canadian Ambient Air Quality Standards (CAAQS). Project AQC for metals were established based on the 24-hour and

annual standards published in Ontario. The following points provide a summary of the results of the air dispersion modelling assessment:

Worst Case Conditions During Normal Operations

- For the normal operations assessment scenario, the predicted maximum 24-hour and average annual concentrations of particulate matter (TSP, PM_{10}), 98^{th} percentile 1-hour concentrations of NO_2 were predicted to be above the applicable Project AQC at the Project fenceline developed for the purposes of the CALMET/CALPUFF model (Figure 2). No exceedances of Project AQC were predicted for the receptor at the on-site workers camp.

- As expected, the highest particulate matter concentrations were predicted to occur along the Project fenceline northeast and south of the pit and adjacent to the Platinum Gulch and Eagle Pup WRSA. This dispersion pattern suggests that dust generated by material handling and traffic along unpaved site roads and pit/pile ramps are the dominant drivers of airborne particulate matter. The elevated concentrations of 24-hour TSP and PM_{10} were limited to areas along the Project fenceline and the frequency of predicted exceedances falls off rapidly with distance.

- Elevated 98^{th} percentile 1-hour concentrations of NO_2 were also predicted along the southern edge of the Project fenceline. For normal mine operations, the highest NO_2 concentrations were predicted to occur south of the pit and adjacent to the Platinum Gulch WRSA. This dispersion pattern is consistent with the expectation that fuel combustion associated with the mobile equipment and haul trucks, as well as the stationary diesel-electric generators, will be the dominant source of NO_2. A frequency analysis confirmed that the elevated concentrations were confined to a very small area near the southern edge of the Project footprint and decline rapidly with distance from Project footprint.

Worst Case Conditions During Normal Blasting

- For the separate short-term assessment of blasting operations, maximum, 99^{th} percentile and 98^{th} percentile 1-hour concentrations of CO, SO_2 and NO_2 were predicted to be below the Project AQC along the Project fenceline. Blasting activities occur infrequently (i.e., no more than 100 times per year) and the emissions from each blast are expected to disperse quickly. As a result, blast-related air quality effects will occur no more than 100 hours per year (i.e., about 1% of the time) and its is unlikely that each blast hour will coincide with worst-case meteorological conditions. Again, no exceedances of Project AQC were predicted for the receptor at the on-site works' camp.

Overall, the predicted potential air quality effects from the Project are limited and are related primarily to:

- Releases of airborne particulate (TSP, PM_{10},) from mining activities within the pit and dust generated by movement of vehicles and equipment along haul roads and pit/pile ramps; and

- Combustion emissions (NO_2) from the standby diesel generators and mobile equipment/vehicles travelling within the pit and along haul roads and pit/pile ramps

Since the predicted exceedances occur well within the LSA and there are no known sensitive human receptors in the vicinity of the Project site, the actual potential for human exposure to elevated concentrations of air contaminants in the vicinity of the Project is expected to be very low. The results of this air dispersion modelling exercise will be evaluated and confirmed as part of the activities completed under SGC's *Ambient Air Quality Monitoring Plan* [5] and *Environmental Monitoring, Surveillance and Adaptive Management Plan* [6], which will include a vegetation monitoring program and metals uptake monitoring. The monitoring plans will help identify trends that would trigger management responses by SGC to limit and/or mitigate localized air quality effects.

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

StrataGold Corporation (SGC), a directly held wholly owned subsidiary of Victoria Gold Corp., has proposed to construct, operate, close and reclaim a gold mine in central Yukon. The Eagle Gold Project (the "Project") is located 85 km from Mayo, Yukon using existing highway and access roads. The Project will involve open pit mining and gold extraction using a three-stage crushing process, heap leaching, and a carbon adsorption, desorption and recovery system over the mine life.

The mine will produce gold from a conventional open pit and heap leach mining operation. The extracted ore will be refined on site into doré, which will be shipped off-site via existing all-weather access roads. The mine will operate year-round at an average annual production rate of 10 million tonnes of ore per year (Mt/y) over the life of the mine. Gold extraction is expected to continue for 1-2 years after the cessation of active mining operations depending on gold recovery rates and market conditions.

The Yukon Environmental and Socio-economic Assessment Board (YESAB) has reviewed the *Project Proposal* for the mine [7] and the Yukon Government (YG) has accepted YESAB's recommendations [1] (outlined in YESAB's *Decision Document*) with specific terms and conditions associated with air quality. In support of SGC's Application for Air Emissions Permit pursuant to the Yukon *Air Emissions Regulations*, Independent Environmental Consultants (IEC) was retained to complete an updated air dispersion modelling assessment of the Project. The purpose of the assessment was to assess the potential effects of the mine operations on ambient air quality. The dispersion modelling was completed using the CALMET/CALPUFF modelling package and following the YESAB *Model Documentation Guide* [2], as well as specific guidance provided as part of the YESAB *Decision Document* [1]. Relevant technical guidance for air dispersion modelling provided in the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4] was also incorporated in the updated assessment, as appropriate. The dispersion model was used to predict ground-level concentrations of Constituents of Potential Concern (COPC), including particulate matter and common gaseous pollutants (e.g., nitrogen dioxide), as well as other compounds listed in YG's terms and conditions (i.e., metals, ammonia). Based on these predictions, the potential effects to air quality were evaluated and are discussed in the following sections of this report.

2.0 PROCESS/FACILITY DESCRIPTION

The Eagle Gold Project is a conventional open pit gold mine and heap leach mining operation. The current *Mine Development, Operations and Material Management Plan* [11] anticipates extracting 86 Mt of leachable ore and no more than 98 Mt of waste rock over 9 years of mining operations. Site construction commenced in late 2017 (Year -2 (Y-2)) and preproduction commenced in 2019 (Year -1 or Y-1). Full-scale mine operations are expected to last 9 years from Year 1 (Y1) to Year 9 (Y9) with decommissioning to follow afterwards. The current Project production schedule is provided in Table 2-1 and the general layout of the site is shown in Figure 1.

Table 2-1: Project Production Schedule

Year	Construction		Operations									Total
	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	
Ore Mined (kt)	0	16	8,760	10,950	10,949	10,950	10,950	10,950	10,951	10,900	624	86,000
Average Ore Grade (g/t)	-	0.49	0.75	0.81	0.77	0.78	0.8	0.71	0.62	0.61	0.58	0.731
Contained Gold (koz)	0	0	212	287	272	275	282	251	218	213	12	2,022
Recovered Gold (koz)	0	0	155	209	198	200	206	183	159	155	8.5	1,474
Total Waste Mined (kt)	-	2,074	7,990	15,712	13,639	15,686	11,418	9,458	10,003	11,105	877	97,962
Platinum Gulch Waste (kt)	0	1,810	2,709	14,062	3,039	0	0	0	0	0	0	21,620
Eagle Pup Waste (kt)	0	255	4,177	9	9,083	15,320	10,026	7,745	7,791	9,291	723	64,360
to Low Grade Stockpile (kt)	0	9	1,104	1,642	1,517	367	1,391	1,712	2,213	1,814	154	11,923
Total Material Mined (kt)	-	2,090	16,751	26,663	24,588	26,636	22,367	20,408	20,954	22,006	1,501	183,964
NOTES: kt = kilo-tonnes or 1,000 tonnes; g/t = grams per tonne; koz = kilo-ounce or 1,000 ounces of gold												

The Project will be comprised of the following major facilities:

- **Open Pit**: Gold-bearing ore and waste rock is removed from the Eagle deposit by conventional drill, blast, shovel and truck mining. The footprint of the final open pit will have a surface area of approximately 67 hectares (ha) and the minimum elevation of the pit will be approximately 810 metres above sea level (masl). The east highwall of the pit will have a crest elevation of approximately 1,390 asl and the west highwall will have crest elevation of approximately 915 masl.

- **Waste Rock Storage Areas**: Waste rock is extracted from the pit and is deposited in one of two waste rock storage areas (WRSAs). The Platinum Gulch WRSA will be located south of the pit and the Eagle Pup WRSA will be located to the north of the pit. During the first several years of operations, waste rock will be delivered to both the Platinum Gulch WRSA and the Eagle Pup WRSA. For the remainder of the life of the Project, waste rock will be trucked to the Eagle Pup WRSA.

- **Crusher and Conveyor System**: Ore from the pit is delivered by haul truck to the primary crusher, which is located adjacent to what will become the northern rim of the open pit. Ore is crushed and then conveyed by a covered conveyor to the coarse ore transfer station. From the coarse ore transfer station, the primary crushed ore is either:

    - conveyed directly to the coarse ore stockpile and then on to the secondary crusher, secondary screens and tertiary crushers and screens; or

  - temporarily stored on a prepared pad for approximately 90 days each winter and then blended back into the crushing circuit over the other 275 operating days in the year.

- **Heap Leach Facility**: The HLF will be an in-valley heap leach pad. Crushed ore will be delivered and stacked on the heap leach pad by mobile stacking conveyors. In the event that agglomeration is used for the crushed ore, it was conservatively assumed that lime and cement from storage silos would be added to the crushed ore prior to stacking on the pad; however, agglomeration is not currently required. Process solution containing a low concentration of cyanide will be applied to the ore to extract gold and collected by the HLF pad leachate collection and recovery system. The HLF pad will consist of a composite liner system in the upper and lower reaches of the facility. The lower section of the HLF pad acts as an 'in-heap pond' for primary storage of pregnant solution. A lined pond external to the HLF has also been constructed to temporarily store excess process solution (i.e., generated due to rare upset events, spring freshet and precipitation) and any solution contained in the pond will be recycled back into the heap leach circuit.

- **Process Plant (Adsorption/Desorption/Regeneration Plant (ADR))**: Pregnant leach solution containing gold and cyanide is collected from the HLF and processed at an on-site processing plant located west of the HLF. Gold-bearing solution is pumped from the in-heap pond to the process plant. Gold is recovered from the pregnant leach solution by activated carbon adsorption and pressurized caustic desorption, followed by electro-winning onto steel anodes, and on-site smelting in an electric induction furnace to produce gold doré. The remaining gold-barren leach solution is re-circulated back to the HLF for reuse.

The Project will be supported by additional mine infrastructure, including: water management facilities, a truck shop and maintenance buildings, offices and worker accommodations, an incinerator, fuel storage facilities, an explosives and magazine storage facility, borrow quarries and laydown areas, a diesel-fired standby powerplant, a transmission line and substation, mine site roads, and the existing roads which access the site. The access roads and the mine site roads will be unpaved gravel roads.

Electricity will be supplied to the site via the Yukon Energy Corporation (YEC); however, the mine will also be equipped with standby diesel generators to supply electricity in the event of a power failure or unreliable power supply. Three (3) standby generators each having capacity of 1.65 megawatts (MW) will be located in the main powerplant and one (1) additional diesel generator with a total capacity of 0.4 MW will be located at the explosives and magazine storage facility.

3.0 ASSESSMENT METHODOLOGY

The following sections provide an overview of the methodology used to complete the air dispersion modelling assessment. In general, the YESAB *Model Documentation Guide* [2] was followed and specific guidance from the YG Decision Document [1] was incorporated. In addition, relevant technical guidance for air dispersion modelling provided in the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4] was also incorporated in the assessment, as appropriate.

3.1 CONSTITUENTS OF POTENTIAL CONCERN

Project activities are expected to result in airborne emissions of various air pollutants or constituents of potential concern (COPC). Mining operations and supporting activities may generate dust (including metallic constituents) at times, as well as gaseous emissions from combustion and fugitive emissions from the heap and process plant. Specifically, the following list of COPC were assessed:

- Total suspended particulate (TSP);
- Particulate matter less than 10 microns (µm) in diameter (PM_{10});
- Particulate matter less than 2.5 microns (µm) in diameter ($PM_{2.5}$);
- Metal constituents in TSP, including:
    - Arsenic (As);
    - Cadmium (Cd);
    - Copper (Cu);
    - Chromium (Cr);
    - Lead (Pb);
    - Mercury (Hg);
    - Nickel (Ni);
    - Zinc (Zn);
- Nitrogen oxides (NOx);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO); and;
- Ammonia (NH_3).

Note that the above list of COPC is expanded from the list of air pollutants considered as part of the original air quality assessment for the Project [12], which was included as part of the *Project Proposal* [7]. In particular, the above list of COPC considers emissions related to the gold recovery and refining processes, as required by the terms of the YG *Decision Document* [1]. This includes particulate (including metallic constituents), and ammonia, which are expected to be emitted from smelting and electrowinning at the process plant.

3.2 Assessment Scenarios

As outlined in the previous air quality assessment for the Project [12], there is three distinct phases of the Project:

- **Construction**: The construction phase of the project (i.e., Y-2 and Y-1) has involved clearing and grubbing and preparation of the Project site. Activities during this phase will include stockpiling soils, blasting and overburden removal, site grading, and construction of site infrastructure and haul roads. Emissions of COPC during this phase are expected to be dominated by combustion emissions from the site equipment and dust emissions due to soil disturbance.

- **Operations**: Following construction, operations of the mine are currently expected to last nine years (i.e., Y1 to Y9). Activities during this phase of operations will include all major components of the open pit mining process, including:

    - blasting and extraction of ore and waste rock;
    - hauling and handling of raw ore and waste rock;
    - construction of the WRSAs and HLF;
    - crushing of ore and handling of crushed ore;
    - operation of the HLF to extract gold from the crushed ore; and
    - processing and refining of the extracted gold at the on-site processing plant (e.g., electrowinning and smelting).

    In addition to the above activities, various support facilities, including the on-site standby powerplant and waste incinerator, is active in this phase.

    Emissions of COPC during operations will include combustion emissions from the site equipment, dust (including metallic constituents) from the extraction, handling and processing of ore and waste rock, as well as emissions specific to the various processes at the HLF and process plant (e.g., emissions of metals, and ammonia).

- **Closure and Reclamation**: After mining operations have ceased, the mine will move into a phase of closure and reclamation of the Project site, which is expected to last 10 years, as described in the *Project Proposal* [7]. Activities during this phase of the Project are expected to be similar to (but less intense than) those during the Construction phase (i.e., including combustion emissions from site equipment and dust from soil disturbance). Although there are some emissions of COPC associated with these activities, the previous air quality assessment [12] assumed that emissions from Construction would be greater. As such, air quality impacts during the Closure and Reclamation phase of the Project were not previously quantified or assessed in detail.

Since YESAB's comments on the previous air quality assessment for the Project (i.e., Term #91 and #95 of the Decision Document [1]) are specific to Operations phase of the Project. As such, only the Operations phase of the Project was assessed.

In air dispersion modelling, it is impractical to model every year of a mine's operating life. Instead, an "assessment scenario" is selected and developed to represent the most conservative emission estimates and COPC concentrations for the period that they represent. As shown in Table 2-1, peak mine operations are expected to occur in Y2 and Y4, where approximately 26.6 Mt/y of ore and waste rock is expected to be mined. This is expected to result in increased air emissions in Y2 and Y4 as compared with the other operating years. Further, since both WRSAs and the Eagle Pit will be more developed in Y4 (as compared to Y2), it was determined that emissions to air would likely be highest in Y4. As such, Y4 was selected to represent the expected maximum operating case for mining operations.

The operating information and production rates used to develop the air emissions inventory match the time-averaging periods for the specified air quality performance criteria (see Section 3.5). As such, the Y4 operations of the Project were evaluated in two parts:

- The short-term emissions inventory captured the maximum 1-hour or 24-hour operating conditions and production rates of the various site activities; and
- The average annual emissions inventory reflected the operating and production rates of the various site activities over the full year and corresponds to the annual production rates listed in the mine plan schedule.

The Y4 activities and productions rates evaluated as part of this assessment include:

- **Extraction**: Gold-bearing ore will be extracted from the pit at an annual production rate of 10.95 Mt/y using a traditional drill/blast method. Blasting of ore and waste rock within the pit will employ ammonium nitrate fuel oil (ANFO) explosive and blasts are expected to occur no more than twice per week. Blasted ore and waste rock will be extracted by mechanical shovel and loaded into haul trucks.
- **Hauling:** Waste rock will be hauled directly to the Eagle Pup WRSA at an annual rate of 15.69 Mt/y. The Platinum Gulch WRSA will not be active after Y3 and it is assumed that revegetation of the Platinum Gulch WRSA will begin in Y4. Most ore from the pit will be hauled to the primary crusher, although some ore may be hauled directly to the heap leach facility (HLF) and stacked on the heap.
- **Crushing:** The primary crusher will operate at a maximum hourly throughput of 1,848 tonnes of ore per hour (t/h). Ore will undergo secondary and tertiary crushing before being conveyed to the HLF.
- **Heap leach**: Ore will be conveyed by a network of transfer towers and covered conveyors and then stacked on the heap. Process solution will be applied to the heap at a rate of 23,032 cubic meters per day (m^3/d) and gold-bearing pregnant solution will be collected at the base of the heap via a system of

sump pumps. From the HLF, the pregnant solution will be pumped to the process plant where the gold will be extracted from solution and refined.

- **Refining:** The gold-containing sludge will be smelted into doré bars and the barren solution will be recycled to the HLF. The annual gold recovery rate is expected to be 200 koz.

- **Power Generation:** Standby diesel generators will be used to provide power to the Project site in the event of a power outage or unreliable power supply from YEC. To evaluate the potential effects of power generation, it was assumed that all three main generators will operate concurrently at 100% load and the explosives storage facility generator will operate at 50% load. To determine the worst-case short-term effects, the generators were assumed to operate 24 hours per day, 365 days per year. However, to determine the worst-case long term (i.e., annual) effects, the generators were assumed to operate 24 hours per day during the months of December, January and February only. It is during these months that the power supply from YEC is most likely to be unreliable.

For more information on the emission sources and operating conditions considered in the Y4 assessment scenario, see Section 5.0 and Appendix A.

3.3 SPATIAL BOUNDARIES

For the purposes of this assessment, local and regional study areas were established. The location of the Project and the study areas are described in the following sections.

3.3.1 Project Location

The Project site is approximately 45 kilometres (km) north of the village of Mayo, Yukon and is located within the traditional territory of the First Nation of Na-Cho Nyak Dun. Access to the Project site is possible via an existing public gravel road known as Haggart Creek Road, which extends 23 km from the site. Haggart Creek Road joins with the South McQuesten Road and the Silver Trail Highway (Highway 11), which connect the Project site with Mayo. By road, the total distance from the Project site to Mayo is approximately 85 km.

The location of the Project and the extent of the mine claim is shown in Figure 2. The Figure also shows parcels of Settlement Land that lie adjacent to the SGC Dublin Gulch mine claims. And while local hunters have accessed the area near the Project site, SGC is not aware of any permanent hunting or fishing cabins located nearby.

3.3.2 Project Fenceline

For this assessment, the Project fenceline was delineated as the 500-m buffer around the physical elements of the site or the public road, which ever was closer (shown in Figure 1) and is the boundary at which air quality effects were assessed. Air quality effects are not evaluated inside of the Project fenceline. See section 3.5 for more detail.

3.3.3 Local Study Area

The Local Study Area (LSA) includes all areas that could experience air quality effects due to the operation of the mine. The LSA established for this assessment is shown in Figure 2. The LSA is 15 km by 15 km centred on the

Project footprint and falls almost entirely within the boundaries of the SGC Dublin Gulch mine claims. The size of the LSA meets the requirements of the *BC Air Quality Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4], which specify a minimum modelling domain size of 10 km by 10 km.

3.3.4 Regional Study Area

The Regional Study Area (RSA) is shown in Figure 2. It is approximately 30 km by 30 km centred on the Project footprint. This area was established as part of the previous air quality assessment for the Project [12] and is maintained in this assessment for consistency. Within the RSA, air quality effects resulting from mine activities are expected to be insignificant.

3.4 AIR DISPERSION MODEL

Air dispersion modelling was performed using CALPUFF (v7.0), which is an advanced three-dimensional (3-D) dispersion model. The CALPUFF modelling package [13] [14] is able to handle complex meteorology and multiple emissions sources from facilities and activities located over large areas. CALPUFF is also better suited to resolve local land use features such as the steep topography of the Project site, which creates unique local meteorological conditions that cannot be represented by a simpler model (e.g., the U.S. EPA's AERMOD model).

CALPUFF consists of two key subsystems:

- CALMET, which is an advanced non-steady-state diagnostic meteorological model that produces hourly three-dimensional gridded wind fields from available meteorological, terrain and land use data; and
- CALPUFF, which is a multi-layer, multi species, non-steady-state puff dispersion model that can simulate the effects of varying meteorological conditions in time and space on pollutant transport.

CALPUFF runs in conjunction with CALMET to estimate pollutant concentration for each source-receptor combination for each hour of input meteorology. The maximum (or n^{th} percentile) predicted 1-hour, 24-hour and average annual concentrations are then determined from the hourly CALPUFF model outputs at each receptor point.

Although CALPUFF is more sophisticated than other air dispersion models, there are many assumptions and simplifications that are inherent to air dispersion modelling, which include:

- Simplification and accuracy limitations related to source data (i.e., emissions and modelled source characteristics);
- Limitations in the meteorological data input; and/or
- Simplification of model physics to replicate the random nature of atmospheric dispersion processes.

Thus, while dispersion modelling may over- or under-estimate measured ground-level concentrations at any particular time or place, the models are reasonably reliable in estimating the magnitude of the overall maximum concentration.

3.4.1 Meteorological Inputs

For this assessment, a single CALMET meteorological dataset was created at a fine 200 m by 200 m spatial resolution covering the RSA. CALMET was initialized using site-specific meteorological data produced with the Weather Research and Forecast (WRF) Non-Hydrostatic Mesoscale Model (WRF-NMM). WRF-NMM was employed to generate 1 year of site-specific meteorology for the entire model domain. From this dataset, surface and upper air data was extracted for representative points within the RSA and these meteorological data were used as input to the CALMET model. The selected year of meteorology was 2015.

WRF-NMM was initialized using archived North America Model (NAM) mesoscale re-analysis wind fields produced by the United States National Center for Environmental Prediction (NCEP). The re-analysis data from NCEP were developed based on all available surface and upper air observations and were made available on a 6-hour interval (i.e., 4 times per day). The spatial coverage of the re-analysis fields included most of North America at a 32 km by 32 km grid spacing. The WRF-NMM modelling was used to refine the re-analysis data and produce hourly meteorology at a spatial resolution of approximately 3 km by 3 km. The outputs of WRF-NMM encompass a large area of the Yukon, stretching well beyond the RSA and in all directions.

The output from the WRF-NMM model was then used to generate hourly surface observations data (wind speed, wind direction, temperature, cloud cover, etc.) as well as upper air profiles for use in CALMET. Referred to as “pseudo-observation” points, hourly surface and upper air data were generated for 35 locations in the RSA, as shown in Figure 2.

Additional details about the CALMET and CALPUFF model setups is provided in Appendix B. In general, both CALMET and CALPUFF compared well to observations made at the on-site camp weather station maintained by SGC, lending confidence to the model results.

3.5 EVALUATION OF POTENTIAL AIR QUALITY EFFECTS

For this assessment, the potential air quality effects were evaluated using the Yukon Ambient Air Quality Standards (YAAQS) and the Canadian Ambient Air Quality Standards (CAAQS). In addition, since the YG *Decision Document* [1] required assessment of several compounds that do not have defined air quality standards in the Yukon (or in neighbouring jurisdictions such as British Columbia and Alberta), additional air quality standards for these compounds were drawn from the Ontario Air Contaminants Benchmarks List (Ontario ACB List) [15]. When assessing Project-related air quality impacts against these standards, it is accepted practice that an ambient background concentration be added to modelled concentrations before comparing to the applicable air quality standard. Minimal background concentration data was available to be added to model predicted concentrations prior to assessing air quality effects (see Section 4.0 for additional details). As such, most of the air quality results reported in this assessment represent the *incremental* contribution of the Project alone.

As detailed in both the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4], air quality standards do not apply inside of a “property boundary”, which is defined as an area where there is no public access. For this assessment, the Project fenceline described in section 3.3.2 was used as the property boundary. Although the actual boundary of the SGC mine claims extends much further (see Figure 2), air quality effects were conservatively evaluated at the edge of the Project fenceline in addition to the edge of mine claim area.

Aside from the on-site workers' camp, there are no known sensitive human receptor locations (e.g., hunting or fishing camps) that fall within the LSA; however, local hunting and small-scale placer mining activities do occur at a few locations within the LSA.

3.5.1 Yukon and Canadian Ambient Air Quality Standards

As of April 2010, the Yukon Department of Environment established the Yukon Ambient Air Quality Standards (YAAQS) which are "used to determine the acceptability of emissions from proposed and existing developments." The YAAQS were most recently updated in September 2014 [16]. The Canadian Government has also established standards for ambient air quality. First published in May 2013 under the auspices of the Canadian Council of Ministers of the Environment (CCME), the Canadian Ambient Air Quality Standards (CAAQS) were established as non-binding target levels for air quality [17]. Since that time, however, Environment Canada has adopted and begun to enforce these standards. Although many of the CAAQS are not yet in force, they are expected to apply by 2020 when Project operations are underway. As such, the CAAQS were considered in this assessment. Table 3-1 presents both the YAAQS and the CAAQS.

Table 3-1: Yukon and Canadian Ambient Air Quality Standards (µg/m³)

COPC	Averaging Period	YAAQS (µg/m³)	CAAQS (µg/m³)	
			Apply in 2015	*Apply in 2020*
TSP	24-hour	120	--	--
	Annual	60 (c)	--	--
PM_{10}	24-hour	50	--	--
$PM_{2.5}$	24-hour	28	28	27 (d)
	Annual	10	10	8.8
CO (a)	1-hour	14,885	--	--
	8-hour	5,725	--	--
SO_2 (a)	1-hour	450	--	183 (e)
	24-hour	149	--	--
	Annual	29	--	13
NO_2 (a)	1-hour	400	--	113 (f)
	24-hour	199	--	--
	Annual	60	--	32

NOTES:
(a) Standards for gaseous pollutants (NO_2, SO_2 and CO) are expressed in units of parts per billion (ppb_v). To compare to the results of the air dispersion modelling, these standards have been converted to equivalent values in units of micrograms per cubic metre (µg/m³) at standard conditions [16].
(b) Unless otherwise noted, values for 1-hour or 24-hour periods are calculated as the **maximum** (i.e., 100th percentile) of all 1-hour or 24-hour averages across the entire metrological period/dataset (i.e., 1 year = 365 days = 8,760 hours).
(c) Calculated as the annual geometric mean
(d) Calculated as the **98th percentile** of all daily (i.e., 24-hour) averages
(e) Calculated as the **99th percentile** of all 1-hour averages
(f) Calculated as the **98th percentile** of all 1-hour averages

3.5.2 Ontario Air Contaminant Benchmarks

The Yukon, British Columbia and Alberta do not currently have published standards for several COPC considered in this assessment. This includes NH_3 and the various metals identified in the YG *Decision Document* [1]. As a result, criteria for these COPC were adopted from the Ontario Ministry of Environment Conservation and Parks' most recent Air Contaminants Benchmarks List (Ontario ACB List) [15]. The air quality criteria from the Ontario ACB List that have been adopted for use in this assessment are summarized in Table 3-2.

Table 3-2: Ontario Air Quality Criteria (µg/m³)

Averaging Period	COPC									Units
	As	Cd	Cu	Cr [(a)]	Pb	Hg	Ni	Zn	NH_3	
24-hour	0.3	0.025	50	0.5	0.5	2	0.2	120	100	µg/m³
Annual	--	--	--	--	--	--	0.04	--	--	µg/m³

3.5.3 Summary of Project Air Quality Criteria

Table 3-3 summarizes the Project Air Quality Criteria (Project AQC) applied in this assessment, which were based on the YAAQS and CAAQS from Table 3-1 and the Ontario ACB List from Table 3-2. Note that in some cases multiple criteria apply to the same COPC and time averaging period, although the statistical form of the criteria can differ. For example, while the YAAQS for 24-hour $PM_{2.5}$ is assessed against a maximum daily value, the 2020 CAAQS for 24-hour $PM_{2.5}$ is assessed against the 98th percentile of daily values.

For simplicity and to ensure a conservative assessment, a single criterion was selected for each COPC and time averaging period based on the most stringent applicable standard. For the most part, the Project AQC apply to the maximum predicted value for each time averaging period, after allowing for the removal of meteorological anomalies.[1] Three Project AQC are, nevertheless, based on percentiles, as shown in Table 3-3.

Table 3-3: Project Air Quality Criteria

COPC	Time Averaging Period/Statistic	Project AQC (µg/m³)
TSP	24-hour (Max)	120
	Annual (Average)	60
PM_{10}	24-hour (Max)	50
$PM_{2.5}$	24-hour (98th Percentile)	27
	Annual (Average)	8.8
CO	1-hour (Max)	14,885
	8-hour (Max)	5,725

COPC	Time Averaging Period/Statistic	Project AQC (µg/m³)
As	24-hour (Max)	0.3
Cd	24-hour (Max)	0.025
Cr	24-hour (Max)	0.5
Cu	24-hour (Max)	50
Hg	24-hour (Max)	2
Ni	24-hour (Max)	0.2
	Annual (Average)	0.04

[1] As per the *Alberta Air Quality Model Guideline* [10], predicted concentrations at ground level can be high due to extreme, rare, and transient meteorological conditions and any predicted concentration values above the 99.9th percentile for each receptor in each year can be disregarded. Thus, the 8 highest 1-hour predictions and the single highest 24-hour prediction at each receptor were discarded according to this method.

COPC	Time Averaging Period/Statistic	Project AQC (µg/m³)
SO_2	1-hour (99th Percentile)	183
	24-hour (Max)	149
	Annual (Average)	13
NO_2	1-hour (98th Percentile)	113
	24-hour (Max)	199
	Annual (Average)	32

COPC	Time Averaging Period/Statistic	Project AQC (µg/m³)
Pb	24-hour (Max)	0.5
Zn	24-hour (Max)	120
NH_3	24-hour (Max)	100

3.5.4 NOx to NO_2 Conversion

Emissions of nitrogen oxides (NOx) from combustion sources are comprised of nitric oxide (NO) and small amounts of nitrogen dioxide (NO_2). Over time, NO is converted to NO_2 through a series of chemical reactions in the atmosphere. Since the Project AQC are based on NO_2, a conversion method needs to be applied to NOx levels predicted by the air dispersion modelling in order to estimate corresponding levels of NO_2.

As discussed in both the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4], there are several valid methods for calculating the conversion of NOx to NO_2. These methods are applied sequentially, progressing from more conservative to more refined. These methods include:

- **Total Conversion of NOx to NO_2**: This method is the simplest and most conservative. The model-predicted concentrations of NOx are conservatively assumed to exist as 100% NO_2 and are directly compared to the applicable air quality criteria.

- **Ambient Ratio Method**: This method is typically applied as the first refinement to the Total Conversion Method. It is based on the premise that in-plume NO_2/NOx ratios change with distance from an emission source but that this ratio attains an equilibrium value at some distance away from the source. To employ this method, it is necessary to have at least one year of representative ambient hourly NO and NO_2 monitoring data for the Project site [3]. The monitoring data must also be collected from a robust network of monitoring stations established at various distances (15 km and 80 km) downwind of the Project site [4]. However, in the absence of high-quality NO and NO_2 monitoring data, it is permissible to apply a conservative default NO_2/NOx ratio of 70% [4].

- **Ozone Limiting Method**: This method is the most refined approach to calculating the conversion of NOx to NO_2. To employ this method, it is necessary to have at least one year of representative hourly ozone (O_3) monitoring data for the Project site [3]. The calculation method then proceeds as follows:

    - If the maximum measured O_3 concentration is *greater* than 90% of the model-predicted NOx concentration, then it is assumed that 100% of the NOx converts to NO_2; or

    - If O_3 is *less* than 90% of model-predicted NOx, then NO_2 is calculated as 10% of NOx plus an amount of NOx equal to the O_3 concentration.

  As noted in Section 4.0, baseline ambient concentrations of O_3 have not been measured at the Project site and the nearest permanent air quality monitor with available data (located in Whitehorse, Yukon) is not suitable due to the distance from the Project and the urban influences in the Whitehorse area.

However, the Alberta *Air Quality Model Guideline* [4] does provide default "rural" O_3 concentrations in the absence of applicable monitoring data. These data are summarized in Section 4.0.

This assessment employs the Ozone Limiting Method, which is expected to provide reasonable predictions of NO_2 concentrations within the LSA and RSA.

4.0 EXISTING AIR QUALITY

As discussed in Section 3.5, it is accepted practice that ambient background air concentrations be added to modelled air concentrations before comparing to applicable air quality standards. Both the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4] provide a detailed discussion of this exercise. Background (or baseline) air concentrations are defined as those concentrations due to emissions from both natural and human-caused sources that are the result of the contribution from all sources except the source(s) being modelled. Typically, background air concentrations are determined through air quality monitoring conducted in advance of the Project or by reference to air quality monitoring completed at nearby permanent air quality stations. In either case, 1 year of ambient monitoring data is typically required and the data must undergo rigorous validation and quality control to ensure that it is representative of conditions at the Project site.

As noted in the previous air quality assessment for the Project [12], the existing air quality at the Project site was expected to be "pristine." As such, the previous assessment assumed that ambient background concentrations of most COPC were negligible and that "ambient $PM_{2.5}$ concentrations are expected in the range of 2 to 3 µg/m³ during the summer months." In addition, the previous assessment presented assumed background concentrations for O_3, which were developed based on default O_3 levels for "rural" areas that are available in Appendix E of the Alberta *Air Quality Model Guideline* [4]. These background O_3 concentrations are summarized in Table 4-1 and were used as input to the Ozone Limiting Method for calculating the conversion of NOx to NO_2, as described in Section 3.5.4.

Table 4-1: Default O_3 Concentrations for "Rural" Areas

Averaging Period	O_3 Concentration (ppm)	O_3 Concentration (µg/m³) [(a)]
1-hour	0.047	94.0
24-hour	0.040	80.3
Annual	0.029	57.3

NOTES:
(a) For comparison to other concentrations presented, the default O_3 concentrations shown here are also converted from parts per million (ppm) to µg/m³ at standard conditions [16].

No permanent air quality monitoring station exists at the Project site or within the Dublin Gulch area. The closest permanent air quality monitoring station with available data is the Environment Canada National Air Pollution Surveillance Network (NAPS) station in Whitehorse, Yukon, which is located more than 360 km to the south of the Project site. In addition, measurements at the Whitehorse station are dominated by anthropogenic emission sources typical of an urban environment. As such, the previous air quality assessment also concluded that the background air quality data available from Whitehorse are not representative of conditions at the Project site.

Since the time that the previous air quality assessment was completed, SGC completed monitoring of background ambient air concentrations at the Project site. The collected data included the measurement of two particulate fractions (TSP and $PM_{2.5}$) during the spring of 2013. The results of this sampling campaign are presented in Table 4-2. In some cases, the measurements were below the method detection limit (MDL). For these samples, the measured concentration was conservatively assumed to be *equal* to the MDL.

Table 4-2: Ambient Air Quality Measurements at the Project Site

Date	Sample ID	Averaging Period	Air Quality Parameter	Measured Concentration (µg/m³)
3 March 2013	15085	24-hour	TSP	2.3
17 March 2013	15117	24-hour	TSP	2.1 [(a)]
23 March 2013	15103	24-hour	TSP	2.1 [(a)]
29 March 2013	15130	24-hour	TSP	4.3
4 April 2013	15098	24-hour	TSP	5.4
6 March 2013	15086	24-hour	$PM_{2.5}$	2.1 [(a)]
20 March 2013	15116	24-hour	$PM_{2.5}$	2.1 [(a)]
26 March 2013	15094	24-hour	$PM_{2.5}$	2.1

NOTES:

[(a)] For samples with measured concentrations below the MDL, the concentration was conservatively assumed to be equal to the MDL.

The data shown in Table 4-2 support the conclusion of the previous air quality assessment that existing air quality at the Project site is pristine. However, in order to apply these data as additive background concentrations in this air quality assessment, it was necessary to make several conservative assumptions:

- Since the 24-hour particulate sampling data are limited to TSP and $PM_{2.5}$, 24-hour PM_{10} concentrations were estimated by assuming that they were twice the measured $PM_{2.5}$ levels. This assumption is based on the work of Brook *et al*. [18], who concluded that on average $PM_{2.5}$ is approximately 50% of PM_{10}.

- Annual average concentrations of TSP, PM_{10} and $PM_{2.5}$ were estimated from the corresponding 24-hour particulate concentrations by employing the time-averaging conversion relationship[2] recommended by the Ontario MECP [19].

[2] As per the Ontario MECP guidance [19], it is permissible to use the following conservative relationship to convert air concentration estimates between different time-averaging periods:

$$C_1 = C_2 \left(\frac{T_2}{T_1}\right)^{0.28}$$

The background air quality data that were used in this assessment are summarized in Table 4-3. However, these concentrations are only applicable to some of the COPC (TSP, PM_{10} and $PM_{2.5}$). For the other COPC, it was not possible to determine an appropriate background concentration level that could be added to the model-predicted concentrations. As such, model results for those COPC are assessed only as incremental concentrations.

Table 4-3: Summary of Project Background Air Quality Concentrations

COPC	Period	Background Air Concentration (µg/m³)
TSP	24-hour	5.4
	Annual	1.0
PM_{10}	24-hour	4.8
$PM_{2.5}$	24-hour	2.4
	Annual	0.5

5.0 AIR EMISSIONS

This section of the report discusses the various emission sources considered in the air quality assessment and provides a summary of the emission rates for the assessment scenario. In general, the emission factors and calculation methods used to complete the emissions inventories were based on accepted best practice and estimation techniques that are commonly employed in jurisdictions across Canada. In most instances, there are no Canadian-specific estimation techniques and most regulators and practitioners defer to the compendium of estimation methods assembled by the U.S. EPA (known as AP-42 emission factors [20]). These methods form the core of the emissions inventory in this assessment. However, guidance from other organizations, such as the Western Regional Air Partnership [21] and the Australian Department of Environment and Energy [22], was also followed as appropriate, since these organizations have produced especially detailed estimation methods for certain activities not fully covered by the U.S. AP-42 methods (e.g., blasting emissions from mining operations). Details of the quantification methods are provided in Appendix A.

5.1 SOURCES OF PARTICULATE MATTER AND METALS

5.1.1 TSP, PM_{10} and $PM_{2.5}$

Fugitive dust is particulate matter (i.e., TSP, PM_{10} and $PM_{2.5}$) emitted from sources other than point sources (i.e., stacks). Fugitive dust at the Project site is primarily emitted from unpaved roads. To control road dust during summer (May to October), water and/or calcium carbonate will be applied to all site roads and pit and pile ramps, which was assumed to mitigate these emissions by 74% [21]. In the winter months (November to April), natural mitigation from snow/ice can control unpaved road dust by up to 90% [23]. Additionally, vehicle speeds at the Project site are assumed to be limited to 25 km/h along the site haul roads and ramps with a maximum site-wide speed limit of 40 km/h, which will also reduce the amount of road dust generated. The roads and

Where:
T_1 and T_2 = Time averaging periods under consideration (e.g., T_1 = 1 year = 8,760 hours and T_2 = 24 hours)
C_1 and C_2 = Air concentrations (µg/m³) at time averaging periods T_1 and T_2

ramps are also maintained during the summer months using a grader, which is itself a lesser source of particulate matter along the roads.

Within the pit, emissions of particulate matter are generated by the various mining activities, including blasting, drilling of blast holes, mechanical extraction and handling of the blasted material, and loading of the haul trucks. Particulate emissions are also generated when the ore and waste rock are handled outside the pit, such as when material is unloaded from the haul trucks at the primary crusher and WRSAs. A small amount of ore may be unloaded directly from the haul trucks to the HLF. Diesel fuel combustion associated with the mining equipment and haul trucks also generate particulate matter emissions (primarily in the $PM_{2.5}$ fraction).

Crushing and screening of the ore at the crushing plant is a major source of particulate matter emissions; however, these emissions are captured and controlled by the building's dust control systems before being released to the atmosphere through dedicated exhausts. The system of conveyors, transfer towers and stackers that transport the crushed ore to the HLF also emit fugitive dust. These emissions are mitigated by the partial enclosure of the conveyors and transfer towers and the use of variable height stackers at the HLF. Additional handling of the crushed ore for conditioning (e.g., lime addition) prior to stacking on the heap may also be a minor source of particulate matter emissions.

Wind erosion at the temporary stockpiles and WRSAs is another a source of fugitive dust, particularly in the summer when the piles are free of snow and ice. When winds are strong, erodible fines (i.e., small particles) can be picked up and dispersed by the wind. Fugitive dust is also generated at the stockpiles when material is added to or removed from the pile. In addition, the active portion of the WRSAs were assumed to be shaped and maintained using a bulldozer, which also generates particulate matter emissions. As noted in Section 3.2, only the Eagle Pup WRSA is active in Y4 with the Platinum Gulch WRSA having reached its final configuration in prior year (Y3). As such, it is assumed that the Platinum Gulch WRSA is not a significant source of fugitive dust emissions in the assessment year, since the majority of erodible material available to wind erosion will have been lost in previous years and reclamation/revegetation of the Platinum Gulch WRSA will be well underway.

Additional sources of particulate matter emissions (primarily in the $PM_{2.5}$ fraction) include other combustion sources at the Project site, such as the standby diesel generators, the heaters and boilers at the ADR facility, diesel and gasoline combustion associated with other equipment/vehicles on the site roads, and the waste incinerators.

5.1.2 Metals in TSP

Metals were assumed to be emitted as a fraction of TSP. The amount of metals emitted from a particular source is dependent upon on the composition of the parent material (e.g., ore, waste rock, overburden, etc.). The compositions of the various sources used in this assessment are discussed in Appendix A.

5.2 SOURCES OF NOx, SO_2 AND CO

Combustion of diesel, gasoline or propane fuel in surface equipment/vehicles (e.g., the standby diesel generators) results in emissions of gaseous COPC including NOx, SO_2, and CO. Specific combustion sources were described previously in Section 5.1. Blasting activities within the pit employ ammonium nitrate/fuel oil (ANFO) explosives, which also results in emissions of gaseous COPC including NOx, SO_2, and CO. Blasting activities are planned to occur no more than twice per week throughout the year (i.e., maximum of 100 blasts per year) and will be confined to the hours of 11:00 to 14:00.

5.3 Sources of NH_3

The electrowinning process at the ADR facility generates mists due to the evolution of gases within the tanks/cells. Resulting releases of NH_3 are captured by the air handling systems in the ADR facility and exhausted to the atmosphere through dedicated stacks.

5.4 Summary of Air Emission Rates

COPC emission rates were estimated for the assessment scenario described in Section 3.2 and emissions inventories were developed to capture the maximum or worst-case emission rates for each applicable time-averaging period. To do so, assumptions were made in the emissions calculations that have resulted in conservative emissions estimates. For example, the emission sources were assumed to operate concurrently at their individual maximum rates of production in order to estimate the worst-case emission rates in each of the scenarios. In reality, production rates will vary on a day-to-day basis and some activities may not actually occur simultaneously. However, this approach provides an upper bound estimate of air emissions for the assessment scenario and helps to ensure that the predicted COPC concentrations reflect the concurrence of maximum emission rates with worst-case meteorological conditions. Other assumptions that resulted in conservative emissions estimates are detailed in the emissions calculations provided in Appendix A.

Note that for some sources, like unpaved roads, emissions of particulate matter varied between summer (May to October) and winter (November to April) to account for differences in dust mitigation levels. As a result, both summer and winter emission rates are provided for some sources; however, rates for some COPC will be the same in both seasons. In addition, the short-term (i.e., 1-hour) emission rates for blasting activities are presented separately from the rest of the emissions inventory. For safety reasons, mining activities are halted during blasting events, which means that during those short periods, emissions from blasting and explosive detonation dominate. However, on a daily and annual basis, emissions from blasting are blended with the rest of the emission sources within the pit.

Table 5-1 provides the short-term maximum (i.e., 1-hour and 24-hour) emission rates for the normal mine operations in Y4, while Table 5-2 provides the short-term maximum (i.e., 1-hour) emission rates for blasting. Average annual emission rates for normal mine operations (including blasting) are provided in Table 5-3. As discussed in Section 3.2, these emissions scenarios were based on a planned annual ore extraction rate of 10.95 Mt/y and an annual waste rock extraction rate of 15.69 Mt/y.

The maximum emission rate of TSP occurs in summer and is 62.7 g/s. The dominant sources of TSP emissions are the unpaved site roads and pit/pile ramps and various mining activities within the pit itself. Maximum site-wide emission rates of PM_{10} and $PM_{2.5}$ were estimated to be 24.7 g/s and 3.9 g/s, respectively and gaseous emissions were 27.7 g/s for NOx, 0.80 g/s for SO_2, and 35.5 g/s for CO. PM_{10} and $PM_{2.5}$ emissions are dominated by unpaved roads and the pit and gaseous emissions are dominated combustion emissions from the standby diesel generators and other mine equipment/vehicles.

Table 5-1: Year 4 Short-term COPC Emission Rates for Normal Mine Operations

Source	Season	Emission Rate (g/s)														
		TSP	PM_{10}	$PM_{2.5}$	CO	SO_2	NOx	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	NH_3
Pit	Summer	1.40E+01	8.01E+00	1.10E+00	2.52E+01	7.18E-01	9.53E+00	3.54E-03	5.23E-06	1.37E-03	3.12E-04	1.54E-07	2.59E-04	2.78E-04	9.58E-04	0.00E+00
Pit	Winter	1.06E+01	6.13E+00	9.03E-01	2.52E+01	7.18E-01	9.52E+00	2.71E-03	4.11E-06	1.01E-03	2.45E-04	1.07E-07	1.98E-04	2.13E-04	7.57E-04	0.00E+00
Crushing	All	1.83E+00	6.69E-01	6.44E-01	1.86E-01	1.19E-03	5.83E-01	7.10E-04	1.34E-06	1.16E-04	6.72E-05	1.34E-09	4.24E-05	6.41E-05	2.61E-04	0.00E+00
Material Handling	All	3.59E+00	1.70E+00	2.57E-01	0.00E+00	0.00E+00	0.00E+00	1.40E-03	2.66E-06	2.29E-04	1.33E-04	2.66E-09	8.38E-05	1.27E-04	5.16E-04	0.00E+00
Agglomeration/Ore conditioning	All	5.62E-03	2.35E-03	1.02E-03	0.00E+00	0.00E+00	0.00E+00	1.39E-08	0.00E+00	9.47E-08	0.00E+00	0.00E+00	1.37E-07	3.57E-08	0.00E+00	0.00E+00
Stockpiles	Summer	2.83E+00	7.78E-01	1.26E-01	2.51E-02	9.21E-04	4.72E-01	6.93E-04	1.24E-06	2.72E-04	9.05E-05	1.53E-09	6.13E-05	4.62E-05	2.31E-04	0.00E+00
Stockpiles	Winter	5.43E+00	2.00E+00	3.06E-01	2.51E-02	9.21E-04	4.72E-01	1.72E-03	3.19E-06	4.35E-04	1.87E-04	3.46E-09	1.22E-04	1.39E-04	6.09E-04	0.00E+00
Heap Leach Pad	Summer	2.41E+00	1.14E+00	1.74E-01	0.00E+00	0.00E+00	0.00E+00	9.44E-04	1.79E-06	1.54E-04	8.93E-05	1.79E-09	5.63E-05	8.53E-05	3.47E-04	0.00E+00
Heap Leach Pad	Winter	2.40E+00	1.13E+00	1.72E-01	0.00E+00	0.00E+00	0.00E+00	9.38E-04	1.77E-06	1.53E-04	8.87E-05	1.77E-09	5.60E-05	8.47E-05	3.45E-04	0.00E+00
Roads	Summer	3.77E+01	1.20E+01	1.28E+00	9.20E+00	5.05E-03	2.58E+00	1.01E-02	1.37E-05	4.31E-03	8.11E-04	5.84E-07	7.39E-04	7.91E-04	2.46E-03	0.00E+00
Roads	Winter	2.58E+01	8.21E+00	8.98E-01	9.18E+00	4.89E-03	2.50E+00	6.90E-03	9.35E-06	2.95E-03	5.55E-04	3.99E-07	5.06E-04	5.41E-04	1.68E-03	0.00E+00
Incinerator	All	1.43E-03	1.43E-03	1.43E-03	3.65E-04	1.01E-04	1.04E-03	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
Generators	All	1.84E-01	1.84E-01	1.84E-01	7.76E-01	7.20E-02	1.41E+01	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
ADR - Boilers	All	3.92E-02	3.92E-02	3.92E-02	9.81E-02	4.18E-03	3.53E-01	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
ADR - Kiln	All	4.69E-03	4.69E-03	4.69E-03	1.17E-02	4.99E-04	4.22E-02	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
ADR - Electrowinning	All	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	4.77E-04
ADR - Melt Furnace	All	1.39E-01	1.31E-01	1.28E-01	0.00E+00	2.19E-03	0.00E+00	2.23E-07	2.27E-11	3.64E-08	2.74E-09	4.22E-13	1.33E-08	9.26E-09	8.20E-08	0.00E+00
Total	Summer	6.27E+01	2.47E+01	3.94E+00	3.55E+01	8.04E-01	2.77E+01	1.74E-02	2.59E-05	6.45E-03	1.50E-03	7.45E-07	1.24E-03	1.39E-03	4.77E-03	4.77E-04
	Winter	5.00E+01	2.02E+01	3.54E+00	3.55E+01	8.04E-01	2.76E+01	1.44E-02	2.24E-05	4.89E-03	1.28E-03	5.15E-07	1.01E-03	1.17E-03	4.17E-03	4.77E-04

NOTES:
[1] Sources marked with "summer" and "winter" have different emission rates in those seasons (i.e., "summer" is defined as May to October and "winter" is November to April). Sources mark with "all" have the same (i.e., constant) emission rates throughout the year.
TSP and PM_{10} emissions from sources in the pit are reduced by 50% and 5%, respectively, to account for retention of particulate within the pit. Emissions of metals are also reduced by 50% to account for pit retention [24].

Table 5-2: Year 4 Short-term COPC Emission Rates for Blasting

Source	Season	Emission Rate (g/s)														
		TSP	PM_{10}	$PM_{2.5}$	CO	SO_2	NOx	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	NH_3
Blasting	All	2.80E+01	2.77E+01	1.68E+00	5.80E+02	1.71E+01	1.36E+02	7.60E-03	1.38E-05	2.54E-03	9.22E-04	1.61E-08	6.16E-04	5.53E-04	2.60E-03	0.00E+00

NOTES:
TSP and PM_{10} emissions from sources in the pit are reduced by 50% and 5%, respectively, to account for retention of particulate within the pit. Emissions of metals are also reduced by 50% to account for pit retention [24].

Table 5-3: Year 4 Annual COPC Emission Rates for Normal Mine Operations

Source	Season	Emission Rate (g/s)														
		TSP	PM_{10}	$PM_{2.5}$	CO	SO_2	NOx	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	NH_3
Pit	Summer	1.29E+01	6.95E+00	9.58E-01	7.92E+00	2.11E-01	5.47E+00	3.24E-03	4.69E-06	1.27E-03	2.76E-04	1.54E-07	2.35E-04	2.57E-04	8.57E-04	0.00E+00
Pit	Winter	9.46E+00	5.07E+00	7.60E-01	7.92E+00	2.11E-01	5.46E+00	2.41E-03	3.57E-06	9.14E-04	2.09E-04	1.06E-07	1.74E-04	1.92E-04	6.56E-04	0.00E+00
Crushing	All	1.12E+00	4.12E-01	3.96E-01	1.86E-01	1.19E-03	5.83E-01	4.30E-04	8.13E-07	7.00E-05	4.07E-05	8.13E-10	2.56E-05	3.88E-05	1.58E-04	0.00E+00
Material Handling	All	2.27E+00	1.07E+00	1.63E-01	0.00E+00	0.00E+00	0.00E+00	8.88E-04	1.68E-06	1.45E-04	8.40E-05	1.68E-09	5.30E-05	8.02E-05	3.26E-04	0.00E+00
Agglomeration/Ore conditioning	All	2.56E-03	1.13E-03	3.33E-04	0.00E+00	0.00E+00	0.00E+00	6.93E-09	0.00E+00	4.74E-08	0.00E+00	0.00E+00	6.83E-08	1.78E-08	0.00E+00	0.00E+00
Stockpiles	Summer	2.25E+00	5.03E-01	8.15E-02	2.51E-02	9.21E-04	4.72E-01	5.19E-04	9.23E-07	2.24E-04	7.09E-05	1.17E-09	4.84E-05	3.26E-05	1.70E-04	0.00E+00
Stockpiles	Winter	4.09E+00	1.37E+00	2.09E-01	2.51E-02	9.21E-04	4.72E-01	1.24E-03	2.29E-06	3.39E-04	1.39E-04	2.54E-09	9.12E-05	9.82E-05	4.36E-04	0.00E+00
Heap Leach Pad	Summer	1.48E+00	6.99E-01	1.06E-01	0.00E+00	0.00E+00	0.00E+00	5.78E-04	1.09E-06	9.42E-05	5.47E-05	1.09E-09	3.45E-05	5.22E-05	2.12E-04	0.00E+00
Heap Leach Pad	Winter	1.47E+00	6.96E-01	1.05E-01	0.00E+00	0.00E+00	0.00E+00	5.75E-04	1.09E-06	9.38E-05	5.44E-05	1.09E-09	3.43E-05	5.20E-05	2.11E-04	0.00E+00
Roads	Summer	3.77E+01	1.20E+01	1.28E+00	9.20E+00	5.05E-03	2.58E+00	1.01E-02	1.37E-05	4.31E-03	8.11E-04	5.84E-07	7.39E-04	7.91E-04	2.46E-03	0.00E+00
Roads	Winter	2.58E+01	8.21E+00	8.98E-01	9.18E+00	4.89E-03	2.50E+00	6.90E-03	9.35E-06	2.95E-03	5.55E-04	3.99E-07	5.06E-04	5.41E-04	1.68E-03	0.00E+00
Incinerator	All	1.43E-03	1.43E-03	1.43E-03	3.65E-04	1.01E-04	1.04E-03	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
Generators	All	1.84E-01	1.84E-01	1.84E-01	7.76E-01	7.20E-02	1.41E+01	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
ADR - Boilers	All	3.92E-02	3.92E-02	3.92E-02	9.81E-02	4.18E-03	3.53E-01	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
ADR - Kiln	All	4.69E-03	4.69E-03	4.69E-03	1.17E-02	4.99E-04	4.22E-02	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
ADR - Electrowinning	All	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	4.77E-04
ADR - Melt Furnace	All	1.39E-01	1.31E-01	1.28E-01	0.00E+00	2.19E-03	0.00E+00	2.23E-07	2.27E-11	3.64E-08	2.74E-09	4.22E-13	1.33E-08	9.26E-09	8.20E-08	0.00E+00
Total	Summer	5.81E+01	2.20E+01	3.34E+00	1.82E+01	2.97E-01	2.36E+01	1.57E-02	2.29E-05	6.11E-03	1.34E-03	7.42E-07	1.13E-03	1.25E-03	4.18E-03	4.77E-04
	Winter	4.46E+01	1.72E+01	2.89E+00	1.82E+01	2.97E-01	2.35E+01	1.24E-02	1.88E-05	4.51E-03	1.08E-03	5.11E-07	8.84E-04	1.00E-03	3.47E-03	4.77E-04

NOTES:
[1] Sources marked with “summer” and “winter” have different emission rates in those seasons (i.e., “summer” is defined as May to October and “winter” is November to April). Sources mark with “all” have the same (i.e., constant) emission rates throughout the year.
TSP and PM_{10} emissions from sources in the pit are reduced by 50% and 5%, respectively, to account for retention of particulate within the pit. Emissions of metals are also reduced by 50% to account for pit retention [24].

6.0 AIR QUALITY MODEL RESULTS

The COPC emissions rates presented in Section 5.0 were carried forward to the air dispersion modelling exercise. Each emissions source was represented in the CALPUFF model, which was run for the entire RSA (and area of more than 9,000 km²) with single year of meteorology (see Section 3.4 and Appendix B for further details).

Results of the air dispersion modelling are presented in Table 6-1 and Table 6-2 and presented graphically in Figure 3 through Figure 31. Where possible, background COPC concentrations have been added to the incremental COPC concentrations predicted by the model before being compared against the Project AQC. It is important to note that the short-term (1-h, 8-h, 24-h) predicted COPC concentrations shown in the Figures represent the maximum (i.e., single highest) or percentile (i.e., n^{th} highest) concentration predicted by the model at each location, at any time during the assessment period. By contrast, the annual predicted COPC concentrations represent the average concentration predicted by the model at each location over the full 1-year meteorological period.

As discussed in Sections 3.2 and 5.0, the emission rates used in the modelling were conservatively based on maximum production rates, which were expected to occur in Y4 of the Project. Emissions of COPC occurring during other years are therefore expected to be lower than emissions in Y4. In addition, the air emission estimates conservatively assumed that individual activities at the Project site will operate at their individual maximum daily capacity every day over the entire meteorological assessment period. Thus, actual emissions of COPC from Project activities are expected to be substantially less than the emission rates considered in this assessment most of the time. As such, this dispersion modelling assessment considers an upper bounding case for Project operations that helps to ensure that the predicted COPC concentrations reflect the concurrence of maximum emission rates with worst-case meteorological conditions. This conservative approach is expected to adequately capture the potential maximum effects from any year of operations in the current mine schedule (i.e., Y1 to Y9). As discussed in Section 3.2, air quality effects of construction and decommissioning activities are also expected to be substantially lower than during operations.

Given these considerations and the multiple levels of conservativism built into the assessment, it is expected that actual air concentrations of COPC due to the Project will be substantially lower than those predicted by the model.

6.1 PARTICULATE MATTER

Table 6-1 presents the model predicted 24-hour and annual concentrations of TSP, PM_{10}, and $PM_{2.5}$ (including background) for the nearest human receptor (the on-site workers' camp) and maximum predicted locations, which occur along the Project fenceline. Aside from the camp, there are no known sensitive human receptor locations (e.g., hunting or fishing camps) that fall within the LSA; however, local hunting and small-scale placer mining activities do occur at a few locations within the LSA and RSA. While the potential for air quality effects of the Project have been conservatively assessed at the Project fenceline, the actual potential for human exposure to elevated air quality levels within the LSA is expected to be very low.

As shown in Table 6-1, maximum 24-hour concentrations of TSP and PM_{10} are predicted to be above the applicable Project AQC of 120 µg/m³ and 50 µg/m³, which are located directly adjacent to the Eagle Pup WRSA (TSP) and Platinum Gulch WRSA (PM_{10}). The overall maximum TSP and PM_{10} concentrations are 367.9 µg/m³ and 210.5 µg/m³, respectively. The maximum 24-hour $PM_{2.5}$ concentrations were below the Project AQC.

Annual TSP, PM_{10} and $PM_{2.5}$ concentrations were also predicted to be below the Project AQC of 60 µg/m³ and 8.8 µg/m³. The 24-hour and annual predicted concentrations for particulates are below the Project AQC at the worker camp.

As shown in Figure 3 and Figure 4, predicted maximum 24-hour and annual concentrations of TSP are elevated near the Project fenceline, with the overall maxima occurring adjacent to the Eagle Pup WRSA. Similarly, isopleths of predicted 24-hour PM_{10} and $PM_{2.5}$ are highest along the Project fenceline south of the Platinum Gulch WRSA. As expected, this dispersion pattern suggests that dust generated by material handling and traffic along unpaved site roads and pit/pile ramps dominate TSP, PM_{10} and $PM_{2.5}$ concentrations during future operations.

While predicted annual average TSP remained below the applicable Project AQC, the nature of the predicted TSP and PM_{10} exceedances of 24-hr Project AQC was examined by completing a frequency analysis was completed. The results of the frequency analysis are also summarized in Table 6-1 for the maximum predicted location at the edge of the Project fenceline and presented graphically in Figure 5 and Figure 7, which correspond to the predicted concentrations of TSP and PM_{10}, respectively. The analysis showed that maximum 24-hour TSP concentrations at the Project fenceline was expected to exceed the applicable Project AQC of 120 µg/m³ 29 days per year (i.e., 8% of the time). Similarly, 24-hour PM_{10} concentrations are predicted to exceed the applicable Project AQC 34 days per year (9% of the time). However, as shown in the figures, the spatial extent of the predicted exceedances is limited to areas near the southern and north eastern extents of Project fenceline and the frequency of predicted exceedances falls off rapidly with distance. For example, while elevated concentrations of 24-hour TSP are predicted within approximately 1,500 m of the Project fenceline, the frequency of exceedances at this distance is expected to be only a single day per year (i.e., 0.3% of the time). By comparison, exceedances of 24-hour PM_{10} are predicted to occur no more than 1 day per year (i.e., 0.3 % of the time) within approximately 500 m of the Project footprint.

As mentioned in Section 4.0, conservative background air concentrations of particulate matter have been added to the maximum (or 98th percentile) particulate air concentrations predicted by the air dispersion model. Therefore, actual future concentrations of TSP, PM_{10} and $PM_{2.5}$ and the number of exceedances is likely to be substantially less than what has been predicted in this assessment.

6.2 Gaseous COPC

The predicted incremental concentrations of gaseous COPC (NO_2, SO_2, CO, and NH_3) associated with normal operations at the Project site are provided in Table 6-1. Contour plots for these COPC are provided in Figure 10 through Figure 19. As mentioned earlier, measurements of background air concentrations of gaseous COPC at the Project site or in LSA are not available. Therefore, predicted concentrations of NO_2, SO_2, CO, and NH_3 are presented as incremental concentrations (i.e., without the addition of background; see Section 4.0).

As shown in Table 6-1 and the figures, no exceedances of the Project AQC are predicted at the worker camp and the predicted concentrations of all gaseous COPC are well below the applicable Project AQC at the Project fenceline, with one exception. The predicted 98th percentile 1-hour NO_2 concentrations due to emissions from normal Project operations are expected to be above the applicable Project AQC of 113 µg/m³ along the Project fenceline in an area adjacent to the pit and WRSAs (Figure 15).

To examine the nature of the elevated 98th percentile 1-hour NO_2, a frequency analysis was completed. The results of the analysis are also summarized in Table 6-1 and presented graphically in Figure 18. Together, the table and figures illustrate that the predicted number and extent of the elevated 1-hour NO_2 concentrations are very limited. The maximum number of predicted exceedances of 1-hour NO_2 is 49 hours per year (or about 0.6% of the time), which is restricted to a very small area along the Project fenceline south of the pit between the explosive's storage area and the Platinum Gulch WRSA.

In addition, the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4] note that the Ozone Limiting Method (OLM; see Section 3.5.4) used to convert NOx to NO_2 is conservative [1]. Therefore, actual concentrations of NO_2 and the number of exceedances of the 1-hour Project AQC are likely to be substantially less than what has been predicted by the model.

6.2.1 Gaseous COPC Due to Blasting

As discussed in the Section 5.3, blasting operations at the Project site also emit gaseous COPC (CO, SO_2, NO_2). On a short-term (i.e., 1-hour) basis, these sources of emissions dominate, as other site mining operations are suspended during blasting for safety reasons. In addition, explosives detonation during blasting does cause sizable short-term spikes in predicted 1-hour concentrations of CO, SO_2 and NO_2. Thus, short-term air quality effects due to blasting operations are also assessed separately from normal site operations.

Table 6-2 presents the predicted maximum, 99th percentile and 98th percentile incremental 1-hour concentrations of CO, SO_2 and NO_2, respectively, due to blasting emissions at the workers' camp and at the Project fenceline. Results for the same three gaseous COPC are presented graphically in and Figure 20, Figure 21 and Figure 22. As shown in Table 6-2 and the figures, concentrations at the camp and along the Project Fenceline are predicted to remain below the Project AQC. The maximum 1-hr concentration of CO and NO_2 along the Project fenceline are 95% and 84% of their respective Project AQCs.

In addition, as discussed in Section 5.3, blasting activities are expected to occur infrequently (i.e., no more than 100 times per year) and the emissions from each blast are expected to disperse quickly. As a result, blast-related emissions will occur no more than 100 hours per year (i.e., about 1% of the time) and it is very unlikely that each blast hour will coincide with worst-case meteorological conditions. As such, the results presented in Table 6-2 and the figures are expected to be conservative. Actual concentrations of CO, SO_2 and NO_2 and the number of exceedances of the applicable 1-hour Project AQC are likely to be substantially less than what has been predicted by the model.

6.3 METALS

Table 6-1 shows the maximum predicted concentrations of all metal COPC included in this assessment. Note that unlike the predictions for particulate (discussed above) the predictions for metallic COPC are presented as incremental concentrations (i.e., without the addition of background concentrations; see Section 4.0) since no measurements of background air concentrations are available. The incremental concentrations of the metals are also presented graphically in Figure 23 through Figure 31. As shown in Table 6-1 and the figures, the predicted values for most metals are a small fraction (most less than 1%) of the applicable Project AQC at the Project fenceline. Predicted concentrations of arsenic are slightly elevated; however, the concentration remains at only 46% of its respective 24-hour Project AQC. Overall, there are no predicted exceedances of Project AQC for metals at the workers camp, or in the broader LSA.

Table 6-1: Year 4 Maximum Predicted Concentrations of COPC at Due to Emissions from Normal Operations

COPC		Time Averaging Period	Project AQ Criteria (µg/m³)	Workers' Camp (On Site)		Maximum Location (Edge of Project Footprint)				
				Max Predicted Conc. (µg/m³)	% of Criteria	Max Predicted Conc. (µg/m³)	% of Criteria	Predicted No. of Elevated Conc.	Location of Max UTM X	Location of Max UTM Y
Particulate	TSP	24-hour (Max)	120	46.1	38%	367.9	**307%**	**29 days per year**	460.746	7101.438
		Annual (Average)	60	13.3	22%	32.3	54%	NA	460.824	7101.361
	PM_{10}	24-hour (Max)	50	21.1	42%	210.5	**421%**	**34 days per year**	459.653	7098.308
	$PM_{2.5}$	24-hour (98th Percentile)	27	4.7	17%	20.6	76%	0 days per year	459.653	7098.308
		Annual (Average)	8.8	1.2	14%	2.7	31%	NA	459.653	7098.308
Gases	CO	1-hour (Max)	14,885	856.6	6%	2,115.9	14%	0 hours per year	461.165	7099.578
		8-hour (Max)	5,725	591.8	10%	959.9	17%	0 hours per year	461.168	7099.482
	SO_2	1-hour (99th Percentile)	183	1.0	1%	19.0	10%	0 hours per year	459.653	7098.308
		24-hour (Max)	149	0.6	0.4%	13.4	9%	0 days per year	459.653	7098.308
		Annual (Average)	13	0.03	0.2%	0.28	2%	NA	459.653	7098.308
	NO_2	1-hour (98th Percentile)	113	38.4	34%	115.9	**103%**	**49 hours per year**	459.653	7098.308
		24-hour (Max)	199	24.1	12%	104.4	52%	0 days per year	459.653	7098.308
		Annual (Average)	32	2.3	7%	11.8	37%	NA	457.742	7099.001
	NH_3	24-hour (Max)	100	0.0007	0.001%	0.0045	0%	0 days per year	460.206	7103.060
Metals	As	24-hour (Max)	0.3	0.0140	5%	0.1372	46%	0 days per year	459.653	7098.308
	Cd	24-hour (Max)	0.025	0.00002	0.1%	0.00021	1%	0 days per year	459.653	7098.308
	Cr	24-hour (Max)	0.5	0.0057	1%	0.0515	10%	0 days per year	460.757	7101.425
	Cu	24-hour (Max)	50	0.0011	0.002%	0.0120	0%	0 days per year	459.653	7098.308
	Hg	24-hour (Max)	2	0.000001	0.0001%	0.000007	0%	0 days per year	460.757	7101.425
	Ni	24-hour (Max)	0.2	0.0010	1%	0.0096	5%	0 days per year	459.653	7098.308
		Annual (Average)	0.04	0.0003	1%	0.0008	2%	NA	460.824	7101.361
	Pb	24-hour (Max)	0.5	0.0011	0.2%	0.0111	2%	0 days per year	459.653	7098.308
	Zn	24-hour (Max)	120	0.0035	0.003%	0.0392	0%	0 days per year	459.653	7098.308

NOTES:
1 **Bold** and yellow highlighted values indicate predicted concentrations that are above the Project AQC (see Section 3.5.3).
2 Predicted concentrations are presented after removal of meteorological anomalies as per the *Alberta Air Quality Model Guideline* [10].
Results for TSP, PM_{10} and $PM_{2.5}$ include the addition of background air concentrations (see Section 4.0). Results for all other COPC do not include background.

Table 6-2: Year 4 Maximum Predicted Concentrations of COPC at Due to Emissions from Blasting

COPC		Time Averaging Period	Project AQ Criteria (µg/m³)	Workers' Camp (On Site)		Maximum Location (Edge of Project Footprint)			
				Max Predicted Conc. (µg/m³)	% of Criteria	Max Predicted Conc. (µg/m³)	% of Criteria	Location of Max	
								UTM X	UTM Y
Gases	CO	1-hour (Max)	14,885	907.6	6%	14,163.3	95%	459.653	7098.308
	SO_2	1-hour (99th Percentile)	183	8.3	5%	36.7	20%	459.653	7098.308
	NO_2	1-hour (98th Percentile)	113	28.4	25%	94.6	84%	459.653	7098.308

NOTES:
[1] **Bold** and yellow highlighted values indicate predicted concentrations that are above the Project AQC (see Section 3.5.3).
[2] Predicted concentrations are presented after removal of meteorological anomalies as per the *Alberta Air Quality Model Guideline* [10].
Results for TSP, PM_{10} and $PM_{2.5}$ include the addition of background air concentrations (see Section 4.0). Results for all other COPC do not include background.

7.0 CONCLUSION

On the basis of the above, the following points summarize the results of the air quality modelling assessment:

Worst Case Conditions During Normal Operations

- For the normal operations assessment scenario, the predicted maximum 24-hour and average annual concentrations of particulate matter (TSP, PM_{10}), 98th percentile 1-hour concentrations of NO_2 were predicted to be above the applicable Project AQC at the Project fenceline. No exceedances of Project AQC were predicted for the receptor at the on-site workers camp.

- As expected, the highest particulate matter concentrations were predicted to occur along the Project fenceline northeast and south of the pit and adjacent to the Platinum Gulch and Eagle Pup WRSA. This dispersion pattern suggests that dust generated by material handling and traffic along unpaved site roads and pit/pile ramps are the dominant drivers of airborne particulate matter. The elevated concentrations of 24-hour TSP and PM_{10} were limited to areas along the Project fenceline and the frequency of predicted exceedances falls off rapidly with distance.

- Elevated 98th percentile 1-hour concentrations of NO_2 were also predicted along the southern edge of the Project fenceline. For normal mine operations, the highest NO_2 concentrations were predicted to occur south of the pit and adjacent to the Platinum Gulch WRSA. This dispersion pattern is consistent with the expectation that fuel combustion associated with the mobile equipment and haul trucks, as well as the stationary diesel-electric generators, will be the dominant source of NO_2. A frequency analysis confirmed that the elevated concentrations were confined to a very small area near the southern edge of the Project footprint and decline rapidly with distance from Project footprint.

Worst Case Conditions During Normal Blasting

- For the separate short-term assessment of blasting operations, maximum, 99th percentile and 98th percentile 1-hour concentrations of CO, SO_2 and NO_2 were predicted to be below the Project AQC along the Project fenceline. Blasting activities occur infrequently (i.e., no more than 100 times per year) and the emissions from each blast are expected to disperse quickly. As a result, blast-related air quality effects will occur no more than 100 hours per year (i.e., about 1% of the time) and its is unlikely that each blast hour will coincide with worst-case meteorological conditions. Again, no exceedances of Project AQC were predicted for the receptor at the on-site works' camp.

8.0 REFERENCES

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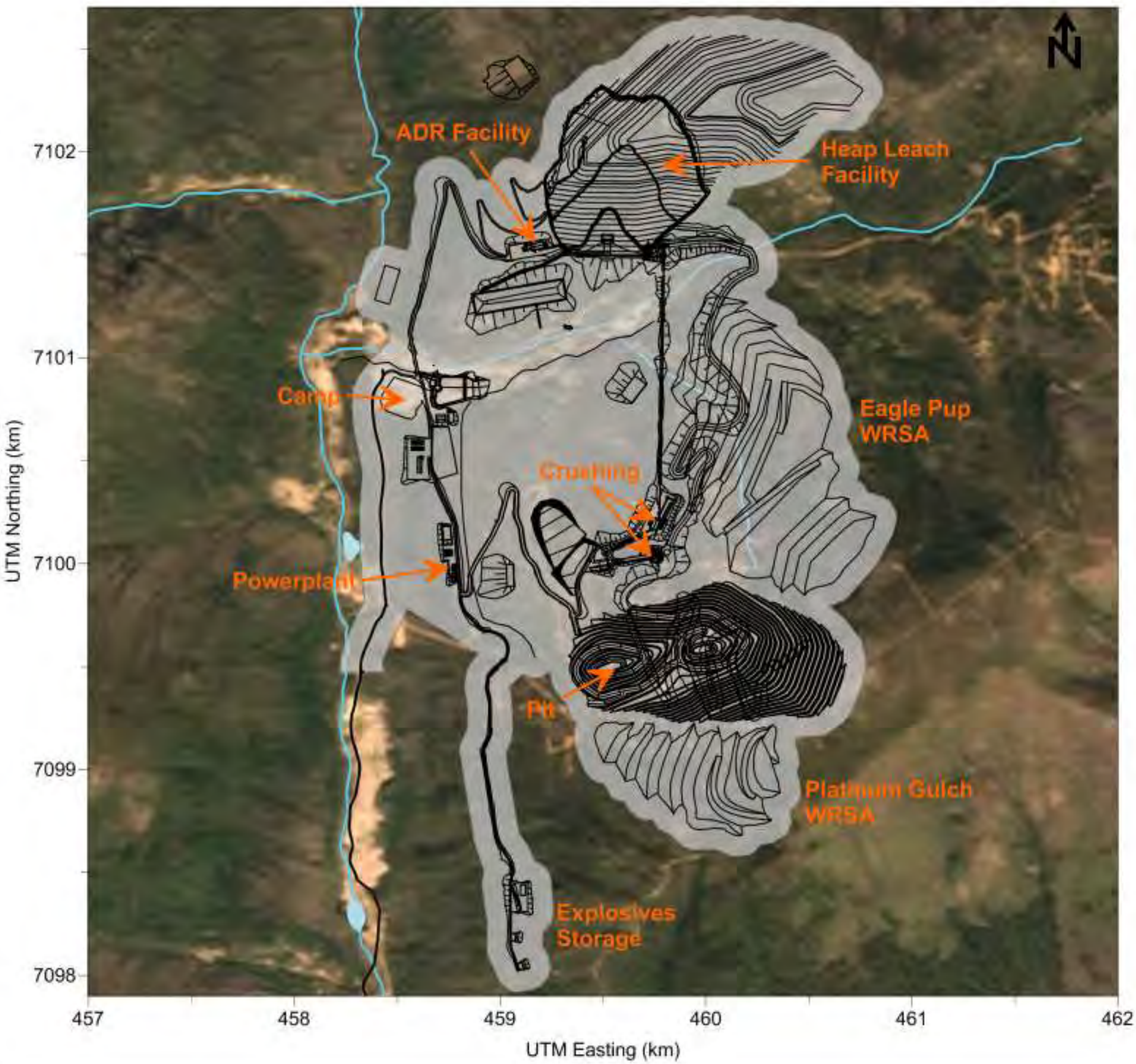
Figures:



LEGEND:

Site Footprint (100 m buffer)

Site Roads and Infrastructure

NOTES:

SCALE:

0 km 0.5 km 1 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

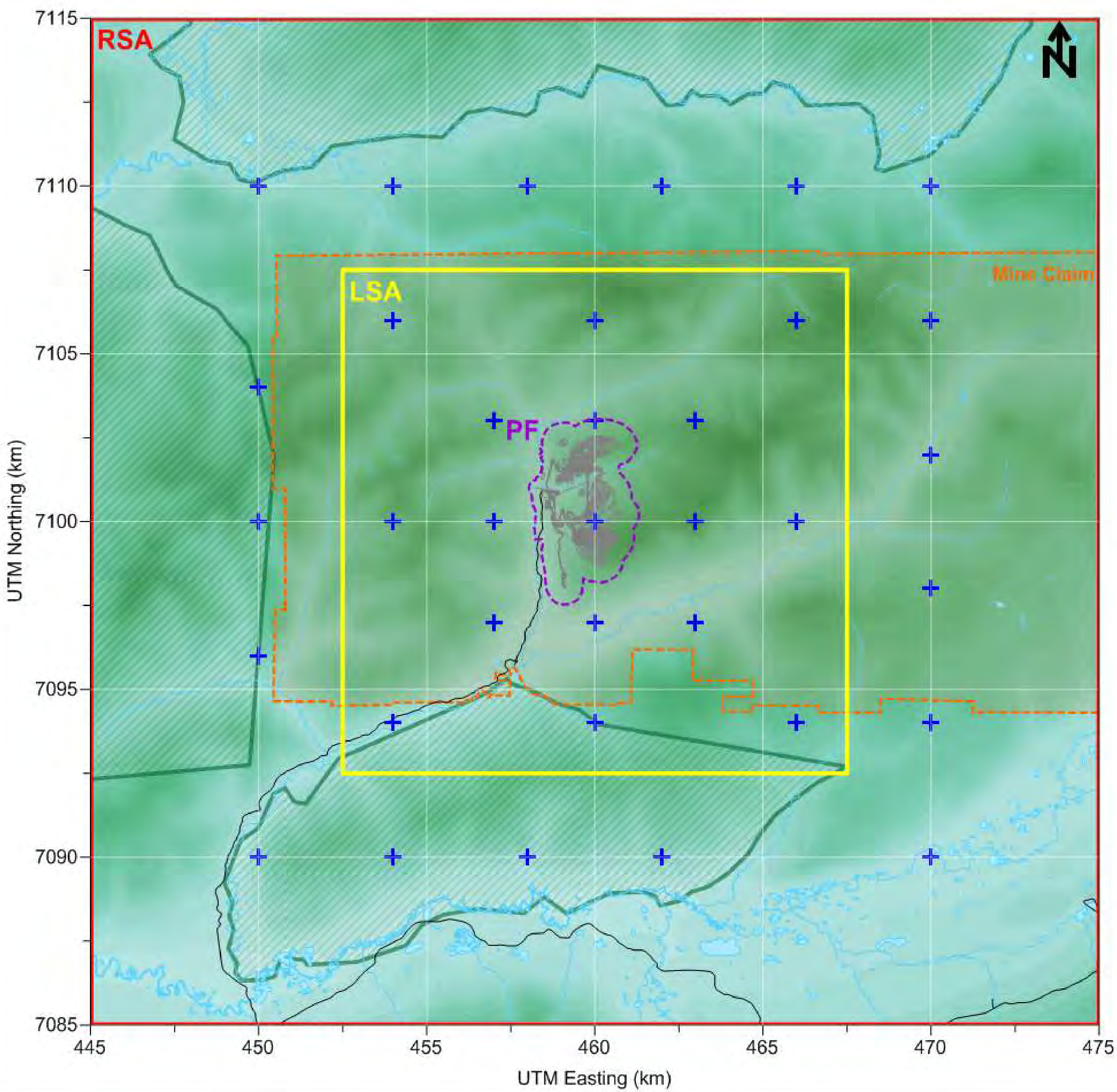
WGS84 UTM Zone 8N

Victoria Gold Corp.

Eagle Gold Mine, Yukon

Site Layout

Drawn By:	Approved By:	Figure No.:
JAHF	PLK	1
Date: April 2019	Project No.: SX16-0004	



LEGEND:

- Site Footprint and Infrastructure
- Access Road
- Regional Study Area (RSA)
- Local Study Area (LSA)
- Mine Claim Boundary
- Project Fenceline (PF)
- Na-cho Nyak Dun First Nation Settlement Land
- WRF-NMM/CALMET Pesudo-observation Points

NOTES:

SCALE:

0 km 2 km 4 km 6 km

REVISIONS:

No.	Date	By	Revision

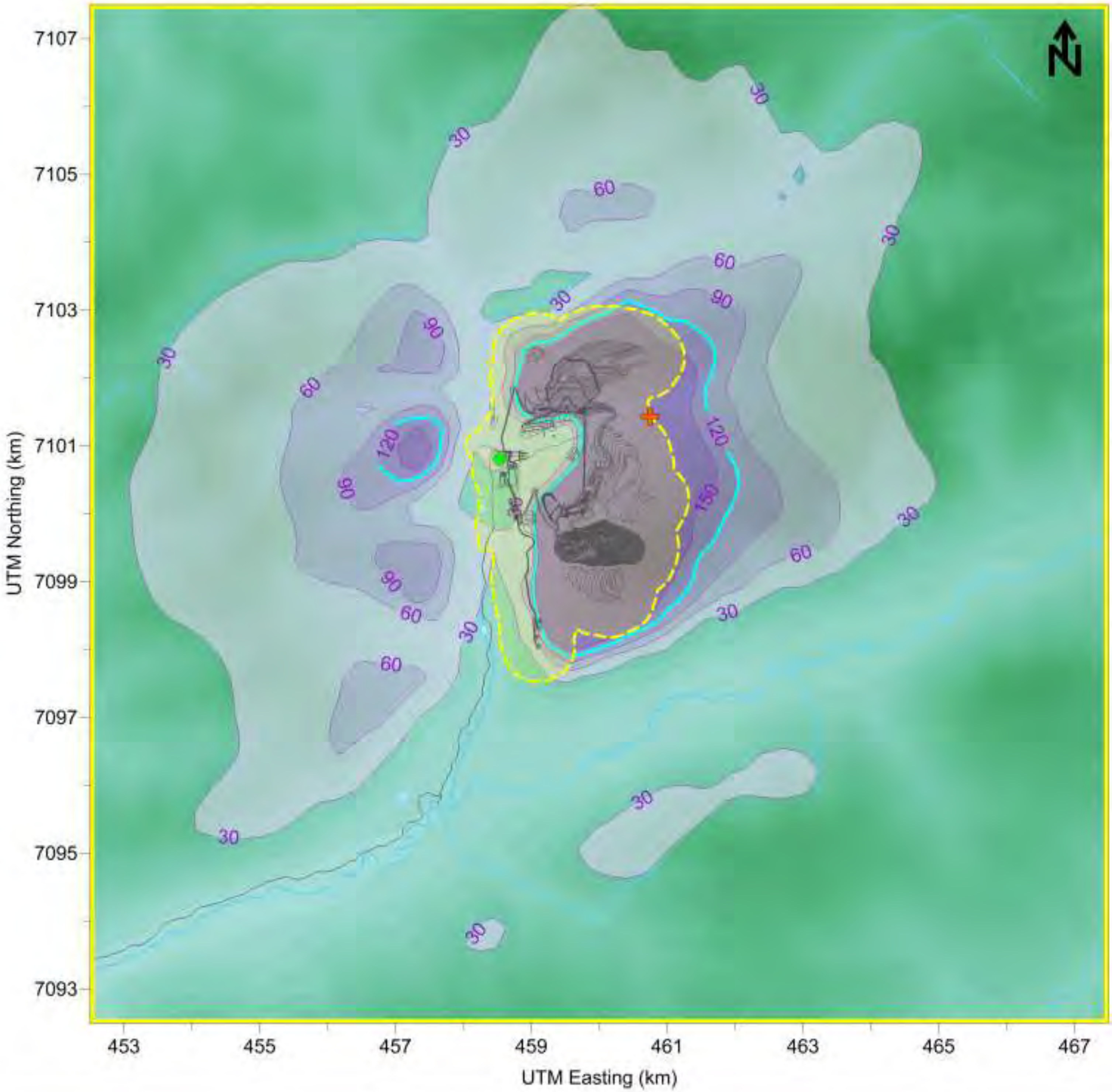
REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

Local and Regional Study Areas, Mine Claim and Project Fenceline

Drawn By:	Approved By:	Figure No.:
JAHF	PLK	2
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
2. Predicted particulate concentrations include the addition of a conservative background air concentration.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

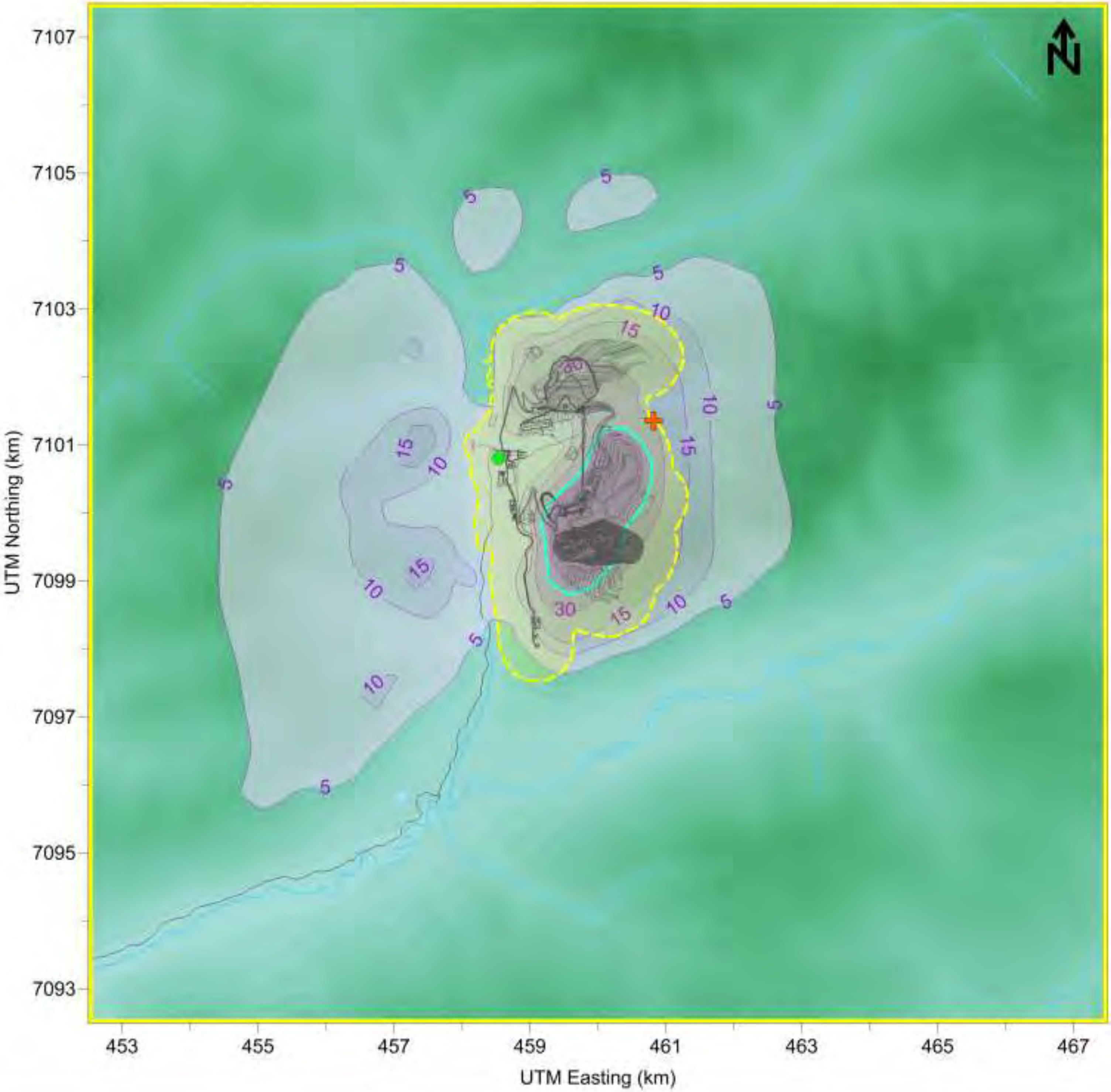
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum 24-h
TSP Concentrations (μg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	3
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
2. Predicted particulate concentrations include the addition of a conservative background air concentration.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

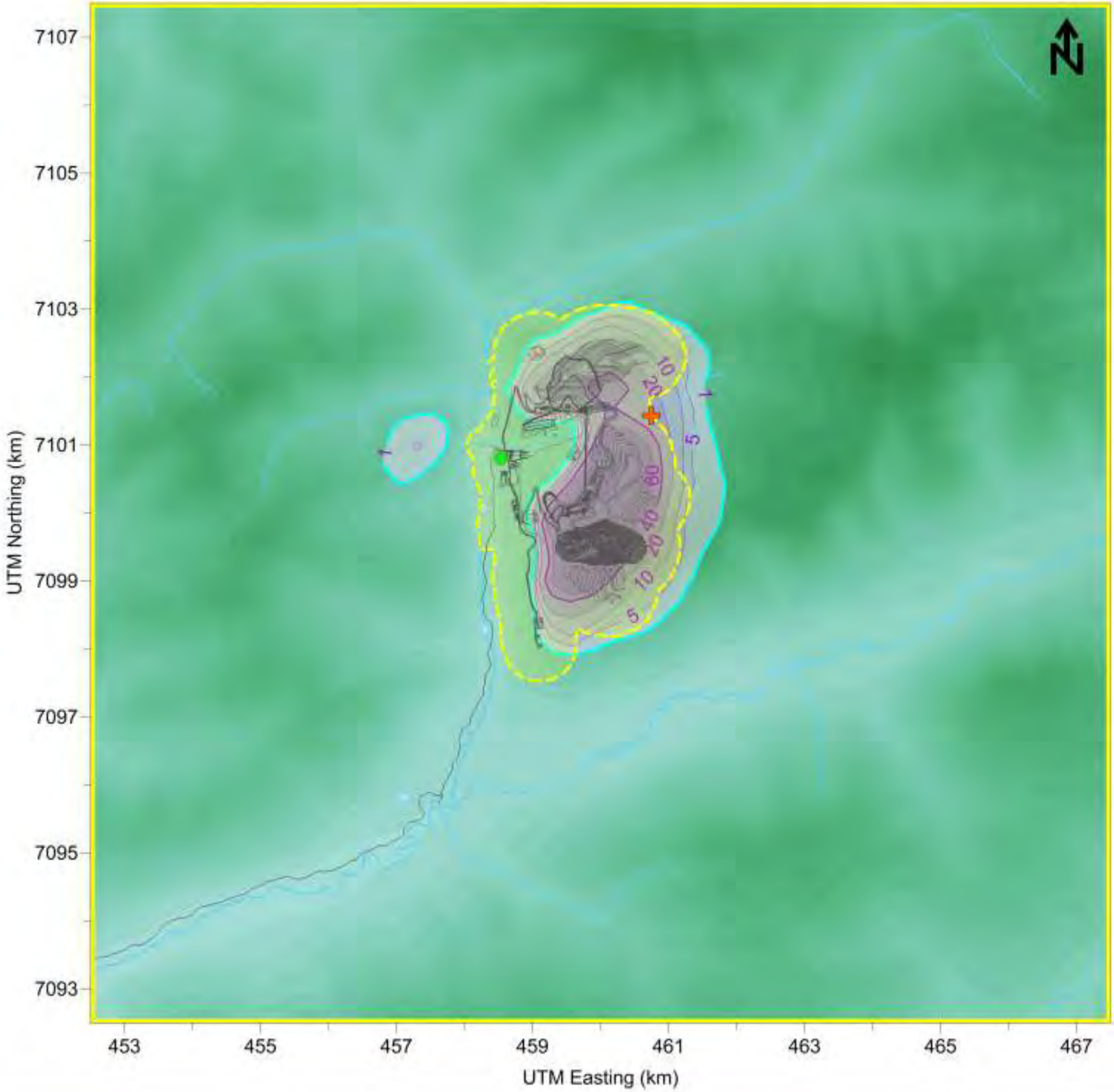
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Annual Average
TSP Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	4
Date: July 2019	Project No.: SX16-0004	



LEGEND:

No. of Exceedances (hours/year)

Property Boundary

Camp Receptor

Max Location (Off-Property)

NOTES:

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

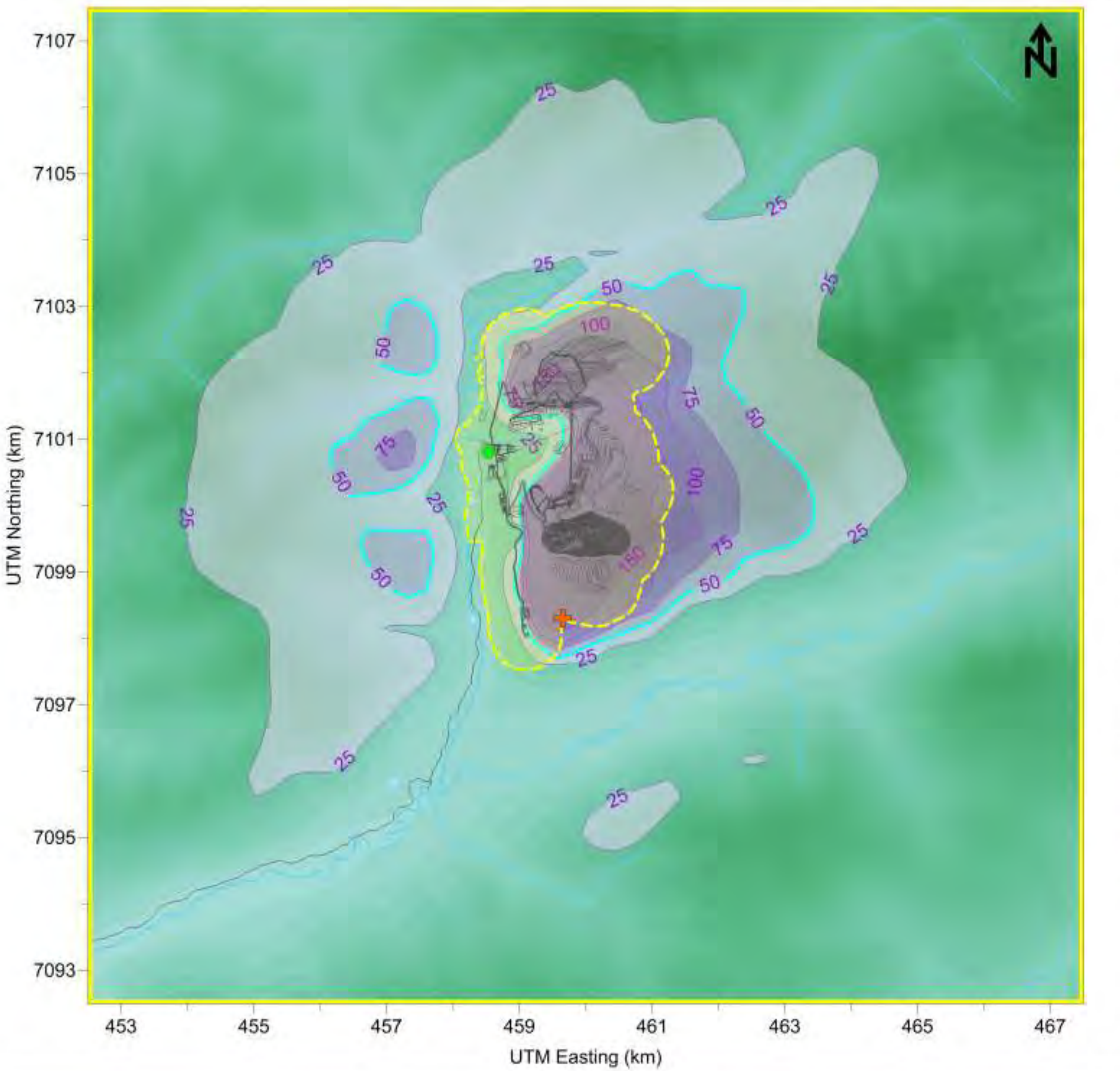
WGS84 UTM Zone 8N

Victoria Gold Corp.

Eagle Gold Mine, Yukon

Exceedances of 24-h TSP Criterion (days/year)

Drawn By:	Approved By:	Figure No.:
KT	PLK	5
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
2. Predicted particulate concentrations include the addition of a conservative background air concentration.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum 24-h
PM_{10} Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	6
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- No. of Exceedances (hours/year)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

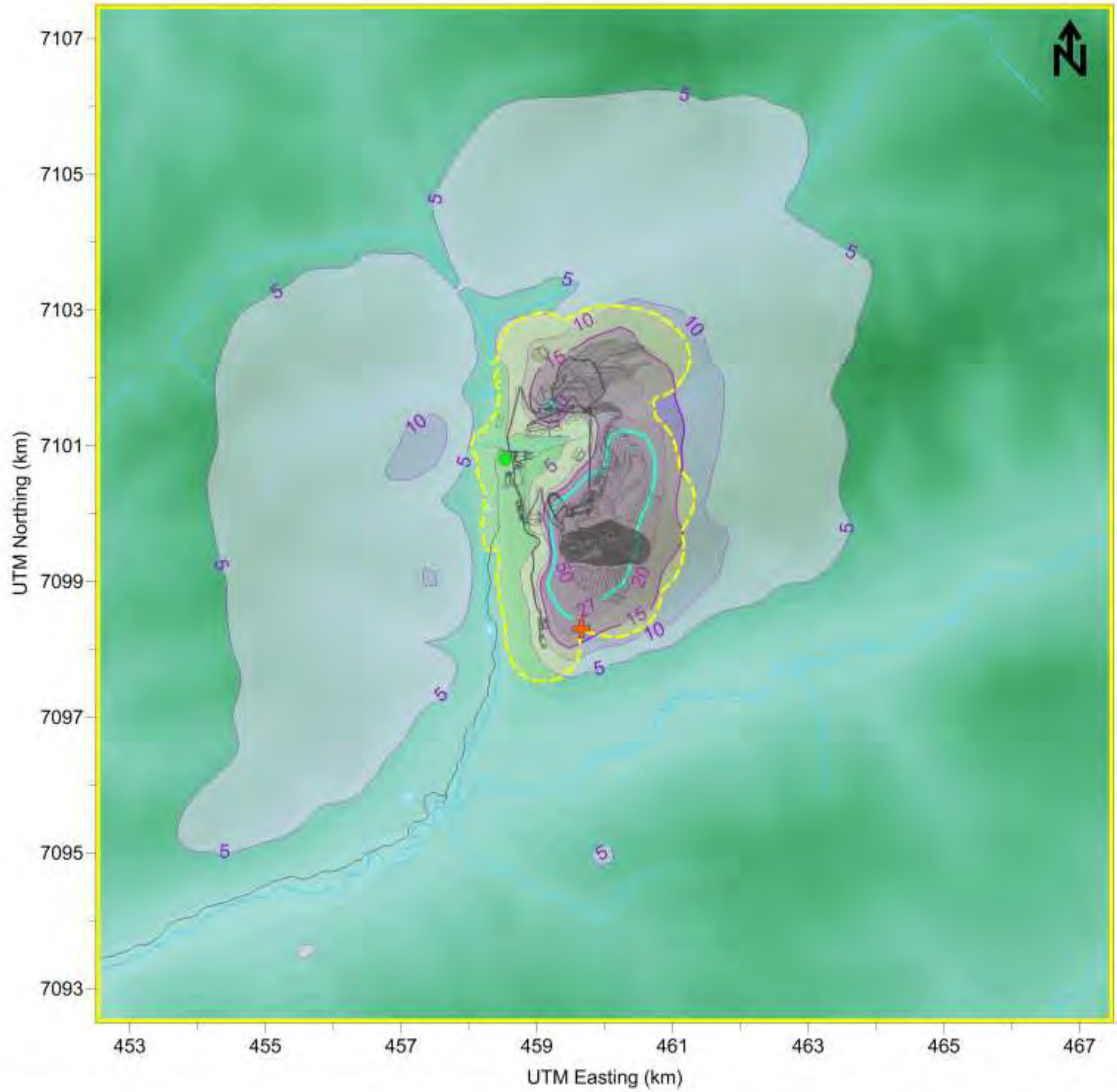
WGS84 UTM Zone 8N

Victoria Gold Corp.

Eagle Gold Mine, Yukon

Exceedances of 24-h PM_{10} Criterion (days/year)

Drawn By:	Approved By:	Figure No.:
KT	PLK	7
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
2. Predicted particulate concentrations include the addition of a conservative background air concentration.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
98th Percentile 24-h
$PM_{2.5}$ Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	8
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
2. Predicted particulate concentrations include the addition of a conservative background air concentration.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

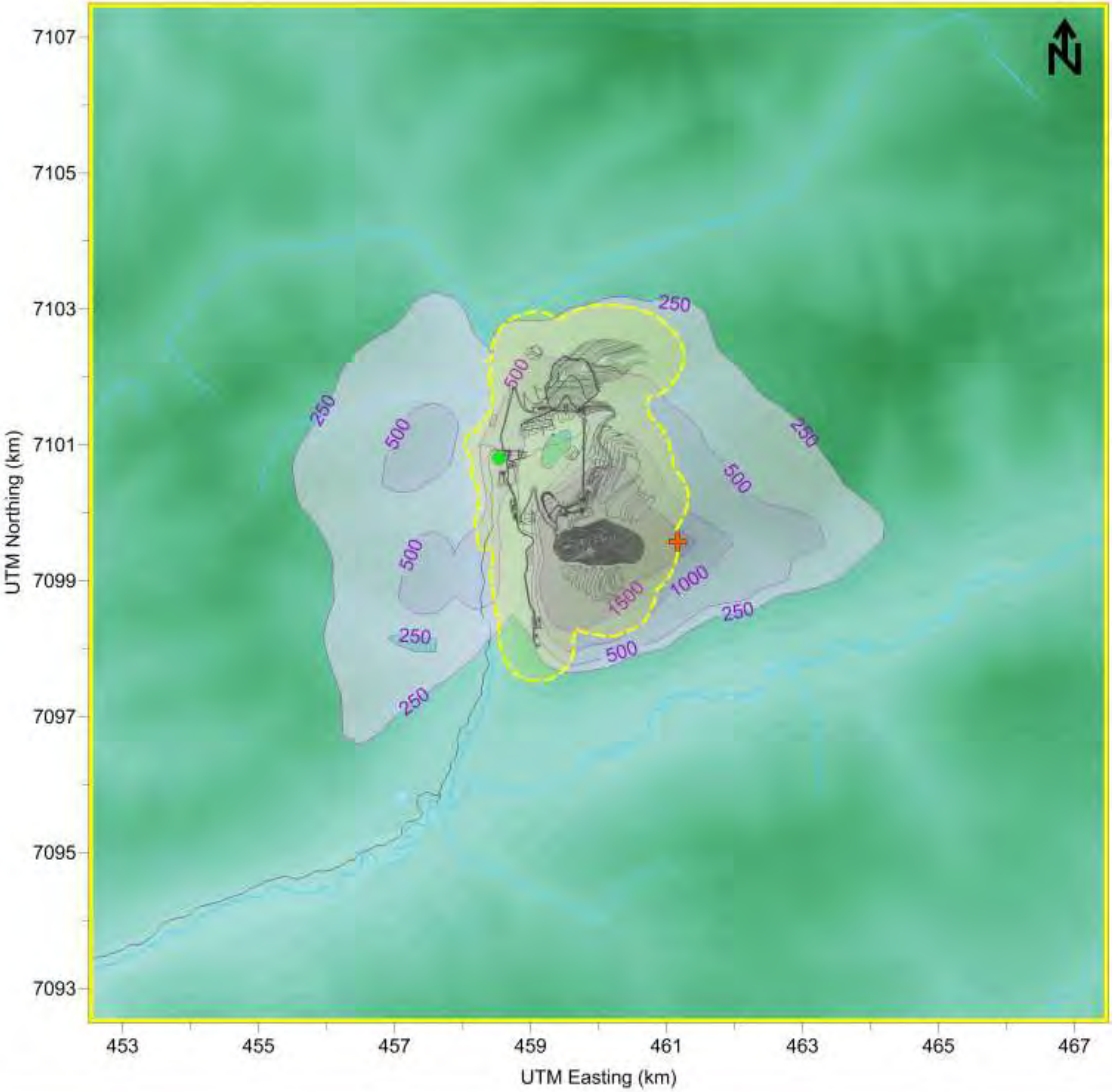
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Annual Average
$PM_{2.5}$ Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	9
Date: July 2019	Project No.: SX16-0004	



LEGEND:

Concentrations (µg/m³)

Project AQ Criteria (µg/m³)

Property Boundary

Camp Receptor

Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

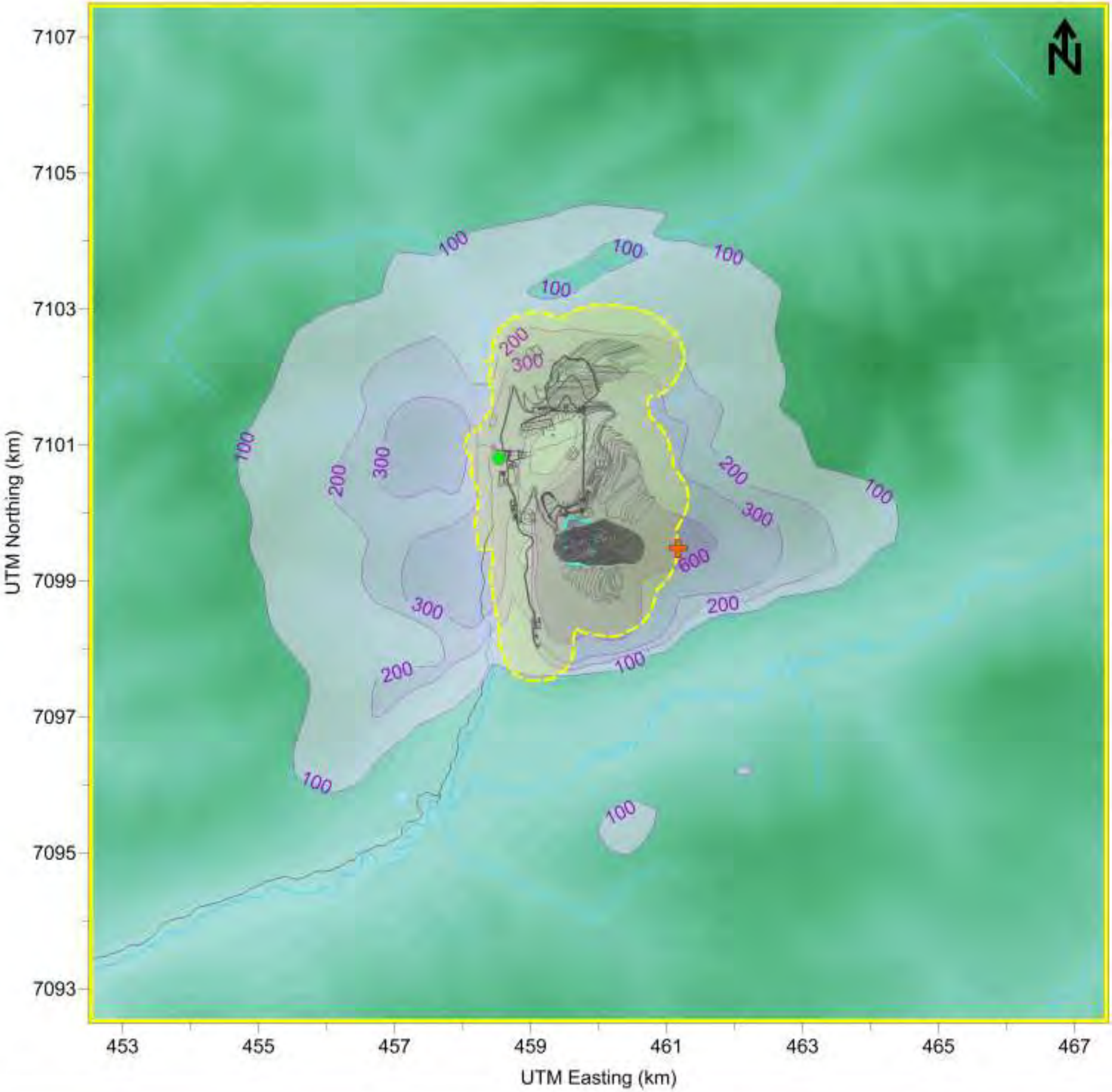
WGS84 UTM Zone 8N

Victoria Gold Corp.

Eagle Gold Mine, Yukon

Maximum Incremental 1-h CO Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	10
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 8-h CO Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	11
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

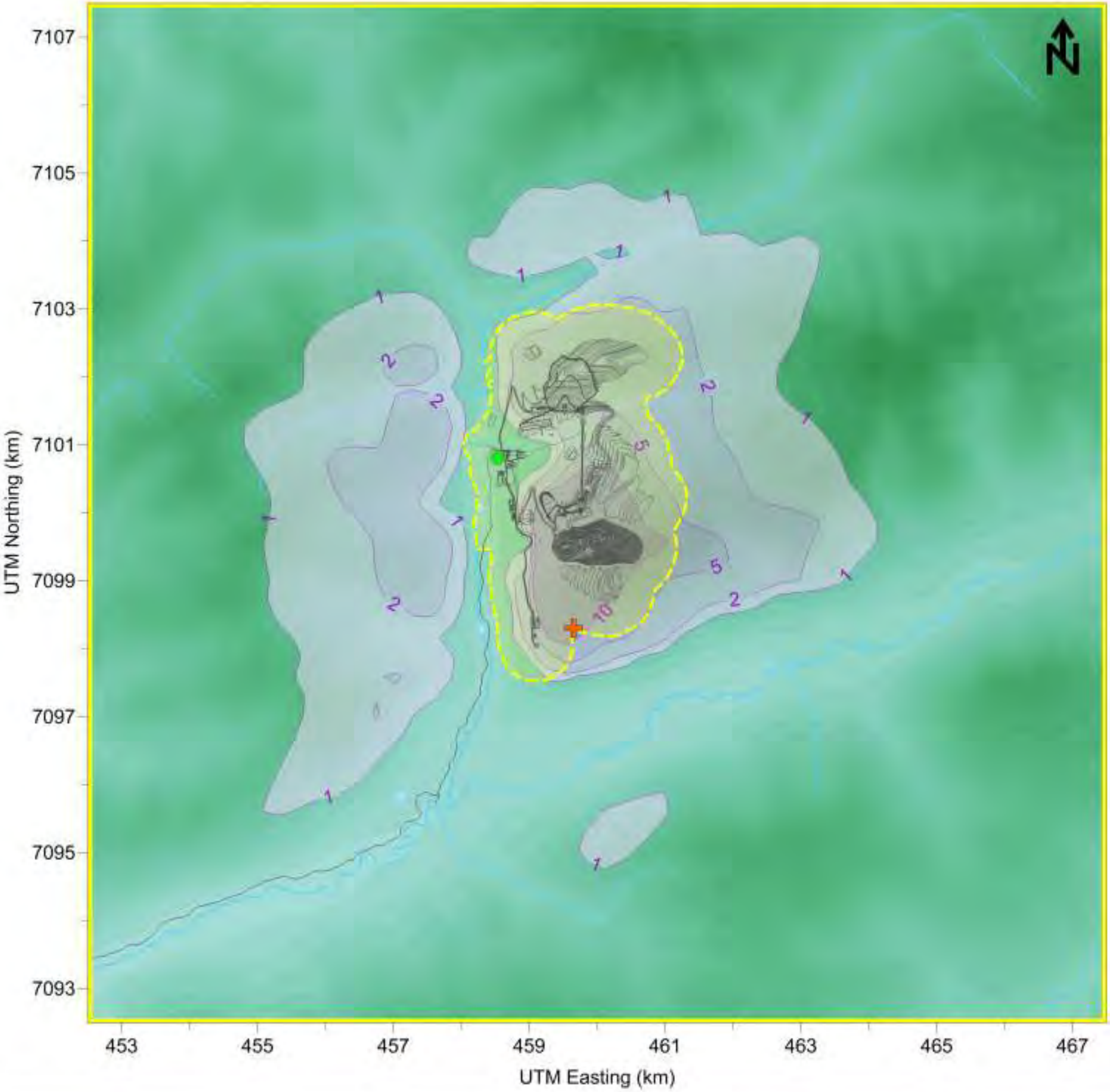
REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

99th Percentile Incremental 1-h SO_2 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	12
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

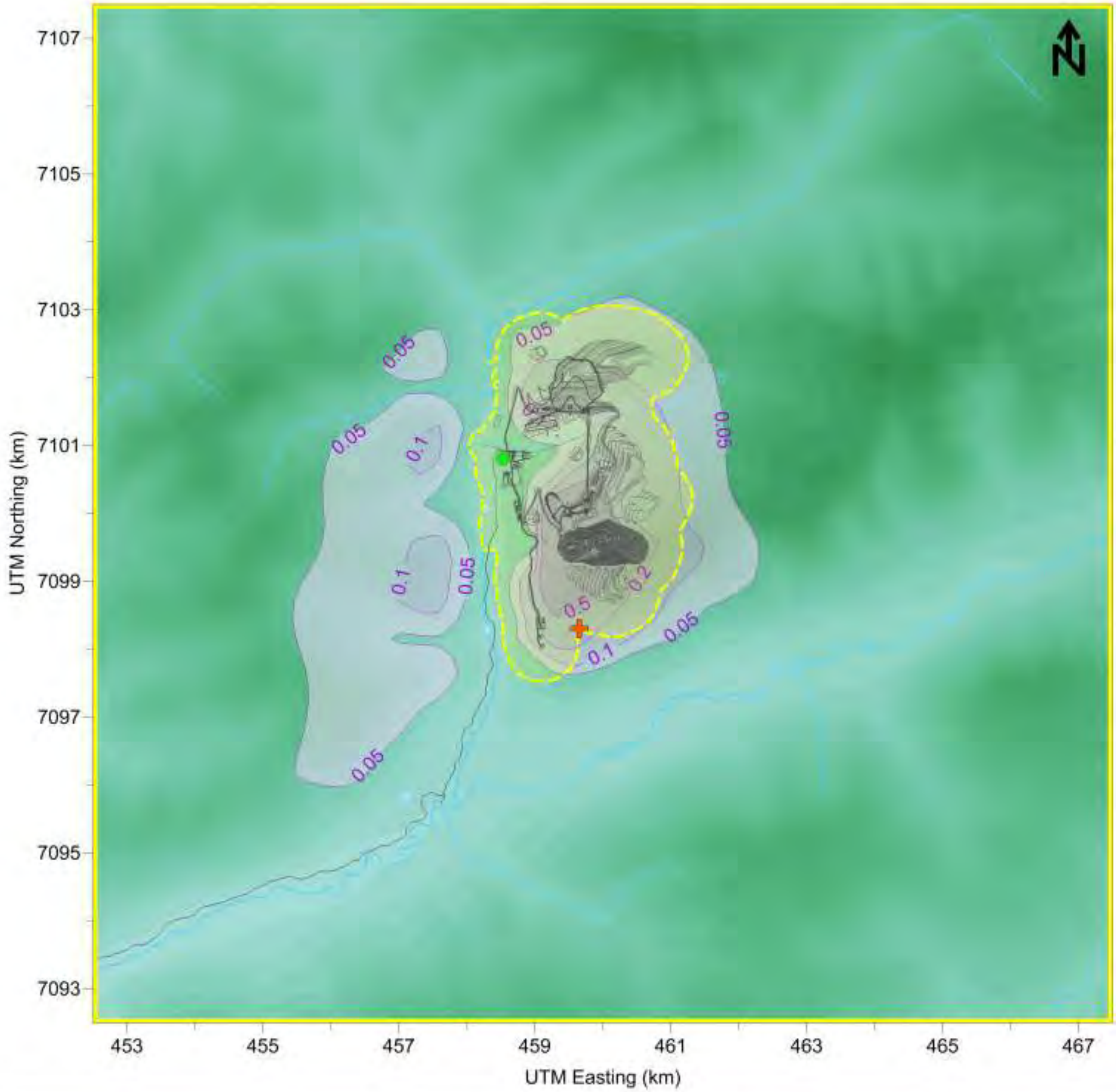
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h SO_2 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	13
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

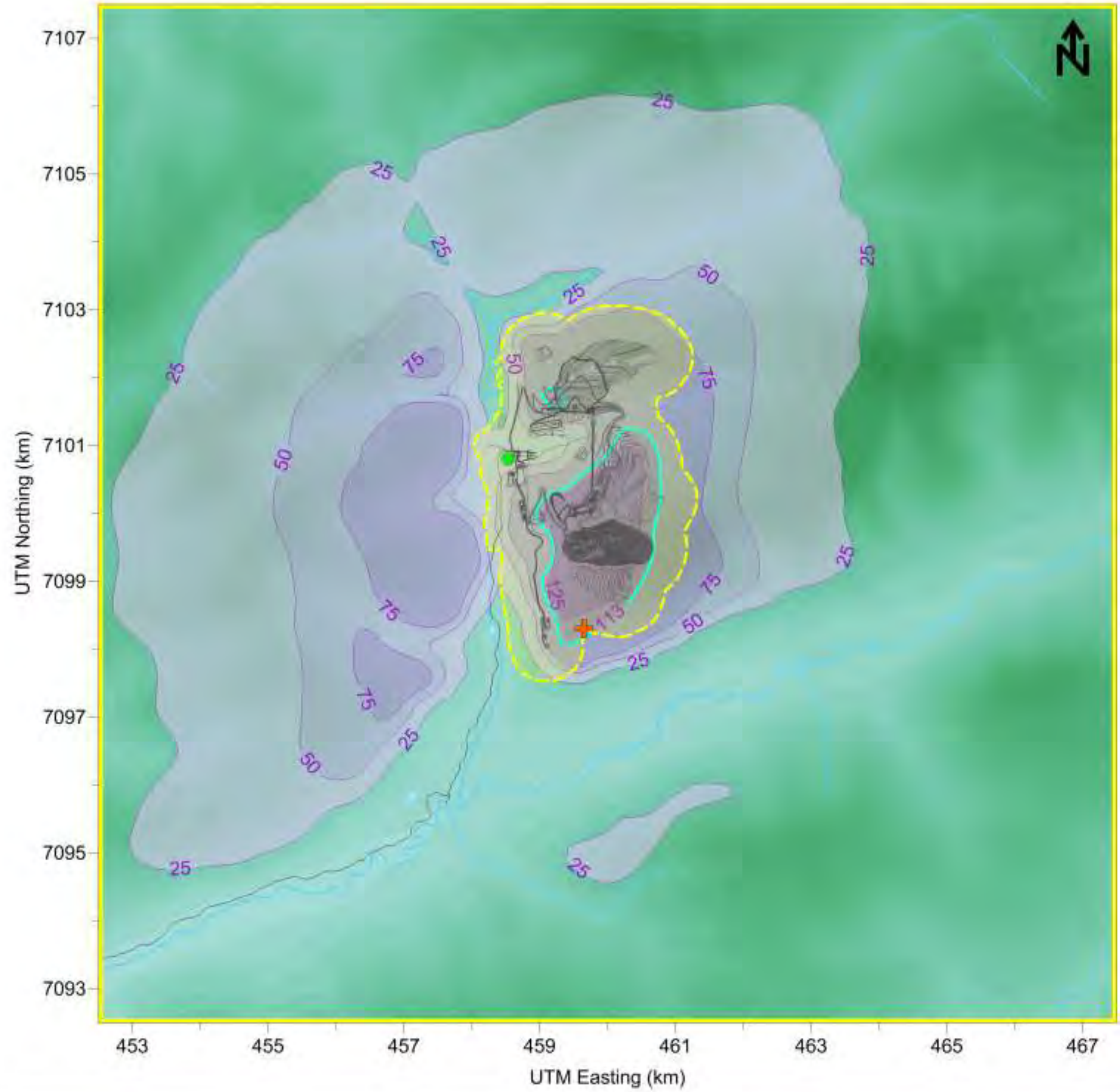
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Incremental Annual Average SO_2 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	14
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

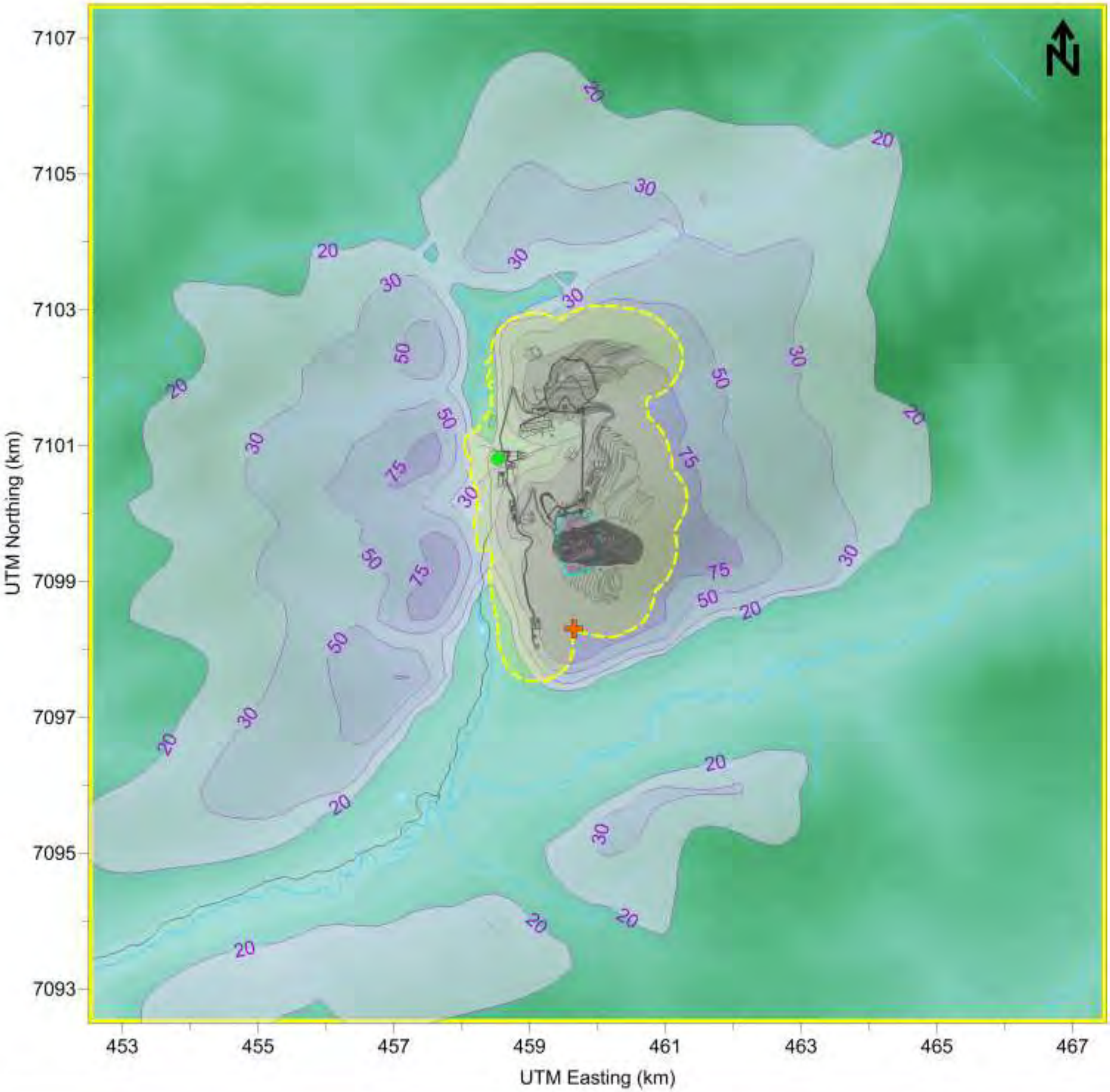
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
98th Percentile Incremental 1-h NO_2 Concentrations (μg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	15
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

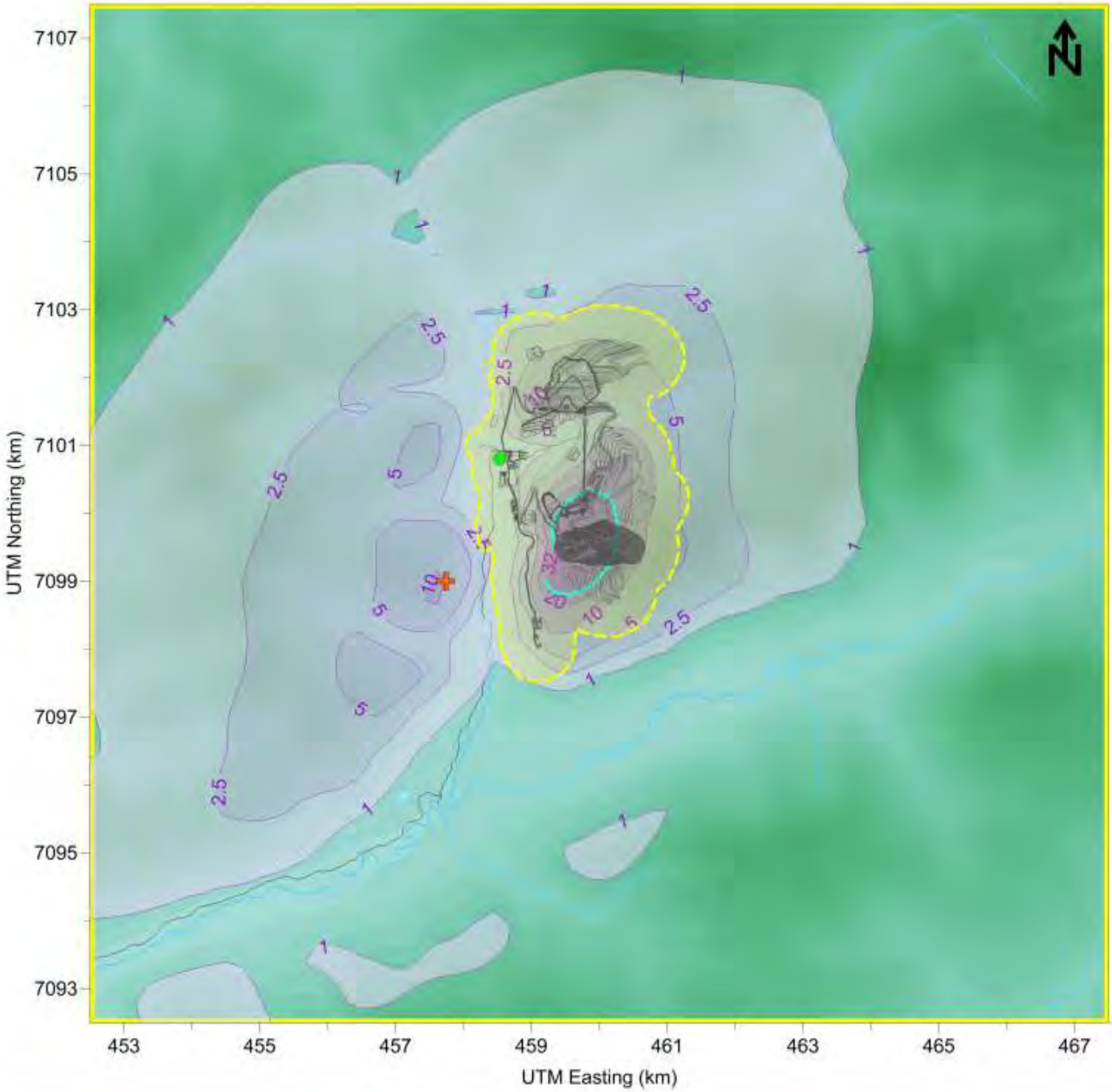
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h NO_2 Concentrations (μg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	16
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

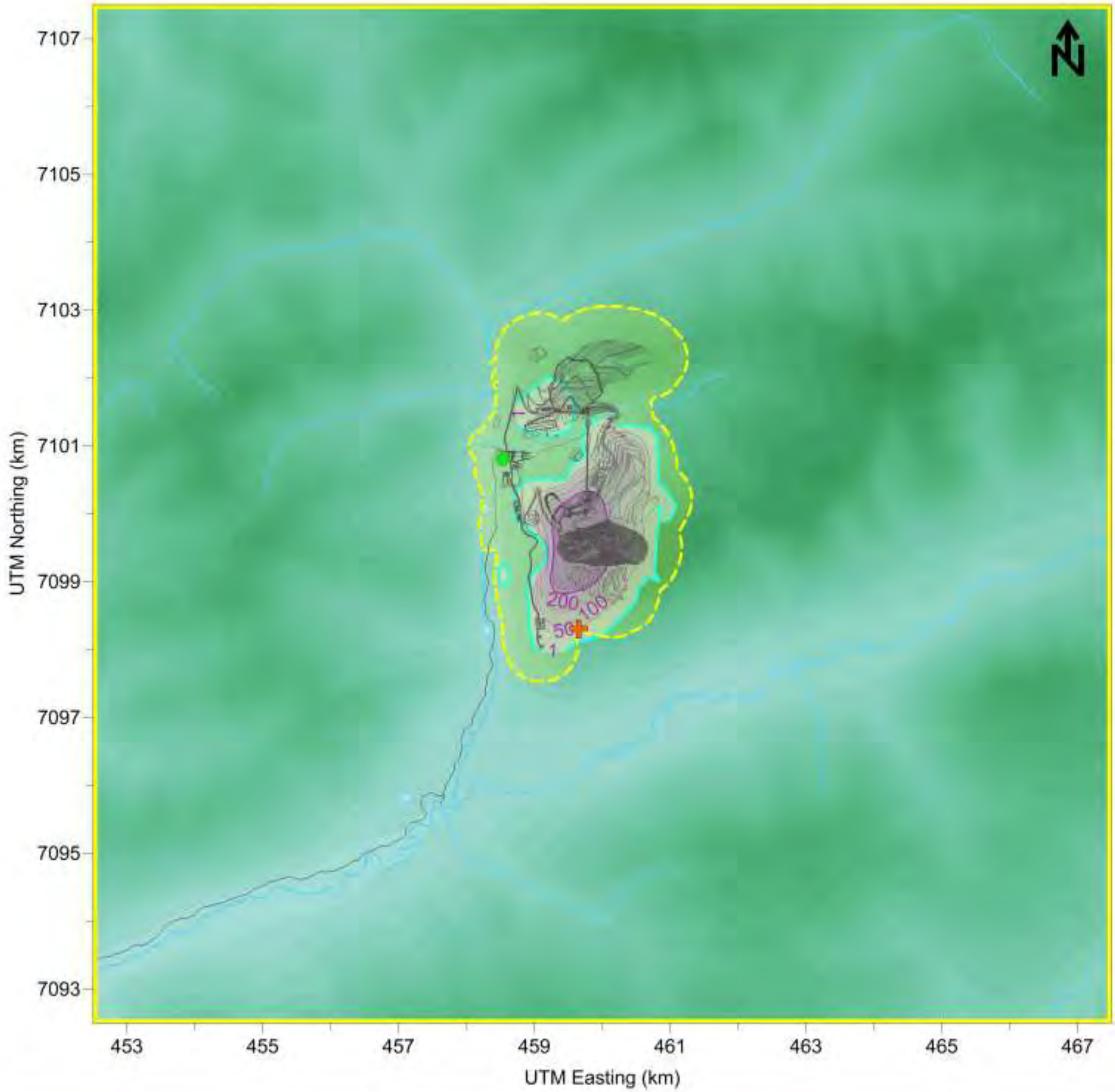
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Incremental Annual Average NO_2 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	17
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- No. of Exceedances (hours/year)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

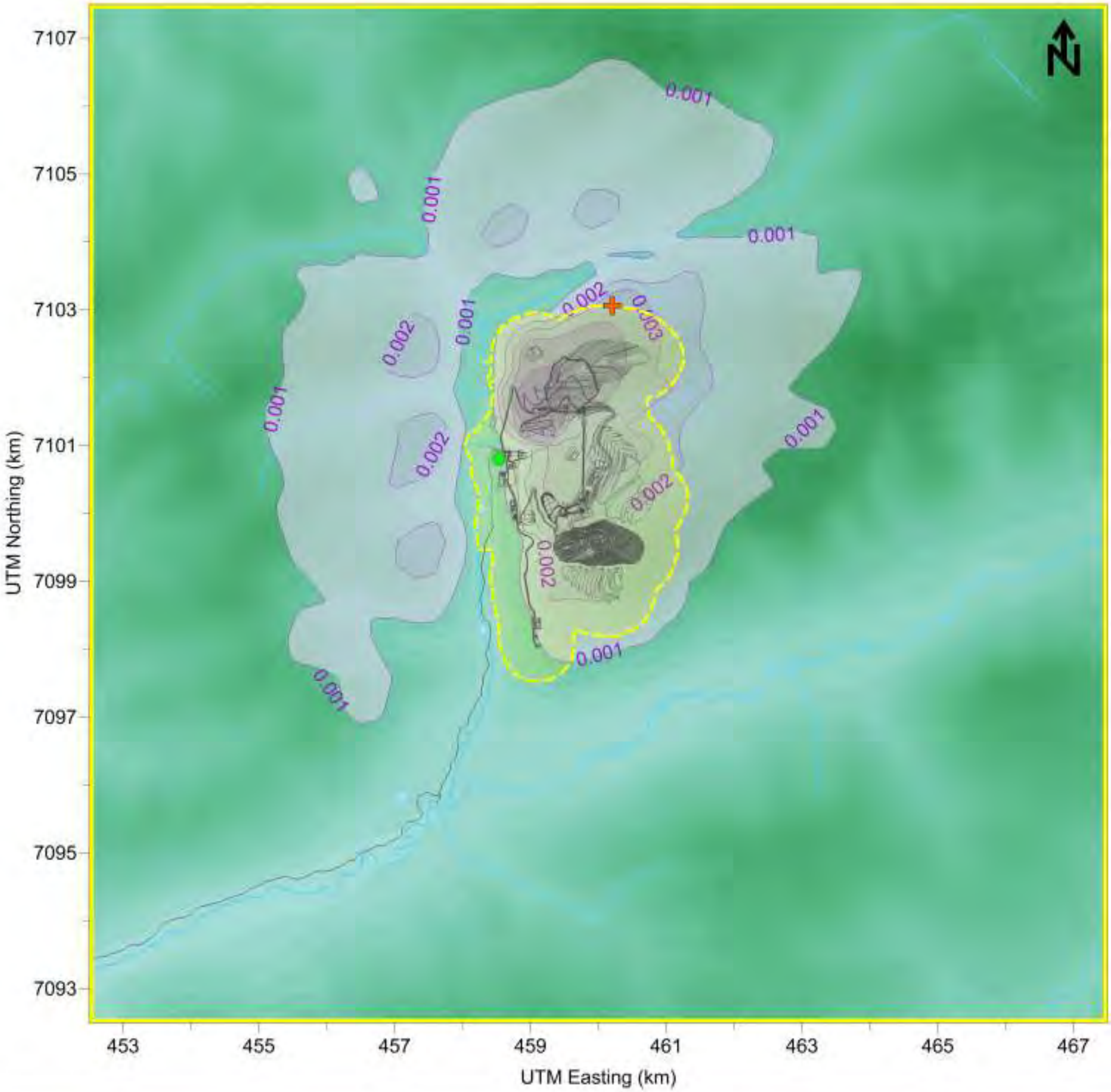
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Exceedances of 1-h NO_2 Criterion (hours/year)

Drawn By:	Approved By:	Figure No.:
KT	PLK	18
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

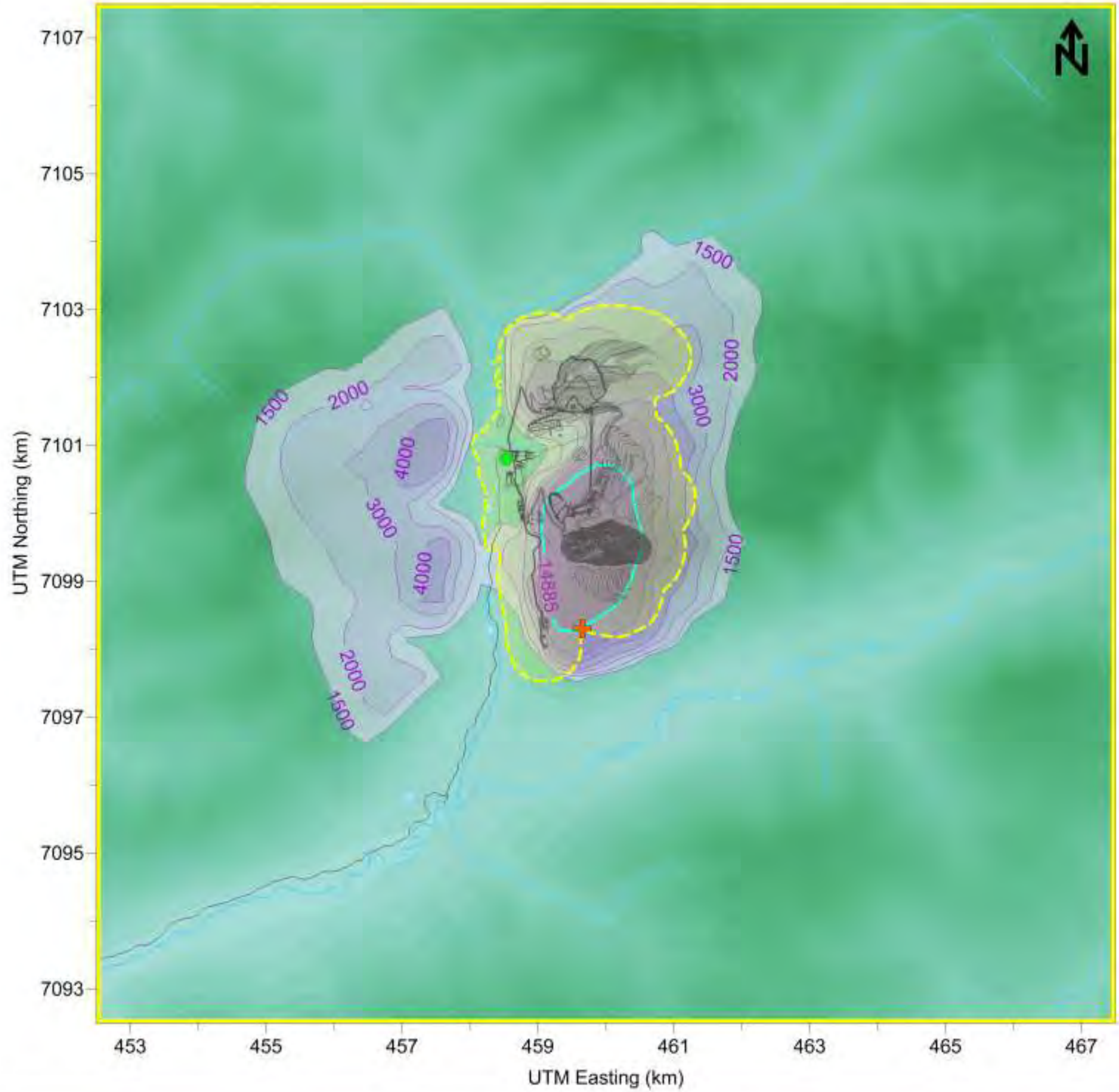
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h
NH_3 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	19
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

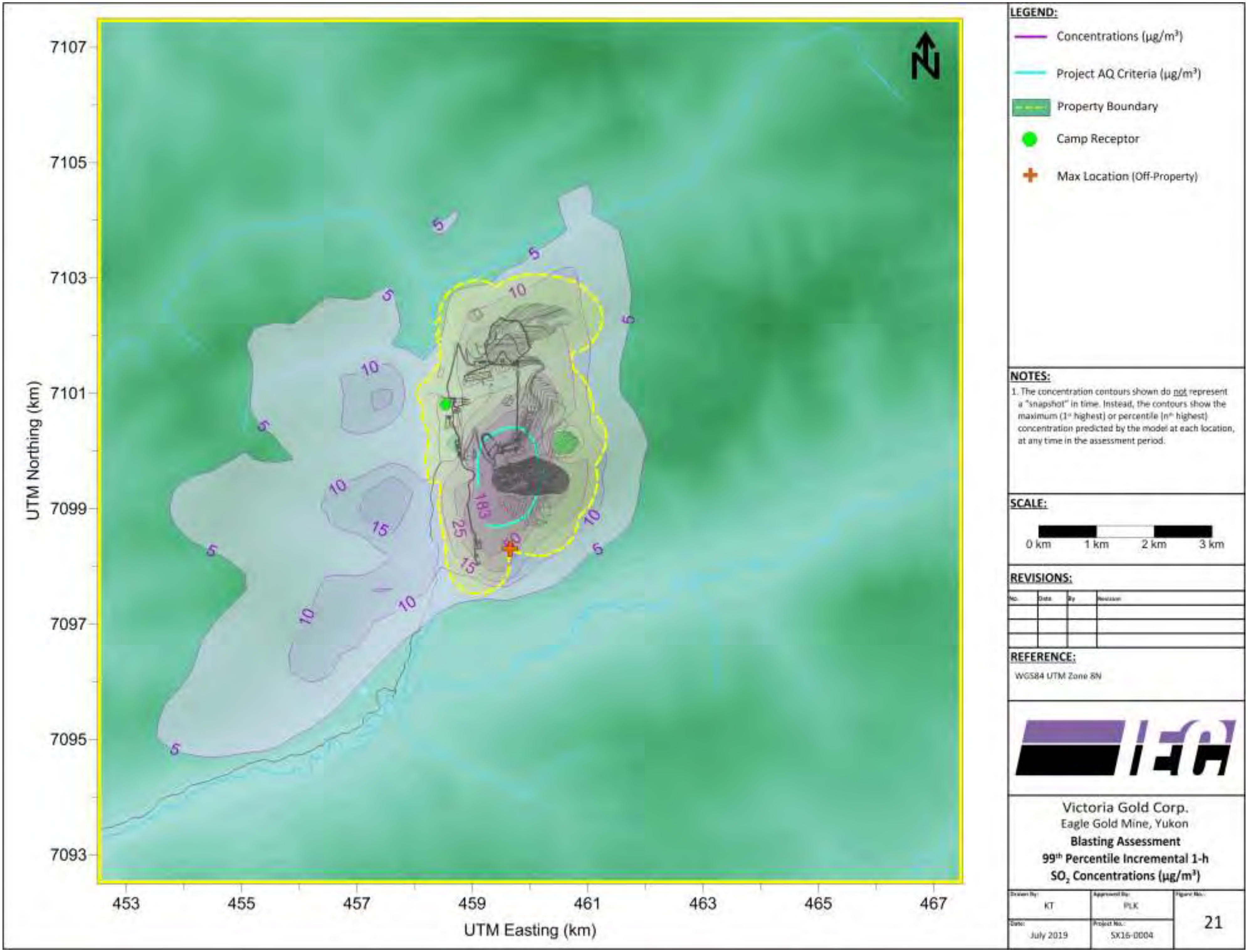
REFERENCE:

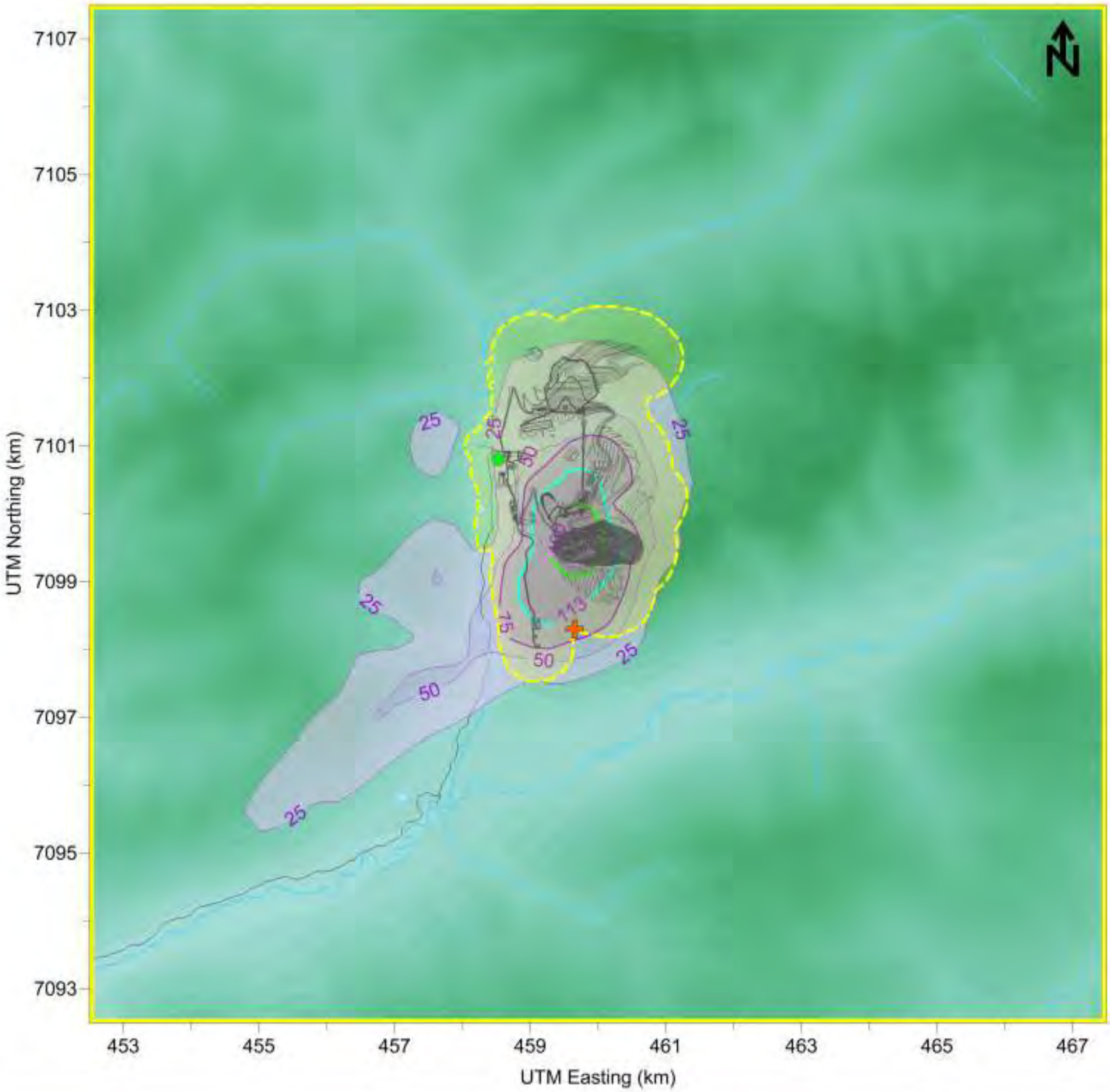
WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

Blasting Assessment
Maximum Incremental 1-h
CO Concentrations (μg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	20
Date: July 2019	Project No.: SX16-0004	


7107
7105
7103
7101
7099
7097
7095
7093
UTM Northing (km)
453
455
457
459
461
463
465
467
UTM Easting (km)
N
5
10
15
25
183
LEGEND:
Concentrations (µg/m³)
Project AQ Criteria (µg/m³)
Property Boundary
Camp Receptor
Max Location (Off-Property)
NOTES:
1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.
SCALE:
0 km
1 km
2 km
3 km
REVISIONS:
No.
Date
By
Revision
REFERENCE:
WGS84 UTM Zone 8N
Victoria Gold Corp.
Eagle Gold Mine, Yukon
Blasting Assessment
99th Percentile Incremental 1-h
SO2 Concentrations (µg/m³)
Drawn By:
KT
Approved By:
PLK
Figure No.:
21
Date:
July 2019
Project No.:
SX16-0004



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

Blasting Assessment
98th Percentile Incremental 1-h
NO_2 Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	22
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

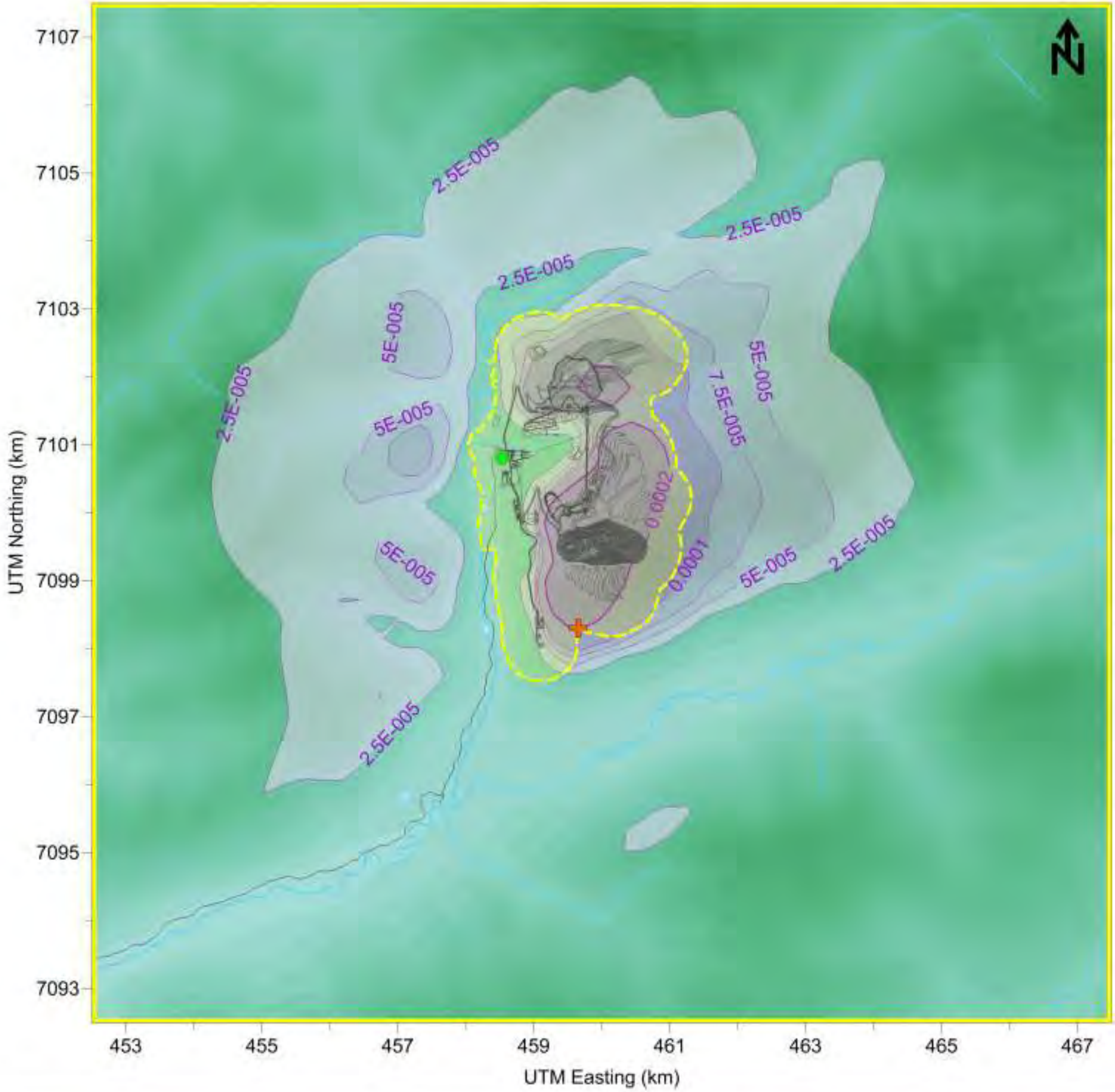
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h As Concentrations (μg/m³)

Drawn By: KT	Approved By: PLK	Figure No.: 23
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

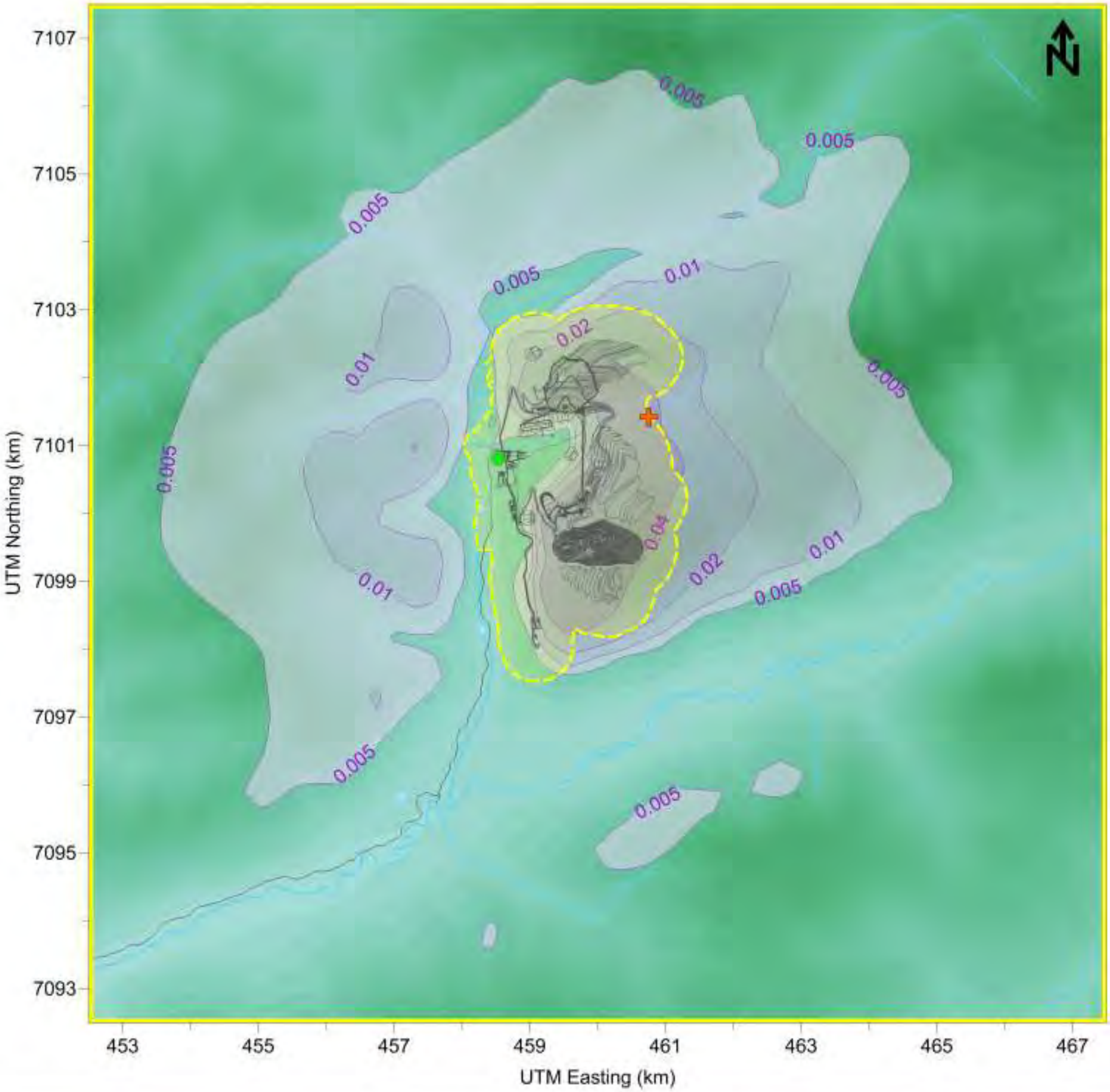
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h Cd Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	24
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h Cr Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	25
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

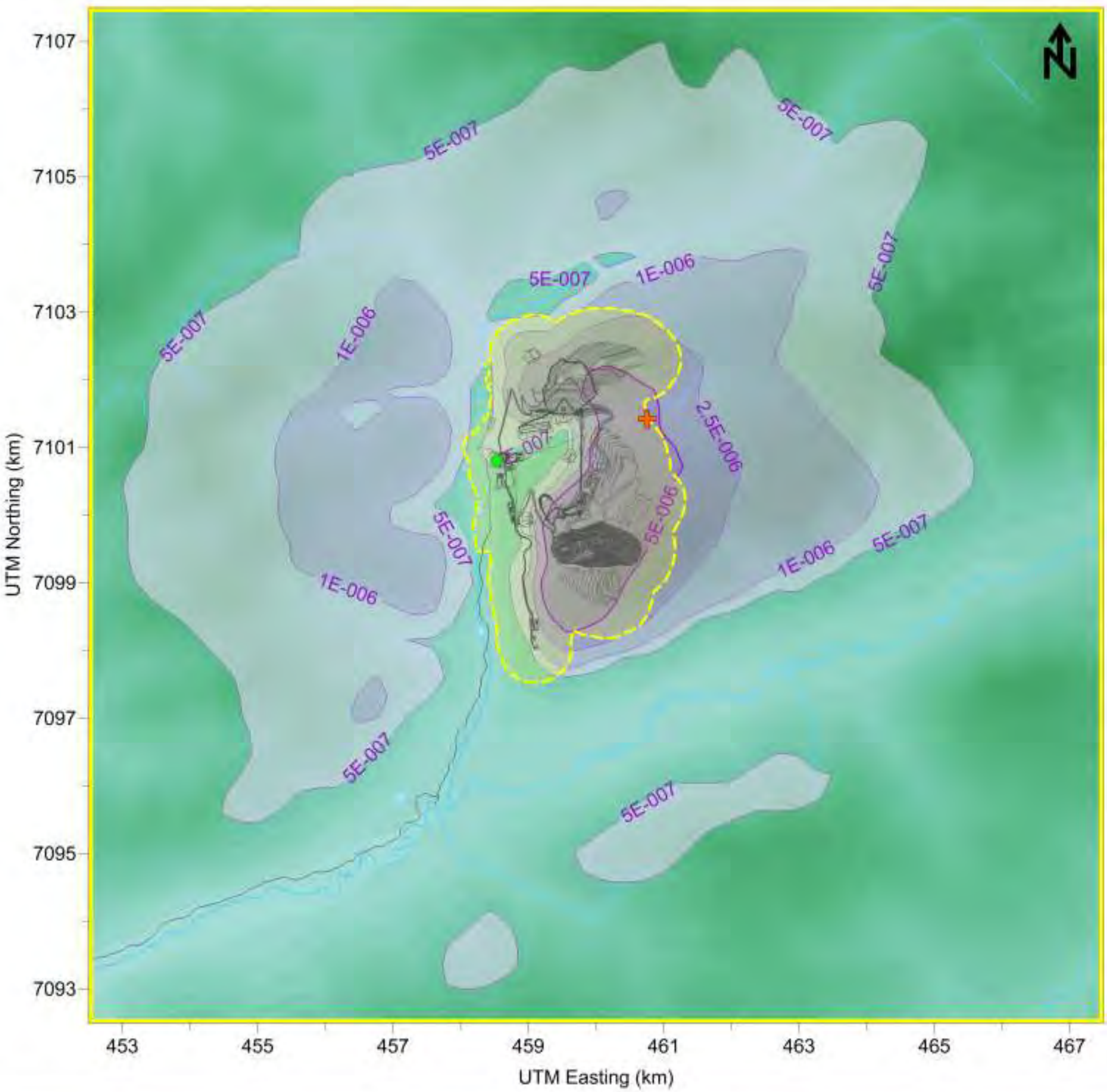
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h Cu Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	26
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

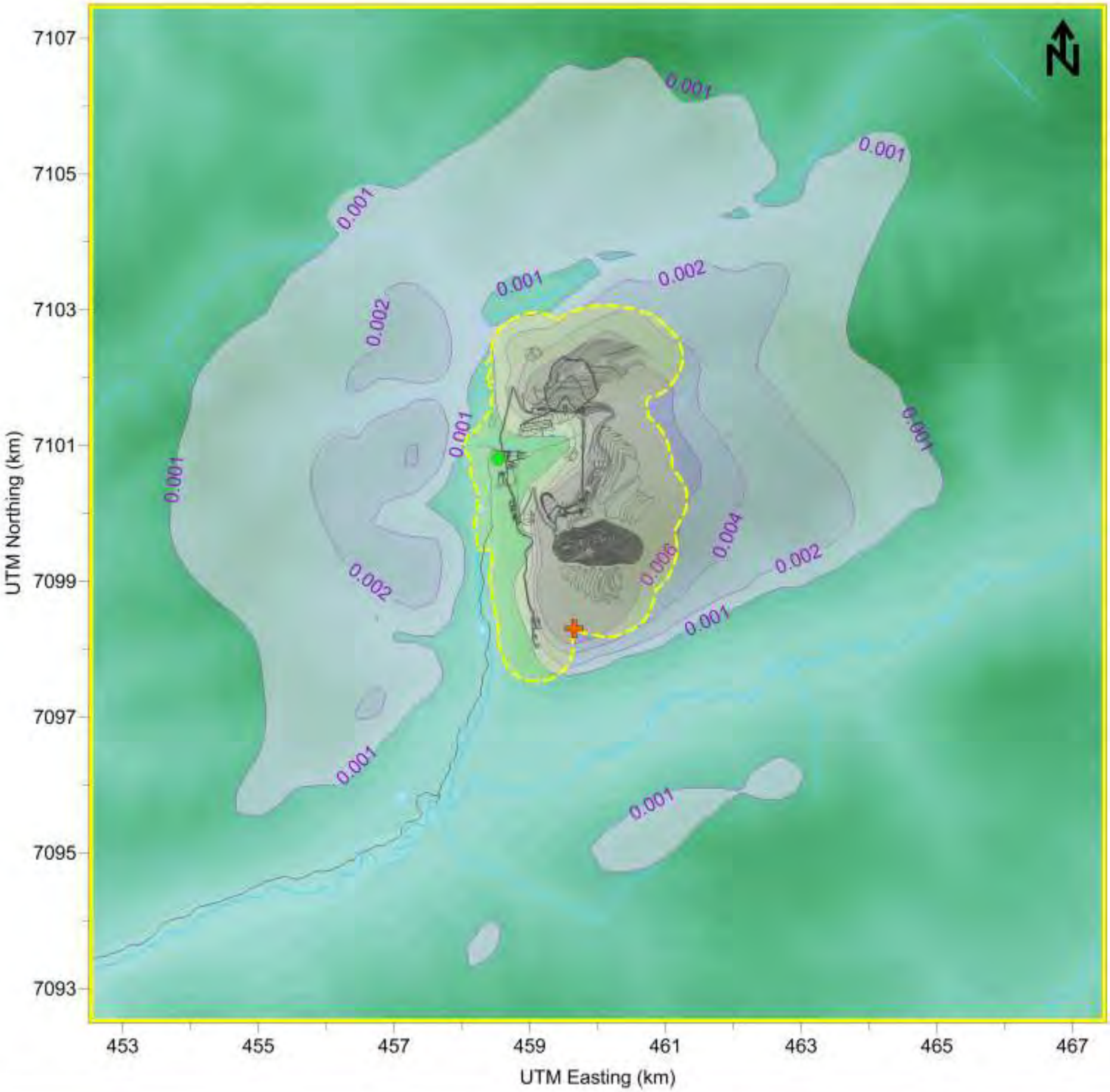
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h Hg Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	27
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations ($\mu g/m^3$)
- Project AQ Criteria ($\mu g/m^3$)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

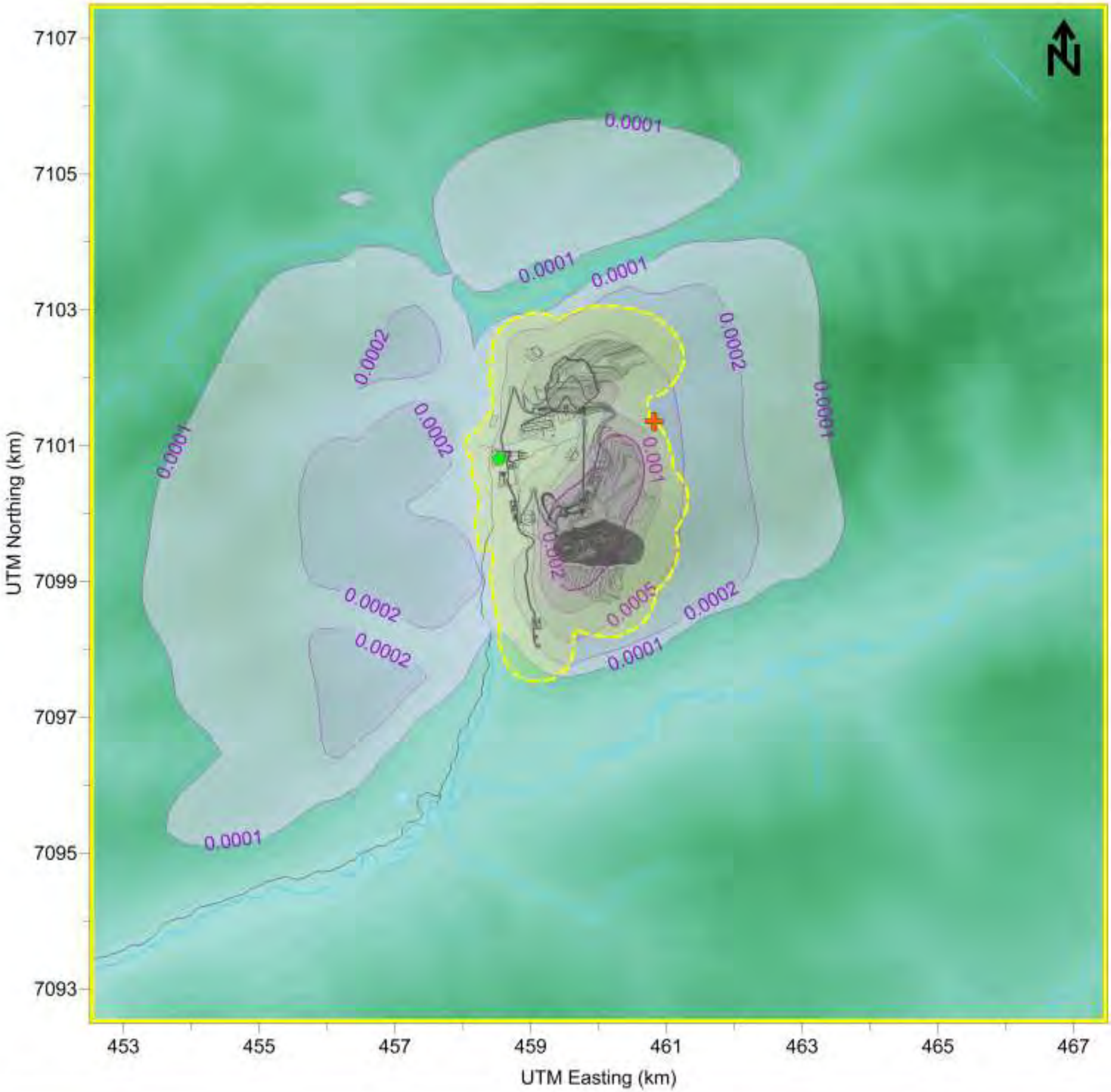
REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

Maximum Incremental 24-h Ni Concentrations ($\mu g/m^3$)

Drawn By:	Approved By:	Figure No.:
KT	PLK	28
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Incremental Annual Aaverage
Ni Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	29
Date: July 2019	Project No.: SX16-0004	

LEGEND:

- Concentrations (µg/m³)
- Project AQ Criteria (µg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

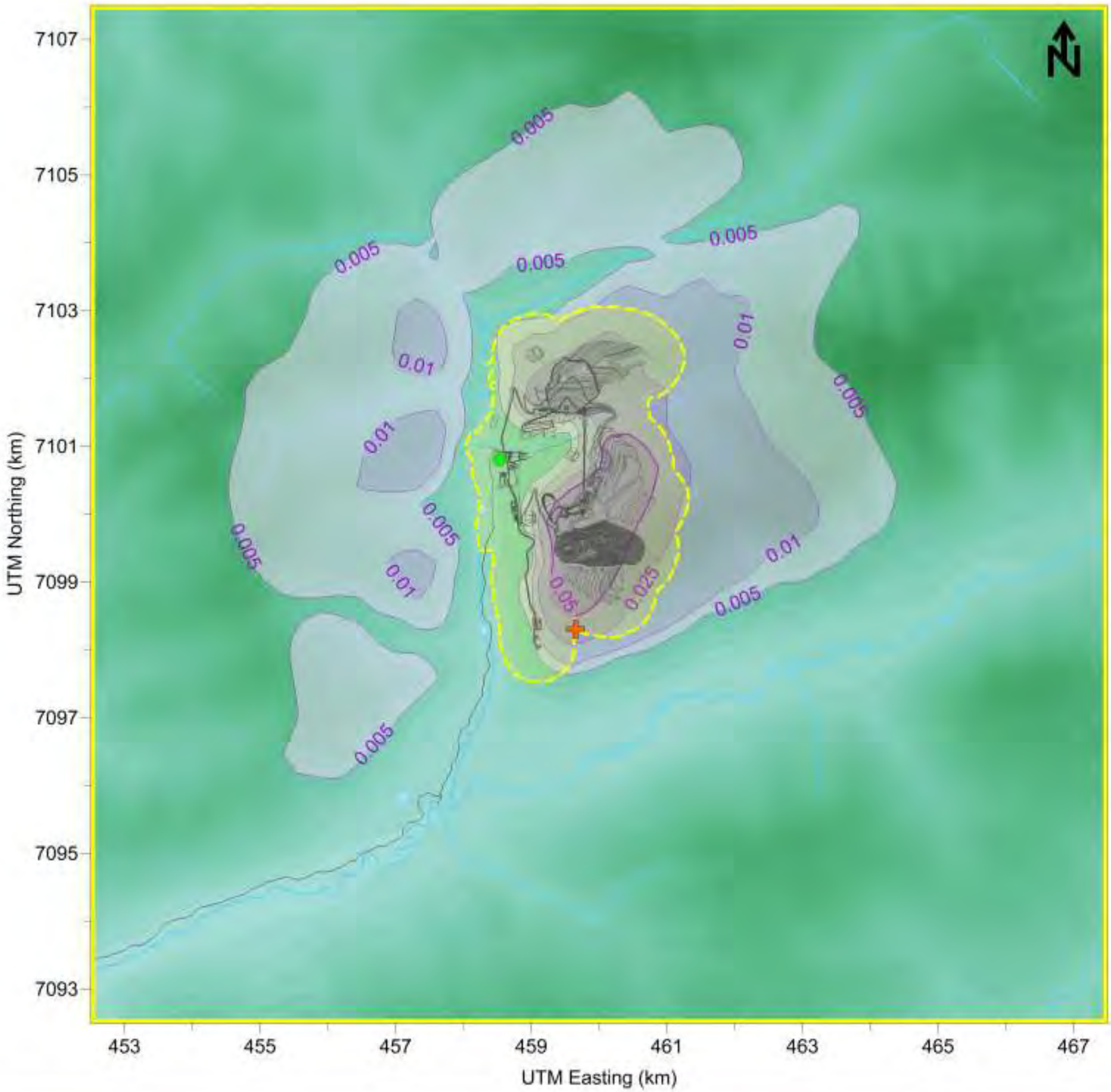
No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon
Maximum Incremental 24-h
Pb Concentrations (µg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	30
Date: July 2019	Project No.: SX16-0004	



LEGEND:

- Concentrations (μg/m³)
- Project AQ Criteria (μg/m³)
- Property Boundary
- Camp Receptor
- Max Location (Off-Property)

NOTES:

1. The concentration contours shown do not represent a "snapshot" in time. Instead, the contours show the maximum (1st highest) or percentile (nth highest) concentration predicted by the model at each location, at any time in the assessment period.

SCALE:

0 km 1 km 2 km 3 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

Maximum Incremental 24-h Zn Concentrations (μg/m³)

Drawn By:	Approved By:	Figure No.:
KT	PLK	31
Date: July 2019	Project No.: SX16-0004	

Appendix A:

Air Emissions Inventory

Appendix A: Air Emissions Inventory

As discussed in the main body of the report, the significant sources of air emissions from the Project include:

- Road dust generated from traffic along the unpaved site roads and pit/pile ramps;
- Drilling and blasting within the pit;
- Material handling, conveyor transfers and stacking;
- Ore crushing;
- Wind erosion of the surface stockpiles;
- Bulldozing in the pit and at the WRSAs;
- Grading unpaved roads;
- Agglomeration operations at the HLF;
- Incineration of food waste;
- Stationary fuel combustion (e.g., standby diesel generators);
- Mobile fuel combustion (e.g., mining vehicles and equipment); and
- Processing activities at the ADR, including electrowinning and doré smelting.

The emissions quantification methods for each of the above sources are detailed below. The production information and variables and assumptions that were used to calculate the air emissions are summarized in a series of tables provided at the end of this Appendix. The main production information used to support the air emissions calculations is provided in Table A. 1. These tables will be referred to throughout the discussion below.

A.1 Unpaved road dust

Dust is emitted from unpaved roads by the action of vehicle wheels against the surface and by the turbulent wake created behind a moving vehicle. Emissions of unpaved road dust were estimated using the emission factor equation for industrial roads from U.S. EPA AP-42 Chapter 13.2.2 [25]:

$$EF = 281.9 \times k \times \left(\frac{s}{12}\right)^{a} \times \left(\frac{W}{3}\right)^{0.45}$$

Where,
EF = emission factor in lb/VKT
k = particle size multiplier (TSP = 4.9; PM_{10} = 1.5; $PM_{2.5}$ = 0.15)
s = silt content (%)
W = vehicle weight (tons)
a = constant (TSP = 0.7; PM_{10} and $PM_{2.5}$ = 0.9)
VKT = vehicle kilometres travelled

To estimate emissions from unpaved roads, silt content, average vehicle weight, and the number of vehicle kilometres travelled (VKT) is required. As shown in Table A.6, a silt content of 8.3% was used. Traffic information, including vehicle weights and VKT are provided in Table A.3.

Emissions of road dust can be mitigated through operational practices such as watering or applying chemical dust suppressants. For the summer months (May to October), a control of 74% was applied to the site roads, pit/pile ramps and access road to account for the application of water and/or a chemical dust suppressant (calcium carbonate). In the winter (November to April), a control of 90% was applied, which is based on the findings of a study completed at the De Beers Victor diamond mine in northern Ontario and Snap Lake diamond mine in the Northwest Territories [23]. An additional 44% control was applied in both seasons to account for vehicle speeds under 40 km/h as per the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook [21]. Vehicle speeds at the Project site are assumed to be limited to 25 km/h along the site haul roads and ramps with a maximum site-wide speed limit of 40 km/h.

A.2 Drilling

Prior to blasting, holes must be drilled into the rock in order to place the explosives and facilitate the blasting. Emissions of dust from the drilling activities were estimated using the emission factors from the NPRI guidance document for pits and quarries [26]:

$$EF\ (TSP) = 0.59\ kg/hole$$
$$EF\ (PM_{10}) = 0.31\ kg/hole$$
$$EF\ (\mathrm{PM}_{2.5}) = 0.31\ kg/hole$$

The above emission factors simply require the number of holes drilled, which are summarized in Table A.1.

A.3 Blasting and Explosives Detonation

Emissions from blasting and explosives detonation were estimated using the particulate emission factors from *Chapter 11.9 Western Surface Coal Mining* of AP-42 [27] and the gaseous emission factors published in the Australian *National Pollutant Inventory Emission Estimation Technique Manual for Explosives Detonation and Firing Ranges* [22]. These factors are reproduced in the table below.

Emission Factors for Blasting and Explosives Detonation

Particulate	Gaseous COPC
PM_{10} [kg/blast] = 0.52 x 0.00022(A)$^{1.5}$ $PM_{2.5}$ [kg/blast] = 0.03 x 0.00022(A)$^{1.5}$ where, ***A*** = area of the blast face [m²]	***CO*** = 12 [kg/tonne emulsion] ***NOx*** = 2 [kg/tonne emulsion]

The estimates of particulate emission require an estimate of the horizontal area displaced by blasting and the gaseous emissions require an estimate of the amount of explosive used. As shown in Table A.7, the explosive used in blast is ammonium nitrate/fuel oil (ANFO) with a powder factor of 0.65 kg of explosive per m³ of ore. As such, it was assumed that only one blast would occur per day and that blasting would occur only between the hours of 11:00 and 14:00. The average size of each blast is provided in Table A.1.

A.4 Material Handling

Emissions of dust will be generated when material is handled (e.g., loaded or unloaded from a haul truck, transferred by conveyor, stacked on the heap, etc.). Material handling emissions were estimated using the emission factor equation from U.S. EPA AP-42 Chapter 13.2.4 [28]:

$$EF = k \times 0.0016 \times \left(\frac{U}{2.2}\right)^{1.3} \times \left(\frac{M}{2}\right)^{-1.4}$$

Where,
EF = emission factor in kg/tonne
k = particle size multiplier (TSP = 0.74; PM_{10} = 0.35; $PM_{2.5}$ = 0.053)
U = wind speed (m/s)
M = material moisture content (%)

To estimate emissions from material handling, wind speed, material moisture content, and the amount of material handled is required. The mean annual wind speed at the Project site is 3.1 m/s, which is based on CALMET data for a point near the on-site meteorological station, which is located near the workers' camp (see Appendix B). The assumed moisture content of the waste rock is 3%. Material handling rates are provided in Table A.1.

A.5 Crushing and Screening

Emissions of dust will be generated when the raw ore is crushed and screened. These activities take place within the crushing building, which has dedicated exhausts and dust controls. Emissions from crushing and screening were estimated using the emission factors from U.S. EPA AP-42 Chapter 11.24 [29] and these factors are reproduced in the table below.

Emission Factors for Crushing and Screening

Source	Emission Factor (kg/tonne of ore)		
	TSP	PM_{10}	$PM_{2.5}$
Primary Crushing	0.01	0.004	0.004
Secondary Crushing	0.03	0.012	0.012
Tertiary Crushing	0.03	0.010	0.010

Note that the emission factors shown in the table are for "high moisture" ore (i.e., material that has a moisture content of 4% or more at the mine or primary crusher inlet) and $PM_{2.5}$ emissions were conservatively assumed to be equal to those of PM_{10}. As discussed in AP-42 Chapter 11.24 [29], a single crushing operation includes emissions from typical associated sources (e.g., a hopper or ore dump, screens, crusher, surge bin, apron feeder and conveyor belt transfer point).

To estimate emissions from crushing and screening, the amount of material handled, and the control efficiency of the dust control systems are required. Material handling rates are provided in Table A.1 and control efficiencies are provided in Table A.4.

A.6 Wind Erosion

Temporary stockpiles, the heap and WRSAs are susceptible to wind erosion. Wind erosion emissions were estimated using the emission factor equation from the WRAP Fugitive Dust Handbook [21]:

$$EF = k \times 1.9 \times \left(\frac{s}{1.5}\right) \times \left(\frac{f}{15}\right)$$

Where,
EF = emission factor in kg/ha/day
k = particle size multiplier (TSP = 1.0; PM_{10} = 0.5; $PM_{2.5}$ = 0.075)
s = silt content (%)
f = percentage of the time with the unobstructed wind speed greater than 5.4 m/s in percent (%)

To estimate wind erosion emissions the following parameters are required: surface area of the pile, silt content, and percentage of time where the unobstructed wind speed is greater than 5.4 m/s at the mean pile height. Silt contents for the various materials/piles are shown in Table A.6. The frequency term 'f' was calculated to be 9.2% based on CALMET data for a point near the on-site meteorological station, which is located near the workers' camp (see Appendix B). The calculated surface areas of the various stockpiles are outlined in Table A.8. Note that only a portion of the pile surfaces were considered "active" or subject to wind erosion. For stockpiles made of coarse rock (like majority of the piles at the Project site), the amount of erodible material is finite unless there is a mechanical disturbance (e.g., bulldozing) that can replenish silt levels in the pile. Since the amount of disturbance of each stockpile is limited, the portion of the pile active at any given time was estimated based on the amount of material added each day.

No emissions controls were applied when estimating summer wind erosion emissions; however, a control of 90% was applied to winter emissions to account for natural mitigation of dust from snow and ice cover.

A.7 Dozing

Bulldozers will be used to move ore and waste rock within the pit and to shape and maintain the WRSAs. Emissions of dust from bulldozing were estimated using the emission factor equation in U.S. EPA AP-42 Chapter 11.9 [27]:

$$EF\ (TSP) = 2.6 \times s^{1.2} \times M^{-1.3}$$
$$EF\ (PM_{10}) = k \times 0.75\ \times 0.45 \times s^{1.5} \times M^{-1.4}$$
$$EF\ (\mathrm{PM}_{2.5}) = 0.105 \times 2.6 \times s^{1.2} \times M^{-1.3}$$

Where,
EF = emission factor in kg/hour
s = material silt content in percent (%)
M = material moisture content in percent (%)

This equation requires the silt and moisture content of the material being bulldozed, as well as the number of operating hours. The silt and moisture contents of are provided in Table A.6 and the number of bulldozing hours is provided in Table A.1.

A.8 Grading

The mine site roads and the access road will be maintained with grading. Emissions of dust from grading were estimated using the emission factor equation in U.S. EPA AP-42 Chapter 11.9 [27]:

$$EF\ (TSP) = 0.0034 \times S^{2.5}$$
$$EF\ (PM_{10}) = 0.60\ \times 0.0056 \times S^{2.0}$$
$$EF\ (PM_{2.5}) = 0.031 \times 0.0034 \times S^{2.5}$$

Where,
EF = emission factor in kg/VKT
S = grader speed in km/h
VKT = vehicle kilometres travelled

This equation requires an estimate of the grader speed (assumed to be 8 km/h) as well as the number of kilometres travelled, which was calculated based on the length of road and the number of gradings (see Table A.3). Note that grading was assumed to occur only during the summer months.

A.9 Agglomeration

Lime addition for ore conditioning will occur throughout operation and although agglomeration is not planned, to conservatively cover lime addition and the unlikely event that agglomeration was required, the model assumed that, prior to stacking on the heap, the crushed ore would periodically be treated with additional lime and cement in a process known as agglomeration. The agglomeration plant is assumed to be located adjacent to the HLF and contains silos of lime and cement that deposit directly to the crushed ore conveyor belt that feeds the stackers at the HLF. Dust emissions would be generated when cement and lime are transferred to the storage silos and when the cement and lime a deposited onto the conveyor belt.

Emissions for loading of the cement and lime silos were estimated using the emission factors provided in U.S. EPA AP-42 Chapter 11.12 [30], which are summarized in the following table:

Activity	Site Emission Factor (kg/tonne material)		
	TSP	PM_{10}	$PM_{2.5}$
Cement/lime transfer to storage silo	0.0005	0.00017	0.000075

Material handling emissions associated with the cement and lime deposition on the conveyor belt were calculated as per the method outlined above (see Section A.4).

A.10 Incineration

The mine has an incinerator used to dispose of food waste. Emissions of particulate matter from the incinerator were estimated using emission factors from U.S. EPA AP-42 Chapter 2.1 [31]:

$$EF\ (TSP) = 3.5\ kg/tonne$$
$$EF\ (PM_{10}) = 3.5\ kg/tonne$$
$$EF\ (\mathrm{PM}_{2.5}) = 3.5\ kg/tonne$$

$$EF\ (CO) = 0\ kg/tonne$$
$$EF\ (SO_2) = 0.25\ kg/tonne$$
$$EF\ (\mathrm{NO}_x) = 1\ kg/tonne$$

Note that it was conservatively assumed that PM_{10} and $PM_{2.5}$ were equal to the TSP emission factor. The amounts of food waste that were assumed to be incinerated are provided in Table A.1.

A.11 On-Road Mobile Combustion

On-road mobile combustion sources include any vehicles permitted to drive on public roads (e.g., delivery trucks). To calculate exhaust emissions from on-road mobile combustion sources, U.S. EPA Tier 2 emission factors (which apply to vehicles for model years 2004-2009) were conservatively used and are summarized in the table below.

Emission Factors for On-Road Vehicles Conforming to U.S. EPA Tier 2 Standards (Model Years 2004-2009)

Vehicle Type	Fuel Type	Technology Type	Emission Factors				Units
			HC	CO	NOx	PM	HC
Light Duty Vehicle (LDV)	Gasoline	Tier 2	0.09	4.20	0.07	0.01	g/mile
	Diesel	Tier 2	0.09	4.20	0.07	0.01	g/mile
Medium Duty Vehicle (MDV)	Gasoline	Tier 2	0.09	4.20	0.07	0.01	g/mile
	Diesel	Tier 2	0.09	4.20	0.07	0.01	g/mile
Heavy Duty Vehicle (HDV)	Gasoline	Tier 2	0.14	15.50	0.20	0.01	g/bph-hr
	Diesel	Tier 2	0.14	15.50	0.20	0.01	g/bph-hr

Emission factors for light- and medium-duty on-road vehicles depend on the number of vehicle kilometers travelled (VKT), whereas emission factors for heavy-duty vehicles depend on the engine size and number of operating hours. VKT and engine horsepower are summarized in Table A.2 and Table A.3.

Instead of emission factors, SO_2 emissions from on-road mobile sources were calculated using a mass balance approach:

$$SO_2\left(\frac{g}{s}\right) = FC \times FD \times sox \times 0.01 \times 2.00$$

Where:
FC = fuel consumption in L
FD = fuel density in g/L
sox = fuel sulphur content in %
0.01= conversion from percent to fraction
2.00 = the mass ratio of sulphur dioxide to sulphur (assumes 100% oxidation of sulphur)

Fuel consumption data was calculated based on the vehicle fuel economy and VKT data, which are also available in Table A.2 and Table A.3. The fuel sulphur content for diesel and gasoline was based on the *Sulfur in Diesel Fuel Regulations* [32] and *Sulphur in Gasoline Regulations* [33], which specify sulphur contents of 15 parts per million (ppm) and 30 ppm, respectively, for diesel and gasoline.

A.12 Non-Road Combustion

Non-road or off-road combustion sources at the Project site include heavy equipment (e.g., dozers, graders, loaders) and mining vehicles (e.g., haul trucks). In general, emissions for these sources were calculated as follows:

$$ER\left(\frac{g}{s}\right) = EF\left(\frac{g}{hp-hr}\right) \div BSFC\left(\frac{lb\ fuel}{hp-hr}\right) \times FC\left(\frac{lb\ fuel}{yr}\right) \div 365\left(\frac{days}{yr}\right) \div 24\left(\frac{hr}{day}\right) \div 3600\left(\frac{s}{hr}\right)$$

Where:
ER = emission rate
EF = emission factor
BSFC = brake-specific fuel consumption
FC = annual fuel consumption

The emission factors and BSFC values were obtained from the following U.S. EPA documents:

- Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression-Ignition [34]; and
- Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Spark-Ignition [35].

For non-road diesel combustion, Tier 4 emission factors were assumed and for non-road gasoline combustion, Phase I emission factors were assumed. All of the emission factors used in the assessment are summarized in the table below and engine horsepower data are provided in Table A.2. SO_2 emissions were calculated using the same methodology described above in Section A.9.

Emission Factors for Off-Road Vehicles Conforming to U.S. EPA Tier 4 Standards (Model Years 2008-2015)

Construction Equipment Type	Engine Tier	Fuel Type	Engine Size (hp)	BSFC	Steady State Emission Factor (g/hp-hr)			
					HC	CO	NOx	PM
Bore/Drill Rigs	Tier 4	Diesel	>750 except generator sets	0.367	0.282	0.764	2.392	0.069
Crawler Dozer	Tier 4	Diesel	>600 to 750	0.367	0.131	0.133	2.500	0.009
Excavators	Tier 4	Diesel	>750 except generator sets	0.367	0.282	0.764	2.392	0.069
Graders	Tier 4	Diesel	>300 to 600	0.367	0.131	0.084	2.500	0.009
Off-highway Trucks	Tier 4	Diesel	>750 except generator sets	0.367	0.282	0.764	2.392	0.069
Rubber Tire Dozers	Tier 4	Diesel	>300 to 600	0.367	0.131	0.084	2.500	0.009
Rubber Tire Loaders	Tier 4	Diesel	>750 except generator sets	0.367	0.282	0.764	2.392	0.069
Tractors/Loaders/Backhoes	Tier 4	Diesel	>300 to 600	0.367	0.131	0.084	2.500	0.009

A.13 Stationary Combustion

Stationary combustion sources at the Project site include the diesel-fired process boilers and carbon regeneration kiln at the ADR facility, the standby diesel-fired generators at the powerplant and explosives storage area, and the propane-fired waste incinerator. Emissions associated with stationary fuel combustion were estimated using either published emission factors or manufacturers' data.

- Process boiler, regeneration kiln and waste-incinerator: U.S. EPA *AP-42 Chapter 1.5 - External Combustion: Liquefied Petroleum Gas Combustion* [36]
- 1.65 MW diesel generator sets: manufacturer's specifications for Inhaltsverzeichnis engine model 16V000G83 as provided by WN Brazier Associates
- 0.4 MW explosives storage area diesel generator set: U.S. EPA *AP-42 Chapter 3.3 - Stationary Internal Combustion Sources: Gasoline and Diesel Industrial Engines* [37]

To estimate combustion emissions from these stationary sources it is necessary to know the size of the equipment and either the amount of fuel combusted, or the operating load and operating time for the equipment. This information is provided in Table A.1 and the emission factors used in the calculations are summarized in the table below.

Emission Factors for Stationary Combustion Sources

Pollutant	External Combustion			Internal Combustion		
	Propane[(a)]	Diesel < 100 MMBTU/h[(a)]	Units	Diesel < 600 HP[(a)]	Diesel > 600 HP[(b)]	Units
TSP	2.40E-02	2.40E-01	kg/m³	1.34E+00	7.95E-02	kg/MW-h
PM_{10}	2.40E-02	2.40E-01	kg/m³	1.34E+00	7.95E-02	kg/MW-h
$PM_{2.5}$	2.40E-02	2.40E-01	kg/m³	1.34E+00	7.95E-02	kg/MW-h
SO_2	0.00E+00	2.56E-02	kg/m³	1.25E+00	2.00E-03	kg/MW-h
CO	8.99E-01	6.00E-01	kg/m³	4.06E+00	4.00E-01	kg/MW-h
NOx	1.56E+00	2.16E+00	kg/m³	1.88E+01	9.51E+00	kg/MW-h

NOTES:
(a) Published U.S. AP-42 emission factors [36] [37]
(b) Manufacturer's specifications

A.14 Electrowinning

Emissions of NH_3 are also produced at the ADR Facility when the gold-bearing solution undergoes electrowinning. These emissions are estimated using emission factors from U.S. EPA AP-42 Chapter 12.20 [39]. Note that these emission factors were originally developed to describe emissions from copper-cyanide electroplating, which is a similar process to gold-cyanide electroplating/electrowinning. The emission factors used to calculate emissions from electrowinning at the ADR Facility are provided in the following table.

Emission Factors for an Electric Smelting Furnace

Parameter	Value	Unit	Notes
NH_3	0.096	mg/dsm³	Assumes control by packed bed scrubber

As shown in the above table, the emission factors are based on assumed concentrations of NH_3 in the building air near the electrowinning process. To calculate emissions of NH_3 to the atmosphere, it is necessary to know the flow rate of the exhaust fans serving the electrowinning process area. As shown in Table A.7, it was conservatively assumed that the exhaust fans would operate at their maximum flow rate (10,500 ft³/min) 24 hours per day, 365 days per year.

A.15 Smelting

Doré bars are smelted using an electric induction furnace at the ADR Facility. Although the furnace produces no emissions associated with fuel combustion, the smelting process itself does produce emissions of particulates and SO_2. These emissions were estimated based on emission factors published in U.S. EPA AP-42 Chapter 12.3 [40]. Note that these emission factors were initially developed to assess smelting of copper ore in an electric furnace, which is a similar (but not identical) process. In particular, the AP-42 emission factors assume the ore being smelted has a sulphur content of 30% by weight. As shown in Table A.5, the sulphur composition of the ore at the Project site is considerably less (<0.2%). As such, emissions of SO_2 from the melt furnace at the ADR Facility were based on the AP-42 emission factor for copper smelting but multiplied by the ratio of the sulphur contents (i.e., 0.2%/30%). In addition, emission factors for PM_{10} and $PM_{2.5}$ were not available for the electric furnace source type, so emission factors for PM_{10} and $PM_{2.5}$ were conservatively based on the TSP emission factor and the particle size distribution for the multiple hearth roaster source type. The emission factors used to calculate emissions from the melt furnace at the ADR Facility are provided in the following table.

Emission Factors for an Electric Smelting Furnace

Pollutant	Factor	Units	Notes
TSP	50	kg/tonne	Electric furnace.
PM_{10}	47	kg/tonne	Electric furnace. Based on particle size distribution for multiple hearth roaster
$PM_{2.5}$	46	kg/tonne	
SO_2	0.79	kg/tonne	Electric furnace. Scaled based on estimated sulphur content of the gold ore concentrate (<0.2%). Default U.S. AP-42 emission factor (120 kg/tonne) assumes concentrated copper ore with 30% sulphur.

To estimate emissions from the smelting process, it is necessary to know the amount of gold ore concentrate smelted per day. This information is provided in Table A.1.

A.16 Metals in TSP

Emission rates of metals were calculated based on the composition of the parent material from which TSP is emitted. The specific calculation is:

$$Metal\left(\frac{g}{s}\right) = TSP\left(\frac{g}{s}\right) \times metal\ content\ (\%)$$

The metal content of the various material types is outlined in Table A.5.

A.17 Insignificant or Negligible Sources

The borrow quarries and the Platinum Gulch WRSA were not considered sources of fugitive dust as they will no longer be active in Y4. Other supporting activities that were not considered significant include water treatment and any supporting services that take place in the maintenance shops and warehouses. There are also several vents at the ADR facility that either exhaust non-process areas (e.g., electrical room) or exhaust process areas that involve low-temperature handling of aqueous solutions (e.g., caustic and cyanide mix tanks). These vents at the ADR facility are assumed to be negligible emissions sources. The potential for HCN gas releases from the ADR and Heap Leach facilities were considered very low due to strict pH controls applied as part of StrataGold's Cyanide Management Plan.

Table A. 1: Individual Operating Rates

Year	Input	Value	Units	Period	Comments
Y4	Annual Production - Ore to Crusher	10,950,000	dry tonne/year	year	
Y4	Annual Production - Total Waste Mined	15,686,000	dry tonne/year	year	
Y4	Primary Crushing - Ore Feed Rate	1,848	tonne/op hr	1 h	365 operating days
Y4	Secondary Crushing - Ore Feed Rate	2,146	tonne/op hr	1 h	275 operating days
Y4	Tertiary Crushing - Ore Feed Rate	4,707	tonne/op hr	1 h	275 operating days
Y4	Tertiary Crushing - Ore Return Rate	2,562	tonne/op hr	1 h	Calculated. 275 operating days
Y4	Tertiary Crushing - Ore Discharge Rate	2,145	tonne/op hr	1 h	275 operating days
Y4	Winter Storage - Ore Feed Rate	1,848	tonne/op hr	1 h	90-day stockpile
Y4	Winter Storage - Ore Reclaim Rate	529	tonne/op hr	1 h	275 operating days
Y4	Belt Agglomeration - Lime Feed Rate	1.8	tonne/op hr	1 h	275 operating days
Y4	Belt Agglomeration - Cement Feed Rate	3.1	tonne/op hr	1 h	275 operating days
Y4	Heap Leach - Low Grade Ore from Pit	222	tonne/op hr	1 h	365 operating days
Y4	Waste Rock Storage - Eagle Pup	2,647	tonne/op hr	1 h	Assumed. Based on annual ore/waste rock produced. 365 operating days
Y4	Lime Silo Loading Rate	8.3	tonne/op hr	1 h	Assumed. 1x 200 tonne silo loaded in 24h
Y4	Cement Silo Loading Rate	8.3	tonne/op hr	1 h	Assumed. 1x 200 tonne silo loaded in 24h
Y4	Drilling Rate	2.5	holes/op hr	1 h	Calculated. Based on ore + waste rock
Y4	Blasting Rate – Max Day	0.04	blast/hour	1 h	As per S. Tang. 2 blasts per week but 1 blast per 24h in max day
Y4	Blasting Rate -- Annual	0.01	blast/hour	1 h	As per S. Tang. 2 blasts per week per year
Y4	Blasting – Tonnes of Rock/Ore per Blast	255,000	tonnes/blast	blast	As per S. Tang.
Y4	Dozing - Active Hours	12	hours/day	24 h	Assumed. 50% of the time
Y4	Incinerator - Food Waste	1.5	kg/hr	1 h	As per J. Knox. 35 kg/day for 450 ppl
Y4	Grader - Speed	8	km/h	--	Assumed
Y4	Incinerator - Propane	12,800	L/year	year	Calculated based on information supplied by J. Knox
Y4	Heating Sol. Boiler - Diesel	500	L/h	1 h	Calculated. 18.1 million BTU/h
Y4	Elution Sol. Boiler - Diesel	88	L/h	1 h	Calculated. 3.2 million BTU/h
Y4	Carbon Regen. Kiln - Diesel	70	L/h	1 h	Calculated. 2.544 million BTU/h
Y4	Standby diesel gen #1 - Capacity	1.65	MWe	1 h	As per H. Coyle/S. Wilbur
Y4	Standby diesel gen #2 - Capacity	1.65	MWe	1 h	As per H. Coyle/S. Wilbur
Y4	Standby diesel gen #3 - Capacity	1.65	MWe	1 h	As per H. Coyle/S. Wilbur
Y4	Standby diesel gen #4 - Capacity	0.4	MWe	1 h	As per H. Coyle

Year	Input	Value	Units	Period	Comments
Y4	Standby diesel gen #1 - Load	100	%	1 h	The assessment assumes a worst-case 1- and 24-hour operating scenario where all three main generators (gen #1-3) are operating continuously at 100% load, and the explosives storage area generator (gen #4) operates continuously at 50% load. The annual operating scenario assumes that the generators operate at the same engine loads (i.e., 100% and 50%) in December-January-February only, as these are the months in which the power supply from Yukon Energy Corporation is most likely to be unreliable.
Y4	Standby diesel gen #2 - Load	100	%	1 h	
Y4	Standby diesel gen #3 - Load	100	%	1 h	
Y4	Standby diesel gen #4 - Load	50	%	1 h	
Y4	Standby diesel gen #1 – Annual Load	100	%	year	
Y4	Standby diesel gen #2 – Annual Load	100	%	year	
Y4	Standby diesel gen #3 – Annual Load	100	%	year	
Y4	Standby diesel gen #4 – Annual Load	50	%	year	
Y4	Cyanide addition - Total	3,836	tonne/year	year	
Y4	Smelting - Daily throughput	8000	kg/day	24 h	ADR processes 8 tonnes of concentrated ore per day. Max capacity of the furnace is 660 kg

Table A. 2: Vehicles and Site Equipment

Year	Description	Model	Quantity	Empty Weight (tonnes)	Full Weight (tonnes)	Vehicle Type	hp	Fuel Economy (L/km)
Y4	Drill, Diesel rotary, 229mm diameter	MD6290	2	n/a	n/a	HDV	875	n/a
Y4	Front Shovel, Diesel, 22m^3	6040 FS	2	n/a	n/a	HDV	2032	n/a
Y4	Backhoe, 4 m^3	390F	1	n/a	n/a	HDV	524	n/a
Y4	Wheel Loader, 11 m^3	993K	2	n/a	n/a	HDV	973	n/a
Y4	Track Dozer	D10T2	4	n/a	n/a	HDV	754	n/a
Y4	Rubber Tired Dozer	834K	1	n/a	n/a	HDV	562	n/a
Y4	Haul Truck, 136 Tonne Class	785D	11	117	253	HDV	1450	n/a
Y4	Water Truck, 91 Tonne Class	777G WT	1	52	143	HDV	1025	n/a
Y4	Grader	16M	2	26	26	HDV	312	n/a
Y4	Cement/Lime Trucks	Paystar Int. 5600l		51	73	HDV	500	0.362
Y4	Shipping/Supply Trucks	Paystar Int. 5600l		51	73	HDV	500	0.362
Y4	Bus	Blue Bird Type C	1	15	15	MDV	260	0.428
Y4	Light vehicles	Ford 350	12	2.4	3.1	LDV	385	0.118

NOTES:
n/a – not applicable as the information is not required for air emissions calculations

Table A. 3: Traffic Along Site Roads

Year	Road No.	Road Description	Length (km)	Vehicle Description	Model	Empty Weight (tonnes)	Full Weight (tonnes)	One-way Trips/day	VKT/day
Y4	Pit	Haul Road in Pit	1.2	Haul Truck, 136 Tonne	785D	117	253	793	1840
Y4	Pit		1.2	Water Truck, 91 Tonne	777G WT	52	143	3.2	7
Y4	Pit		1.2	Grader	16M	26	26	1.0	2.3
Y4	Road1	Haul Road from Pit towards Primary Crusher	0.5	Haul Truck, 136 Tonne	785D	117	253	793	777
Y4	Road1		0.5	Water Truck, 91 Tonne	777G WT	52	143	3.2	3
Y4	Road1		0.5	Grader	16M	26	26	1.0	1.0
Y4	Road2	Haul Road from Primary Crusher towards Eagle Pup WRSA	0.8	Haul Truck, 136 Tonne	785D	117	253	467	775
Y4	Road2		0.8	Haul Truck, 136 Tonne	785D	117	253	39	65
Y4	Road2		0.8	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	2
Y4	Road2		0.8	Water Truck, 91 Tonne	777G WT	52	143	2.3	4
Y4	Road2		0.8	Grader	16M	26	26	1.0	1.7
Y4	WRSA_road	Haul truck traffic across Eagle Pup WRSA	1.8	Haul Truck, 136 Tonne	785D	117	253	467	1682
Y4	WRSA_road		1.8	Water Truck, 91 Tonne	777G WT	52	143	5	18
Y4	Road3	Haul Road from Primary Crusher towards Truck Shop	3.3	Haul Truck, 136 Tonne	785D	117	253	1	7
Y4	Road3		3.3	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	7
Y4	Road3		3.3	Water Truck, 91 Tonne	777G WT	52	143	9.0	59
Y4	Road3		3.3	Grader	16M	26	26	1.0	7
Y4	Road4	Camp towards Truck Shop	0.4	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	1
Y4	Road4		0.4	Water Truck, 91 Tonne	777G WT	52	143	1.1	1
Y4	Road4		0.4	Grader	16M	26	26	1.0	1
Y4	Road5	Eagle Pup WRSA towards Heap Leach Pile	1.3	Haul Truck, 136 Tonne	785D	117	253	39	102
Y4	Road5		1.3	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	3
Y4	Road5		1.3	Water Truck, 91 Tonne	777G WT	52	143	3.5	9
Y4	Road5		1.3	Grader	16M	26	26	1.0	3
Y4	Road6	Guardhouse towards Camp	1.7	Shipping/Supply Trucks	Paystar Int.5600l	102	146	10	34
Y4	Road6		1.7	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	3
Y4	Road6		1.7	Water Truck, 91 Tonne	777G WT	52	143	4.6	16
Y4	Road6		1.7	Grader	16M	26	26	1.0	3

Year	Road No.	Road Description	Length (km)	Vehicle Description	Model	Empty Weight (tonnes)	Full Weight (tonnes)	One-way Trips/day	VKT/day
Y4	Road7	Camp towards Main Plant	1.6	Shipping/Supply Trucks	Paystar Int.5600l	102	146	10	32
Y4	Road7		1.6	Bus	Blue Bird Type C	15	15	4	13
Y4	Road7		1.6	Light vehicles	Ford 350	2.4	3.1	48	154
Y4	Road7		1.6	Water Truck, 91 Tonne	777G WT	52	143	4.4	14
Y4	Road7		1.6	Grader	16M	26	26	1.0	3
Y4	Road8	Haggart Creek Road (from Guardhouse towards Mayo)	1.0	Shipping/Supply Trucks	Paystar Int.5600l	102	146	10	20
Y4	Road8		1.0	Cement/Lime Trucks	Paystar Int.5600l	102	146	1	2
Y4	Road8		1.0	Water Truck, 91 Tonne	777G WT	52	143	2.7	5
Y4	Road8		1.0	Grader	16M	26	26	1.0	2

NOTES:

1. Traffic movements are assumed and/or calculated based on daily extraction rates for ore and waste rock.
2. Traffic movements for the water truck and the grader are not included in the winter. Based on data from the Environment Canada weather station at Mayo, "winter" is defined as the period from Jan.1-Apr.14 and Oct.16-Dec.31 and "summer" is defined as the period from Apr.15-Oct.15.
3. Road 2 and Road 5 include haul truck traffic for the delivery of ROM ore directly to the heap leach pad.
4. The length of Road 2 has been modified to 0.8 km to reflect SGC's comments. Note that for ease of model setup both Road 2 and Road 3 connect directly to Road 1 at the primary crusher and therefore the two roads overlap for 0.3 km. This does not affect emissions, since the traffic on the two roads is considered separately.
5. The water truck has been added to the haul road on the WRSA. This was to ensure that dust emissions from the haul trucks travelling on the pile are 85% controlled.
6. Road lengths are based on the Sept. 2017 version of the Project site plan/drawing with modifications to the route for Road 2, as per direction from SGC (Nov. 10, 2017).

Table A. 4: Assumed Emissions Control Efficiencies

Source Type	Control Efficiency (%)	Comments
Primary Crusher	99%	Dedicated baghouses with 95-99% control efficiency and enclosed in a building (additional 75% control)
Secondary Crusher	97%	Dedicated baghouses with 95-99% control efficiency
Tertiary Crusher	97%	Dedicated baghouses with 95-99% control efficiency
Conveyors and Transfer Towers	50%	Conveyors are partially covered or enclosed. Assumed 50% control of dust
Stockpiles (Winter)	90%	Frozen ground in winter. Assumed 90% dust control.
Stackers	25%	Variable height radial stackers have 25% control efficiency
Melt Oven	97%	Dedicated baghouse. Assumed 95-99% control efficiency
Site Roads (Summer)	85%	Summer. 74% control for watering and 44% control for speeds < 40 km/h
Site Roads (Winter)	90%	Frozen ground in winter. Assumed 90% dust control.

Table A. 5: Metals Composition

Material	Assumed Metals Composition (% by mass or g/g)									
	S	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Units
Waste rock	1.30E-03	1.87E-04	3.20E-07	1.09E-04	3.00E-05	4.60E-10	2.10E-05	8.80E-06	5.70E-05	g/g
Ore	1.97E-03	3.91E-04	7.40E-07	6.38E-05	3.70E-05	7.40E-10	2.33E-05	3.53E-05	1.44E-04	g/g
Crushed ore	1.97E-03	3.91E-04	7.40E-07	6.38E-05	3.70E-05	7.40E-10	2.33E-05	3.53E-05	1.44E-04	g/g
Roads	4.91E-04	2.38E-04	3.23E-07	1.02E-04	1.92E-05	1.38E-08	1.75E-05	1.87E-05	5.81E-05	g/g
Leachate	2.27E-05	4.82E-07	4.91E-11	8.31E-08	5.91E-09	1.07E-12	3.12E-08	2.00E-08	2.23E-07	g/g
Pregnant solution	7.58E-05	1.61E-06	1.64E-10	2.77E-07	1.97E-08	3.57E-12	1.04E-07	6.67E-08	7.45E-07	g/g solids
Electrowinning sludge	7.58E-05	1.61E-06	1.64E-10	2.77E-07	1.97E-08	3.57E-12	1.04E-07	6.67E-08	7.45E-07	g/g solids
Lime	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	g/g
Cement	0.00E+00	4.24E-06	0.00E+00	2.90E-05	0.00E+00	0.00E+00	4.18E-05	1.09E-05	0.00E+00	g/g

NOTES:

1. Compositions for Ore and Crushed ore are based on the **oxidized, altered and unaltered granodiorite** in Table 4 of Appendix G1. Composition for Waste rock is based only on the **metasediments** in Table 4 of Appendix G1.
2. Composition for the electrowinning sludge is based on the leachate composition and moisture content (i.e., the solid fraction of the leachate). Given the uncertainty in this approach, composition for Leachate is conservatively based on the maximum of all samples in Table 8 in Appendix G1.
3. Composition information for Cr and some other metals in the leachate (Hg, Ni and Zn) are estimated conservatively based on method detection limits and other information in Appendix G1. This is necessary in order to ensure that the air quality assessment quantifies emissions for all metals requested by YESAB.

Table A. 6: Other Composition Information

Material	Moisture Content (%)	Silt Content (%)	Density (tonne/m³)
Waste rock	3	5	2.7
Ore	3	5	2.7
Crushed ore	3	5	1.7
Roads	n/a	8.3	n/a
Leachate	70	n/a	1.1
Lime	1	n/a	n/a
Cement	1	n/a	n/a

Table A. 7: Other Operating Information and Assumptions

Input	Value	Units	Comments
Operating Schedule - Mining/Primary Crushing	365	day/year	
Operating Schedule - Secondary Crushing/Ore Stacking	275	day/year	
Operating Schedule - Process Plant	365	day/year	
Operating Hours per Day	24	hour/day	
Operating Hours per Shift	12	hour/shift	Assumed
Utilization - Mining Equipment	67	%	Used weighted avg. of 67%. Overall utilization will be 65% for drills, 69% for excavators, and 67% for haul trucks
Utilization - Primary Crushing	70	%	
Utilization - Secondary Crushing/Ore Stacking	80	%	
Utilization - Process Plant	98	%	
Haul Truck - Capacity	136	tonnes	
Site wide Speed Limit	25	km/h	
Blasting Powder Factor	0.65	kg ANFO/m³ rock	0.6-0.7 kg/m3
Drill Spacing (l x w)	5.6 x 6.4 (ore) 6.0 x 6.8 (waste rock)	m	
Pit bench height	10	m	
WRSA lift height	45	m	Based on previous FS
WRSA bench width	60	m	Measured off drawing
WRSA slope ratio (H:V)	2.5:1		Assumed

Input	Value	Units	Comments
HL lift height	10	m	
HL bench width	25	m	Measured off drawing
HL slope ratio (H:V)	2.5:1		Assumed
90-d winter storage lift height	13	m	Based on previous FS
90-d winter storage top width	60	m	Assumed
90-d winter storage slope ratio (H:V)	2.5:1		Assumed
2,000 tonne coarse ore stockpile slope ratio (H:V)	2.5:1		Assumed
2,000 tonne coarse ore stockpile radius	20.0	m	Pile radius of 20 m
Percent sulphur content – Diesel (soxdsl)	0.0015	%	Assumed. Based on Canadian fuel standards
Percent sulphur content – Gasoline (soxgas)	0.0030	%	Assumed. Based on Canadian fuel standards
Heating value - diesel	137,030	Btu/gal	
Density - gasoline	838.9	g/L	
Density - diesel	737.0	g/L	
Electrowinning exhaust fan - flow rate	10,500	ft^3/min	Assumed. Based on 2.2 kW (3 hp) fan (Twin City 300BCRU)

Table A. 8: Stockpile Areas

Pile	Shape	Material Type	Density (tonne/m³)	Volume (m³)	Active Length (m)	Top Width (m)	Bottom Width (m)	Height (m)	Radius (m)	Side Length (m)	Surface Area (m²)
Active portion of Eagle Pup WRSA	Parallelepiped (with bottom/back against the slope)	Waste rock	2.7	23,531	3	60	60	45	--	121	15,126
Active portion of Heap Leach Pile	Parallelepiped (with bottom/back against the slope)	Crushed ore	1.7	30,282	45	25	25	10	--	27	3,682
Active portion of the 90-day winter storage pile	Trapezoidal prism	Ore	2.7	4,702	2	60	125	13	--	35	2,976
2,000 tonne coarse ore stockpile	Cone	Crushed ore	--	--	--	--	--	8	20	22	2,610

Appendix B:

CALMET/CALPUFF Model Setup

Appendix B: CALMET/CALPUFF Model Setup

B.1 CALMET

The CALMET model was used to develop 1 year of hourly meteorological data fields for use in CALPUFF. The selected meteorological year was 2015. The CALMET setup is discussed below, followed by summary of the CALMET model results.

B.1.1 Meteorological Data

CALMET can accept inputs from mesoscale meteorological models, surface and upper air observations, or a combination thereof. For this assessment, a single CALMET meteorological dataset was created at a fine 200 m by 200 m spatial resolution covering the RSA. CALMET was initialized using site-specific meteorology produced with the Weather Research and Forecast (WRF) Non-Hydrostatic Mesoscale Model (WRF-NMM), which was employed to generate 1 year of site-specific meteorology for the entire model domain. The selected year of meteorology was 2015.

WRF-NMM was initialized using archived North America Model (NAM) mesoscale re-analysis wind fields produced by the United States National Center for Environmental Prediction (NCEP) [41]. The re-analysis data from NCEP were developed based on all available surface and upper air observations and were made available on a 6-hour interval (i.e., 4 times per day). The spatial coverage of the re-analysis fields included most of North America at a 32 km by 32 km grid spacing. The WRF-NMM modelling was used to refine the re-analysis data and produce hourly meteorology at a spatial resolution of approximately 3 km by 3 km. The outputs of WRF-NMM encompass a large area of the Yukon, stretching well beyond the RSA and in all directions.

The output from the WRF-NMM model was then used to generate hourly surface observations data (wind speed, wind direction, temperature, cloud cover, etc.) as well as upper air profiles for use in CALMET. Referred to as "pseudo-observation" points, hourly surface and upper air data were generated for 35 locations in the RSA, as shown in Figure 2.

B.1.2 Terrain Data

Terrain data inputs for CALMET were processed through the TERREL program. TERREL is a pre-processor program provided with the CALMET/CALPUFF modelling system that accepts surface elevation data in a variety of formats to produce grid-cell averaged terrain files for use in the MAKEGEO pre-processor. For this assessment, Canadian Digital Elevation Model (CDED) files in 3 arcsecond format were used. CDED files are available online from Natural Resources Canada's Geo-Gratis database [42].

TERREL was run for each CALMET domain. The resulting gridded terrain files produced by TERREL are presented graphically in Figure B.1. The outputs from TERREL were also used to assign ground elevations to the sources and receptors used in CALPUFF.

B.1.3 Land Use Data

Gridded land use classifications were obtained from the United States Geological Service database [43]. This data set was further edited by recoding the land use to reflect times of the year when the area is snow/ice covered. For such periods, the land use classification was changed to 90 (perennial snow or ice). The period with snow/ice was October 16 to April 14, inclusive. The resulting gridded land use file produced by MAKEGEO for the model domain is provided in Figure B.2 and the corresponding model parameters for each land use type are shown in the following tables. Note that the figures reflect the snow/ice free period.

Non-Winter (Apr.15-Oct.15)							
Input Land Use Category	z_0 (m)	Albedo	Bowen Ratio	Soil Heat Flux Parameter	Anthropogenic Heat Flux (W/m²)	Leaf Area Index	Output Category ID
-20 – Agricultural Land Irrigated	0.25	0.15	1.0	0.15	0.0	3.0	30
30 - Shrub and Brush Rangeland	0.05	0.25	1.0	0.15	0.0	0.5	30
40 - Deciduous Forest Land	1.0	0.1	1.0	0.15	0.0	7.0	40
51 - Fresh Water	0.001	0.1	0.0	1.0	0.0	0.0	51
70 - Bare Exposed Rock	0.05	0.3	1.0	0.15	0.0	0.05	70

Winter with Snow Cover (Jan.1-Apr.14 and Oct.16-Dec.31)							
Input Land Use Category	z_0 (m)	Albedo	Bowen Ratio	Soil Heat Flux Parameter	Anthropogenic Heat Flux (W/m²)	Leaf Area Index	Output Category ID
-20 - Agricultural Land Irrigated	0.01	0.7	0.5	0.15	0.0	0.0	30
30 - Shrub and Brush Rangeland	0.005	0.7	0.5	0.15	0.0	0.5	30
40 - Deciduous Forest Land	0.5	0.5	0.5	0.15	0.0	0.0	40
70 - Bare Exposed Rock	0.002	0.7	0.5	0.15	0.0	0.0	70
90 - Perennial Snow or Ice	0.05	0.7	0.5	0.15	0.0	0.0	90

B.1.4 CALMET Options

The following table provides all non-default options used in the CALMET modelling runs.

CALMET Option	Selected Option	Explanation
No. of Vertical Layers	NZ = 10	10 vertical layers used: 0, 20, 40, 80, 160, 300, 600, 1000, 1500, 2200, 3000 m
No Observation Mode	NOOBS = 0	Use surface, overwater, or upper air observations
Method to compute cloud fields	ICLOUD = 4	Gridded clouds not used
Use varying radius of influence	LVARY = T	Use varying radius of influence
Maximum radius of influence over land in the surface layer	RMAX1 = 5	Maximum radius of influence of surface stations over land is 5 km
Maximum radius of influence over land in the layer aloft	RMAX2 = 5	Maximum radius of influence of upper air stations over land is 5 km
Maximum radius of influence over water	RMAX3 = 5	Maximum radius of influence of upper air stations over water is 5 km

CALMET Option	Selected Option	Explanation
Minimum radius of influence used in the wind field interpolation	RMIN= 0.1	Minimum radius of influence of stations is 0.1 km
Radius of influence of terrain features	TERRAD = 1 (no default)	Terrain effects are considered up to 1 km for each grid point
Relative weighting of the first guess field and observations in the surface layer	R1 = 1	Weighting used for surface layer is 1km
Relative weighting of the first guess field and observations in the layers aloft	R2 = 1	Weighting used for layers aloft is 1 km
Surface met. station to use for the surface temperature	ISURFT = -1	Use 2-D spatially varying surface temperatures
Option for overwater lapse rates used in convective mixing height growth	ITWPROG = 0	Use SEA.DAT lapse rates and deltaT (or assume neutral conditions if missing)
3D relative humidity from observations or from prognostic data	IRHPROG = 0	Use RH from SURF.DAT file
3D temperature from observations or from prognostic data	ITPROG = 0	Use Surface and upper air stations
Land use categories for temperature interpolation over water	JWAT1 = 999 JWAT2 = 999	Temperature interpolation disabled using 999

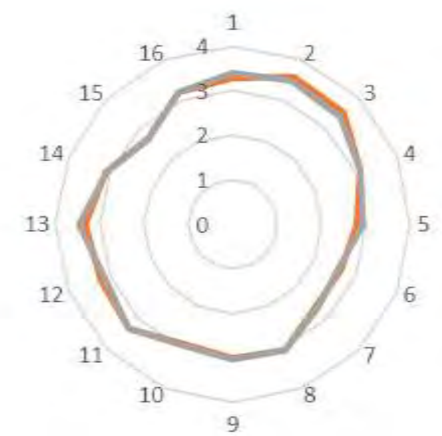
B.1.4 CALMET Results

The following figure presents wind direction frequencies and average wind speed (by direction) produced by CALMET. These data are for a grid point near the Project site and are compared with the corresponding wind data from the WRF-NMM dataset. As seen in the figure, the wind rose for the CALMET run corresponds well with the WRF-NMM data, which indicates good performance of the CALMET model.

Wind Direction Frequency (%)

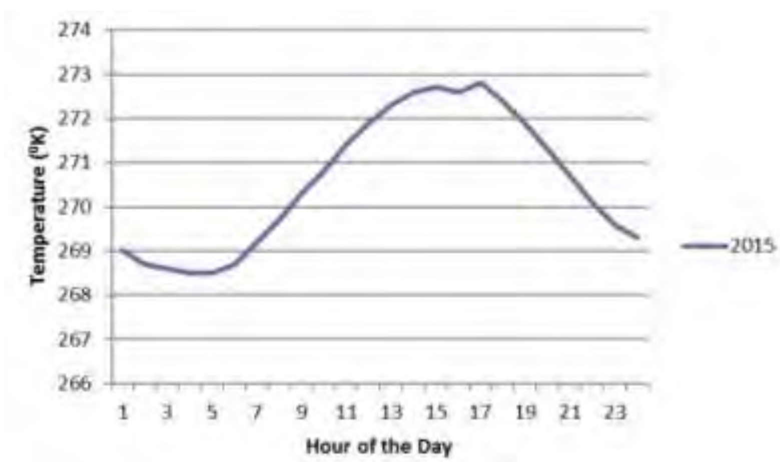
Note: This is the direction the wind blows **from**

Average Wind Speed (m/s)



Percentage Calms = 2.46% -CALMET

As a second measure of model performance, the following figure shows the day profile of mixing heights for a CALMET grid point near the Eagle Gold site. The figure demonstrates that the CALMET meteorology for the Project site has a typical mixing height profile, showing how mixing height grows after sunrise and collapses after sunset. This profile provides further confirmation that CALMET is able to correctly reproduce the physical parameters that are important for air dispersion modelling. As such, there is expected to be less uncertainty in the CALPUFF dispersion modelling exercise, which means that predicted the CALPUFF concentrations are likely to be more realistic.



B.2 CALPUFF

The following sections outline the CALPUFF model setup including a description of the sources, building layout, and receptor grids that were used in the model.

B.2.1 Modelled Sources

Three types of sources were used in the CALPUFF model to represent the various emission sources at the Project site: point sources, volume sources, and area sources. A majority of the emission sources, including the surface stockpiles, conveyors, transfer towers, WRSAs and unpaved roads were represented using volume sources. Point sources were used to model the stationary combustion sources (i.e., generators, incinerator, exhausts from the crushing building, and sources on the ADR facility) and the open pit was represented by an area source.

The locations of modelled sources are shown in Figure B.3. The corresponding source parameters are provided in the following three tables for volume sources, point sources, and area sources, respectively.

CALPUFF Volume Source Parameterization

ID	Description	Base Elev. (m)	Height (m)	Sigma Y (m)	Sigma Z (m)	UTM Coordinates (m)	
						X	Y
COARSE	Coarse Ore Stockpile	996	4	6.98	1.86	459514	7100055
CVY1	Fines Conveyor Drop 1	1020	3	0.93	0.70	459814	7100320
CVY2	Fines Conveyor Drop 2	1055	3	0.93	0.70	459842	7100307
CVY3	Drop from Lime Silo to Conveyor	945	3	0.41	0.70	459788	7101533
CVY4	Drop from Cement Silo 2 To Conveyor	945	3	0.41	0.70	459781	7101533
CVY5	Drop from Cement Silo 3 To Conveyor	945	3	0.41	0.70	459774	7101534
DIVERT	Diverter	1005	3	2.79	0.70	459528	7099993
EPWRSA	Eagle Pup Waste Rock Storage Area	1073	90	88.37	41.86	460466	7100163
HL1	Active Portion of Heap Leach Pile	1090	5	93.02	2.33	459571	7102043
HL2		1080	5	40.70	2.33	459763	7102197
HL3		1080	5	40.70	2.33	459945	7102199
HL4		1080	5	40.70	2.33	459764	7102017
HL5		1080	5	40.70	2.33	459945	7102019
HL6		1080	5	81.40	4.65	459861	7102375
TOWER1	Secondary/Tertiary Transfer Tower	1020	19	1.16	13.49	459772	7100215
TOWER2	Transfer Tower to Tertiary Belt Feeders	1039	8	2.33	3.72	459783	7100180
TOWER3	Transfer Tower Near Lime Silo	943	8	1.16	3.72	459797	7101533
TOWER4	Transfer Tower to Heap Leach	945	8	1.16	3.72	459723	7101535
WINTER1	90 Day Winter Storage Pile	962	6.5	41.86	3.02	459238	7100144
WINTER2		962	6.5	41.86	3.02	459330	7100144
WINTER3		962	6.5	41.86	3.02	459282	7100049
WINTER4		962	6.5	41.86	3.02	459374	7100049
WINTER5		962	6.5	39.53	3.02	459328	7099956
WINTER6		962	6.5	37.21	3.02	459213	7100233
WINTER7		962	6.5	37.21	3.02	459297	7100233
ROAD1_1	Haul Road #1	1064	5.61	26.61	5.22	459651	7099652
ROAD1_2		1065	5.61	26.61	5.22	459652	7099709

ID	Description	Base Elev. (m)	Height (m)	Sigma Y (m)	Sigma Z (m)	UTM Coordinates (m)	
						X	Y
ROAD1_3		1058	5.61	26.61	5.22	459651	7099766
ROAD1_4		1052	5.61	26.61	5.22	459649	7099823
ROAD1_5		1053	5.61	26.61	5.22	459675	7099872
ROAD1_6		1059	5.61	26.61	5.22	459720	7099907
ROAD1_7		1068	5.61	26.61	5.22	459766	7099941
ROAD1_8		1075	5.61	26.61	5.22	459806	7099982
ROAD1_9		1071	5.61	26.61	5.22	459815	7100035
ROAD2_1	Haul Road #2	1069	5.61	28.49	5.22	459818	7100067
ROAD2_2		1068	5.61	28.49	5.22	459839	7100125
ROAD2_3		1066	5.61	28.49	5.22	459867	7100179
ROAD2_4		1066	5.61	28.49	5.22	459906	7100226
ROAD2_5		1054	5.61	28.49	5.22	459923	7100285
ROAD2_6		1044	5.61	28.49	5.22	459939	7100344
ROAD2_7		1034	5.61	28.49	5.22	459959	7100401
ROAD2_8		1024	5.61	28.49	5.22	459985	7100457
ROAD2_9		1014	5.61	28.49	5.22	460022	7100505
ROAD2_10		1003	5.61	28.49	5.22	460057	7100555
ROAD2_11		992	5.61	28.49	5.22	460091	7100606
ROAD2_12		986	5.61	28.49	5.22	460125	7100657
ROAD2_13		987	5.61	28.49	5.22	460158	7100708
ROAD2_14		994	5.61	28.49	5.22	460176	7100765
ROAD3_1	Haul Road #3	830	4.59	19.36	4.27	458660	7100505
ROAD3_2		834	4.59	19.36	4.27	458678	7100424
ROAD3_3		842	4.59	19.36	4.27	458711	7100348
ROAD3_4		850	4.59	19.36	4.27	458744	7100271
ROAD3_5		857	4.59	19.36	4.27	458775	7100194
ROAD3_6		860	4.59	19.36	4.27	458786	7100112
ROAD3_7		860	4.59	19.36	4.27	458794	7100029
ROAD3_8		860	4.59	19.36	4.27	458800	7099946
ROAD3_9		857	4.59	19.36	4.27	458807	7099863
ROAD3_10		869	4.59	19.36	4.27	458852	7099888
ROAD3_11		874	4.59	19.36	4.27	458866	7099969
ROAD3_12		883	4.59	19.36	4.27	458906	7100041
ROAD3_13		893	4.59	19.36	4.27	458947	7100114
ROAD3_14		901	4.59	19.36	4.27	458987	7100187
ROAD3_15		905	4.59	19.36	4.27	459014	7100265
ROAD3_16		904	4.59	19.36	4.27	459035	7100346
ROAD3_17		915	4.59	19.36	4.27	459080	7100329
ROAD3_18		920	4.59	19.36	4.27	459080	7100246
ROAD3_19		928	4.59	19.36	4.27	459101	7100166
ROAD3_20		934	4.59	19.36	4.27	459113	7100084
ROAD3_21		943	4.59	19.36	4.27	459152	7100012
ROAD3_22		954	4.59	19.36	4.27	459190	7099939
ROAD3_23		963	4.59	19.36	4.27	459230	7099868
ROAD3_24		975	4.59	19.36	4.27	459299	7099821

ID	Description	Base Elev. (m)	Height (m)	Sigma Y (m)	Sigma Z (m)	UTM Coordinates (m)	
						X	Y
ROAD3_25		980	4.59	19.36	4.27	459349	7099758
ROAD3_26		991	4.59	19.36	4.27	459388	7099790
ROAD3_27		994	4.59	19.36	4.27	459375	7099872
ROAD3_28		992	4.59	19.36	4.27	459396	7099951
ROAD3_29		986	4.59	19.36	4.27	459439	7100022
ROAD3_30		978	4.59	19.36	4.27	459490	7100086
ROAD3_31		992	4.59	19.36	4.27	459570	7100108
ROAD3_32		1005	4.59	19.36	4.27	459640	7100150
ROAD3_33		1008	4.59	19.36	4.27	459691	7100216
ROAD3_34		1015	4.59	19.36	4.27	459747	7100275
ROAD3_35		1017	4.59	19.36	4.27	459791	7100346
ROAD3_36		1032	4.59	19.36	4.27	459868	7100365
ROAD3_37		1047	4.59	19.36	4.27	459934	7100326
ROAD3_38		1062	4.59	19.36	4.27	459913	7100245
ROAD3_39		1066	4.59	19.36	4.27	459866	7100178
ROAD3_40		1069	4.59	19.36	4.27	459830	7100103
ROAD4_1	Haul Road #4	810	3.57	17.69	3.32	458602	7100899
ROAD4_2		815	3.57	17.69	3.32	458632	7100831
ROAD4_3		821	3.57	17.69	3.32	458648	7100757
ROAD4_4		826	3.57	17.69	3.32	458662	7100682
ROAD4_5		827	3.57	17.69	3.32	458660	7100606
ROAD4_6		829	3.57	17.69	3.32	458658	7100530
ROAD5_1	Haul Road #5	994	3.57	28.73	3.32	460172	7100796
ROAD5_2		990	3.57	28.73	3.32	460149	7100853
ROAD5_3		981	3.57	28.73	3.32	460114	7100903
ROAD5_4		975	3.57	28.73	3.32	460073	7100950
ROAD5_5		968	3.57	28.73	3.32	460033	7100996
ROAD5_6		966	3.57	28.73	3.32	460009	7101052
ROAD5_7		967	3.57	28.73	3.32	460012	7101113
ROAD5_8		961	3.57	28.73	3.32	460023	7101173
ROAD5_9		958	3.57	28.73	3.32	460044	7101231
ROAD5_10		954	3.57	28.73	3.32	460067	7101288
ROAD5_11		956	3.57	28.73	3.32	460104	7101338
ROAD5_12		957	3.57	28.73	3.32	460149	7101378
ROAD5_13		959	3.57	28.73	3.32	460202	7101410
ROAD5_14		958	3.57	28.73	3.32	460232	7101451
ROAD5_15		955	3.57	28.73	3.32	460216	7101510
ROAD5_16		962	3.57	28.73	3.32	460162	7101536
ROAD5_17		966	3.57	28.73	3.32	460104	7101557
ROAD5_18		966	3.57	28.73	3.32	460043	7101567
ROAD5_19		964	3.57	28.73	3.32	459981	7101570
ROAD5_20		958	3.57	28.73	3.32	459920	7101565
ROAD5_21		953	3.57	28.73	3.32	459859	7101558
ROAD5_22		950	3.57	28.73	3.32	459797	7101550
ROAD6_1	Haul Road #6	767	3.57	19.53	3.32	458322	7099487

ID	Description	Base Elev. (m)	Height (m)	Sigma Y (m)	Sigma Z (m)	UTM Coordinates (m)	
						X	Y
ROAD6_2		768	3.57	19.53	3.32	458336	7099569
ROAD6_3		772	3.57	19.53	3.32	458371	7099645
ROAD6_4		776	3.57	19.53	3.32	458403	7099723
ROAD6_5		783	3.57	19.53	3.32	458442	7099796
ROAD6_6		782	3.57	19.53	3.32	458436	7099878
ROAD6_7		782	3.57	19.53	3.32	458426	7099962
ROAD6_8		782	3.57	19.53	3.32	458422	7100046
ROAD6_9		783	3.57	19.53	3.32	458419	7100130
ROAD6_10		785	3.57	19.53	3.32	458417	7100213
ROAD6_11		788	3.57	19.53	3.32	458421	7100297
ROAD6_12		793	3.57	19.53	3.32	458430	7100381
ROAD6_13		797	3.57	19.53	3.32	458430	7100464
ROAD6_14		797	3.57	19.53	3.32	458415	7100547
ROAD6_15		798	3.57	19.53	3.32	458398	7100629
ROAD6_16		799	3.57	19.53	3.32	458385	7100712
ROAD6_17		797	3.57	19.53	3.32	458381	7100796
ROAD6_18		798	3.57	19.53	3.32	458411	7100871
ROAD6_19		802	3.57	19.53	3.32	458462	7100934
ROAD6_20		807	3.57	19.53	3.32	458540	7100913
ROAD7_1	Haul Road #7	811	2.04	19.53	1.90	458600	7100912
ROAD7_2		817	2.04	19.53	1.90	458585	7100993
ROAD7_3		821	2.04	19.53	1.90	458569	7101076
ROAD7_4		826	2.04	19.53	1.90	458572	7101158
ROAD7_5		837	2.04	19.53	1.90	458593	7101240
ROAD7_6		847	2.04	19.53	1.90	458614	7101321
ROAD7_7		857	2.04	19.53	1.90	458634	7101402
ROAD7_8		869	2.04	19.53	1.90	458657	7101483
ROAD7_9		883	2.04	19.53	1.90	458683	7101563
ROAD7_10		892	2.04	19.53	1.90	458699	7101645
ROAD7_11		902	2.04	19.53	1.90	458719	7101727
ROAD7_12		908	2.04	19.53	1.90	458731	7101809
ROAD7_13		925	2.04	19.53	1.90	458770	7101841
ROAD7_14		932	2.04	19.53	1.90	458796	7101761
ROAD7_15		938	2.04	19.53	1.90	458821	7101681
ROAD7_16		942	2.04	19.53	1.90	458852	7101602
ROAD7_17		949	2.04	19.53	1.90	458897	7101532
ROAD7_18		951	2.04	19.53	1.90	458967	7101491
ROAD7_19		957	2.04	19.53	1.90	459051	7101485
ROAD8_1	Haul Road #8	732	3.57	18.99	3.32	458302	7098470
ROAD8_2		740	3.57	18.99	3.32	458272	7098545
ROAD8_3		741	3.57	18.99	3.32	458280	7098627
ROAD8_4		746	3.57	18.99	3.32	458271	7098707
ROAD8_5		750	3.57	18.99	3.32	458271	7098789
ROAD8_6		749	3.57	18.99	3.32	458291	7098867
ROAD8_7		750	3.57	18.99	3.32	458305	7098947

ID	Description	Base Elev. (m)	Height (m)	Sigma Y (m)	Sigma Z (m)	UTM Coordinates (m)	
						X	Y
ROAD8_8		753	3.57	18.99	3.32	458316	7099028
ROAD8_9		754	3.57	18.99	3.32	458293	7099106
ROAD8_10		761	3.57	18.99	3.32	458279	7099186
ROAD8_11		763	3.57	18.99	3.32	458281	7099267
ROAD8_12		761	3.57	18.99	3.32	458297	7099347
ROAD8_13		765	3.57	18.99	3.32	458319	7099425
WRSARD1	Haul Road on the WRSA	983	5.61	28.58	5.22	460181	7100799
WRSARD2		1005	5.61	28.58	5.22	460206	7100854
WRSARD3		1028	5.61	28.58	5.22	460254	7100859
WRSARD4		1028	5.61	28.58	5.22	460251	7100799
WRSARD5		1028	5.61	28.58	5.22	460230	7100742
WRSARD6		1028	5.61	28.58	5.22	460206	7100685
WRSARD7		1028	5.61	28.58	5.22	460175	7100632
WRSARD8		1028	5.61	28.58	5.22	460144	7100579
WRSARD9		1028	5.61	28.58	5.22	460113	7100526
WRSARD10		1028	5.61	28.58	5.22	460083	7100473
WRSARD11		1028	5.61	28.58	5.22	460065	7100415
WRSARD12		1028	5.61	28.58	5.22	460104	7100434
WRSARD13		1028	5.61	28.58	5.22	460132	7100489
WRSARD14		1028	5.61	28.58	5.22	460161	7100543
WRSARD15		1028	5.61	28.58	5.22	460190	7100597
WRSARD16		1028	5.61	28.58	5.22	460220	7100651
WRSARD17		1028	5.61	28.58	5.22	460251	7100704
WRSARD18		1028	5.61	28.58	5.22	460269	7100762
WRSARD19		1028	5.61	28.58	5.22	460284	7100822
WRSARD20		1028	5.61	28.58	5.22	460299	7100881
WRSARD21		1050	5.61	28.58	5.22	460329	7100929
WRSARD22		1073	5.61	28.58	5.22	460383	7100913
WRSARD23		1073	5.61	28.58	5.22	460387	7100852
WRSARD24		1073	5.61	28.58	5.22	460382	7100790
WRSARD25		1073	5.61	28.58	5.22	460376	7100729
WRSARD26		1073	5.61	28.58	5.22	460364	7100669
WRSARD27		1073	5.61	28.58	5.22	460352	7100609
WRSARD28		1073	5.61	28.58	5.22	460360	7100549
WRSARD29		1073	5.61	28.58	5.22	460375	7100489
WRSARD30		1073	5.61	28.58	5.22	460390	7100430
WRSARD31		1073	5.61	28.58	5.22	460405	7100370

CALPUFF Point Source Parameterization

ID	Description	Base Elev. (m)	Height (m)	Diameter (m)	Exit Vel. (m/s)	Exhaust Temp. (K)	Exhaust Config.	UTM Coordinates (m)	
								X	Y
BOILER	Boiler and Elution Solution Heater Exhaust	950	5	0.4	1.9	563.15	Horizontal	459173	7101556

ID	Description	Base Elev. (m)	Height (m)	Diameter (m)	Exit Vel. (m/s)	Exhaust Temp. (K)	Exhaust Config.	UTM Coordinates (m)	
								X	Y
DRYER	Dryer Exhaust	950	6.5	0.1	1.0	563.15	Horizontal	459151	7101533
ELTRWN	Electrowinning Exhaust	950	12	0.46	13.0	313.15	Vertical	459154	7101553
GEN1	Main Powerplant Genset #1 Exhaust	855	6	0.3	84.8	684.15	Vertical	458774	7099969
GEN2	Main Powerplant Genset #2 Exhaust	855	6	0.3	84.8	684.15	Vertical	458774	7099977
GEN3	Main Powerplant Genset #3 Exhaust	855	6	0.3	84.8	684.15	Vertical	458774	7099984
GEN4	Explosives Storage Area Genset #4 Exhaust	930	3	0.152	36.5	787.15	Vertical	459107	7098432
INCIN	Waste Incinerator	825	5.2	0.33	15.0	973.15	Vertical	458779	7100448
KILN	Kiln Combustion	950	23	0.3	3.3	563.15	Vertical	459217	7101550
PCRUSH	Primary Crusher Dust Collector	1038	12.5	0.45	17.6	Ambient	Horizontal	459754	7100041
SCRUSH	Secondary Crusher Dust Collector	1020	8	0.85	20.2	Ambient	Horizontal	459749	7100164
SILO1	Heap Pad Lime Silo	945	22.5	1.7	0.2	Ambient	Vertical	459788	7101546
SILO2	Heap Pad Cement Silo	945	22.5	1.7	0.2	Ambient	Vertical	459781	7101546
SMELTER	Smelter Exhaust	950	12	0.35	14.3	393.15	Vertical	459152	7101553
TCRUSH	Tertiary Crushing Dust Collector	1020	8	0.846	20.4	Ambient	Horizontal	459762	7100213

CALPUFF Area Source Parameterization

ID	Description	Base Elevation (m)	Height (m)	Sigma Z (m)	Width (m)	Length (m)	Rotation Angle (degrees)	UTM Coordinates (m)	
								X	Y
PIT	Open pit	980	0	1	500	200	0	459468	7099435

B.2.2 BPIP-Prime Inputs

Buildings have the ability to affect the flow of air in the vicinity of a point source and cause the plume from a point source to be downwashed. To simulate the effect of building downwash in the model, the Plume Rise Model Enhancements version of the Building Profile Input Program (BPIP PRIME) was utilized in the CALPUFF model. The building configuration that was used in the model is shown in the following table.

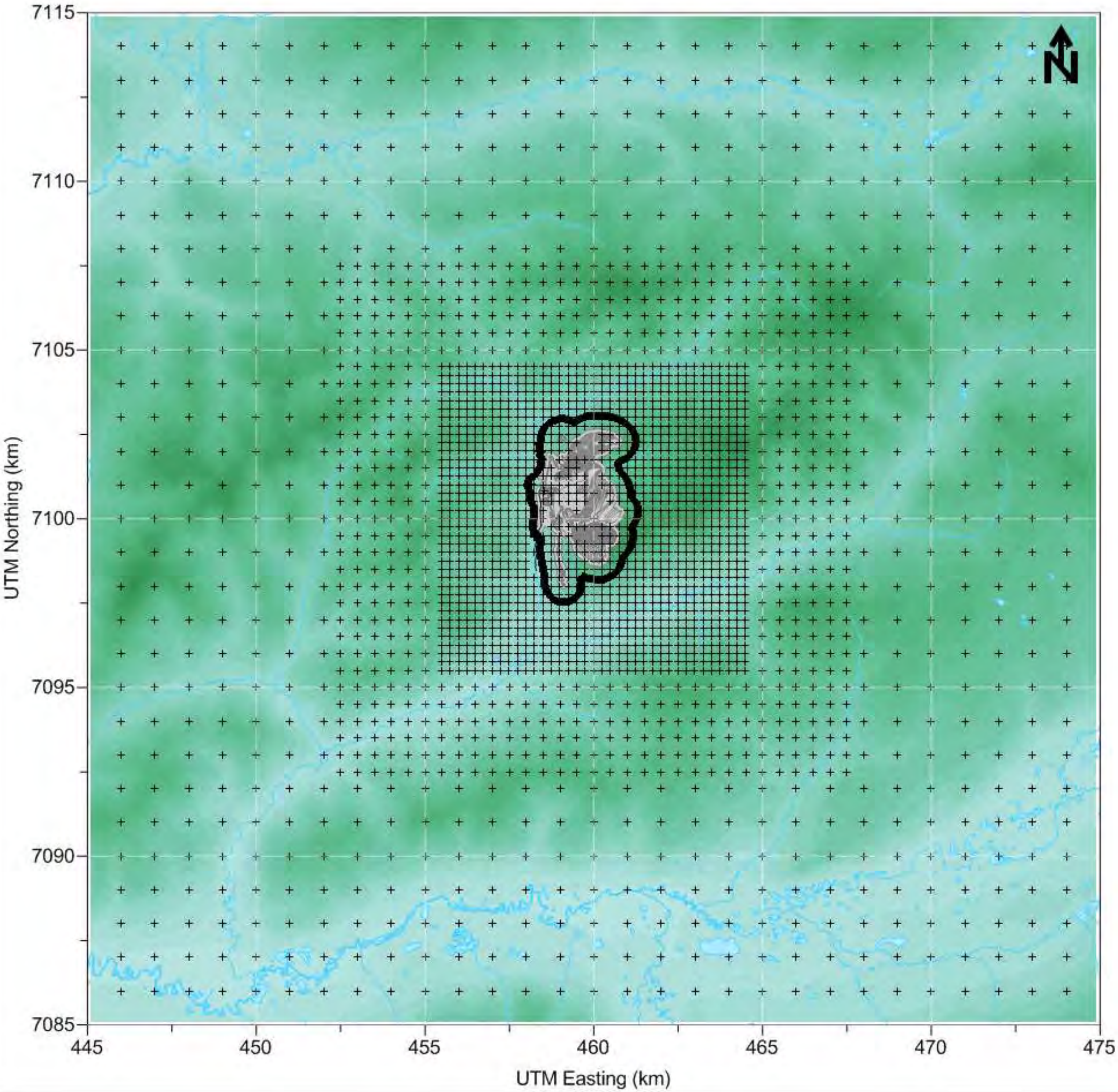
CALPUFF Building Parameterization

Description	Building ID	Base Elevation (m)	Height (m)	Diameter (m)	UTM Building Coordinates (m)											
					1		2		3		4		5		6	
					X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
ADR Building Tier #1	ADR1	950	8.93		459148	7101552	459153	7101522	459163	7101524	459158	7101553				
ADR Building Tier #2	ADR2	950	19.1		459163	7101524	459220	7101534	459215	7101563	459158	7101553				
Lime Silo	SILO1	945	22	6	459788	7101544										
Cement Silo	SILO2	945	22	6	459781	7101544										
Cement Silo	SILO3	945	22	6	459774	7101544										
Primary Crusher Structure	CRUSH1	1037.8	25.95		459753	7100040	459754	7100032	459759	7100033	459759	7100029	459763	7100029	459760	7100042
Secondary/Tertiary Crusher Building	CRUSH2	1020	30.6		459749	7100218	459728	7100174	459755	7100161	459776	7100206				
Main Powerplant Buildings	GENa	855	4		458770	7099996	458767	7099996	458767	7099981	458763	7099981	458763	7099966	458770	7099966
	GENb	855	4		458770	7099968	458770	7099965	458784	7099965	458784	7099968				
	GENc	855	4		458770	7099976	458770	7099972	458784	7099972	458784	7099976				
	GENd	855	4		458770	7099983	458770	7099980	458784	7099980	458784	7099983				
Generator #4 Building	GEN	930	2.75		459104	7098434	459104	7098430	459118	7098430	459118	7098434				

B.2.3 Modelling Domain and Receptors

Figure B.1 shows the extent of the modelling domain, which covers the RSA and is approximately 30 km by 30 km centred on the Project footprint. This area was established as part of the previous air quality assessment for the Project [12] and is maintained in this assessment for consistency. Figure B.1 also shows the nested receptor grid, which contains 3,142 receptors. Within the LSA, the grid has a spacing of 250 m out to a distance of 7.5 km from the centre of the mine site. In the RSA, the next grid has a spacing of 500 m out to 10 km, followed by a grid of 1,000 m spacing out to 15 km from the centre of the site.

As detailed in both the *British Columbia Air Quality Dispersion Modelling Guideline* [3] and the Alberta *Air Quality Model Guideline* [4], air quality standards do not apply inside of a "property boundary", which is defined as an area where there is no public access. For this assessment, the property boundary is the Project footprint (also as referred to as the "zero receptor boundary") and was conservatively defined as the 100-m buffer around the physical elements of the site (shown in Figure 1) even though the actual boundary of the SGC mine claims extends much further, as shown in Figure 2. Receptors were placed every 50 m along edge of the Project footprint.



LEGEND:

+ Receptors

NOTES:

SCALE:

0 km 2 km 4 km 6 km

REVISIONS:

No.	Date	By	Revision

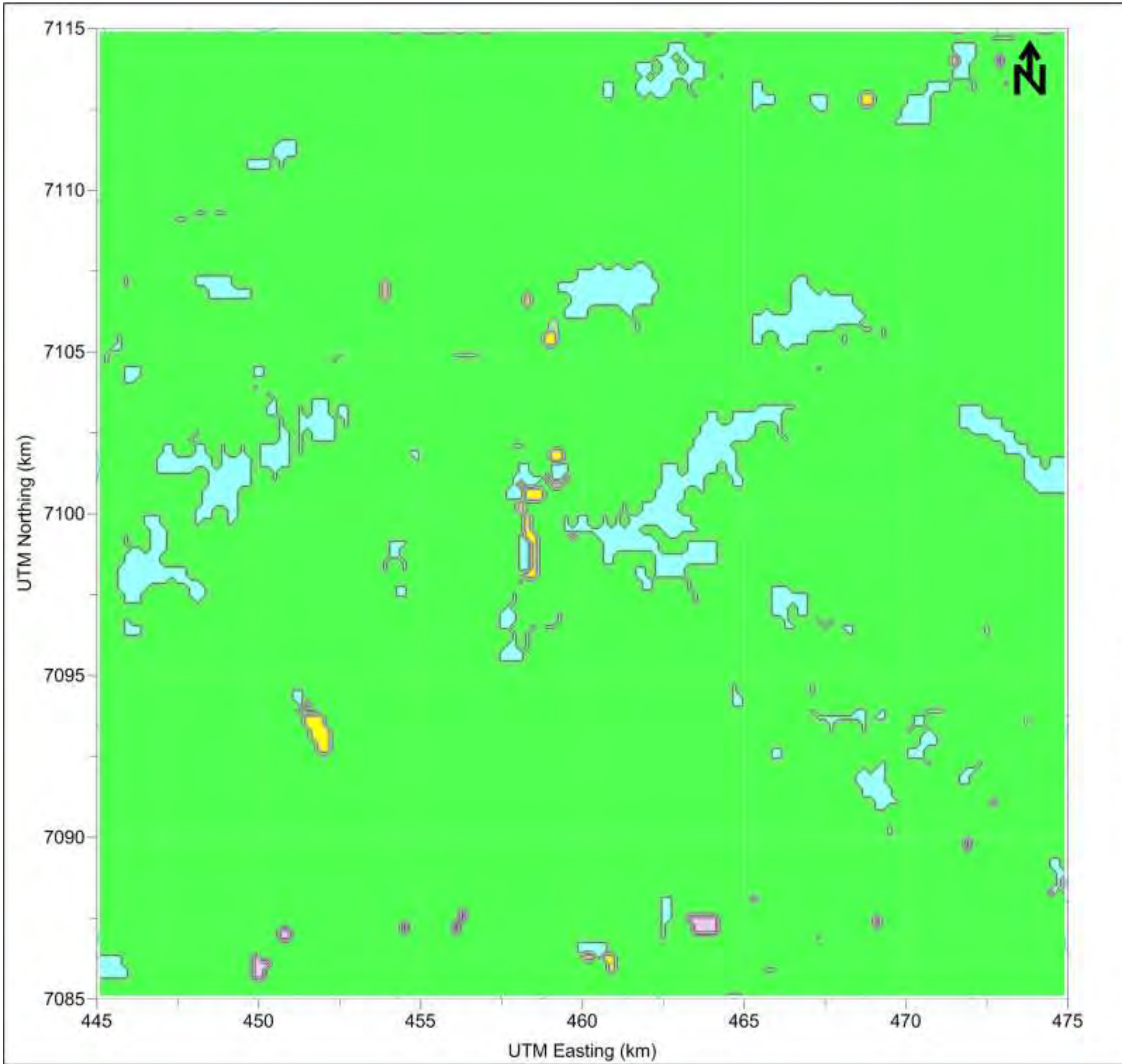
REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

CALMET Terrain and Receptor Grid

Drawn By:	Approved By:	Figure No.:
JAHF	PLK	B.1
Date: July 2019	Project No.: SX16-0004	



NOTES:

SCALE:

0 km 2 km 4 km 6 km

REVISIONS:

No.	Date	By	Revision

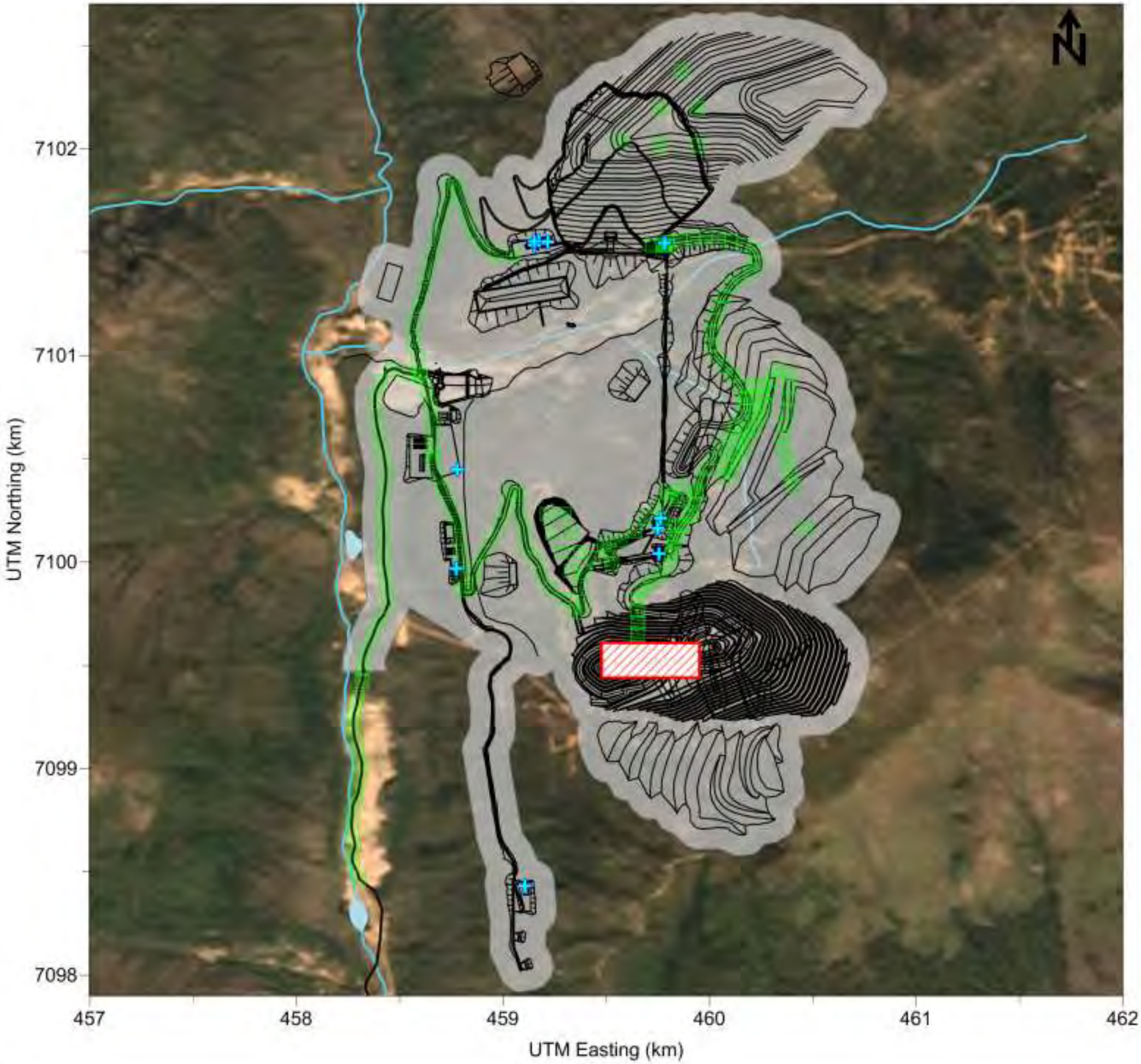
REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

CALMET Land Use

Drawn By:	Approved By:	Figure No.:
JAHF	PLK	B.2
Date: April 2019	Project No.: SX16-0004	



LEGEND:

- Volume Sources
- Area Sources
- Point Sources

NOTES:

SCALE:

0 km 0.5 km 1 km

REVISIONS:

No.	Date	By	Revision

REFERENCE:

WGS84 UTM Zone 8N

Victoria Gold Corp.
Eagle Gold Mine, Yukon

CALPUFF Model Sources

Drawn By: JAHF	Approved By: PLK	Figure No.: B.3
Date: April 2019	Project No.: SX16-0004	