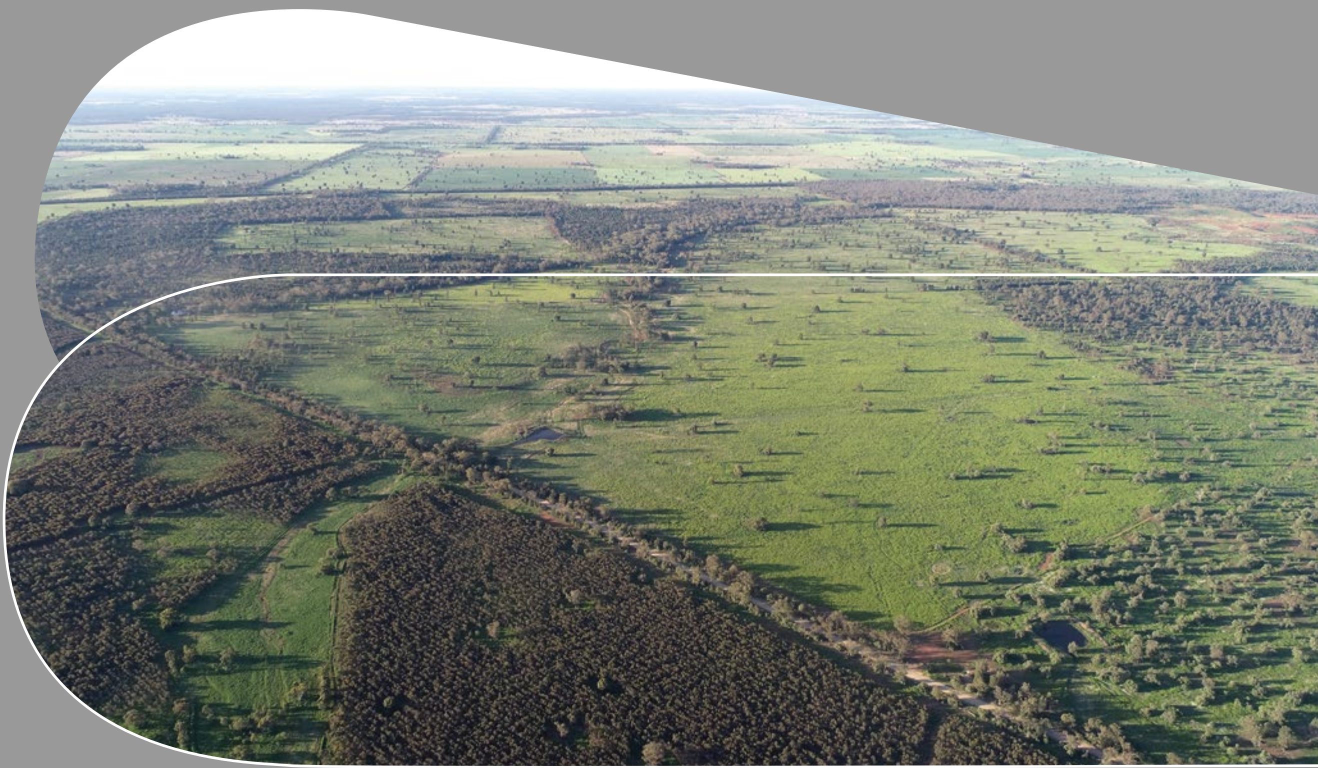
Sunrise Project

Project Execution Plan Modification



Appendix A

Air Quality Assessment

Sunrise Project - Project Execution Plan Modification

Air Quality Assessment

Final | Revision 1

30 June 2021

Sunrise Energy Metals Limited

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Sunrise Project - Project Execution Plan Modification

Project No:	IS366000
Document Title:	Air Quality Assessment
Document No.:	Final
Revision:	Revision 1
Document Status:	-
Date:	30 June 2021
Client Name:	Sunrise Energy Metals Limited
Client No:	-
Project Manager:	Shane Lakmaker
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File Name:	IS366000_Sunrise MOD7_Air Quality & GG_Final_rev1.docx

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Document history and status

Revision	Date	Description	Author	Reviewed	Approved
D1R1	27/02/21	Draft report	S Lakmaker	M Pickett	P Horn
D2R0	8/06/21	Draft report	S Lakmaker	Res Strat	P Horn
D3R0	25/06/21	Draft report	S Lakmaker	Res Strat / SEM	P Horn
Final r1	30/06/21	Final	S Lakmaker	Res Strat / SEM	P Horn

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Acronyms and definitions

Abbreviation	Definition
BoM	Bureau of Meteorology
CALMET	Meteorological model for the CALPUFF air dispersion model
CALPUFF	Computer-based air dispersion model
CO	Carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIE	NSW Department of Planning, Industry and Environment
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
GHG	Greenhouse Gas
Jacobs	Jacobs Group (Australia) Pty Limited
Mtpa	Million tonnes per annum
NGER	National Greenhouse Gas and Energy Reporting
NEPM	National Environment Protection Measure
NEPC	National Environment Protection Council of Australia
NO_2	Nitrogen dioxide
NPI	National Pollutant Inventory
OEH	Office of Environment and Heritage, now part of the Department of Planning, Industry and Environment as Environment, Energy and Science
$PM_{2.5}$	Particulate matter with equivalent aerodynamic diameters less than 2.5 microns
PM_{10}	Particulate matter with equivalent aerodynamic diameters less than 10 microns
POEO Act	*Protection of the Environment Operations (POEO) Act 1997*
SEM	Sunrise Energy Metals Limited
SO_2	Sulphur dioxide
H_2SO_4	Sulphuric acid
TAPM	The Air Pollution Model – a meteorological and air dispersion model developed by CSIRO
TSP	Total suspended particulate matter

Executive Summary

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project.

This Air Quality Assessment has been prepared to support an application by Sunrise Energy Metals Pty Ltd (SEM) to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

The air quality assessment involved identifying the key potential air quality impacts, characterising the existing environment, quantifying emissions to air and modelling the potential impact of the modified Project on local air quality. Greenhouse gas emissions were estimated in accordance with recognised methodologies.

The key potential air quality impacts were identified as construction and operational dust, processing facility emissions, post-blast fume, and diesel exhaust. These potential air quality impacts, plus greenhouse gas emissions, were the focus of the assessment.

The most commonly associated emission to air from open cut mining is dust. Key classifications of particulate matter include:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}).
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$).
- Deposited dust.

A review of the local meteorological and ambient air quality conditions was undertaken. The review considered data collected from existing meteorological and air quality monitors at the mine and processing facility. Approximately two years of meteorological data and one year of air quality data was available from the monitors at the mine and processing facility. One of the objectives for reviewing the data was to develop an understanding of existing air quality impacts as well as the meteorological conditions which typically influence the local air quality conditions. The following conclusions of the background air quality and meteorological data were made:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality during this period. These conditions were not unique to the Central West region of NSW.
- In the absence of Project activities (having not yet commenced), the measured 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the NSW Environment Protection Authority (EPA) criteria on multiple occasions in 2020, due to the extraordinary events (e.g. bushfires, dust storms etc.).
- Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated TSP concentrations and measured deposited dust levels did not exceed the EPA criteria in 2020.

The key outcomes of the modelling and subsequent assessment are:

- Construction and operational dust emissions (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust) due to operations at the mine and processing facility are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. Modelling led to the following specific outcomes for the modified Project:
  - Maximum 24-hour average PM_{10} project only and cumulative concentrations would comply with air quality criteria (50 micrograms per cubic metre [$\mu g/m^3$]) at all private sensitive receptors.
  - Annual average PM_{10} project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Maximum 24-hour average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (8 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average TSP project only and cumulative concentrations would comply with air quality criteria (90 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average project only and cumulative deposited dust levels would comply with air quality criteria (2 g/m^2/month and 4 g/m^2/month respectively) at all private sensitive receptors.
  - Dust concentrations and deposition levels would comply with the Voluntary Land Acquisition and Mitigation Policy (VLAMP) (NSW Government, 2018) criteria at all private sensitive receptors and vacant land.
- Construction and operational dust emissions due to the modified rail siding are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. That is, based on modelling, dust concentration (PM_{10}, $PM_{2.5}$ and TSP) and dust deposition levels would comply with EPA and VLAMP criteria at all private sensitive receptors.
- Processing facility emissions are not expected to cause adverse air quality impacts at the nearest private receptors, based on modelling (using conservative assumptions) which showed compliance with air quality criteria.
- Operational post-blast fume emissions (as NO_2) are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- Operational diesel exhaust emissions associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- The estimated annual average Scope 1 and 2 greenhouse gas emissions from the modified Project represent approximately 0.05% of Australia's 2019 emissions.
- SEM would implement air quality and greenhouse gas emission management measures to minimise the potential impacts of the modified Project.
- No changes would be required to the existing air quality monitoring network.

Given the above, the modified Project is not expected to cause adverse impacts on the local air quality environment near the mine and processing facility or rail siding. Notwithstanding, the existing Air Quality Management Plan (Clean TeQ, 2019a) would be reviewed and updated, where necessary, to incorporate the Modification.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to quantify the potential air quality impacts of a modification to the approved Sunrise Project in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Background

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1.1).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan (Clean TeQ, 2020) to optimise the construction and operation of the Project.

This Air Quality Assessment has been prepared to support an application by Sunrise Energy Metals Pty Ltd (SEM)[1] to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

1.2 Overview of the Modification

SEM has continued to review and optimise the Project design as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the modified Project. The Modification would include (Figure 1.2 and Figure 1.3):

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;

[1] [1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 metres (m) to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased duration of the construction phase from two years to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

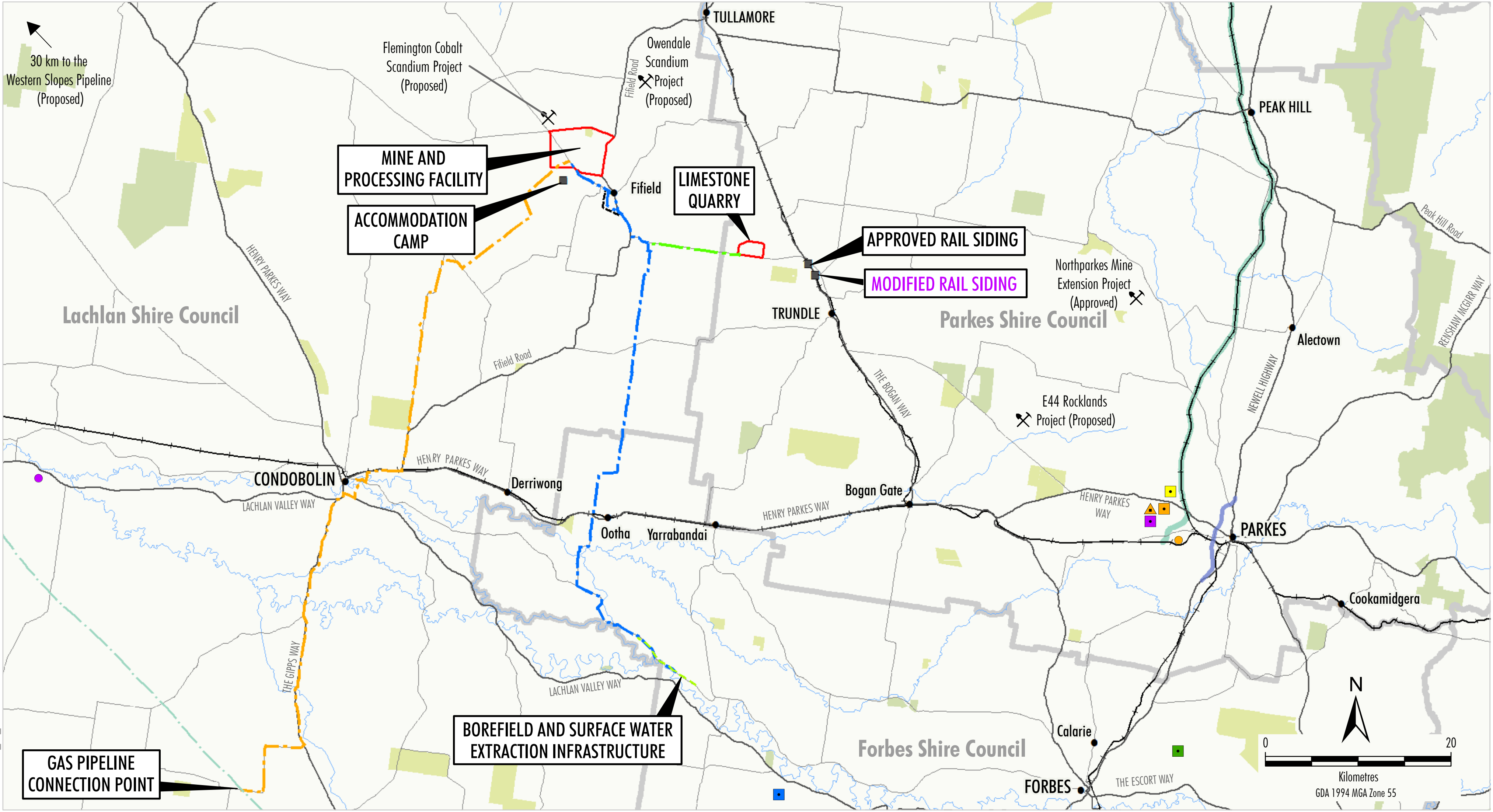
- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kilovolt (kV) electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

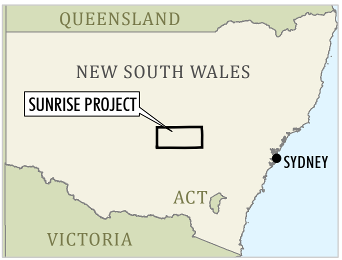
Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor; and
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal sulphate and ammonium sulphate products.





LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components

- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Other Relevant Projects

- Parkes Bypass (Approved)

Other State Significant Projects

- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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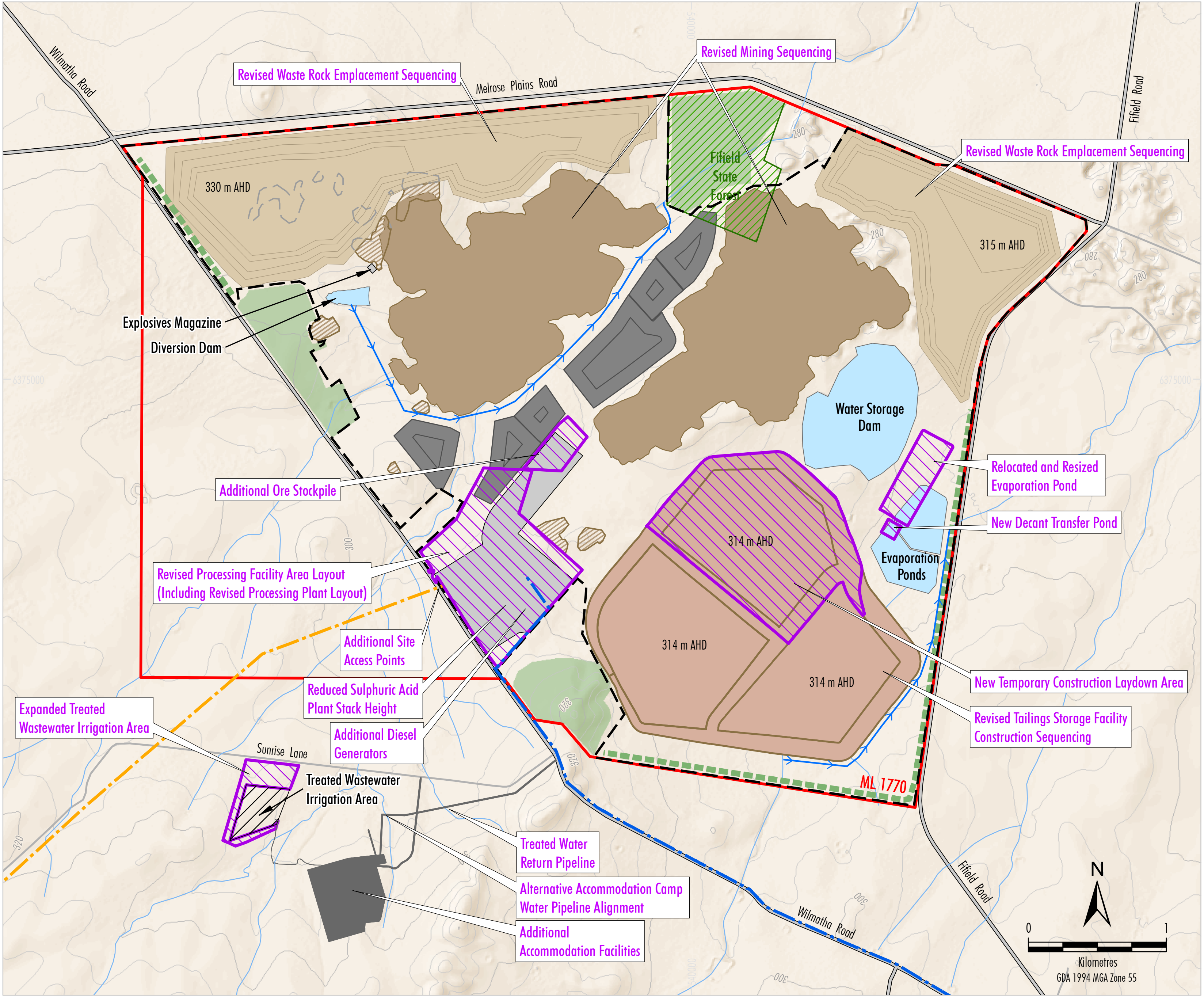
SUNRISE PROJECT

Location of the Sunrise Project

Figure 1.1



LEGEND

State Forest

Approved Project

- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Open Cut Pit (Scandium Oxide)
- Backfilled Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Ore Stockpile
- Accommodation Camp
- Water Storage
- Diversion Structure
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Modified Project

- Modified Layout

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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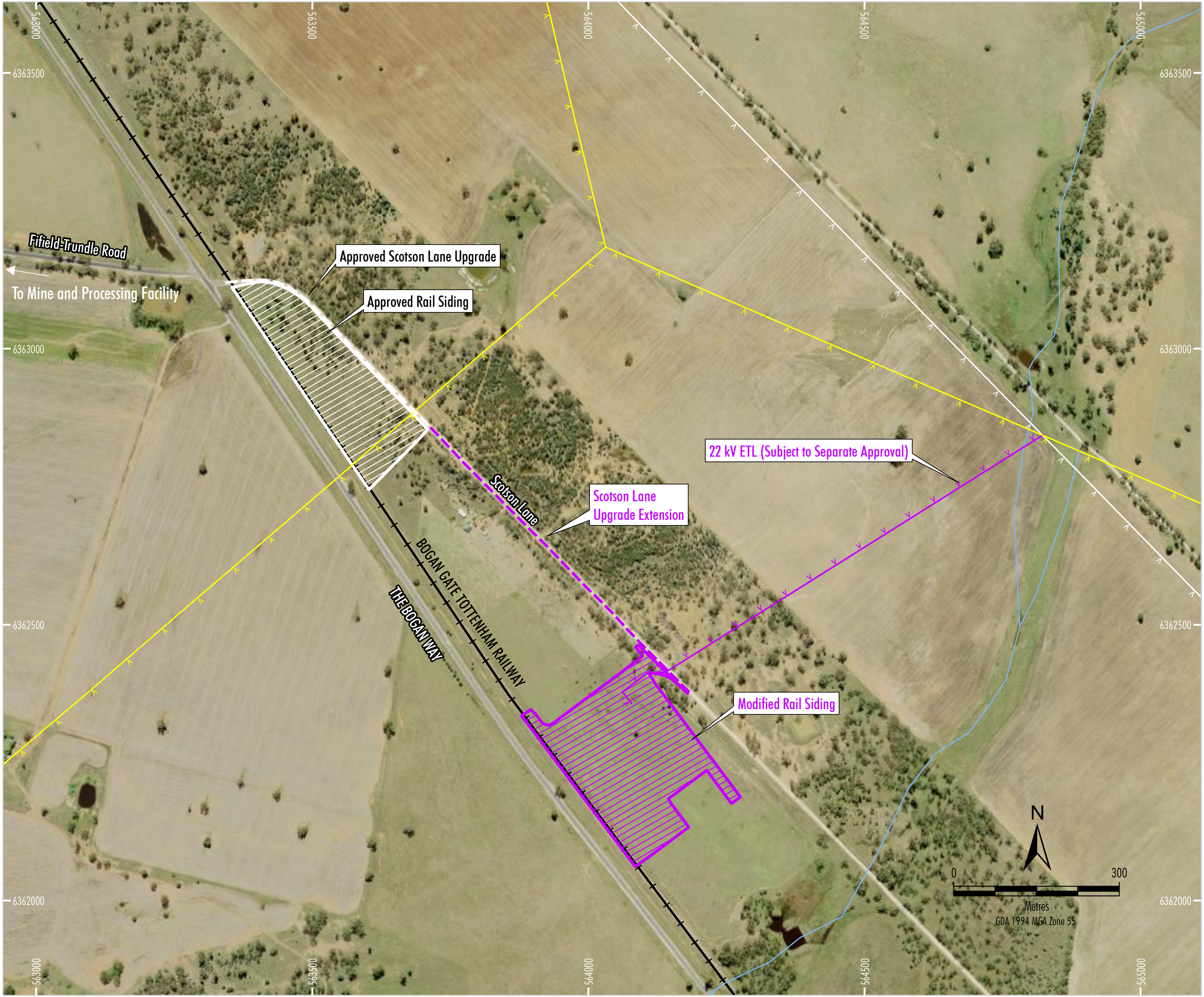
SUNRISE PROJECT

Approved and modified mine and processing facility conceptual general arrangement

Figure 1.2

CTL-20-08 MOD 7_AQ_202B



Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

SUNRISE PROJECT

Approved and modified rail siding location

Figure 1.3

CTL-20-08 MOD 7_AQ_203B

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

1.3 Report Structure

The report is structured as follows:

- Section 1 – Introduces the Air Quality Assessment and provides a summary of the Modification.
- Section 2 – Identifies the key potential air quality and greenhouse gas impacts to be addressed.
- Section 3 – Outlines the key relevant legislative and policy assessment requirements for air quality and greenhouse gas.
- Section 4 – Discusses key features of the existing environment including surrounding land uses, sensitive receptors, and local meteorological and air quality conditions.
- Section 5 – Provides an overview of the methods used to assess the potential for air quality and greenhouse gas impacts.
- Section 6 – Provides an assessment of the potential construction and operational air quality impacts including potential cumulative impacts.
- Section 7 – Provides an assessment of the potential greenhouse gas emissions.
- Section 8 – Outlines the measures to mitigate or otherwise effectively manage and monitor potential impacts.
- Section 9 – Provides the conclusions of the assessment.

2. Potential Impacts

Potential air quality impacts can arise when emissions from an industry or activity lead to a deterioration in the ambient air quality. Potential air quality impacts have been identified from a review of the Modification and associated activities. This identification process has considered the types of emissions to air and proximity of these emission sources to sensitive receptors.

Emissions to air associated with the Modification could occur from a variety of activities including material handling, material transport, blasting, processing, power generation, and wind erosion from exposed areas at the mine and processing facility and the rail siding. These emissions have the potential to be generated during both the construction and operational phases.

Emissions to air from the modified mining operations would include dust, also referred to as particulate matter. Key classifications of particulate matter include:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}).
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$).
- Deposited dust.

Plant and equipment engine exhausts associated with the modified mining operations also have the potential to generate emissions that include carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter, and to a lesser extent sulphur dioxide (SO_2).

The Modification would not change the approved blasting activities on ML 1770. Blasting does have the potential to generate nitric oxide (NO) emissions which, in turn, can oxidise to the more harmful nitrogen dioxide (NO_2).

The processing facility includes a sulphuric acid plant which has the potential to generate emissions of SO_2, NO_x and sulphuric acid mist (H_2SO_4).

Power generation for the modified mine and processing facility would be provided by an on-site gas fired power plant and heat recovery steam generation units. Steam required for process use will be generated from steam produced from the heat recovery steam generation units and/or an auxiliary diesel boiler. Emergency power requirements will be provided by four diesel-powered backup generators.

There is however potential for the sulphuric acid plant to produce sufficient steam to power the co-generation plant and meet the power requirements of the mine and processing facility. If this was to occur, there will be no need for the external gas supply to generate steam and therefore the gas pipeline would not be constructed. When the sulphuric acid plant is not operating (e.g. planned maintenance), the auxiliary diesel boiler would be required to generate process steam and diesel generators will be required to provide emergency power for essential lighting and process loads.

No change to the approved power supply is proposed as part of the Modification with the exception of an increase in the number of backup diesel-powered generators (and associated stacks) from one to four.

For the purposes of this assessment, it has conservatively been assumed that the auxiliary diesel boiler and diesel generators would be operated 24 hours per day, every day of the year as this would represent the maximum case scenario.

Emissions from these diesel-powered power generation activities would potentially include SO_2, CO, NO_x, $PM_{2.5}$ and volatile organic compounds (VOCs) such as benzene and 1,3-butadiene.

The key potential impacts for the Modification would therefore include:

- Construction and operational dust (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust).
- Processing facility emissions (H_2SO_4, SO_2, CO, NO_2, $PM_{2.5}$ and VOCs [e.g. benzene and 1,3-butadiene]).
- Post-blast fumes (NO_2).
- Diesel exhaust (PM_{10}, $PM_{2.5}$ and NO_2).

In addition, the modified Project would generate greenhouse gas emissions (e.g. carbon dioxide [CO_2]). An assessment of the potential greenhouse gas emissions is included in this assessment.

These potential air quality and greenhouse gas impacts are the focus of this assessment.

3. Policy Setting

3.1 Air Quality Criteria

Air quality is typically quantified by the concentrations of substances in the ambient air. Air pollution occurs when the concentration (or some other measure of intensity) of one or more substances known to cause health, nuisance and/or environmental effects exceeds a certain level. With regard to human health and nuisance effects, the substances most relevant to the Modification have been identified (Section 2), as dust in various forms, NO_2, H_2SO_4, SO_2, CO, and VOCs.

The NSW Environment Protection Authority (EPA) has developed assessment criteria for a range of air quality indicators including those mentioned above. These criteria are outlined in the "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA, 2016), hereafter referred to as the Approved Methods. Most of the EPA criteria referred to in this report have been drawn from national standards for air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPMs) (NEPC, 1998). To measure compliance with ambient air quality criteria, the NSW Department of Planning, Industry and Environment (DPIE) has established a network of monitoring stations across NSW and up-to-date records are published on the DPIE website.

The Modification has been assessed in terms of its ability to comply with the air quality criteria set by the EPA as part of the Approved Methods. These criteria (as well as those from Development Consent [DA 374-11-00]) are outlined in Table 3.1 and apply to sensitive receptors, where the Approved Methods defines a sensitive receptor as *"a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area"*. This definition has also been interpreted as places of near-continuous occupation.

Table 3.1 EPA air quality assessment criteria and Development Consent (DA 374-11-00) criteria

Air quality indicator	Averaging time	Criterion	Application[1]	Development Consent (DA 374-11-00)
Particulate matter (PM_{10})	24-hour	50 µg/m^3	100th percentile, cumulative	50 µg/m^3
	Annual	25 µg/m^3	100th percentile, cumulative	25 µg/m^3
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3	100th percentile, cumulative	25 µg/m^3
	Annual	8 µg/m^3	100th percentile, cumulative	8 µg/m^3
Particulate matter (TSP)	Annual	90 µg/m^3	100th percentile, cumulative	90 µg/m^3
Deposited dust	Annual (maximum increase)	2 g/m^2/month	100th percentile, cumulative	2 g/m^2/month
	Annual (maximum total)	4 g/m^2/month	100th percentile, cumulative	4 g/m^2/month
Nitrogen dioxide (NO_2)	1-hour	246 µg/m^3	100th percentile, cumulative	Nil
	Annual	62 µg/m^3	100th percentile, cumulative	Nil
Carbon monoxide (CO)	15-minute	100 mg/m^3	100th percentile, cumulative	Nil
	1-hour	30 mg/m^3	100th percentile, cumulative	Nil
	8-hour	10 mg/m^3	100th percentile, cumulative	Nil
Sulphur dioxide (SO_2)	10-minute	712 µg/m^3	100th percentile, cumulative	Nil
	1-hour	570 µg/m^3	100th percentile, cumulative	Nil
	24-hour	228 µg/m^3	100th percentile, cumulative	Nil
	Annual	60 µg/m^3	100th percentile, cumulative	Nil
Sulphuric acid (H_2SO_4)	1-hour	18 µg/m^3	99.9th percentile, incremental	Nil
Benzene	1-hour	29 µg/m^3	99.9th percentile, incremental	Nil
1,3-butadiene	1-hour	40 µg/m^3	99.9th percentile, incremental	Nil

1 *The 100th percentile application criteria stipulates a 'maximum allowable' criteria (i.e. the criterion must be complied with all the time). The 99.9th percentile application criteria allows for up to 9 hours of exceedance per year (i.e. 0.01% of one year). Criteria for air quality indicators with a 99.9th percentile is applied beyond the development boundary.*

The EPA criteria for all listed indicators in Table 3.1 (except H_2SO_4, benzene and 1,3-butadiene) relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, some consideration of background levels is required when using these criteria to assess the potential impacts of the Modification. Section 4 provides further discussion of background levels.

The modified Project is assessed against the current criteria detailed in the Approved Methods as these criteria would be applied by the consent authority (DPIE) in accordance with the provisions of Clause 12AB of the S*tate Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) (2018 amendment).

The *NSW Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018) (VLAMP) includes the NSW Government's policy for voluntary mitigation and land acquisition to address dust (particulate matter) impacts from state significant mining, petroleum and extractive industry developments. The VLAMP brings the air quality criteria in line with the NEPM standards and EPA criteria.

From the VLAMP, voluntary mitigation rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in Table 3.2 at any residence or workplace on privately owned land.

Table 3.2 VLAMP mitigation criteria for particulate matter

Air quality indicator	Averaging time	Mitigation criterion	Impact type
Particulate matter (PM_{10})	24-hour	50 µg/m^3 **	Human health
	Annual	25 µg/m^3 *	Human health
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3 **	Human health
	Annual	8 µg/m^3 *	Human health
Particulate matter (TSP)	Annual	90 µg/m^3 *	Amenity
Deposited dust	Annual (maximum increase)	2 g/m^2/month **	Amenity
	Annual (maximum total)	4 g/m^2/month *	Amenity

Source: NSW Government (2018).
** Cumulative impact (i.e. increase in concentrations due to the development plus background concentrations due to all other sources).*
*** Incremental impact (i.e. increase in concentrations due to the development alone), with zero allowable exceedances of the criteria over the life of the development.*

Voluntary acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in Table 3.3 at any residence or workplace on privately owned land, or on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls.

The difference between the voluntary mitigation and voluntary acquisition criteria is that acquisition criteria permits up to five exceedances of the relevant criteria over the life of the Project, whereas the mitigation criteria does not allow any exceedances of the relevant criteria.

The particulate matter levels for comparison with the criteria in Table 3.2 and Table 3.3 must be calculated in accordance with the Approved Methods.

Table 3.3 VLAMP acquisition criteria for particulate matter

Air quality indicator	Averaging time	Acquisition criterion	Impact type
Particulate matter (PM_{10})	24-hour	50 µg/m^3**	Human health
	Annual	25 µg/m^3*	Human health
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3**	Human health
	Annual	8 µg/m^3*	Human health
Particulate matter (TSP)	Annual	90 µg/m^3*	Amenity
Deposited dust	Annual (maximum increase)	2 g/m^2/month**	Amenity
	Annual (maximum total)	4 g/m^2/month*	Amenity

Source: NSW Government (2018).
** Cumulative impact (i.e. increase in concentrations due to the development plus background concentrations due to all other sources).*
*** Incremental impact (i.e. increase in concentrations due to the development alone), with up to five allowable exceedances of the criteria over the life of the development.*

3.2 Greenhouse Gas

3.2.1 Overview

Greenhouse gas (GHG) is a collective term for a range of gases that are known to absorb radiation in the atmosphere, where they contribute to the greenhouse effect (global warming). GHGs include:

- CO_2; by far the most abundant GHG, primarily released during fuel combustion.
- Methane (CH_4); generated from the anaerobic decomposition of carbon-based material (including enteric fermentation and waste disposal in landfills).
- Nitrous oxide (N_2O); generated from industrial activity, fertiliser use and production.
- Hydrofluorocarbons (HFCs); commonly used as refrigerant gases in cooling systems.
- Perfluorocarbons (PFCs); used in a range of applications including solvents, medical treatments and insulators.
- Sulphur hexafluoride (SF_6); used as a cover gas in magnesium smelting and as an insulator in heavy duty switch gear.

It is common practice to aggregate the emissions of these gases to the equivalent emission of CO_2. This provides a simple figure for comparison of emissions against targets. Aggregation is based on the potential of each gas to contribute to global warming relative to CO_2 and is known as the global warming potential (GWP). The resulting number is expressed as carbon dioxide equivalents (or CO_2-e) and the National Greenhouse Accounts (NGA) factors describe the methods for estimating greenhouse gas emissions.

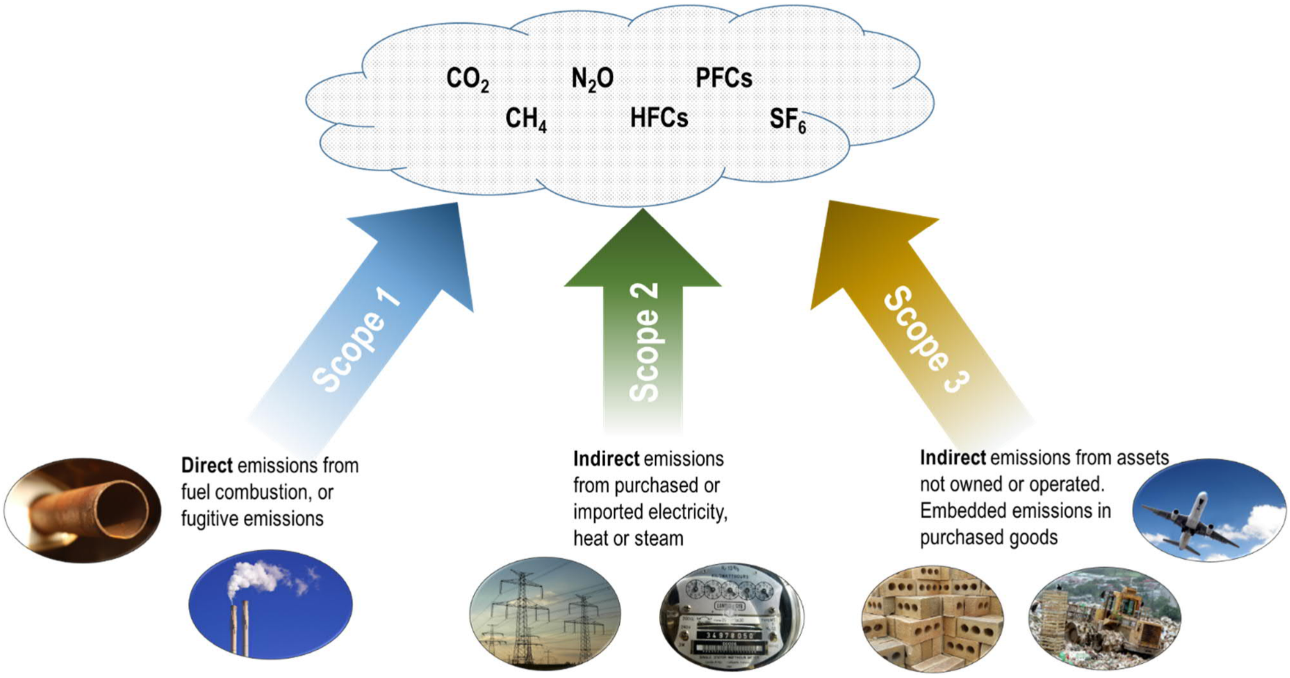
GHG emissions that form an inventory can be split into three categories known as ‘Scopes’. Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol (GHG Protocol)[2] (World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI], 2020) and can be summarised as follows (refer to Figure 3.1):

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).

[2] The GHG Protocol is a collaboration between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol provides guidance on the calculation and reporting of carbon footprints.

- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel (by air or rail) and product usage).

The purpose of differentiating between the scopes of emissions is to avoid the potential for double counting, where two or more organisations assume responsibility for the same emissions.



Adapted from – World Business Council for Sustainable Development – Greenhouse Gas Protocol

Figure 3.1 Sources of greenhouse gases

3.2.2 Federal Greenhouse Gas Policy

Paris Climate Conference COP21

During the 21st yearly session of the Conference of Parties (COP21) held in Paris in 2015 an agreement was reached 'to achieve a balance between anthropogenic (human induced) emissions by sources and removals by sinks of greenhouse in the second half of this century'.

Following COP21, international agreements were made to:

- Keep global warming well below 2.0 degrees Celsius, with an aspirational goal of 1.5 degrees Celsius (based on pre-industrial levels).
- From 2018, countries are to submit revised emission reduction targets every five years, with the first being effective from 2020, and goals set to 2050.
- Define a pathway to improve transparency and disclosure of emissions.
- Make provisions for financing the commitments beyond 2020.

In response to this challenge Australia has committed to reducing emissions to 26-28% of 2005 levels by 2030 (Commonwealth of Australia, 2015).

National Greenhouse and Energy Reporting Act 2007

The Federal Government uses the National Greenhouse Gas and Energy Reporting (NGER) legislation for the measurement, reporting and verification of GHG emissions in Australia. This legislation is used for a range of purposes, including international GHG reporting. Corporations which meet the thresholds for reporting under NGER must register and report their GHG emissions.

Under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), constitutional corporations in Australia which exceed thresholds for GHG emissions or energy production or consumption are required to measure and report data to the Clean Energy Regulator on an annual basis. The *National Greenhouse and Energy Reporting (Measurement) Determination 2008* identifies a number of methodologies to account for GHGs from specific sources relevant to the Project. This includes emissions of GHGs from direct fuel combustion (fuels for transport energy purposes), emissions associated with consumption of power from direct combustion of fuel (e.g. diesel generators used during construction), and from consumption of electricity from the grid. SEM will report its emissions under the NGER Act if trigger levels are reached.

Emissions Reduction Fund (ERF)

Previous legislation passed by the Australian Government to reduce carbon emissions was the *Clean Energy Act 2011*. This legislation established an Emissions Trading Scheme (ETS), also referred to as a carbon price. Under this ETS, approximately 370 companies were required to purchase a permit for every tonne of carbon equivalent they emit.

The *Clean Energy Legislation (Carbon Tax Repeal) Act 2014* repealed the *Clean Energy Act 2011*. This abolished the carbon pricing mechanism from 1 July 2014, and replaced it with the Australian Government's Direct Action Plan, which aims to focus on sourcing low cost emission reductions. The Direct Action Plan includes an ERF; legislation to implement the ERF came into effect on 13 December 2014, and is now considered to be the centrepiece of the Australian Government's policy suite to reduce emissions.

Emissions reduction and sequestration methodologies are available under the ERF which could provide the opportunity to earn carbon credits as a result of emissions reduction activities.

3.2.3 State Greenhouse Gas Policy

NSW Climate Change Policy Framework

In response to national GHG reduction commitments, the NSW government has developed the NSW Climate Change Policy Framework (NSW Government, 2016) which sets the objective of achieving net-zero emissions by 2050. It intends to achieve this through a combination of policy development, leading by example and advocacy.

3.2.4 Existing Approvals

As required under Development Consent (DA 374-11-00), SEM is required to "minimise the greenhouse gas emissions of the development". SEM has a number of processes by which GHG emissions from Project operations will be mitigated. These processes are included in the Air Quality Management Plan (Clean TeQ, 2019a). This plan sets out a range of measures for the management and mitigation of GHGs and opportunities for energy savings.

Section 8 provides further details on these measures.

4. Existing Environment

This section provides a description of the environmental characteristics in the area, including a review of the local meteorological and ambient air quality conditions. The review considers data collected from existing meteorological and air quality monitors at the mine and processing facility (Figure 4.1). One of the objectives for reviewing these data was to develop an understanding of the existing air quality as well as the meteorological conditions which typically influence the local air quality conditions.

4.1 Meteorology

Meteorological conditions are important for determining the transport of emissions, and the potential influences on air quality. In addition, meteorological data are often used with concurrent air quality data to determine potential contributions from sources of interest. This section provides an analysis of meteorological data collected at the Project and identifies the datasets that may be representative of the long term, local conditions.

The EPA prescribes the minimum requirements for meteorological data that are to be used for air quality assessments. These requirements are outlined in the Approved Methods and include minimum data capture rates, siting and operation, and data preparation. Two types of meteorological stations are described by the EPA:

- "Site specific"; and
- "Site representative".

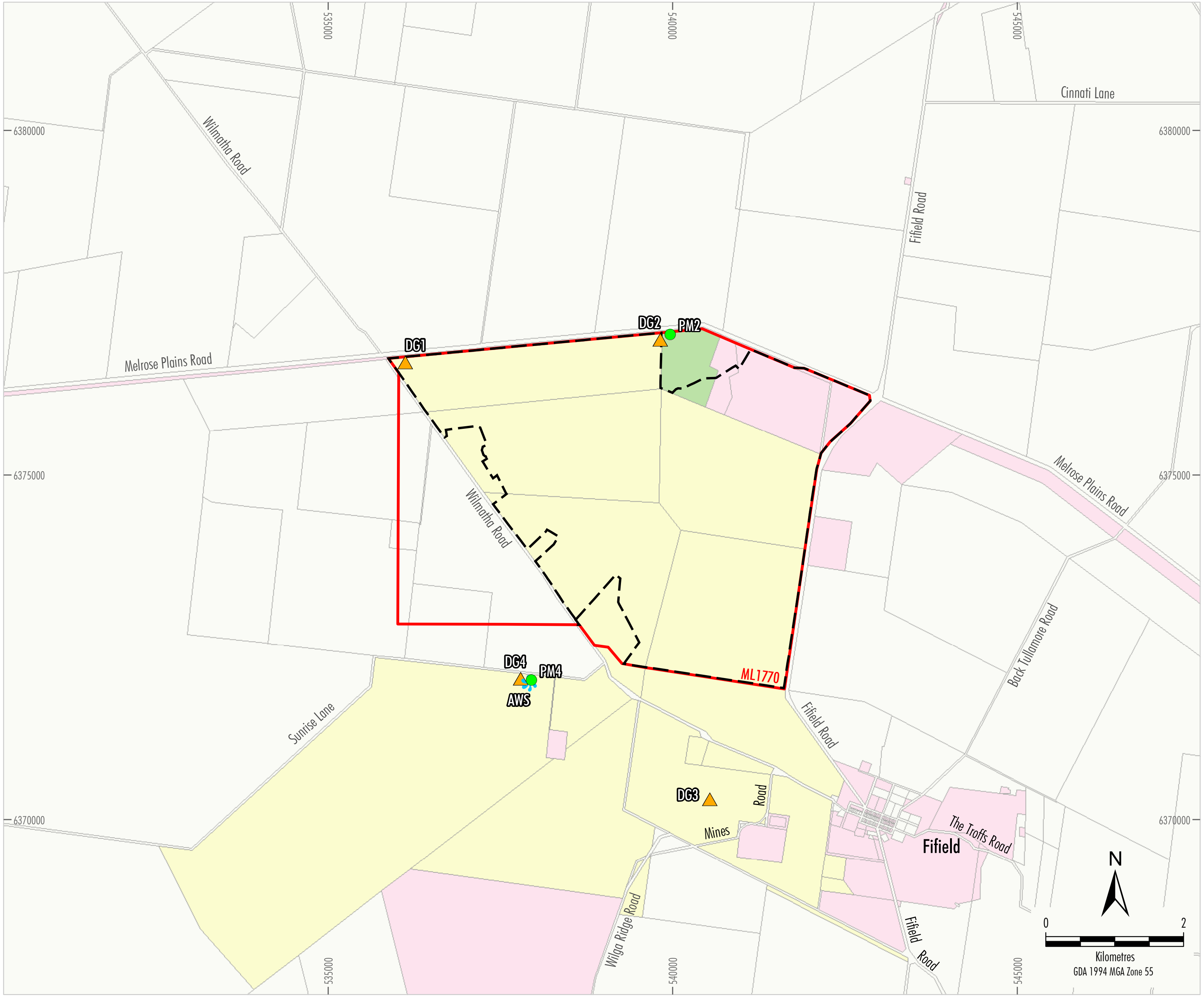
Data from site-specific meteorological stations are preferred for air quality assessments however site representative data are also acceptable provided that analysis indicates that the data adequately describes the expected meteorological conditions at the site of interest.

SEM has been conducting meteorological monitoring at the Automatic Weather Station ("AWS") at the accommodation camp site since November 2018 (Figure 4.1) and in accordance with Schedule 3, Condition 23 of Development Consent (DA 374-11-00). The AWS would be classified as "site-specific" by the Approved Methods based on its proximity to the mine and processing facility. This means that modelling is to be conducted using a dataset that is a minimum of one year duration and at least 90% complete.

Two years of data from the AWS were available and these data have been analysed in order to characterise the local conditions and to identify representative datasets. The analysis involved comparing statistics from the data collected for each calendar year to determine a year-long dataset that most closely reflects the longer term, local conditions. Wind data have primarily been used for this purpose although rainfall data have also been considered.

Wind-roses have been prepared from the 2019 and 2020 data collected at the AWS. The wind-roses (Figure 4.2 and Figure 4.3) show the frequency of wind speeds and wind directions based on hourly records for each year and by season. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

The most common winds in 2019 (Figure 4.2) were from the southwest and north-northeast. This pattern of winds was evident in summer and autumn while fewer north-northeast winds were observed in winter and spring. In 2020 (Figure 4.3) there was a shift in conditions where the most common winds were from the west and east. The most noticeable shift, compared to 2019, was in winter and spring when west-northwest (winter) and east (autumn) winds were observed.



LEGEND
Mining Lease Boundary (ML)
Approved Surface Development Area
Sunrise Energy Metals Owned Land
Crown Land
Fifield State Forest
Private Landholder
Dust Deposition
Meteorological Station
$PM_{2.5}$ and PM_{10}

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Location of air quality and meteorological monitoring sites

Figure 4.1

CTL-20-08 MOD 7_AQ_204A

Figure 4.2 Annual and seasonal wind-roses for data collected at AWS in 2019

Figure 4.3 Annual and seasonal wind-roses for data collected at AWS in 2020

Figure 4.4 shows the wind speed and rainfall data from the AWS.

These data show that wind speeds were slightly higher towards the end of 2019 with maximum wind speeds reaching around 12 metres per second.

Rainfall in 2019 was 26 percent lower than the long term average (recorded by the Bureau of Meteorology [BoM] at the Trundle [Murrumbogie] station number 50028), an outcome of the drought which affected many parts of NSW and lasted from 2017 to 2019. Rainfall recorded at the AWS in 2020 was 790 mm, 66 percent higher than the long term average of 476 mm at Trundle.

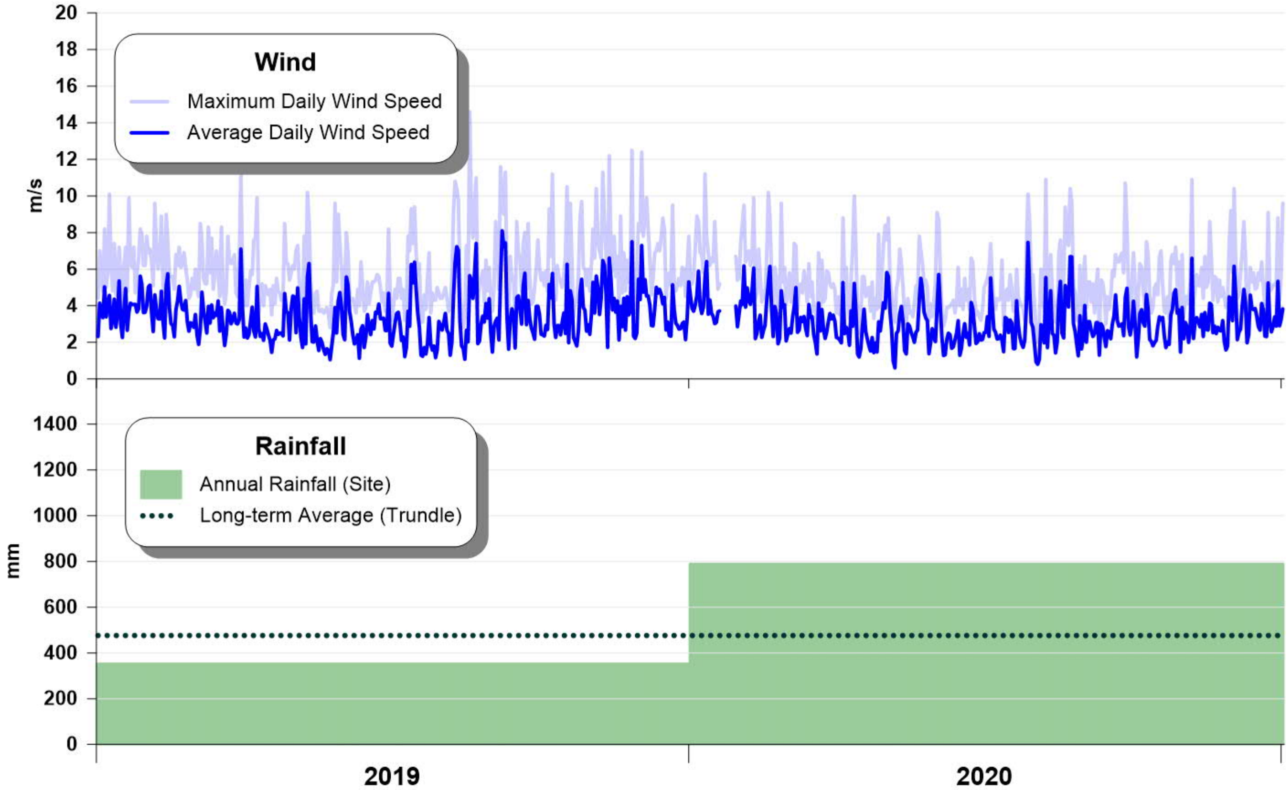


Figure 4.4 Wind speed and rainfall data collected at the AWS during 2019 and 2020

Table 4.1 provides annual wind statistics from the 2019 and 2020 datasets. Data capture exceeded the EPA's minimum requirement (90%) and the mean wind speeds in 2019 and 2020 were within five percent of the average across both years.

Table 4.1 Statistics from meteorological data collected in 2019 and 2020

Year	2019	2020
Percentage complete (%)	100	97
Mean wind speed (m/s)	3.4	3.1
Percentage of calms (<= 0.5 m/s)	5.8	5.3
Percentage of wind speeds >6 m/s	11.6	6.3

The data from 2020 have been used to inform the air quality impacts of the Modification. This selection was based on:

- Meeting the EPA's requirements for site-specific data.
- High data capture rate, meeting the EPA's requirement for a minimum 90% complete dataset.
- The availability of concurrent ambient air quality data.
- A year that was not adversely influenced by bushfire activity or extreme conditions (Section 4.2.1).

Methods used for incorporating the 2020 data into modelling for the Modification are discussed in detail in Section 5.

4.2 Air Quality

This section examines the historical air quality conditions around the Project and establishes the appropriate background levels to be considered for assessment of the Modification.

It should be noted that air quality monitoring data represent the contributions from all sources that have at some stage been upwind of each monitor. In the case of particulate matter (as PM_{10}) for example, a measurement may contain contributions from many sources such as from mining activities, construction works, bushfires and 'burning off', agricultural activities, industry, vehicles, roads, wind-blown dust from nearby and remote areas, fragments of pollens, moulds, and so on.

4.2.1 Extraordinary Events

Air quality in many parts of NSW, including the Central West, was adversely influenced by drought conditions between 2017 to 2019 and into 2020. A deterioration in air quality conditions in recent years was not unique to the Central West region and extraordinary events, beyond normal conditions, have been identified as part of annual reviews of monitoring data.

The DPIE's "Annual Air Quality Statement 2018" concluded that particle levels increased across NSW in 2018 due to dust from the widespread, intense drought and smoke from bushfires and hazard reduction burning (Office of Environment and Heritage [OEH], 2019). Subsequently the "Annual Air Quality Statement 2019" (DPIE, 2020a) and "Annual Air Quality Statement 2020" (DPIE, 2021) concluded that air quality in NSW was greatly affected by the continuing intense drought conditions and unprecedented extensive bushfires during 2019 and into early 2020. In addition, the continued "intense drought has led to an increase in widespread dust events throughout the year [2019]" (DPIE, 2020a). In addition, the NSW Government released an "Air quality special statement spring-summer 2019-20" which indicated that the percentage of hours affected by smoke in the spring-summer 2019-20 period at the closest BoM station to the Project (Condobolin) was 18% (DPIE, 2020b).

The influence of drought conditions on air quality is evident in the DPIE's monitoring data. Figure 4.5 shows the annual average PM_{10} concentrations from data collected at various rural and urban air quality monitoring sites since 2010. These data show an increase in PM_{10} concentrations at all rural and urban locations from 2017 onwards, reflecting the onset of drought conditions, and increased bushfire activity in 2019. The bushfires intensified in late 2019 and continued into early 2020. The annual average PM_{10} concentrations then decreased with the onset of rain in early 2020.

Between 2010 and 2020 all monitoring locations identified in Figure 4.5 recorded at least one year with one or more days when the 24-hour average PM_{10} concentration exceeded 50 $\mu g/m^3$. In 2019, there were no fewer than 17 days (Wollongong being the minimum) when the 24-hour average PM_{10} concentration exceeded 50 $\mu g/m^3$.

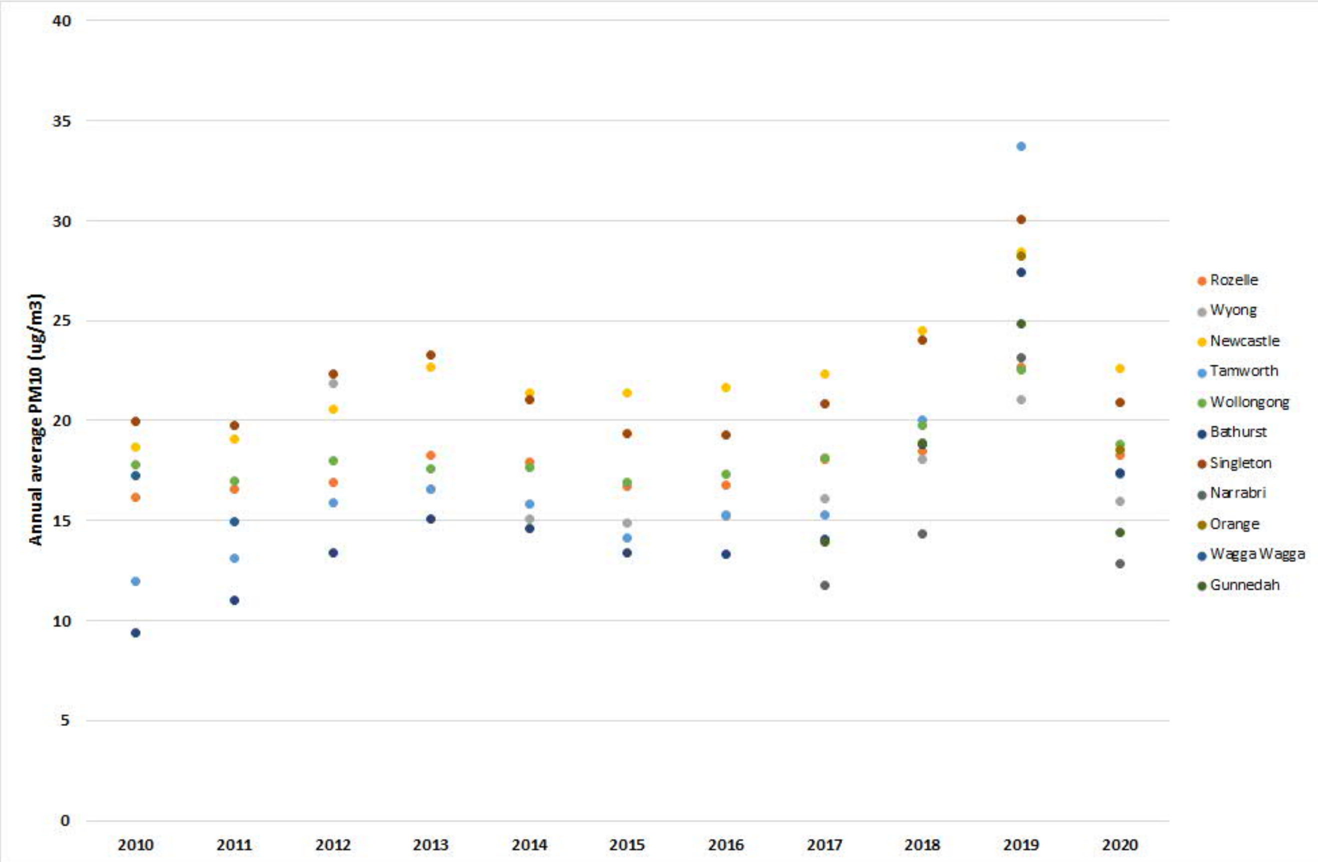


Figure 4.5 Annual average PM_{10} concentrations at various NSW air quality monitoring sites

The use of years with elevated air quality levels, largely driven by extraordinary events or extreme climatic conditions (or both) are avoided in modelling studies primarily because they do not address the definition of representative. In addition, extraordinary events cannot be reliably simulated in air dispersion models as it is not possible to identify all probable factors that led to these events, for example, the factors that influence the time, location and intensity of bushfires. This context has been considered in the analysis below.

4.2.2 Particulate Matter (as PM_{10})

Concentrations of PM_{10} are monitored by SEM at two locations referred to as PM2 and PM4 in the vicinity of the mine and processing facility (Figure 4.1). The monitoring commenced in November 2019 and includes the measurement of PM_{10} as 5-minute averages. These records have been processed into 24-hour averages for comparison with the EPA criteria.

Figure 4.6 shows the measured 24-hour average PM_{10} concentrations from data collected at PM2 and PM4 in 2020. The measurements in January 2020 highlighted the effects of the drought and bushfires on air quality as the 24-hour average PM_{10} concentrations exceeded the EPA (2016) criteria (50 $\mu g/m^3$) on most days in the month. Rainfall in late January and into February coincided with a decrease in the number of days exceeding 50 $\mu g/m^3$. Increases in PM_{10} concentrations from 2017 to 2019, and into early 2020, were not unique to the Central West region of NSW (Figure 4.5).

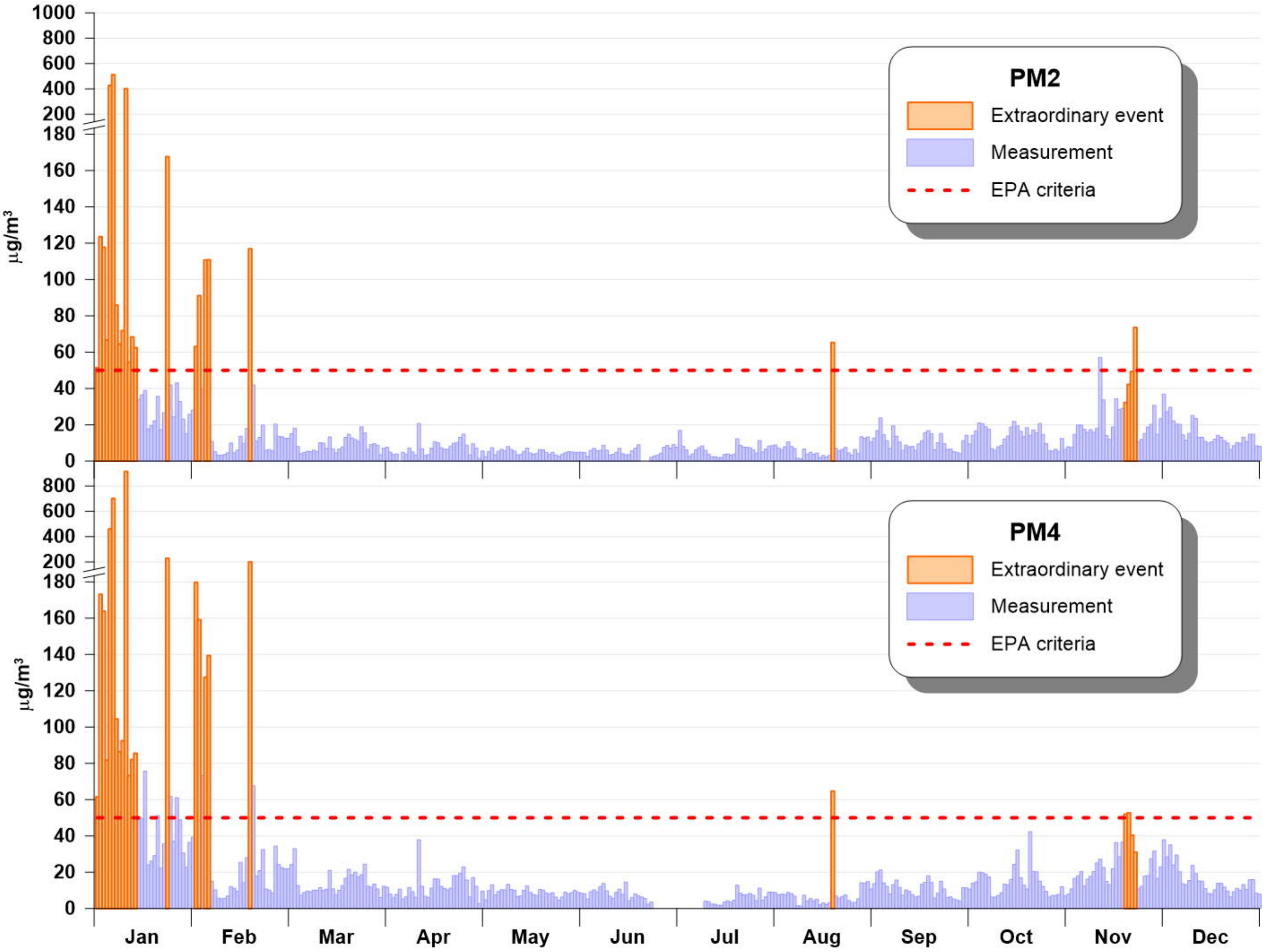


Figure 4.6 Measured 24-hour average PM_{10} concentrations in 2020

Table 4.2 provides a summary of the available PM_{10} data. As noted above, the drought conditions and bushfire activity had adversely affected air quality in early 2020, with many days of PM_{10} concentrations exceeding the 50 µg/m^3 criterion. An estimate of the annual average PM_{10} was conducted excluding extraordinary events. This was done by removing measurements from days where the PM_{10} concentrations exceeded 50 µg/m^3 concurrently at both monitors; an approach that assumes the two monitors (which are five kilometres apart) would not record elevated levels concurrently unless there was a regional influence. As expected, and based on outcomes from other regional NSW air quality monitoring locations, the estimated annual average PM_{10} concentrations (excluding extraordinary events) did not exceed the 25 µg/m^3 criterion.

Table 4.2 Summary of measured PM_{10} concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Including extraordinary events			
Maximum 24-hour average in µg/m^3	512	919	50
Number of days above 50 µg/m^3	22	28	-
Annual average in µg/m^3	18.6	25.5	25
Excluding extraordinary events			
Annual average in µg/m^3	11.0	14.0	25

4.2.3 Particulate Matter (as $PM_{2.5}$)

Concentrations of $PM_{2.5}$ are monitored by SEM at PM2 and PM4 in the vicinity of the mine and processing facility (Figure 4.1). The monitoring commenced in November 2019 and included the measurement of $PM_{2.5}$ as 5 minute averages. These records have been processed into 24-hour averages for comparison with the EPA criteria.

Figure 4.7 shows the measured 24-hour average $PM_{2.5}$ concentrations from data collected at PM2 and PM4 in 2020. As for PM_{10}, the measurements highlighted the effects of the drought and bushfire activity with 24-hour average $PM_{2.5}$ concentrations exceeding the criterion (25 µg/m^3) early in 2020 until rainfall in late January and early February led to a corresponding reduction in measured levels.

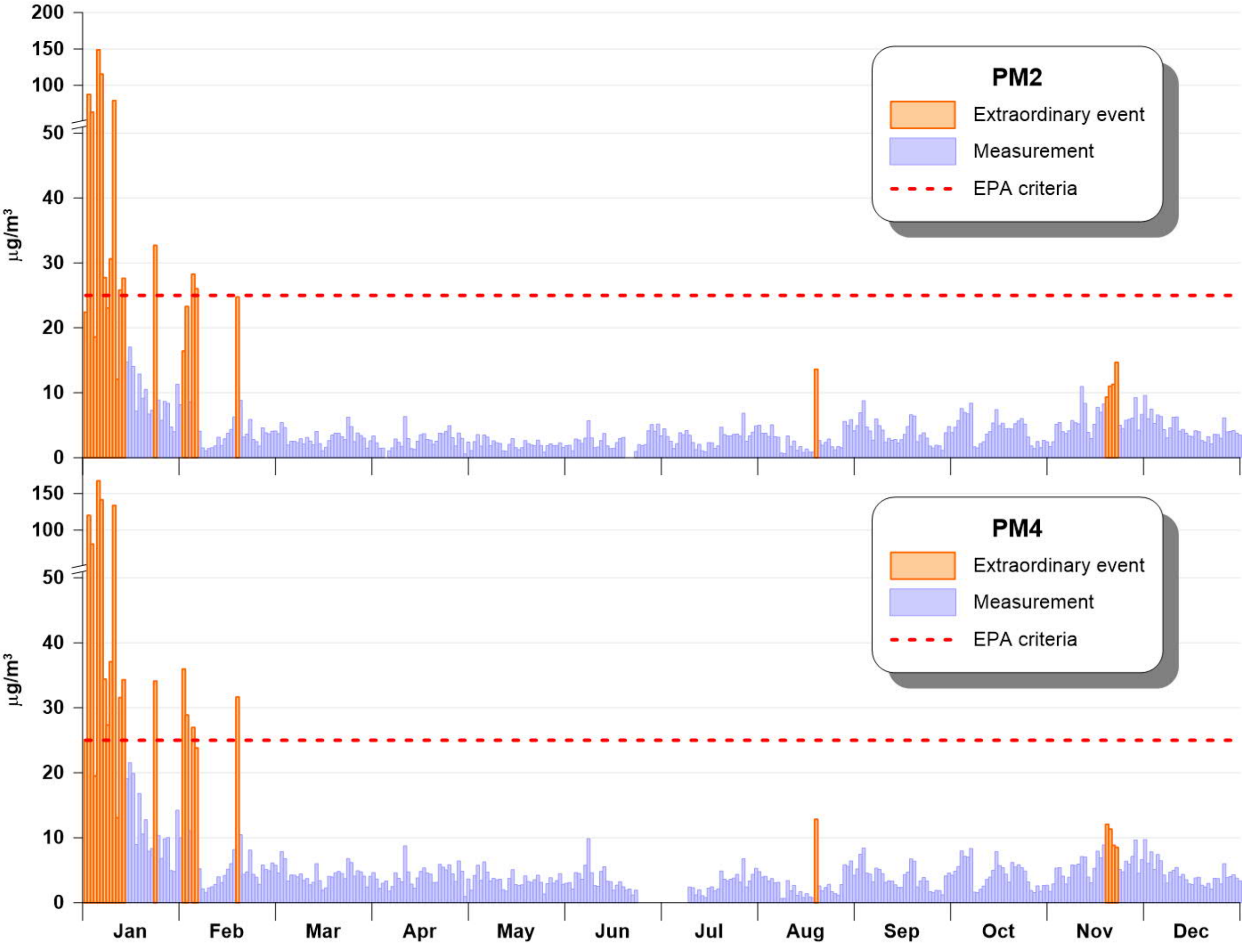


Figure 4.7 Measured 24-hour average $PM_{2.5}$ concentrations in 2020

Table 4.3 provides a summary of the available $PM_{2.5}$ data. The $PM_{2.5}$ concentrations exceeded 25 µg/m^3 criterion on 12 (PM2) to 15 days (PM4), primarily influenced by the drought conditions that persisted into early 2020. Annual average $PM_{2.5}$ concentrations did not exceed the 25 µg/m^3 criterion either with or without records of extraordinary events.

Table 4.3 Summary of measured $PM_{2.5}$ concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Including extraordinary events			
Maximum 24-hour average in µg/m^3	149	168	25
Number of days above 25 µg/m^3	12	15	-
Annual average in µg/m^3	6.0	7.3	8
Excluding extraordinary events			
Annual average in µg/m^3	3.8	4.5	8

4.2.4 Particulate Matter (as TSP)

TSP is not monitored in the vicinity of the Project. The NSW Minerals Council (2000) estimated that, for rural environments in NSW, the average PM_{10} concentrations are typically 40% of the TSP concentrations. In addition, more recent studies (e.g. Jacobs, 2018) examined PM_{10} and TSP data and showed that average PM_{10} concentrations are close to 40% of the TSP concentrations in rural environments of NSW. For this assessment it has been conservatively assumed that the measured PM_{10} concentrations (including extraordinary events) would be 40% of the TSP concentrations, an assumption that yields estimated annual average TSP concentrations of between 46 µg/m^3 (PM2) and 64 µg/m^3 (PM4).

Table 4.4 shows the estimated annual average TSP concentrations from each PM_{10} monitoring site for data collected in 2020. These estimates do not highlight any exceedances of EPA criteria with respect to TSP.

Table 4.4 Summary of estimated TSP concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Annual average in µg/m^3	46	64	90

4.2.5 Deposited Dust

Air quality criteria for deposited dust are set to protect against nuisance amenity impacts. Monitoring of deposited dust relates to the collection of particles that settle from the ambient air, and includes TSP, PM_{10} and $PM_{2.5}$. Insoluble and soluble matter are separated by filtration and the mass of dried insoluble solids is determined gravimetrically. The exposure period is 30 ±2 days and one result (of insoluble solids) is obtained every month.

Monitoring of deposition dust is carried out by SEM at four locations (DG1-DG4) in the vicinity of the mine and processing facility (Figure 4.1) and Table 4.5 shows the annual average deposited dust levels for data collected in 2019 and 2020. Recorded deposited dust levels from all sources have not exceeded the 4 g/m^2/month criterion including extraordinary events.

Table 4.5 Summary of measured deposited dust

Year	DG1	DG2	DG3	DG4	EPA criterion
Annual average in g/m^2/month					
2019	3.4	2.8	2.5	3.0	4
2020	3.1	2.6	2.3	3.2	4

4.2.6 Other Air Quality Indicators

The Project is well removed from regional population centres, towns, main roads, industry and other major developments. The absence of industry and human activity means that concentrations of air quality indicators, other than dust emissions associated with activity in the region (e.g. agriculture and vehicles on unsealed roads), would be negligible and likely to approach baseline levels, that is, near the lowest concentrations that would be measured in NSW. In the context of the potential, modified Project emissions, this outcome applies to NO_2, SO_2, and CO.

4.3 Potential Cumulative Interactions with Other Projects

Other key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project include (Figure 1.1):

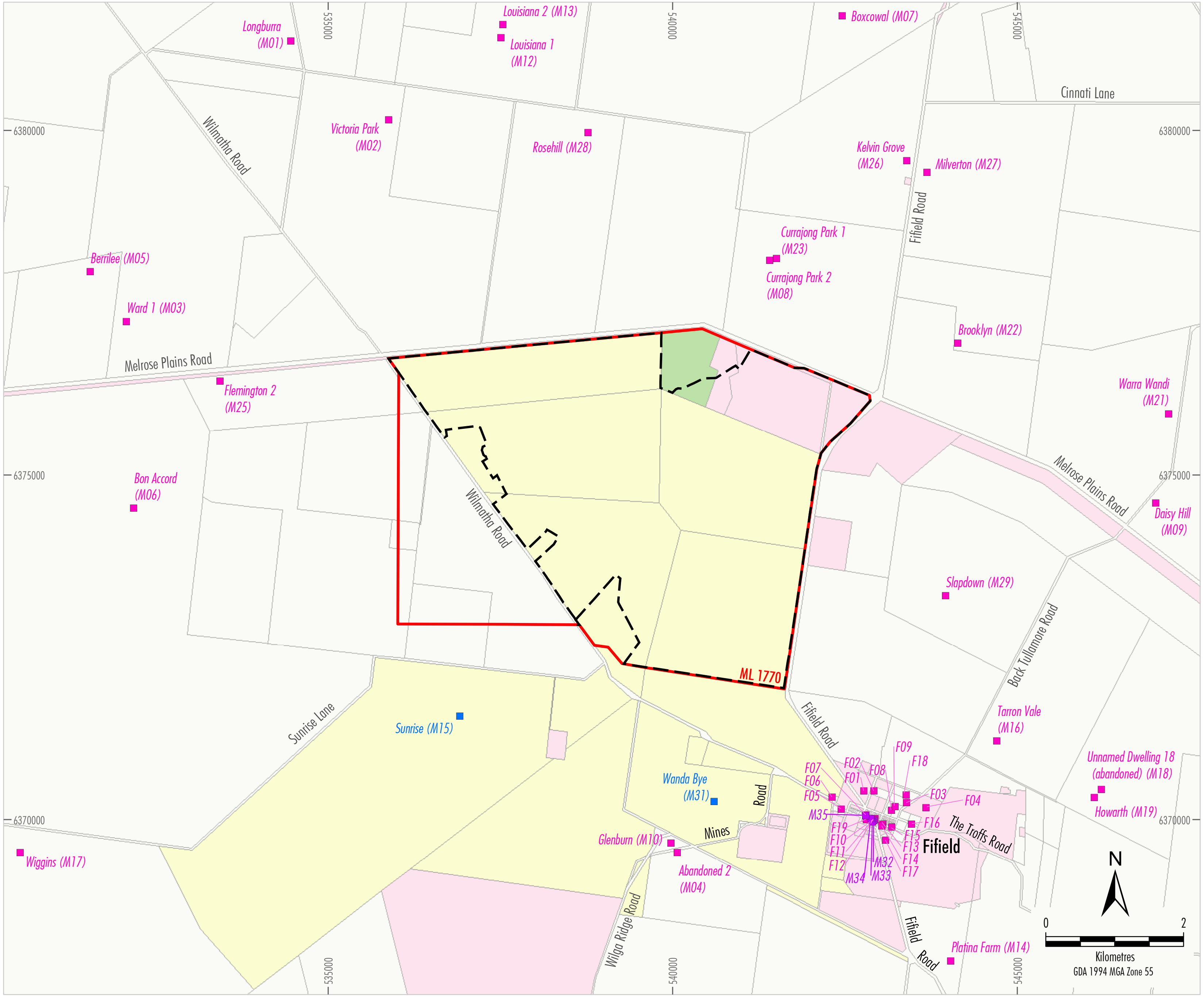
- Parkes Special Activation Precinct.
- Cattle Feedlot and Quarry.
- Flemington Cobalt Scandium Mine.
- Owendale Scandium Mine.
- Western Slopes Pipeline.
- Northparkes Mine Extension Project.
- Inland Rail Parkes to Narromine.
- Parkes Solar Farm.
- Goonumbla Solar Farm.
- Quorn Park Solar Farm.
- Parkes Peaking Power Plant.
- Parkes Bypass.
- E44 Rocklands Project.
- Jemalong Solar Farm.
- Daroobalgie Solar Farm.

Of these key proposed or approved projects, only the proposed Flemington Cobalt Scandium Mine and Owendale Scandium Mine may potentially interact with, or have potential cumulative air quality impacts with, the modified Project as they are located immediately north-west and north-east of the mine and processing facility, respectively. The Environmental Assessment Requirements for these projects were issued in 2018. In accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020c) guideline, these projects are 'potentially relevant projects', and are therefore not required to be considered. It is expected that any potential cumulative interactions between these projects and the modified Project would be considered in the air quality assessments for these projects.

Potential cumulative interactions with other key proposed or approved projects would not be expected as they are located a considerable distance away from approved and modified Project activities (Figure 1.1).

4.4 Sensitive Receptors

The locations of the sensitive receptors assessed in this report are shown on Figure 4.8 (mine and processing facility) and Figure 4.9 (rail siding).



LEGEND
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

S U N R I S E   P R O J E C T

Location of sensitive receptors near the mine processing facility

Figure 4.8

CTL-20-08 MOD 7_AQ_205B

sunrise energy metals

SUNRISE PROJECT

Location of sensitive receptors near the rail siding

Figure 4.9

CTL-20-08 MOD 7_AQ_206B

4.5 Summary of Existing Environment

The review of the existing environment led to the following observations:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality. These conditions were not unique to the Central West region of NSW (Figure 4.5).
- Measured 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the EPA criteria on multiple occasions in 2020, due to the extraordinary events in January associated with drought conditions and bushfires. Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated annual average TSP concentrations and measured annual average deposited dust levels did not exceed the EPA criteria in 2020 after the records of extraordinary events were taken into consideration (i.e. excluded).

One of the objectives for reviewing the air quality monitoring data was to determine appropriate background levels to be added to the modified Project's contributions for the assessment of potential cumulative impacts. Table 4.6 shows the assumed background levels that apply at sensitive receptors based on the review of available monitoring data from 2020 (Section 4.2). These levels are considered to be representative of the local air environment, since they are derived from local measurements, and have been added to the modified Project's contributions to determine the potential cumulative impacts. In situations where background levels are elevated the proponent must "*demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical*" (EPA, 2016).

Table 4.6 Assumed background levels that apply at sensitive receptors

Air quality indicator	Averaging time	Assumed background level that applies at sensitive receptors	Notes
Particulate matter (PM_{10})	24-hour	Variable by day	Average of the measured 24-hour average PM_{10} concentrations from PM2 and PM4 in 2020, excluding extraordinary events. A total of 5 days exceeded 50 µg/m^3 in this dataset.
	Annual	12.3 µg/m^3	Average of the measured annual average PM_{10} concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
Particulate matter ($PM_{2.5}$)	24-hour	Variable by day	Average of the measured 24-hour average $PM_{2.5}$ concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
	Annual	4.0 µg/m^3	Average of the measured annual average $PM_{2.5}$ concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
Particulate matter (TSP)	Annual	55 µg/m^3	Estimated annual average TSP concentration in 2020, calculated by conservatively assuming the measured PM_{10} concentrations (including extraordinary events) is 40% of the TSP (from both PM2 and PM4).
Deposited dust	Annual	3.2 g/m^2/month	Highest annual average deposited dust level from all four gauges (DG1-DG4) in 2020.
Nitrogen dioxide (NO_2)	All	0 µg/m^3	No significant sources near the Project.
Carbon monoxide (CO)	All	0 µg/m^3	No significant sources near the Project.
Sulphur dioxide (SO_2)	All	0 µg/m^3	No significant sources near the Project.
Sulphuric acid (H_2SO_4)	1-hour	0 µg/m^3	No significant sources near the Project.

5. Assessment Methodology

This assessment has followed the procedures outlined in the Approved Methods (EPA, 2016). The Approved Methods include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of potential impacts.

Specific methodologies for each of the identified potential impacts (Section 2) are described below.

5.1 Construction and Operational Dust (Mining Operations)

Construction and operational dust impacts from the mining operations have been quantified by modelling. The choice of model has considered the expected transport distances for the emissions, as well as the potential for temporally and spatially varying flow fields due to influences of the local terrain, land use, and potential for stagnation conditions characterised by calm or very low wind speeds with variable wind directions. The CALPUFF model has been selected. This model is specifically listed in the Approved Methods and has been used to predict ground-level particulate matter concentrations and deposited dust levels due to the modified Project. Concentrations and deposition levels have been simulated for every hour of the representative year and results at local communities and sensitive receptors have then been compared to the relevant air quality assessment criteria.

Figure 5.1 shows an overview of the model inputs. Appendix A provides details of all model settings.

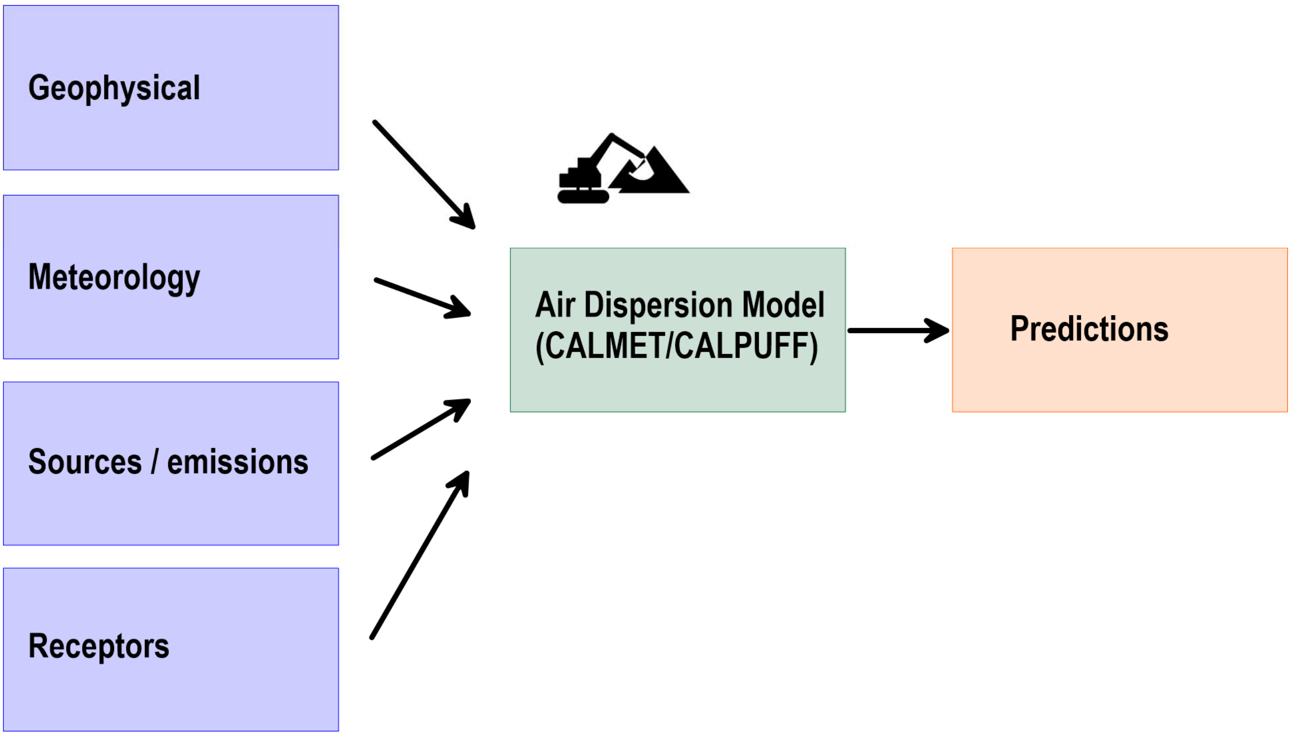


Figure 5.1 Overview of model inputs

The most commonly associated emission to air from open cut mining is dust (particulate matter). A dispersion model commonly required to simulate the dispersion of these emissions. Total dust emissions have been estimated for selected operational scenarios using the mining production schedule, equipment listing and mine plans combined with emission factors from:

- Emission Estimation Technique Manual for Mining (National Pollution Inventory [NPI], 2012); and
- AP 42 (US EPA, 1985 and updates).

The modified Project mining production schedule has been used to identify a range of future operational years to be assessed. There are no specific guidelines or procedures which define an adequate level of information to demonstrate that selected scenarios are representative of worst-case impacts. The worst-case for one location may be different to the worst-case for another location so it is important to consider scenarios of mining at various locations and intensities as well as potential for cumulative effects with other existing or approved operations.

Four future construction and operational scenarios have been selected:

- Construction Year 2; and
- Operations in Years 1, 10 and 17.

These years address the maximum material handling quantities, maximum haul distances, and varying proximities to sensitive receptors.

Table 5.1 summarises the modelled annual TSP, PM_{10} and $PM_{2.5}$ emissions, for each modelled year respectively, due to the modified mining operations. It should be noted that the main intent of the inventories was to capture the most significant emission sources that may affect off-site air quality. Not every source will be captured. However, the contribution of emissions from sources not identified will be captured in the air quality monitoring data and these data have been added to the predicted modified Project contributions. Full details on the emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations are provided in Appendix B.

Table 5.1 Modelled construction and mining operational dust emissions

Air quality indicator	Annual emissions (kg/y)			
	Construction Year 2	Operations Year 1	Operations Year 10	Operations Year 17
Particulate matter (TSP)	329,371	2,005,859	1,674,884	1,650,221
Particulate matter (PM_{10})	124,169	663,351	647,687	663,104
Particulate matter ($PM_{2.5}$)	25,723	113,361	112,547	106,363

Mining operations were represented by a series of volume sources located according to the location of activities for each modelled scenario. Emissions from the dust generating activities were assigned to one or more of the source locations (refer to Appendix B for details of the allocations).

Dust emissions for all modelled mine-related sources have been considered to fit in one of three categories, as follows:

- Wind insensitive sources, where emissions are relatively insensitive to wind speed (for example, dozers).
- Wind sensitive sources, where emissions vary with the hourly wind speed, raised to the power of 1.3, a generic relationship published by the US EPA (1987). This relationship has been applied to sources such as loading and unloading of waste and ore to/from trucks and results in increased emissions with increased wind speed.
- Wind sensitive sources, where emissions also vary with the hourly wind speed, but raised to the power of 3, a generic relationship published by Skidmore (1998). This relationship has been applied to sources including wind erosion from stockpiles, overburden dumps or active pits, and results in increased emissions with increased wind speed.

Emissions from each volume source were developed on an hourly time step, taking into account the level of activity at that location and, in some cases, the hourly wind speed. This approach ensured that light winds corresponded with lower dust generation and higher winds, with higher dust generation.

Blasting activities and associated emissions were assumed to take place only during daylight hours (9 am to 5 pm for the purposes of the modelling) consistent with the hours specified in Condition 14, Schedule 3 of Development Consent (DA 374-11-00). All other activities have been modelled for 24 hours per day.

Pit retention (that is, retention of dust particles within the open pits) has not been included in the model simulations. This is a conservative approach as the coarser dust can remain trapped in the pits, particularly in light winds. Typically, five per cent of the PM_{10} emissions are trapped in the pit.

Finally, the model results at identified sensitive receptors were then compared with the EPA air quality criteria, previously discussed in Section 3.1. Contour plots have also been created to show the spatial distribution of model predictions. Section 6.1 provides the assessment of construction and operational dust for mining operations.

5.2 Construction and Operational Dust (Rail Siding)

Construction and operational dust impacts from the modified rail siding have been quantified by modelling. The modelling methodology was identical to the methodology for mining operations (Section 5.1) except for the location and extent of the model boundaries. Given that the topography of the region is relatively flat, the comprehensive meteorological data from the mine site have been extrapolated to the location of the modified rail siding site. Full details of the model setup are provided in Appendix A.

Table 5.2 summarises the modelled annual TSP, PM_{10} and $PM_{2.5}$ emissions due to construction and operation of the modified rail siding facility. Details on the emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations are provided in Appendix B.

Table 5.2 Modelled rail siding construction and operational dust emissions

Air quality indicator	Annual emissions (kg/y)	
	Construction	Operation
Particulate matter (TSP)	56,508	1,271
Particulate matter (PM_{10})	15,303	625
Particulate matter ($PM_{2.5}$)	5,608	94

Construction and operational activities were represented by a series of volume sources located according to the layout of the modified rail siding. The model results at identified sensitive receptors were then compared with the EPA air quality criteria, previously discussed in Section 3.1. Contour plots have also been created to show the spatial distribution of model predictions. Section 6.2 provides the assessment of construction and operational dust for the modified rail siding.

5.3 Processing Facility

The processing facility includes a sulphuric acid plant which would generate emissions of H_2SO_4, SO_2 and NO_x.

As noted in Section 2, for the purposes of this assessment, it has conservatively been assumed that auxiliary diesel boiler and diesel generators will be required to power the mine and processing facility as this would represent the maximum case scenario. In addition, it has been conservatively assumed that the diesel-powered backup generators would operate 24 hours per day, 365 days per year. This approach is consistent with that adopted in the Air Quality Assessment for the approved Project (Ramboll Environ, 2017). Emissions from these diesel-powered power generation activities would mainly include SO_2, CO, NO_x, $PM_{2.5}$ and VOCs such as benzene (7.9% of total VOCs) and 1,3-butadiene (7% of total VOCs).

Potential impacts due to emissions from these sources have been quantified by modelling.

Table 5.3 shows the source and emission data as used by the dispersion model, based on information supplied by SEM. Mass emission rates of each pollutant were calculated to reflect in-stack concentrations at the limits for scheduled premises under the *Protection of the Environment Operations (Clean Air) Regulation 2010*. It was assumed that emissions would be released continuously from all sources for 24 hours per day, every day of the year. These are conservative assumptions that would over-state potential impacts.

Table 5.3 Modelled processing facility emissions

Source	Sulphuric acid plant stack	Diesel power plant (boiler)	Diesel fired auxiliary power generator 1	Diesel fired auxiliary power generator 2	Diesel fired auxiliary power generator 3	Diesel fired auxiliary power generator 4
Modelled Easting (m)	538400	538490	538482	538482	538482	538482
Modelled Northing (m)	6373390	6373410	6373451	6373451	6373451	6373451
Height (m)	40	30	10	10	10	10
Base elevation (m)	298	299	299	299	299	299
Stack tip diameter (m)	1.80	0.9	0.9	0.9	0.9	0.9
Exhaust temperature (C)	75	180	300	300	300	300
Exhaust velocity (m/s)	26.6	22.7	18.5	18.5	18.5	18.5
Mass emission rates (g/s)						
CO	0	1.1	0.7	0.7	0.7	0.7
H_2SO_4	5.3	0	0	0	0	0
NO_x	18.6	4.4	2.8	2.8	2.8	2.8
PM	0	0.4	0.3	0.3	0.3	0.3
SO_2	53.1	0.01	0.01	0.01	0.01	0.01
VOCs	0	0.3	0.2	0.2	0.2	0.2
In-stack concentrations (mg/Nm^3)						
CO	0	125	125	125	125	125
H_2SO_4	100	0	0	0	0	0
NO_x	350	500	500	500	500	500
PM	0	50	50	50	50	50
SO_2	1000	1.1	1.8	1.8	1.8	1.8
VOCs	0	40	40	40	40	40
Clean Air Regulation limits (mg/Nm^3)						
CO	-	125	125	125	125	125
H_2SO_4	100	-	-	-	-	-
NO_x	350	500	500	500	500	500
PM	50	50	50	50	50	50
SO_2	1000	-	-	-	-	-
VOCs	-	40	40	40	40	40

The model results were then compared with the EPA air quality criteria (Section 3). Contour plots have also been created to show the spatial distribution of model predictions. Section 6.3 provides the assessment of the processing facility emissions and potential impacts.

5.4 Post-Blast Fume

Blasting is approved to be undertaken on ML 1770. The Modification would not change the approved blasting activities.

Blasting activities have the potential to result in fume and particulate matter emissions. Particulate matter emissions from blasting are produced from the modelling discussed in Section 5.1. Post-blast fume has also been quantified by modelling.

Post-blast fume can be produced in non-ideal explosive conditions of the ammonium nitrate/fuel oil (ANFO) and is visible as an orange/brown plume. The fumes are comprised of NO_x which includes NO and NO_2. Various studies that review NO_x monitoring data (see for example Jacobs, 2019) indicate that the percentage of NO_2 in the NO_x is typically inversely proportional to the total NO_x concentration. When NO_x concentrations are high, the percentage of NO_2 in the NO_x is typically of the order of 20%.

The methodology for the operational post-blast fume modelling is outlined below:

- Blast modelled as single volume sources in locations indicative of the centre of the east pit. The blasts are conservatively assumed to be on the surface rather than in-pit.
- Release heights of 20 m, effective plume heights of 40 m, initial horizontal spread (sigma y) of 25 m and initial vertical spread (sigma z) of 10 m. These are conservative estimates based on the data presented by Attalla *et al*. (2008). No plume rise due to buoyancy was modelled, which is again a conservative assumption.
- Blasting emissions are conservatively simulated for every hour between 9 am and 5 pm to assess potential blasting impacts at all hours of permitted blast times (and meteorological conditions). It should be noted that blasting would not be carried out every hour between 9 am and 5 pm.
- Blasting could be on any day of the week; a conservative assumption as, in accordance with Development Consent (DA 374-11-00), blasting cannot occur on Sundays or public holidays unless written approval is obtained from the administering authority.
- NO_x emissions are based on data presented in the Queensland *Guidance Note for the Management of oxides of nitrogen in open cut blasting* (DEEDI, 2011). It was conservatively assumed that the initial NO_2 concentration in the plume would be 17 ppm (34.9 mg/m^3) based on the Rating 3 Fume Category in the Queensland Guidance Note.
- The initial NO_2 concentration in the plume was converted to a total NO_x emission rate based on a detailed measurement program of NO_x in blast plumes in the Hunter Valley made by Attalla *et al*. (2008) which found that the NO:NO_2 ratio was typically 27:1, giving a NO_x:NO_2 ratio of approximately 18.6 g NO_x/g NO_2.
- Calculated emission of 390 g/s of NO_x per blast and an emission release time of 5 minutes.
- 30% of the NO_x is NO_2 at the points of maximum 1-hour average concentrations and at sensitive receptors. This is a conservative assumption; as noted above, when hourly NO_x concentrations are high, the percentage of NO_2 in the NO_x is typically of the order of 20%. The annual average fraction of NO_2 in the NO_x is typically higher than the maximum hourly fraction of NO_2 in the NO_x due to more time available for oxidation.

Model results for post-blast fume have been compared to the applicable EPA air quality criterion for NO_2; that is 246 µg/m^3 as a 1-hour average and taking background levels into account. Section 6.4 provides the assessment of operational post-blast fume.

5.5 Diesel Exhaust

Emissions from diesel exhausts associated with off-road vehicles and equipment at mine sites are often deemed a lower air quality impact risk than dust emissions from material handling activities. This is because of the relatively few emission sources involved, for example when compared to a busy motorway, and the large distances between the sources and sensitive receptors. Nevertheless, a review of the potential impacts has been carried out, including modelling to quantify potential impacts.

The most significant emissions from diesel exhausts are products of combustion including CO, NO_x, PM_{10} and $PM_{2.5}$. It is the NO_x, or more specifically NO_2, and PM_{10} (including $PM_{2.5}$) which have been assessed. DPIE monitoring data have shown that CO concentrations have not exceeded relevant air quality criteria at rural or urban monitoring stations in NSW, indicating that this indicator represents a much lower air quality risk.

The modelling for operational dust (Section 5.1) has considered emission factors that represent the contribution from both wheel generated particulates and the exhaust particulates. These emission factors, including with control factors, are based on measured emissions which included diesel particulates in the form of both PM_{10} and $PM_{2.5}$. The emission factors are also likely to include more diesel exhaust particulate than from a modern truck as the factors were developed on the basis of emissions from trucks measured in the 1980s (that is, older trucks). Todoroski Air Sciences (TAS) has also reported (TAS, 2016) that several studies, reported to the EPA, confirmed that a control factor of 85% can be maintained, representing all components of the truck haulage emission. This information indicates that the potential PM_{10} and $PM_{2.5}$ emissions generated by diesel exhaust are captured in the modelling for operational dust (Section 6.1).

Table 5.4 and Table 5.5 provides the explicit estimates of PM_{10} and $PM_{2.5}$ emissions due to the diesel boiler and equipment exhausts, respectively. Emission factors for “Industrial off-road vehicles and equipment” from the EPA’s Air Emissions Inventory for 2008 (EPA, 2012) were used for the calculations and it has been assumed that there will be no reduction to emissions in the future; a conservative approach. These factors relate to diesel exhaust and evaporative emissions.

Table 5.4 Calculated PM_{10} emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Annual estimated fuel usage (kL/y) (source: SEM)	1,059	10,425	5,041	5,624
PM_{10} diesel exhaust emission factor (kg/kL)	2.84			
PM_{10} diesel exhaust emissions - all equipment (kg/y)	3,009	29,607	14,318	15,971

Table 5.5 Calculated $PM_{2.5}$ emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Annual estimated fuel usage (kL/y) (source: SEM)	1,059	10,425	5,041	5,624
$PM_{2.5}$ diesel exhaust emission factor (kg/kL)	2.75			
$PM_{2.5}$ diesel exhaust emissions – all equipment (kg/y)	2,918	28,719	13,888	15,492

Emissions of NO_x from diesel exhausts have been estimated using fuel consumption data, provided by SEM, and an emission factor from the EPA’s Air Emissions Inventory for 2008 (EPA, 2012). Table 5.6 shows the calculations. Again, it has been assumed that there would be no reduction to emissions in the future; a conservative approach.

The NO_x emission estimates for Operations Year 1 from Table 5.6 have been explicitly modelled to provide an indication of the off-site NO_2 concentrations due to diesel exhaust emissions. Section 6.5 provides the assessment of operational diesel exhaust.

Table 5.6 Modelled NO_x emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Estimated fuel usage (kL) (source: SEM)	1,059	10,425	5,041	5,624
NO_x diesel exhaust emission factor (kg/kL)	40.77			
NO_x diesel exhaust emissions – all equipment (kg/y)	43,190	425,029	205,540	229,277

5.6 Greenhouse Gas Emissions

The GHG inventory has been calculated in accordance with the principles of the GHG Protocol (WBCSD and WRI, 2020). The initial action for a GHG inventory is to determine the sources of GHG emissions, assess their likely significance and set a boundary for the assessment. Creating an inventory of the likely GHG emissions associated with the modified Project has the benefit of determining the scale of the emissions and providing a baseline from which to develop and deliver GHG reduction options.

The results of this assessment are presented in terms of the previously mentioned 'Scopes' to help understand the direct and indirect impacts of the modified Project. The GHG Protocol (and similar reporting schemes) dictates that reporting Scope 1 and 2 sources is mandatory, whilst reporting Scope 3 sources is optional. Reporting *significant* Scope 3 sources is recommended. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities include the extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services. The inventory for this assessment includes all significant sources of GHGs (Scopes 1, 2 and 3) associated with the modified Project.

Future projections of production, fuel usage and site activities were used to determine the GHG emissions from the modified Project. Table 5.7 shows the key emission sources that have been considered in this assessment, their respective scope and the relevant estimation methodologies.

Section 7 provides the assessment of GHG emissions.

Table 5.7 Greenhouse gas emission sources and estimation methodologies

Activity	Description	Scope(s)	Emission estimation methodology
Diesel usage (mining)	Combustion of diesel fuel from mobile mining equipment.	1, 3	Emission factors from NGA Factors (DISER, 2020).
Diesel usage (limestone)	Combustion of diesel fuel from vehicles transporting limestone from the quarry.	1, 3	Emission estimates from Sunrise (formerly Syerston) Project Modification 4 Air Quality and Greenhouse Gas Assessment (Ramboll Environ, 2017).
Diesel usage (sulphur)	Combustion of diesel fuel from vehicles transporting sulphur from rail siding.	1, 3	Emission estimates from Ramboll Environ (2017).
Diesel usage (power generation)	Combustion of diesel fuel from stationary power generation units.	1, 3	Emission estimates from Ramboll Environ (2017).
Processing facility	Emissions from PAL vent scrubber stack, partial neutralisation vent scrubber stack and RIP vent scrubber stack	1	Emission estimates from Ramboll Environ (2017).
Blasting	Detonation of explosives used for blasting.	1	Emission factors from NGA Factors (DCC, 2008).
Transport (rail)	Transport of product by rail to port.	3	Emission factors from the Department for Environment, Food and Rural Affairs (DEFRA) (2019), based on "Freighting goods / freight train". 500 km assumed distance to port.

6. Air Quality Assessment

This section provides an assessment of the identified key potential air quality impacts at the modified mine and processing facility and rail siding (Section 2).

6.1 Construction and Operational Dust (Mining Operations)

Model results for construction and operational dust near the mine site have been assessed for each of the key particulate matter classifications, as outlined below. Tabulated model results are provided in Appendix C.

6.1.1 Particulate Matter (as PM_{10})

Figure 6.1 shows the modelled maximum project only 24-hour average PM_{10} concentrations due to the modified Project for each construction and operational scenario. The EPA does not prescribe a project only criteria for 24-hour average PM_{10}, but the VLAMP refers to 50 µg/m^3 for the purposes of determining land acquisition and mitigation. The modelling shows that the 50 µg/m^3 criterion would not be exceeded at any private sensitive receptor for project only contributions.

Compliance with the EPA's 24-hour average PM_{10} criterion of 50 µg/m^3 has also been assessed. This criterion relates to the total concentration in the air (that is, cumulative) and not just the contribution from the modified Project. As noted in Section 4.2 most locations in NSW have historically recorded one or more days each year when the 24-hour average PM_{10} concentration exceeded 50 µg/m^3. The model has therefore been configured to show the number of days each year above 50 µg/m^3, and an assessment made of whether the modified Project would cause additional exceedances.

Figure 6.2 shows the modelled number of days above 50 µg/m^3 due to the modified Project and other sources of PM_{10} (i.e. cumulative). These results show that, for a representative year, the nearest private sensitive receptors are not expected to experience any additional days when PM_{10} concentrations exceed 50 µg/m^3 due to the modified Project. These results are within the range of historically measured days when PM_{10} concentrations at rural monitors operated by the DPIE have exceeded 50 µg/m^3, excluding extraordinary years such as those years with increased occurrence of dust storms and bushfires. The site specific monitoring carried out by SEM (Section 4.2) showed that there were between 22 and 28 days in 2020 when PM_{10} concentrations exceeded 50 µg/m^3. Excluding extraordinary events, the typical number of days per year above 50 µg/m^3 has been estimated at five (Table 4.6).

Additional investigation of the potential for the modified Project to cause an exceedance has been carried out. This involved examining contemporaneous background and modified Project contributions for each day in the modelling year, referred to as a "Level 2" assessment by the Approved Methods. Figure 6.3 shows a time series of 24-hour average PM_{10} concentrations at the nearest private sensitive receptor, M08 (Currajong Park 2). At M08 (Figure 6.3) the results indicate that there were no additional exceedance days as a result of the modified Project.

Figure 6.4 shows the modelled annual average project only PM_{10} concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average PM_{10} concentrations at the nearest private sensitive receptors would be no more than 6 µg/m^3 per year.

Figure 6.5 shows the modelled annual average PM_{10} concentrations due to the modified Project and other sources of PM_{10} (i.e. cumulative). These results indicate compliance with the EPA's assessment criterion for annual average PM_{10} (25 µg/m^3) at all private sensitive receptors.

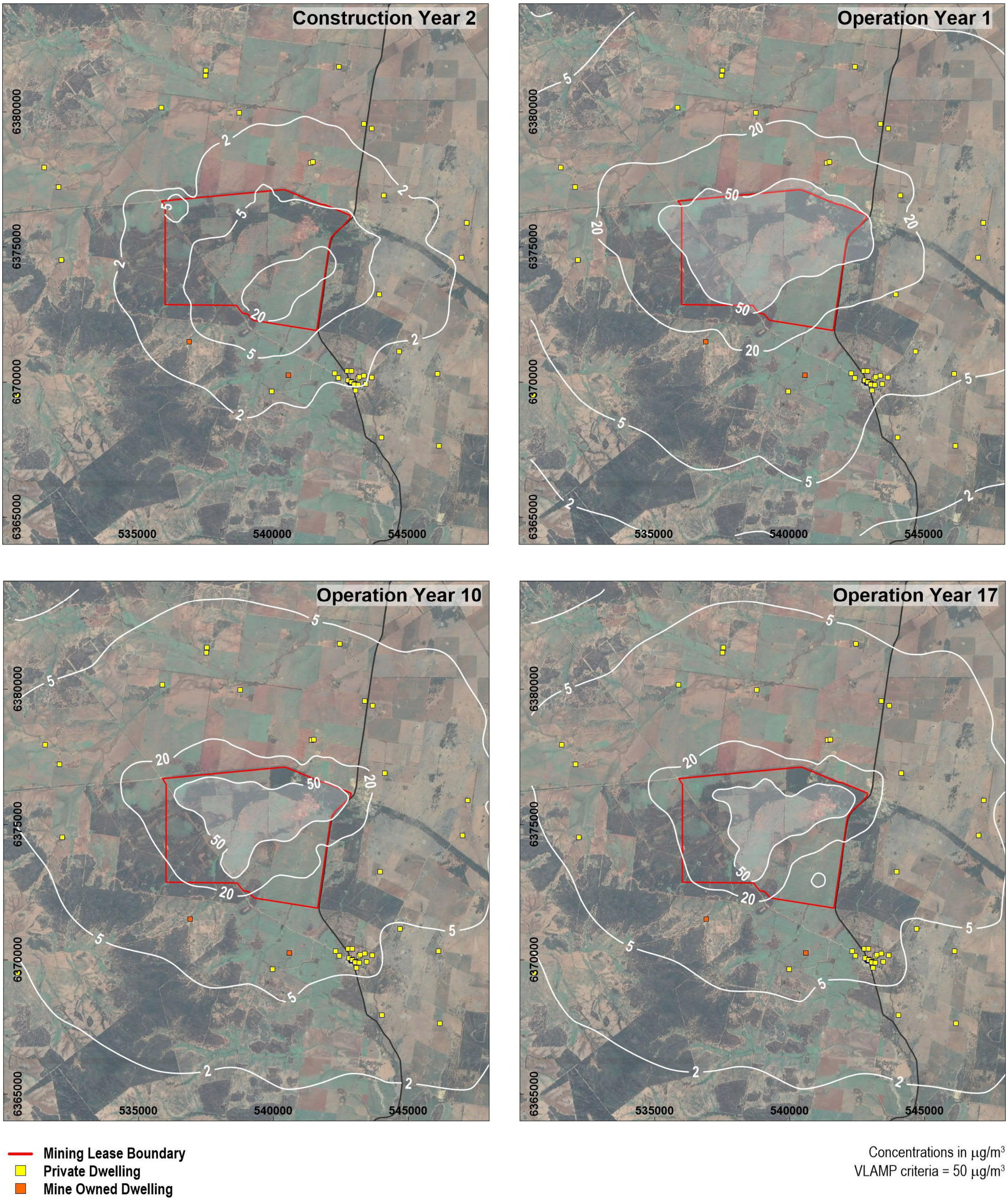


Figure 6.1 Modelled maximum 24-hour average PM_{10} due to the modified Project

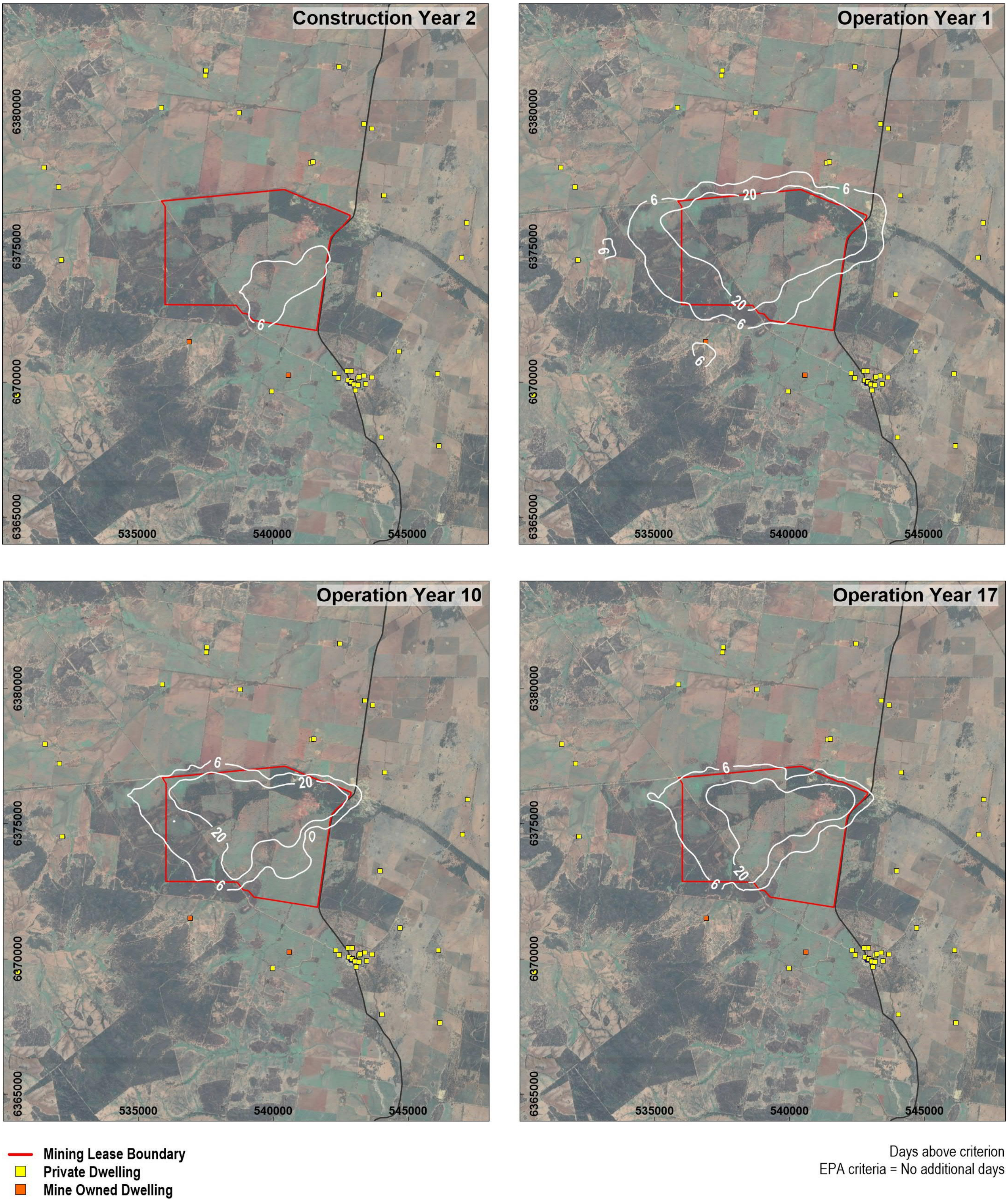


Figure 6.2 Modelled number of days above 50 µg/m³ PM_{10} due to the modified Project and other sources

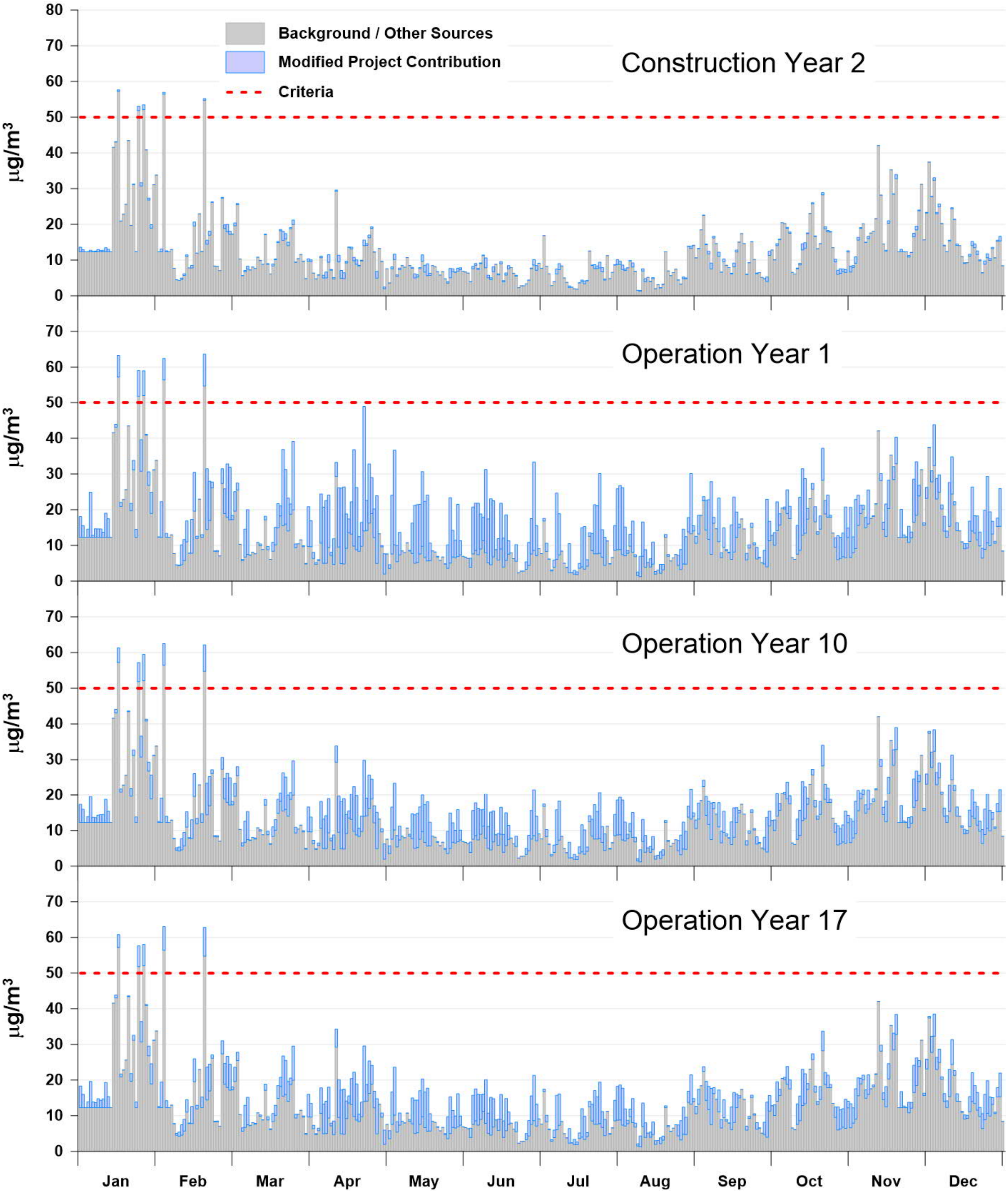


Figure 6.3 Time series of 24-hour average PM_{10} of the modified Project and other sources at M08

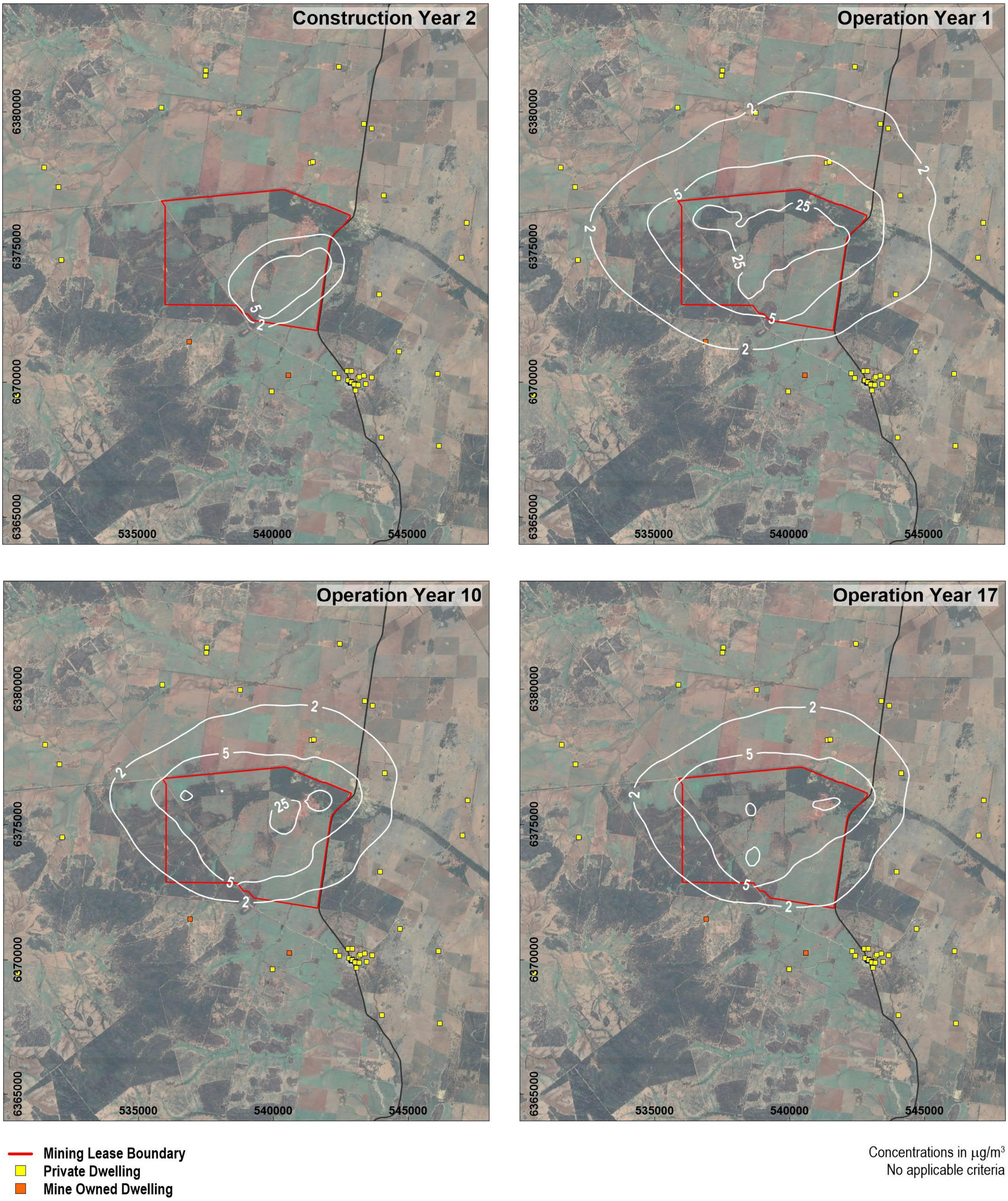


Figure 6.4 Modelled annual average PM_{10} due to the modified Project

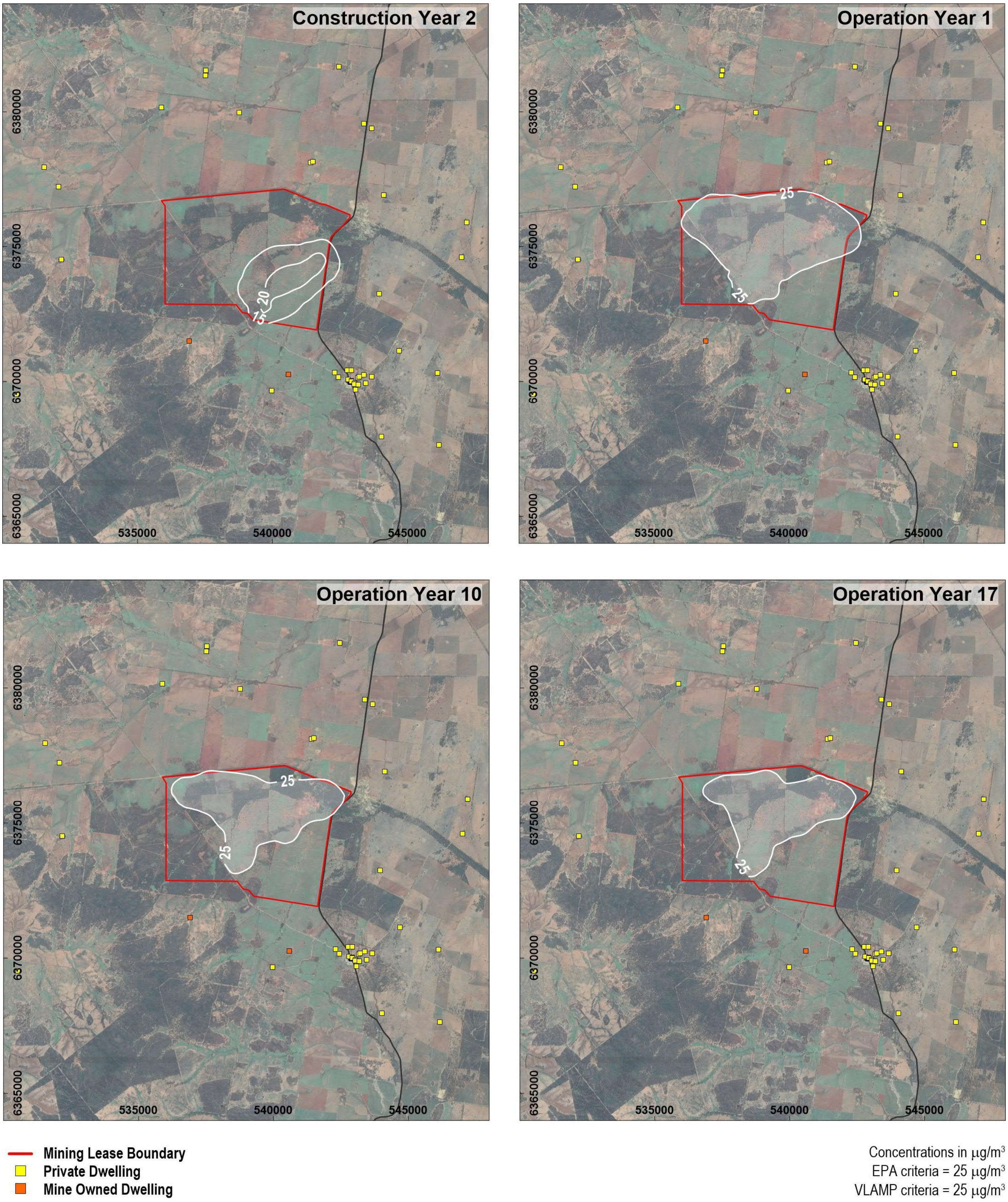


Figure 6.5 Modelled annual average PM_{10} due to the modified Project and other sources

6.1.2 Particulate Matter (as $PM_{2.5}$)

Figure 6.6 shows the modelled maximum 24-hour average $PM_{2.5}$ concentrations due to the modified Project for each assessment scenario. The EPA does not prescribe a project only criteria for 24-hour average $PM_{2.5}$, however the VLAMP (NSW Government, 2018) refers to 25 µg/m^3 for the purposes of determining land acquisition and mitigation. The modelling shows that the 25 µg/m^3 criterion would not be exceeded at any private sensitive receptor.

Compliance with the EPA's cumulative 24-hour average $PM_{2.5}$ criterion of 25 µg/m^3 has also been assessed. Figure 6.7 shows the modelled maximum 24-hour average $PM_{2.5}$ concentrations due to the modified Project and other sources of $PM_{2.5}$. These results indicate compliance with the EPA's assessment criterion for cumulative 24-hour average $PM_{2.5}$ (25 µg/m^3) at all private sensitive receptors.

Figure 6.8 shows the modelled annual average project only $PM_{2.5}$ concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average $PM_{2.5}$ concentrations at the nearest private sensitive receptors would be in the order of 1 to 2 µg/m^3.

Figure 6.9 shows the modelled annual average cumulative $PM_{2.5}$ concentrations due to the modified Project and other sources of $PM_{2.5}$. These results indicate compliance with the EPA's assessment criterion for cumulative annual average $PM_{2.5}$ (8 µg/m^3) at all private sensitive receptors.

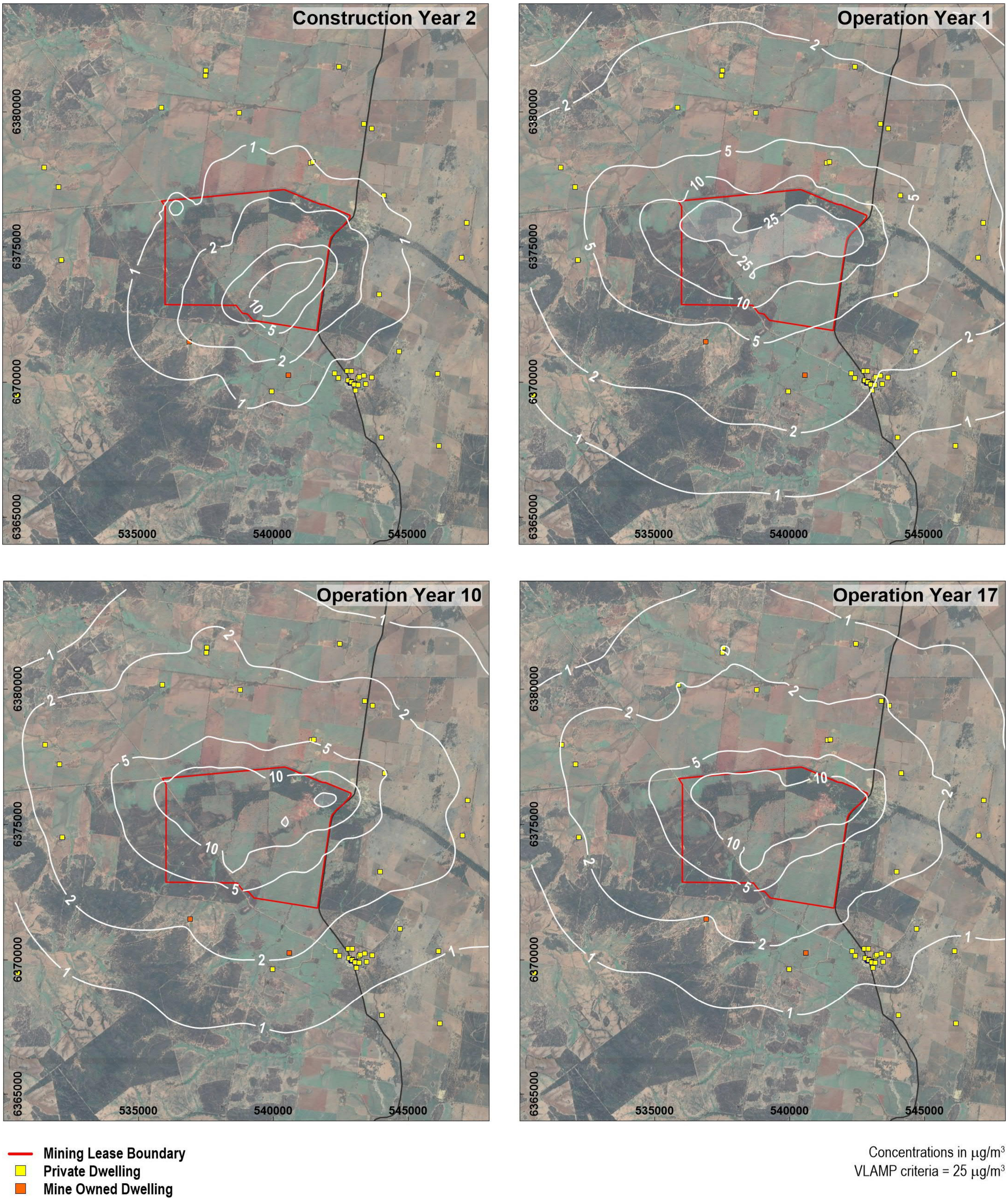


Figure 6.6 Modelled maximum 24-hour average $PM_{2.5}$ due to the modified Project

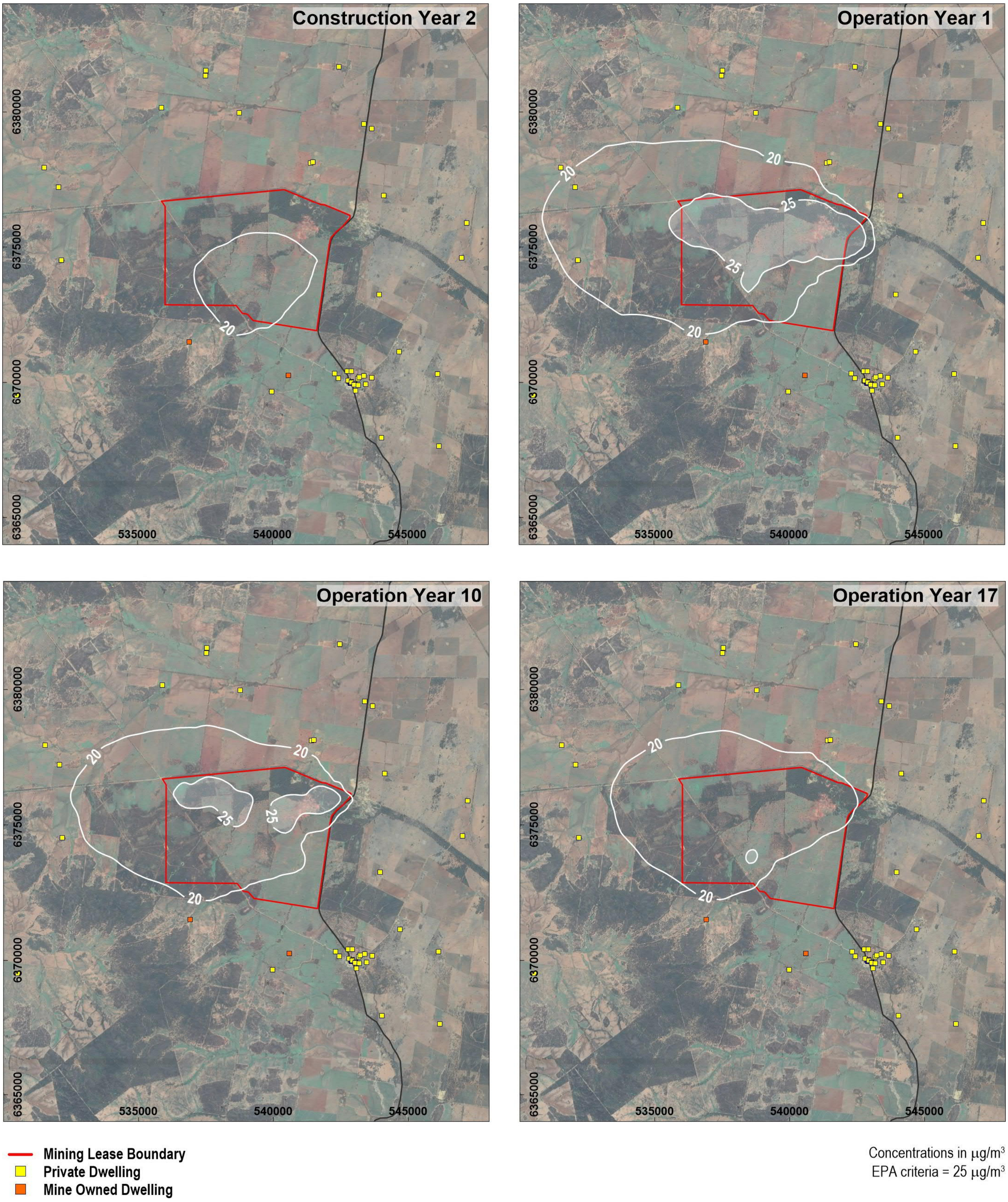


Figure 6.7 Modelled maximum 24-hour average $PM_{2.5}$ due to the modified Project and other sources

Figure 6.8 Modelled annual average $PM_{2.5}$ due to the modified Project

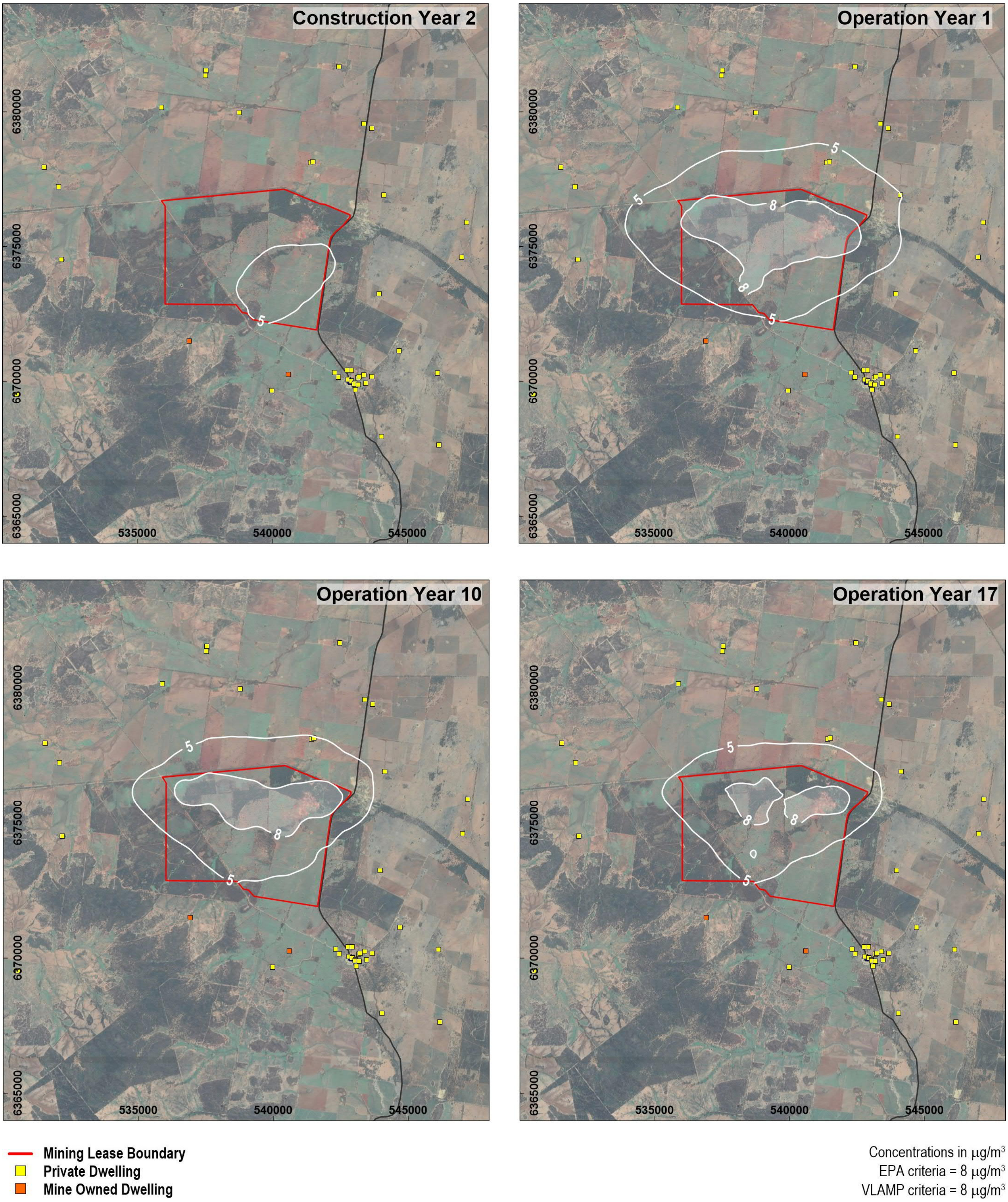


Figure 6.9 Modelled annual average $PM_{2.5}$ due to the modified Project and other sources

6.1.3 Particulate Matter (as TSP)

Figure 6.10 shows the modelled annual average project only TSP concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average TSP concentrations at the nearest private sensitive receptors would be in the order of less than 5 µg/m^3.

Figure 6.11 shows the modelled annual average TSP concentrations due to the modified Project and other background sources of TSP (i.e. cumulative). These results indicate compliance with the EPA's assessment criterion for annual average TSP (90 µg/m^3) at all private sensitive receptors. Consequently, the modified Project is not anticipated to cause adverse air quality impacts in terms of TSP concentrations.

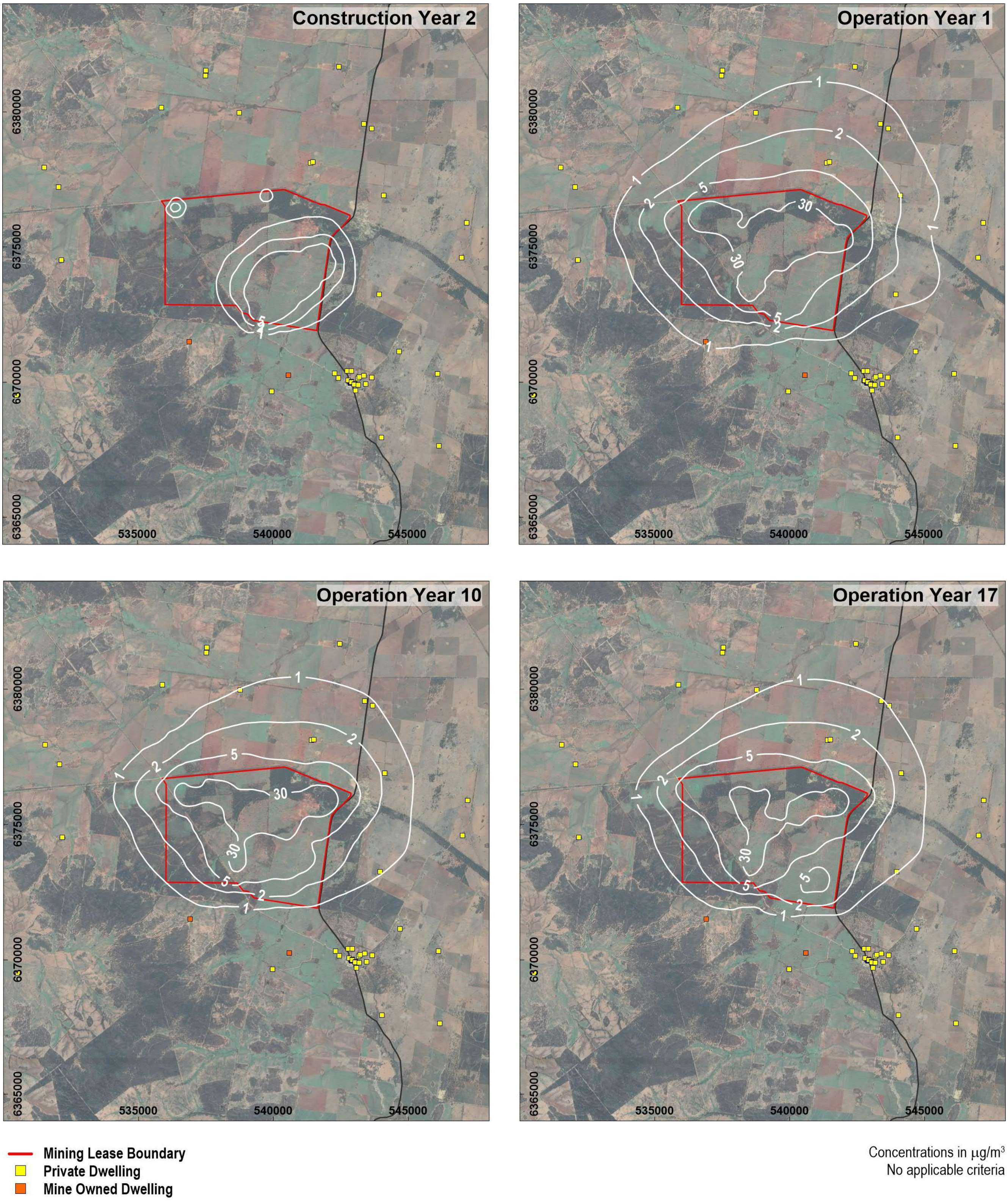


Figure 6.10 Modelled annual average TSP due to the modified Project

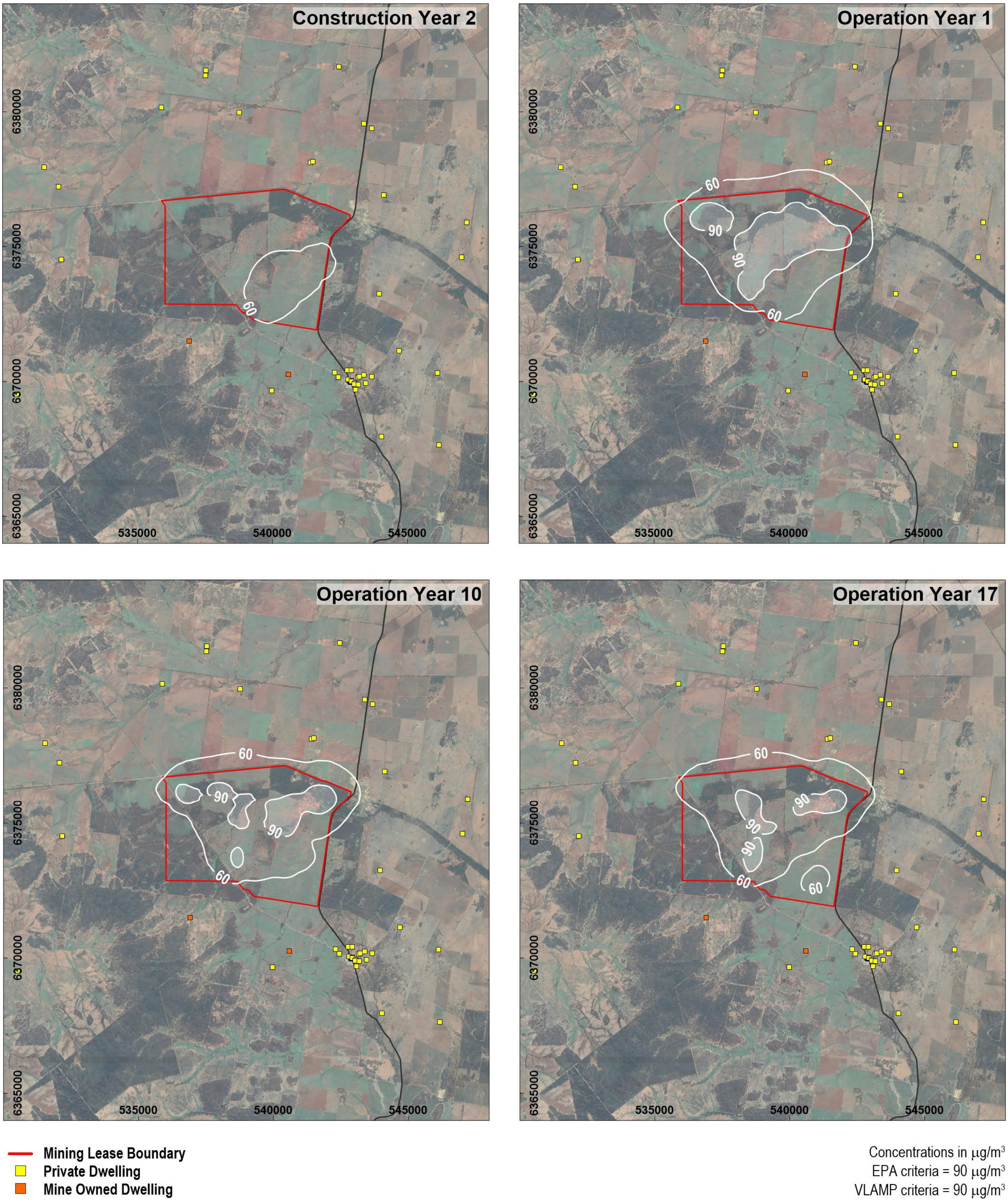


Figure 6.11 Modelled annual average TSP due to the modified Project and other sources

6.1.4 Deposited Dust

Figure 6.12 shows the modelled annual average project only deposited dust levels due to the modified Project. These results show that the EPA's assessment criterion for deposited dust due to project only contributions of the modified Project (2 $g/m^2/month$) would not be exceeded at private sensitive receptors.

Figure 6.13 shows the modelled annual average deposited dust levels due to the modified Project and other sources of deposited dust. These results indicate compliance with the EPA's assessment criterion for total deposited dust (4 $g/m^2/month$) at all private sensitive receptors. Consequently, the modified Project is not anticipated to cause adverse air quality impacts in terms of deposited dust levels.

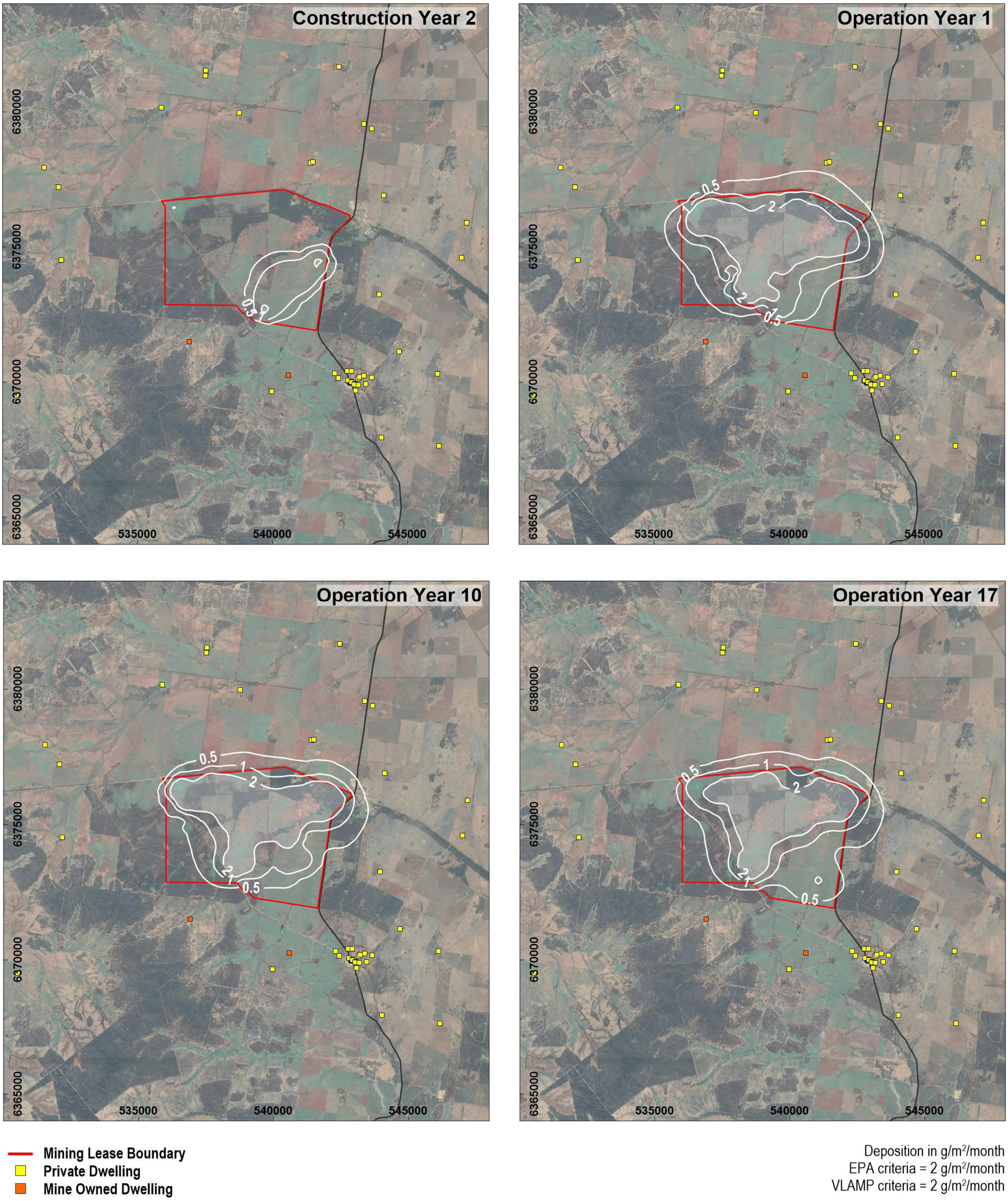


Figure 6.12 Modelled annual average deposited dust due to the modified Project

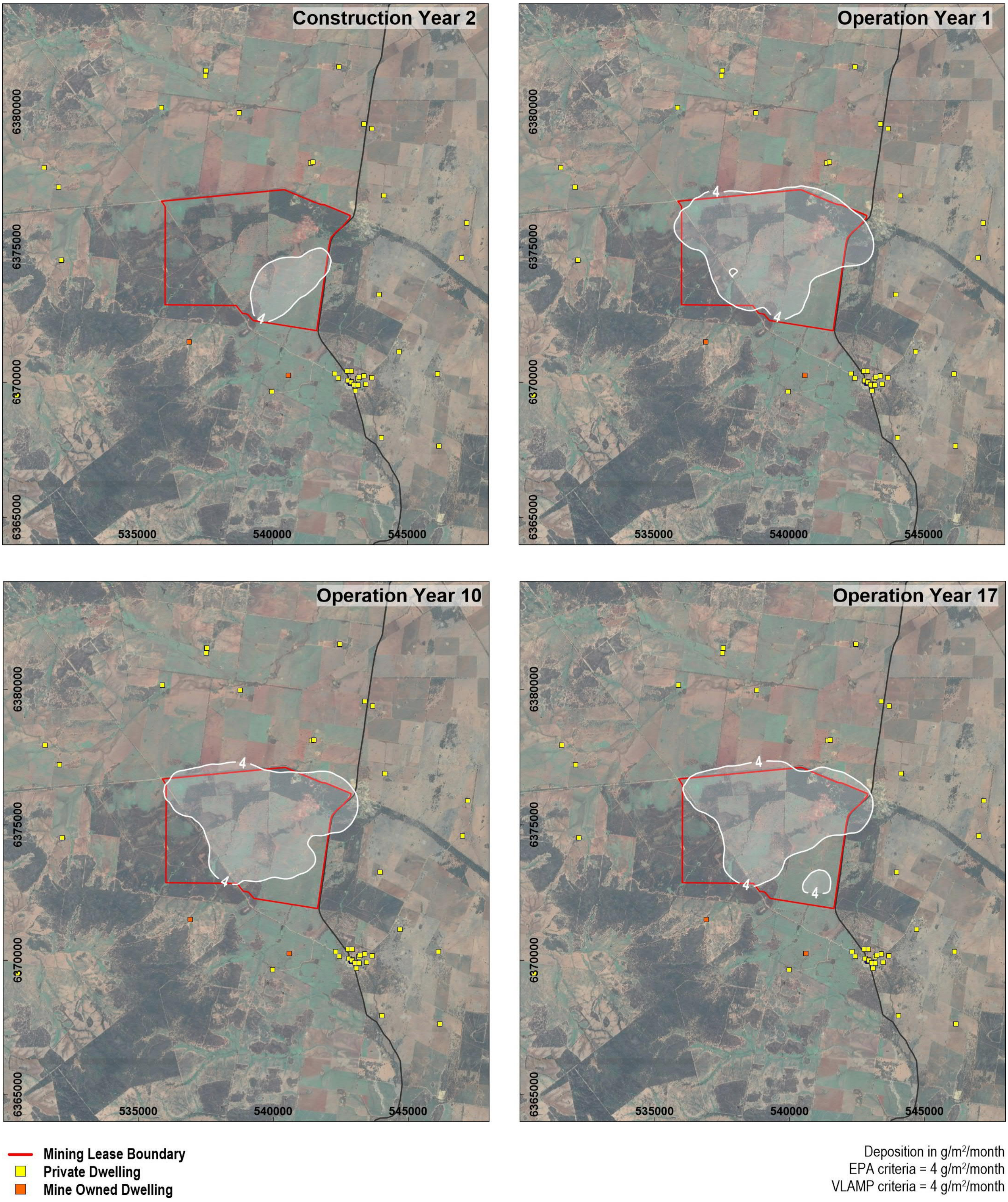


Figure 6.13 Modelled annual average deposited dust due to the modified Project and other sources

6.2 Construction and Operational Dust (Rail Siding)

Model results for construction and operational dust near the rail siding are provided in Appendix D and have been assessed for each of the key particulate matter classifications, as outlined below.

6.2.1 Particulate Matter (as PM_{10})

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of PM_{10}. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.2 Particulate Matter (as $PM_{2.5}$)

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of $PM_{2.5}$. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.3 Particulate Matter (as TSP)

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of TSP. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.4 Deposited Dust

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of deposited dust. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.5 Other Potential Impacts

An ammonium sulphate storage and distribution facility is proposed for the modified railing siding. Potential odour impacts from the ammonium sulphate storage facility would be minimal as ammonium sulphate is an inorganic salt, an odourless substance, and not recognised as a source of odorous emissions.

6.3 Processing Facility

Emissions that were modelled from the processing facility included H_2SO_4, SO_2, CO, NO_x, $PM_{2.5}$ and VOCs such as benzene and 1,3-butadiene. Modelling of these emissions has been carried out based on the methodology described in Section 5.2 with results provided as contour plots in Appendix E.

Inspection of the results from Appendix E led to the following observations:

- Maximum 1-hour average CO concentrations do not exceed the EPA criterion (30 mg/m^3) at the nearest sensitive receptors.
- Maximum 8-hour average CO concentrations do not exceed the EPA criterion (10 mg/m^3) at the nearest sensitive receptors.
- H_2SO_4 concentrations do not exceed the EPA criterion (18 µg/m^3) at the nearest sensitive receptors.
- Maximum 1-hour average NO_2 concentrations do not exceed the EPA criterion (246 µg/m^3) at the nearest sensitive receptors.
- Annual average NO_2 concentrations do not exceed the EPA criterion (62 µg/m^3) at the nearest sensitive receptors.

- Maximum 24-hour average PM_{10} concentrations do not exceed the EPA criterion (50 µg/m^3) at the nearest sensitive receptors as a result of operations of the processing facility in isolation. The maximum contributions of PM_{10} emissions from the processing facility do not introduce adverse cumulative effects with dust from mining operations at the nearest sensitive receptors (less than 1 µg/m^3) (Section 6.1).
- Annual average PM_{10} concentrations do not exceed the EPA criterion (25 µg/m^3) at the nearest sensitive receptors as a result of operations of the processing facility in isolation. The maximum contributions of PM_{10} emissions from the processing facility do not introduce adverse cumulative effects with dust from mining operations at the nearest sensitive receptors (less than 0.1 µg/m^3) (Section 6.1).
- Maximum 1-hour average SO_2 concentrations do not exceed the EPA criterion (570 µg/m^3) at the nearest sensitive receptors.
- Maximum 24-hour average SO_2 concentrations do not exceed the EPA criterion (228 µg/m^3) at the nearest sensitive receptors.
- Annual average SO_2 concentrations do not exceed the EPA criterion (60 µg/m^3) at the nearest sensitive receptors.
- Benzene concentrations do not exceed the EPA criterion (29 µg/m^3) beyond the mining lease boundary for 99.9% of the time (i.e. 99.9th percentile).
- 1-3 butadiene concentrations do not exceed the EPA criterion (40 µg/m^3) beyond the mining lease boundary for 99.9% of the time (i.e. 99.9th percentile).

The results from the processing facility modelling were based on conservative assumptions including continuous release of maximum emissions from all sources. That is, in-stack concentrations were modelled at the limits for scheduled premises under the *Protection of the Environment Operations (Clean Air) Regulation 2010*. Actual emissions are expected to be less than what was modelled. Compliance with the EPA criteria demonstrates that the facility will not lead to adverse air quality impacts.

6.4 Post-Blast Fume

Figure 6.14 shows the modelled maximum 1-hour average NO_2 concentrations due to post-blast fume, based on the methodology outlined in Section 5.4. These results show that, under worst-case meteorological conditions with a rated 3 fume, and conservatively assuming blasting every day between 9 am and 5 pm, the maximum 1-hour average NO_2 concentrations would not exceed EPA's criterion of 246 µg/m^3 at any sensitive receptor location. It should be noted that blasting is expected to occur infrequently and only at depth in the pits towards the end of the mine life (i.e. in Operational Years 16 to 19).

While worst-case assumptions have been made with respect to time-of-day, fume rating and background levels, the modelling has been based on a blast positioned broadly in the middle of the east pit. It is acknowledged that moving the assumed blast location, for example further to the west, would lead to a corresponding shift in the contours, potentially changing the modelled extent of impacts. However, this potential would be managed through the design process for each individual blast which would be designed to comply with relevant criteria. The potential for post-blast fume impacts would be identified prior to all blasts, taking into account the specific parameters of each blast, to avoid worst-case conditions and to minimise fume emissions from blasting, in accordance with contemporary conditions of approval. SEM has developed a pre-blasting procedure which covers fume management (Clean TeQ, 2019b). The Blast Management Plan (Clean TeQ, 2019b) would be implemented during operations, including key fume management actions, such as defining the potential risk zone based upon weather patterns and obtaining internal permission to fire based on an assessment of real-time weather conditions.

Based on the dispersion modelling, with predominantly worst-case assumptions, and proposed implementation of site-specific pre-blast procedures, it has therefore been concluded that the modified Project would not lead to adverse air quality impacts with respect to post-blast fumes.

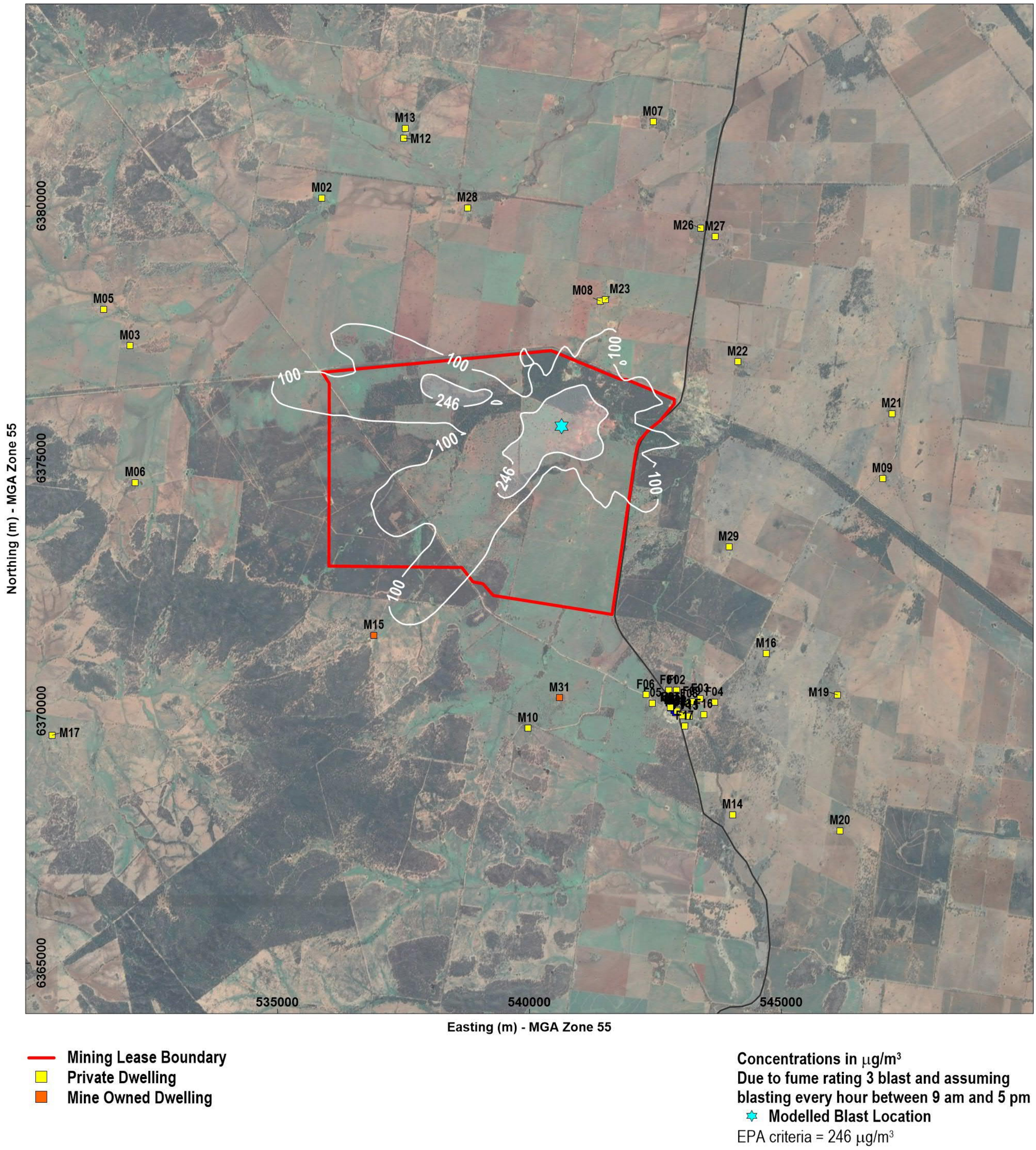


Figure 6.14 Modelled maximum 1-hour average NO_2 due to blasting

6.5 Diesel Exhaust

Figure 6.15 shows the modelled maximum 1-hour average NO_2 concentrations due to diesel exhaust emissions from the operations in Year 1, based on the methodology outlined in Section 5.5. For these hourly average results it has been assumed that 30% of the NO_x is NO_2 at the locations of maximum ground-level concentrations. The results show compliance with the EPA's 246 µg/m^3 criterion at all sensitive receptors. In addition, from inspection of the results in Section 6.3 and Section 6.4, potential cumulative NO_2 concentrations with the processing facility, diesel exhaust, and blasting emissions would also comply with the EPA's criteria (246 µg/m^3) at all sensitive receptors.

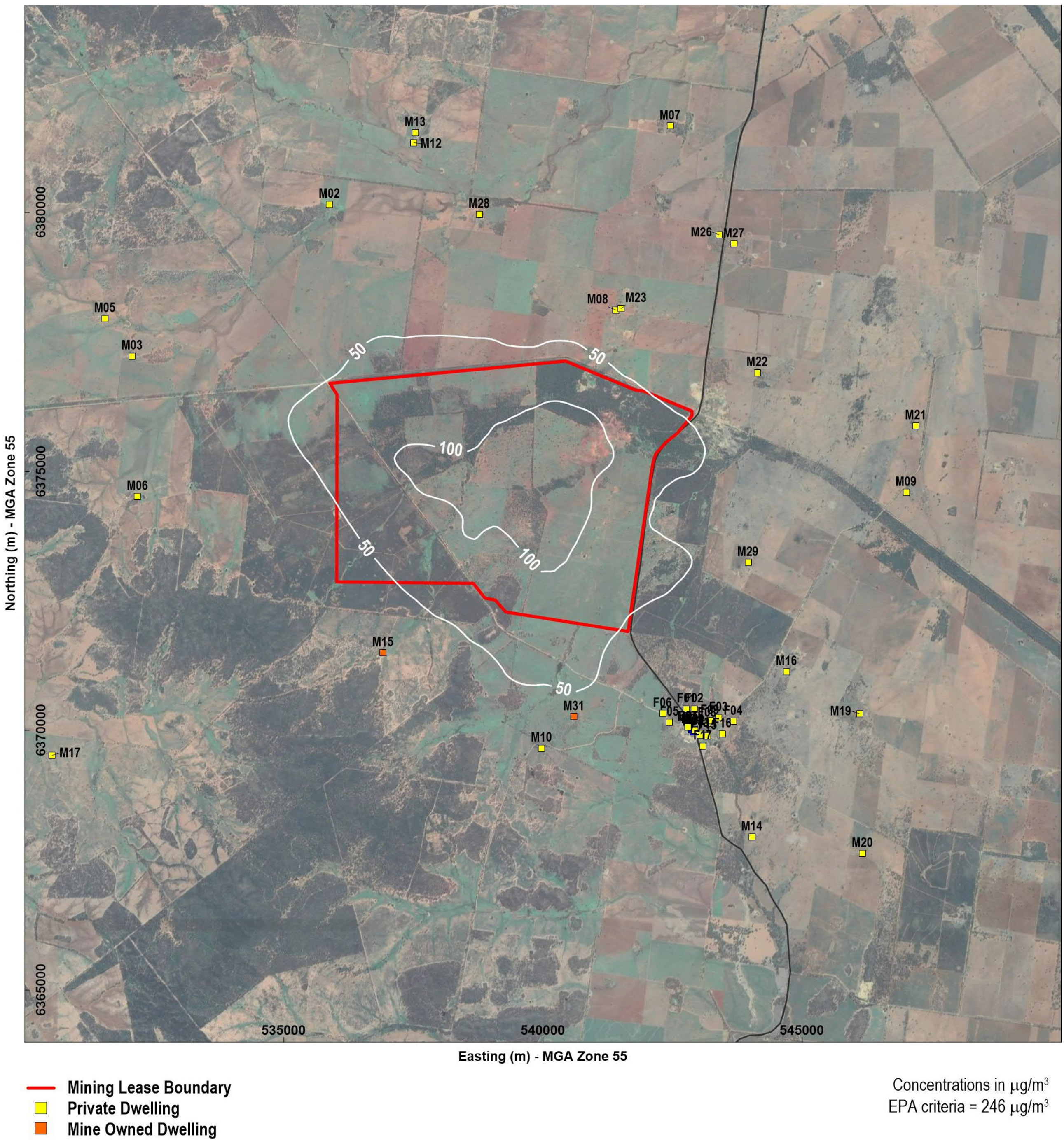


Figure 6.15 Modelled maximum 1-hour average NO_2 due to diesel exhausts

Figure 6.16 shows the modelled annual average NO_2 concentrations. For these annual average results, a conservative assumption of 100% of the NO_x is NO_2 has been applied[3]. The results show compliance with the EPA's 62 µg/m^3 criterion at all sensitive receptors. It has therefore been concluded that the modified Project would not lead to adverse air quality impacts with respect to NO_2 emissions from diesel exhaust.

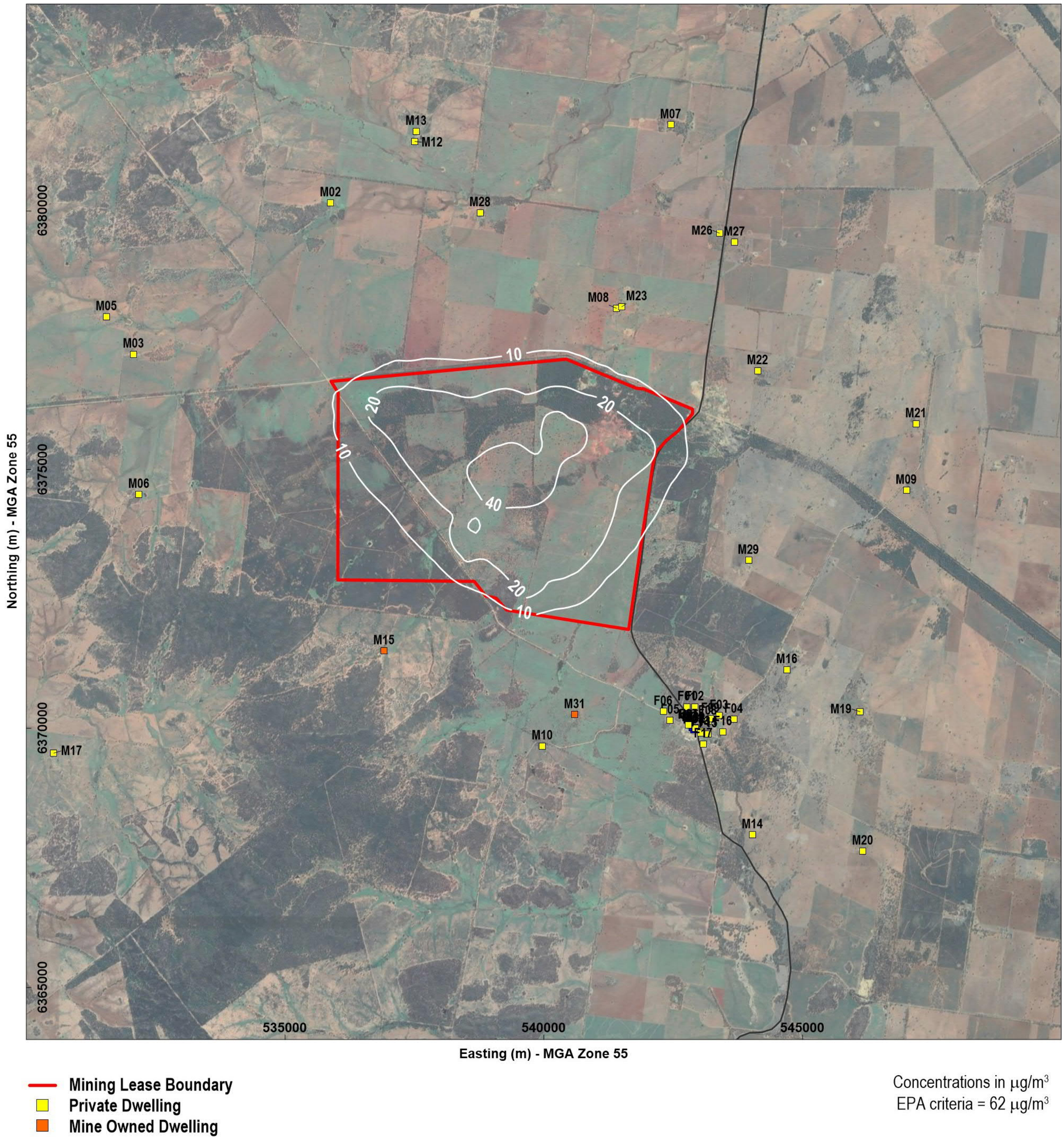


Figure 6.16 Modelled annual average NO_2 due to diesel exhausts

[3] 30% of the NO_x is assumed to be NO_2 at the points of maximum 1-hour average concentrations. The annual average fraction of NO_2 in the NO_x is typically higher than the maximum hourly fraction of NO_2 in the NO_x due to more time available for oxidation. 100% of the NO_x is NO_2 has been assumed to apply for annual average concentrations.

7. Greenhouse Gas Assessment

7.1 Emissions

Table 7.1 shows the estimated emissions of GHGs due to all identified GHG-generating activities for each mining year. Section 5.6 describes the greenhouse gas emission sources, their respective 'Scope' and the GHG emission estimation methodology. Scopes 1, 2 and 3 are defined by the GHG Protocol and can be summarised as follows (Figure 3.1):

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel (by air or rail) and product usage).

Over the lifetime of the modified Project (i.e. 3 year construction and 21 year operational period) the Scope 1 and 2 emissions are estimated to average 0.28 Mt CO_2-e per year. Appendix F provides more detailed breakdowns of the estimated emissions for each activity by mining year.

Table 7.1 Summary of estimated greenhouse gas emissions

Mining year	Emissions (t CO_2-e)[1]		
	Scope 1	Scope 2	Scope 3
Construction Year 1	2,883	-	147
Construction Year 2	2,883	-	147
Construction Year 3	91,642	-	501
Operation Year 1	327,433	-	5,932
Operation Year 2	313,295	-	5,210
Operation Year 3	312,779	-	5,184
Operation Year 4	317,813	-	5,441
Operation Year 5	310,726	-	5,079
Operation Year 6	317,780	-	5,439
Operation Year 7	312,383	-	5,163
Operation Year 8	314,692	-	5,281
Operation Year 9	312,783	-	5,184
Operation Year 10	318,576	-	5,480
Operation Year 11	310,602	-	5,073
Operation Year 12	316,792	-	5,389
Operation Year 13	317,019	-	5,400
Operation Year 14	313,821	-	5,237
Operation Year 15	317,774	-	5,439
Operation Year 16	314,900	-	5,265
Operation Year 17	317,875	-	5,422
Operation Year 18	304,568	-	741
Operation Year 19	303,742	-	698

Mining year	Emissions (t CO_2-e)[1]		
	Scope 1	Scope 2	Scope 3
Operation Year 20	303,319	-	698
Operation Year 21	303,319	-	698
Average	278,308	-	3,927
Total	6,679,398	-	94,246

1 *Values may not sum exactly due to rounding.*

Figure 7.1 shows the estimated GHG emissions by scope and by activity. These estimates show that the processing facility (i.e. acid plant) would be the most significant direct (Scope 1) source of GHG emissions.

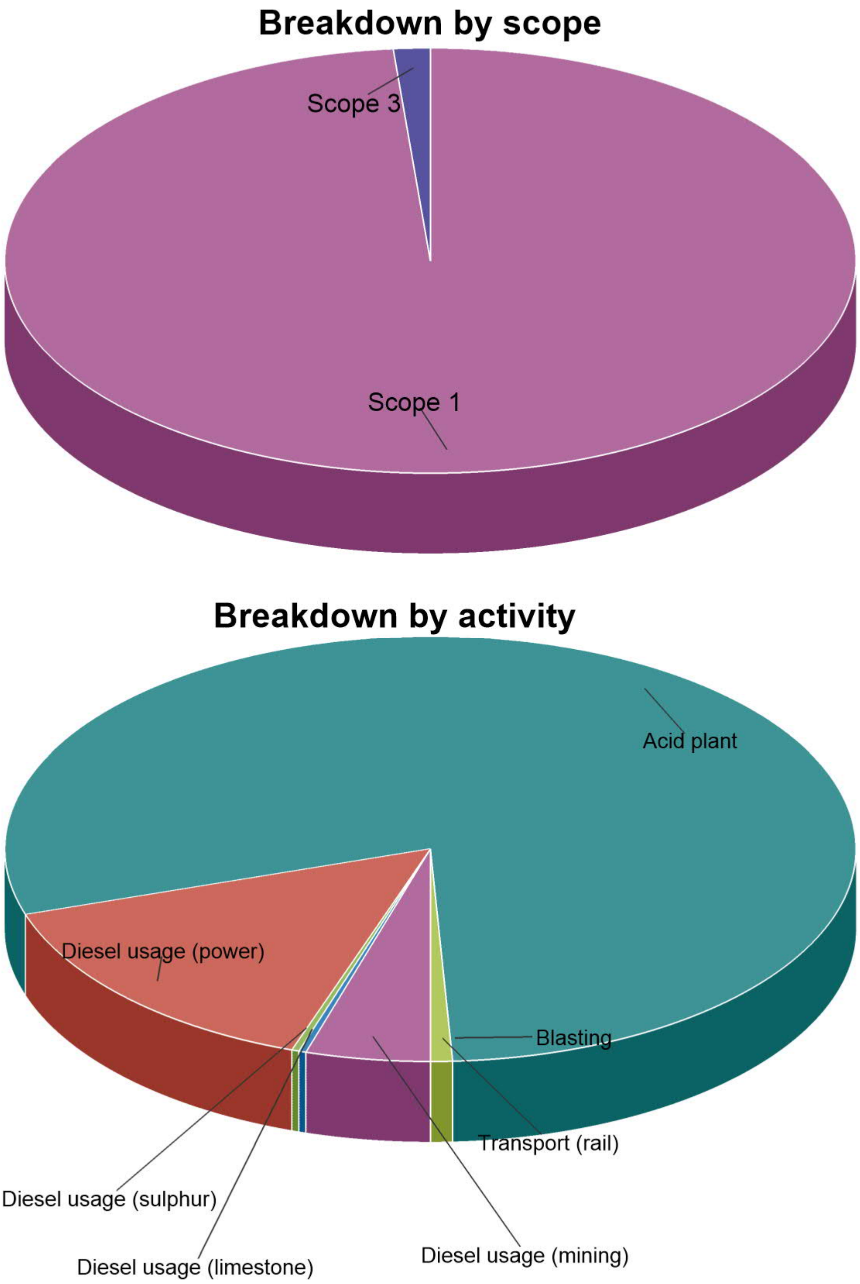


Figure 7.1 Summary of greenhouse gas emissions by scope and activity

7.2 Impact and Context

The Commonwealth Department of Industry, Science, Energy and Resources (DISER) (2021) provides a National Greenhouse Gas Inventory, where statistics on emissions per annum are stored, and detailed analysis of sources can be determined. To develop the context for this assessment, the impacts of the emissions projected in this assessment have been compared with the latest emissions officially recorded on the National Greenhouse Gas Inventory. The latest available data through the inventory is from 2019.

Table 7.2 presents these national and state figures in context with the projected emissions from the modified Project. The estimated annual average Scope 1 and 2 emissions from the modified Project (0.28 Mt CO_2-e) represent approximately 0.05% of Australia's 2019 emissions (DISER, 2021).

Table 7.2 Greenhouse gas emissions in the State and National context

Parameter	Value
National and State statistics	
2019 Total Australia GHG emissions (Mt CO_2-e)	529.3
2019 Total NSW GHG emissions (Mt CO_2-e)	136.6
Modified Project statistics	
Average projected GHG emissions per year (Mt CO_2-e)	0.28
Proportion of 2019 total Australia GHG emissions	0.05%
Proportion of 2019 total NSW GHG emissions	0.20%

In addition, the Sunrise (formerly Syerston) Modification 4 Air Quality and Greenhouse Gas Assessment (Ramboll Environ, 2017) estimated that annual Scope 1 emissions from the approved Project would be 0.32 Mt CO_2-e. The Scope 1 GHG emissions of the modified Project are estimated to be 0.28 Mt CO_2-e (Table 7.1) which is less than the approved Project emissions.

Section 8 outlines the monitoring and management measures for the modified Project including those relevant to the minimisation of GHG emissions.

8. Monitoring and Management

Monitoring and management is discussed below in the context of the potential air quality and GHG impacts for the modified Project.

8.1 Particulate Matter

Table 8.1 summarises the emission management measures from the Air Quality Management Plan (Clean TeQ, 2019a). These emissions management measures would continue to be adopted for the modified Project.

Table 8.1 Particulate matter emission management measures

Activity	Emission management measures	Assumed emission control (%) (NPI, 2012, Donelly et al, 2011)
General	Site inductions will include air quality requirements to ensure employee and contractor awareness of potential dust impacts, especially with respect to the nearest sensitive receptors	-
Disturbed areas	Only the minimum area necessary for construction activities will be disturbed. Cleared areas will be watered, as required. Where any exposed areas, stockpiles, etc. are predicted to be inactive for one month or more, a cover crop will be established, if practicable.	30 (primary rehabilitation)
Material stockpiling and handling	Long-term stockpiles will be revegetated as soon as practicable following completion. Water carts will be used on stockpile areas to minimise dust generation as necessary. Material handling and stripping/ripping will be avoided or postponed if excessive dust lift-off occurs. Material with low moisture content will be sprayed with water prior to and/or during handling if necessary to control visible dust. The drop height will be minimised when loading or unloading material as far as practicable. Spillage from loading/unloading will be minimised and cleaned up as soon as practicable.	70 (water sprays for unloading to hopper) 30 (primary rehabilitation)
Roads	Roads will be constructed in a proper manner and consideration will be given to constructing all major haul roads using material with low silt/fines content. Speed limits will be imposed on all roads. Water carts will be utilised as necessary to minimise excessive visible dust. Road vehicles will remain on formed roads and tracks where practicable.	85 (haul roads)

In addition to the measures listed above, both proactive and reactive dust control strategies informed by air quality and meteorological monitoring systems would be implemented. Reactive air quality management would assess the need to modify site activities in response to the following triggers:

- visual conditions, such as excessive visible dust;
- meteorological conditions, such as dry, strong wind conditions; and
- ambient air quality conditions (that is, elevated short-term PM_{10} concentrations).

Proactive air quality management would involve the planning of activities to minimise potential air quality impacts in advance of potentially adverse conditions.

Prior to the operations phase of the modified Project, the existing Air Quality Management Plan (Clean TeQ, 2019a) would be reviewed and updated, where necessary. The Air Quality Management Plan (Clean TeQ, 2019a) and Blast Management Plan (Clean TeQ, 2019b) would be revised to detail the implementation of monitoring and management controls to manage air quality impacts associated with the operations phase of the modified Project to maintain compliance with air quality criterion as required.

No changes would be required to the existing air quality monitoring network based on the expected impacts of the modified Project.

Environment Protection Licence (EPL 21146) would be reviewed and updated, where necessary, under the *Protection of the Environment (Operations) Act 1997* (POEO Act). Relevant to air quality, the EPL includes requirements to minimise emissions and to monitor air quality. Also relevant is the *Protection of the Environment Operations (Clean Air) Regulation 2010* which prescribes requirements for motor vehicle emissions and industrial emissions (such as VOCs). Motor vehicle emissions would be addressed by regular maintenance of all vehicles associated with the Project.

8.2 Greenhouse Gas Emissions

Mitigation of GHG emissions is inherent in the development of the mine plan. For example, reducing fuel usage by mobile plant and equipment is an objective of mine planning and good practice. Hence, savings of GHG emissions are attributable to appropriate mine planning. Mitigation measures to reduce the level of future GHG emissions include (Clean TeQ, 2019a):

- minimising the re-handling of material;
- maintaining the mobile fleet in good operating order; and
- optimising the design of roads to minimise the distance travelled between working areas.

9. Conclusions

This report has provided an assessment of the potential air quality and GHG impacts of a modification to Development Consent (DA 374-11-00). In summary, the air quality assessment involved identifying the key potential air quality impacts, characterising the existing environment, quantifying emissions to air and modelling the potential impacts of the modified Project on local air quality. GHG emissions were estimated in accordance with recognised methodologies.

The key potential air quality impacts were identified as construction and operational dust, processing facility emissions, post-blast fume, and diesel exhaust. These potential air quality impacts, plus GHG emissions, were the focus of the assessment.

A review of the local meteorological and ambient air quality conditions was undertaken. The review considered data collected from existing meteorological and air quality monitors at the mine and processing facility. Approximately two years of meteorological data and one year of air quality data was available from the monitors at the mine and processing facility. One of the objectives for reviewing the data was to develop an understanding of existing air quality impacts as well as the meteorological conditions which typically influence the local air quality conditions. The following conclusions of the background air quality and meteorological data were made:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality during this period. These conditions were not unique to the Central West region of NSW and it was noted that most locations in NSW have historically recorded one or more days each year when the 24-hour average PM_{10} concentration exceeded EPA criteria.
- In the absence of Project activities (having not yet commenced), the measured background levels of 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the EPA criteria on multiple occasions in 2020, due to the extraordinary events (e.g. bushfires, dust storms etc.).
- Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated TSP concentrations and measured deposited dust levels did not exceed the EPA criteria in 2020.

The key outcomes of the modelling and subsequent assessment are:

- Construction and operational dust emissions (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust) due to operations at the mine and processing facility are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. Modelling led to the following specific outcomes for the modified Project:
  - Maximum 24-hour average PM_{10} project only and cumulative concentrations would comply with air quality criteria (50 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average PM_{10} project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Maximum 24-hour average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (8 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average TSP project only and cumulative concentrations would comply with air quality criteria (90 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average project only and cumulative deposited dust levels would comply with air quality criteria (2 g/m^2/month and 4 g/m^2/month respectively) at all private sensitive receptors.

  - Dust concentrations and deposition levels would comply with the VLAMP (NSW Government, 2018) criteria at all private sensitive receptors and vacant land.

- Construction and operational dust emissions due to the modified rail siding are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. That is, based on modelling, dust concentration (PM_{10}, $PM_{2.5}$ and TSP) and dust deposition levels would comply with EPA and VLAMP criteria at all private sensitive receptors.
- Processing facility emissions are not expected to cause adverse air quality impacts at the nearest private receptors, based on modelling (using conservative assumptions) which showed compliance with air quality criteria.
- Operational post-blast fume emissions (as NO_2) are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- Operational diesel exhaust emissions associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- The estimated annual average Scope 1 and 2 greenhouse gas emissions from the modified Project represent approximately 0.05% of Australia's 2019 emissions.
- SEM would implement air quality and greenhouse gas emission management measures to minimise the potential impacts of the modified Project.
- No changes would be required to the existing air quality monitoring network.

Given the above, the modified Project is not expected to cause adverse impacts on the local air quality environment near the mine and processing facility or rail siding. Notwithstanding, the existing Air Quality Management Plan would be reviewed and updated, where necessary, to incorporate the Modification.

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Appendix A. Model settings and setup

Geophysical

Figure A1 shows the model grid, land-use and terrain information, as used by CALMET. Changes from grassland to barren land (i.e. mining areas) will have very little influence on the modelling results.

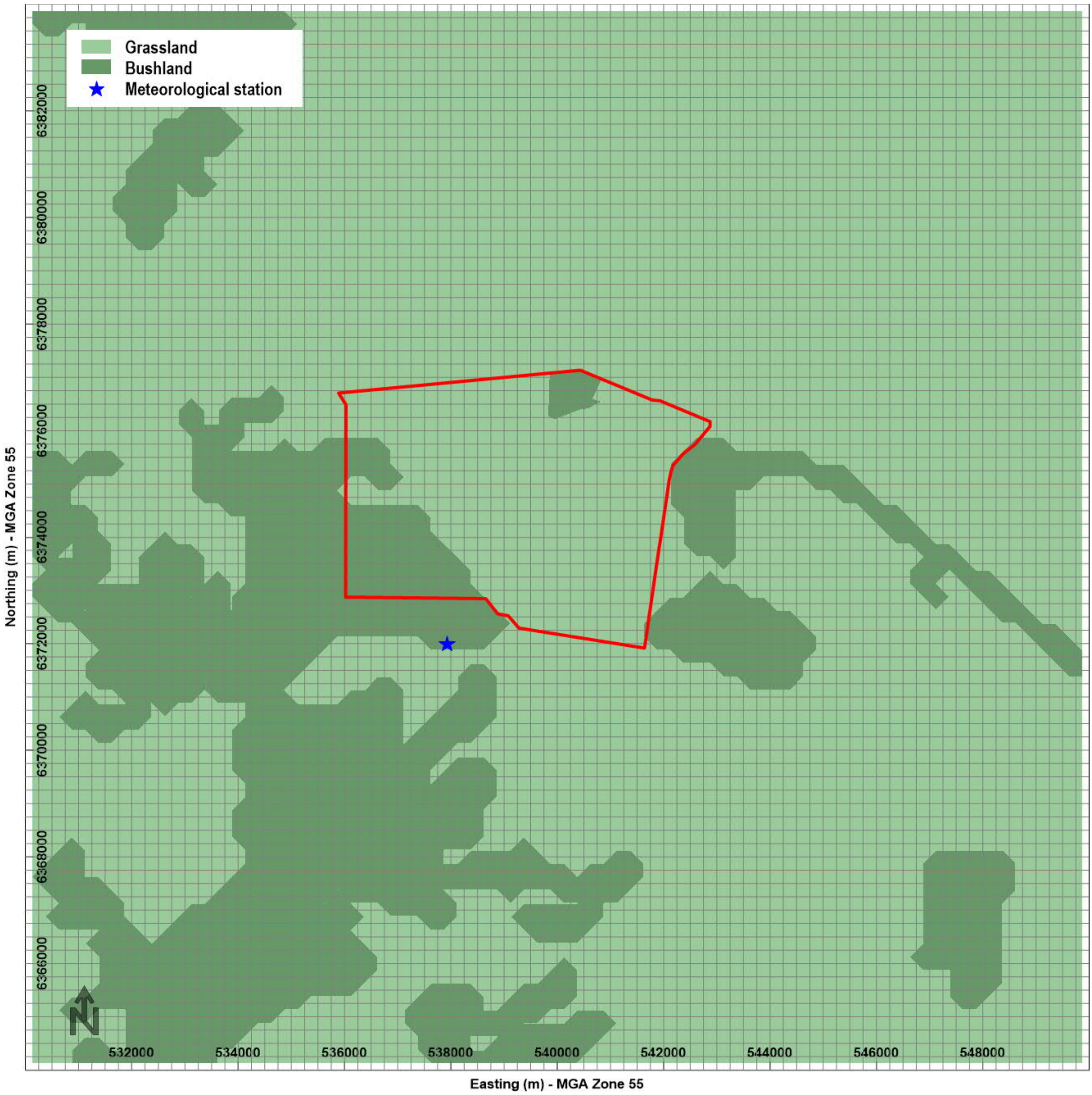

Figure A1 Model domain, grid, land use and terrain information

Meteorology

The CALPUFF model, through the CALMET meteorological pre-processor, simulates complex meteorological patterns that exist in a particular region. The necessary upper air data for CALMET were generated by the CSIRO's prognostic model, TAPM, and the required surface observation data were sourced from the site weather station. CALMET was used to produce a year-long, three-dimensional output of meteorological conditions for input to the CALPUFF air dispersion model. The meteorological modelling followed the guidance of TRC (2011) and adopted the "observations" mode.

Table A1 Model settings and inputs for TAPM

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	4.0.5	4.0.5
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)	4 (30 km, 10 km, 3 km, 1 km)
Number of grid points	35 x 35 x 25	35 x 35 x 25
Year(s) of analysis	2020	2020
Centre of analysis	32°45' S, 147°25' E	32°45' S, 147°25' E
Terrain data source	30 m Shuttle Research Topography Mission (SRTM)	30 m Shuttle Research Topography Mission (SRTM)
Land use data source	Default	Default
Meteorological data assimilation	Project meteorological station. Radius of influence = 10 km. Number of vertical levels for assimilation = 4	Project meteorological station. Radius of influence = 10 km. Number of vertical levels for assimilation = 4

Table A2 Model settings and inputs for CALMET

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	6.334	6.334
Terrain data source(s)	30 m SRTM and Project DEM.	30 m SRTM.
Land use data source(s)	Digitised from aerial imagery	Digitised from aerial imagery
Meteorological grid domain	20 km x 20 km	10 km x 10 km
Meteorological grid resolution	0.25 km	0.2 km
Meteorological grid dimensions	80 x 80 x 9 grid points	50 x 50 x 9 grid points
Meteorological grid origin	530000 mE, 6364000 mN. MGA Zone 55	560000 mE, 6358000 mN MGA Zone 55
Surface meteorological stations	AWS: wind speed, wind direction, temperature and humidity TAPM (at location of AWS): ceiling height, cloud cover, temperature, relative humidity and air pressure	AWS: wind speed, wind direction, temperature and humidity TAPM (at location of AWS): ceiling height, cloud cover, temperature, relative humidity and air pressure
Upper air meteorological stations	Upper air data file for the location of the AWS, derived by TAPM. Biased towards surface observations (-1, -0.8, -0.6, -0.4, -0.2, 0, 0, 0, 0)	Upper air data file for the location of the AWS, derived by TAPM. Biased towards surface observations (-1, -0.8, -0.6, -0.4, -0.2, 0, 0, 0, 0)
Simulation length	8784 hours (1 Jan 2020 to 31 Dec 2020)	8784 hours (1 Jan 2020 to 31 Dec 2020)
R1, R2	0.5, 1	0.5, 1
RMAX1, RMAX2	5, 20	5, 20
TERRAD	5	5

Table A3 Model settings and inputs for CALPUFF

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	6.42	6.42
Computational grid domain	80 x 80	50 x 50
Chemical transformation	None	None
Dry deposition	Yes	Yes
Wind speed profile	ISC rural	ISC rural
Puff element	Puff	Puff
Dispersion option	Turbulence from micrometeorology	Turbulence from micrometeorology
Time step	3600 seconds (1 hour)	3600 seconds (1 hour)
Terrain adjustment	Partial plume path	Partial plume path
Number of volume sources	See below. Height = 5 m, SY = 20 m, SZ = 10 m.	See below. Height = 5 m, SY = 20 m, SZ = 10 m.
Receptors	562 discrete receptors. See below.	Gridding receptors at 200 m resolution.

Sources (mine site)

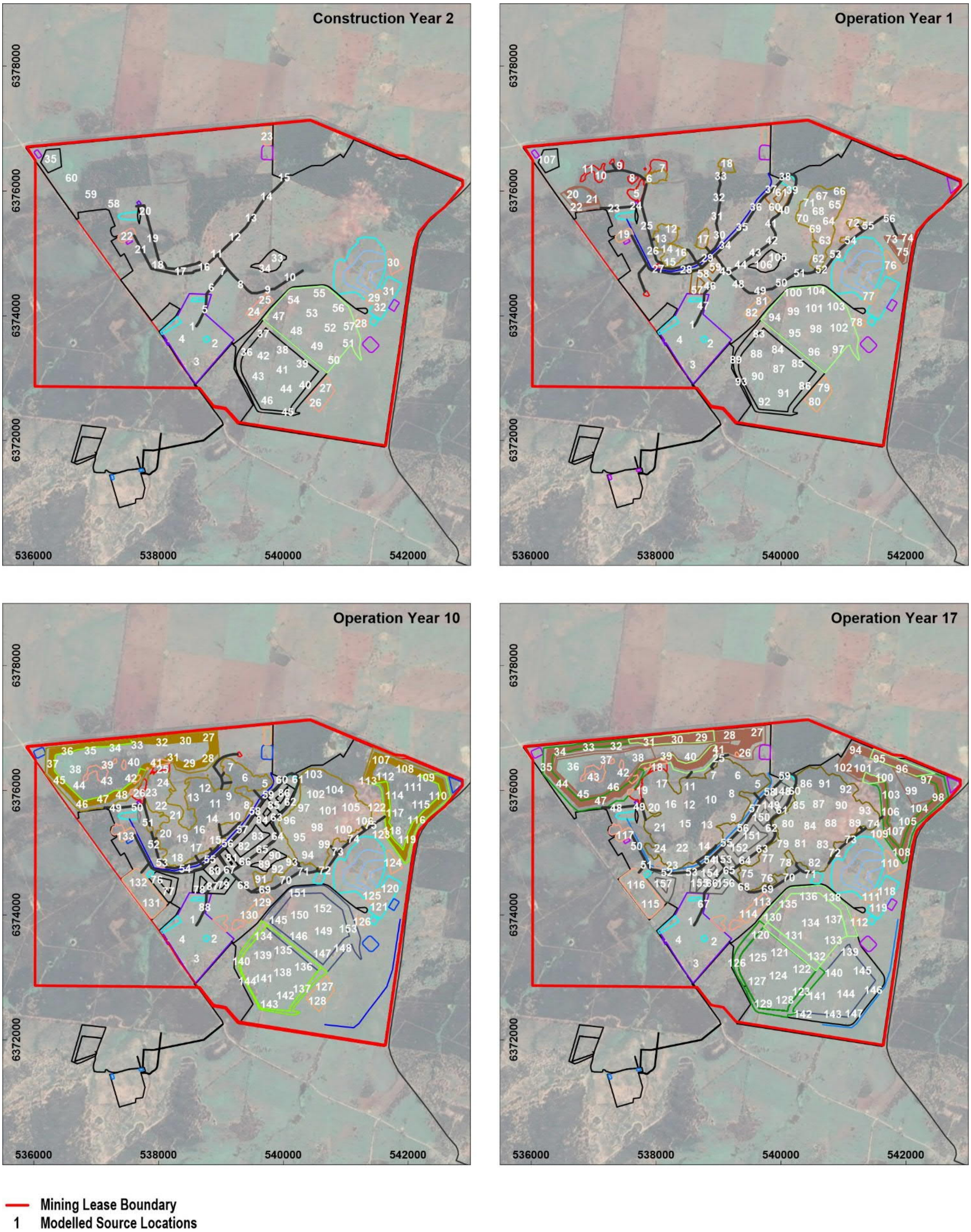

Figure A2 Location of modelled sources of construction and operational dust emissions at mine site

Sources (rail siding)

Figure A3 Location of modelled sources of construction and operational dust emissions at the modified rail siding

Receptors

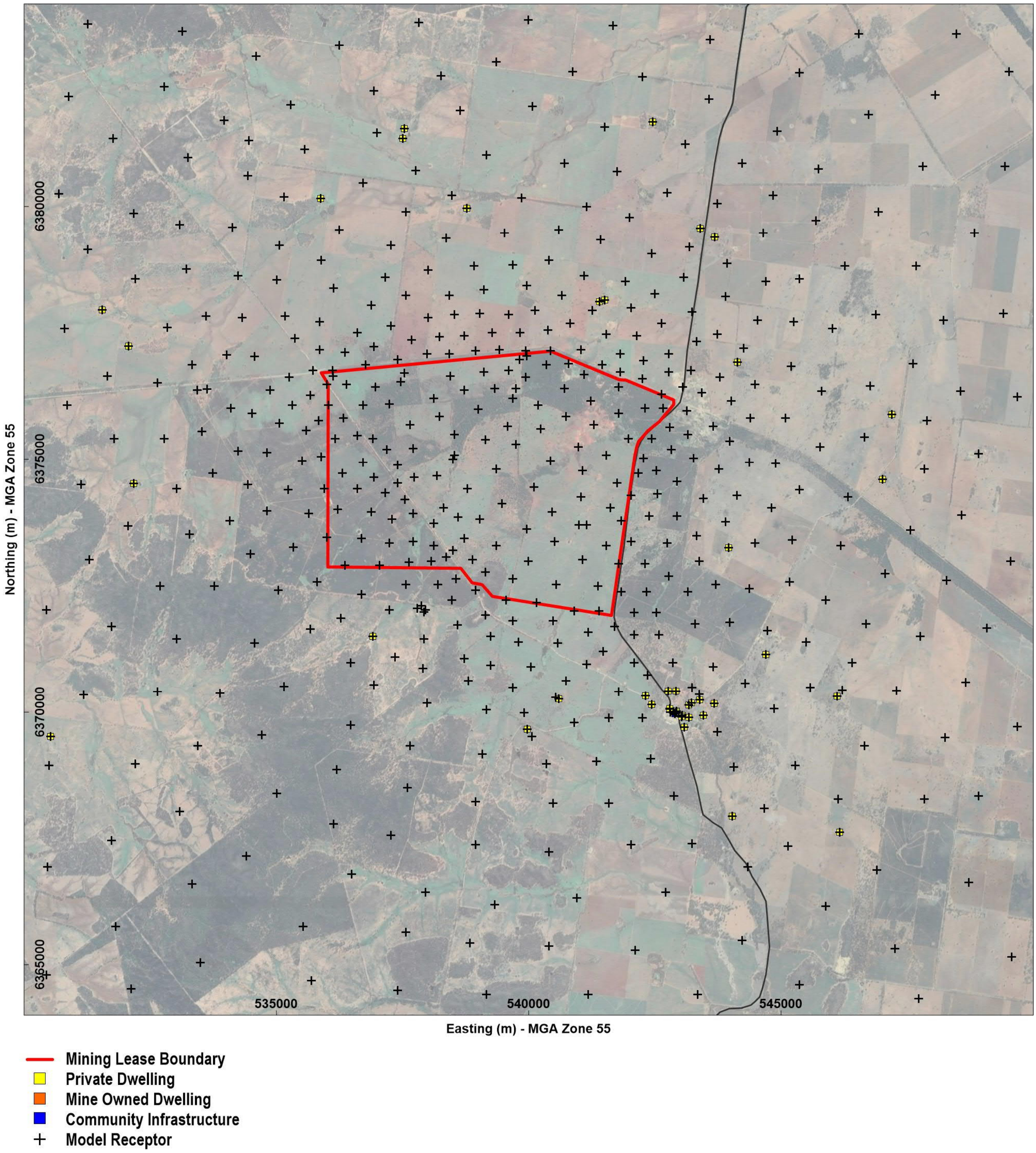

Figure A4 Location of model receptors for mine site

Appendix B. Emission calculations

Emission factors

Activity	Emission factor			Units	Source
	TSP	PM_{10}	$PM_{2.5}$		
Drilling	$E_{TSP} = 0.59$	$E_{PM10} = 0.52 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/hole	US EPA / NPI
Blasting	$E_{TSP} = 0.00022 \times A^{1.5}$	$E_{PM10} = 0.52 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/blast	US EPA / NPI
Loading / dumping waste / ore	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	kg/t	US EPA / NPI
Hauling on unsealed roads	$E_{TSP} = 4$	$E_{PM10} = 0.3 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/VKT	SPCC
Dozers working	$E_{TSP} = 2.6 \times (S^{1.2}/M^{1.3})$	$E_{PM10} = 0.3375 \times (S^{1.5}/M^{1.4})$	$E_{PM2.5} = 0.105 \times E_{TSP}$	kg/hour	US EPA / NPI
Miscellaneous transfers	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	kg/t	US EPA / NPI
Wind erosion from exposed areas	$E_{TSP} = 0.1$	$E_{PM10} = 0.5 \times E_{TSP}$	$E_{PM2.5} = 0.075 \times E_{TSP}$	kg/ha/h	US EPA
Grading roads	$E_{TSP} = 0.0034 \times s^{2.5}$	$E_{PM10} = 0.00336 \times s^{2}$	$E_{PM2.5} = 0.0001054 \times s^{2.5}$	kg/VKT	US EPA / NPI

A = blast area (m^2)
U = wind speed (m/s)
M = moisture content (%)
S = silt content (%)
s = speed (km/h)

Emission inventory

Sunrise MOD 7 - Construction Year 2	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	0	0	0	0	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	0	0	0	0	0	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - unloading waste to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	0	0	0	0	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	0	0	0	0	0	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - unloading waste to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	4932	2333	353	0	2500000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	13857	4095	416	85	833333	t/y	0.11086	kg/t	0.03276	kg/t	0.003	kg/t	-	-	-	4	98	2.8	-	-
Evaporation ponds - hauling for pond construction 2	13857	4095	416	85	833333	t/y	0.11086	kg/t	0.03276	kg/t	0.003	kg/t	-	-	-	4	98	2.8	-	-
Evaporation ponds - hauling to TSF	16827	4972	505	85	833333	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-

Sunrise MOD 7 - Construction Year 2	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Evaporation ponds - unloading to TSF	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
Processing - loading low grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Processing - hauling high grade ore to ROM	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Processing - unloading ore to ROM	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	0	0	0	0	0	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Processing - unloading limestone to ROM	0	0	0	0	0	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	0	0	0	0	0	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Processing - unloading elemental sulpur to hopper	0	0	0	70	0	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	0	0	0	0	0	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	0	0	0	0	0	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Rejects - loading rejects to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Rejects - unloading rejects to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	17170	8585	1288	0	20	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	0	0	0	30	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	101704	50852	7628	10	129	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	30397	15199	2280	0	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	7189	2542	79	50	23360	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	329371	124169	25723																	

Sunrise MOD 7 - Operation Year 1	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	156766	46326	4703	85	4713742	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
East pit - unloading waste to dump	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
East pit - hauling ore to high grade stockpile	218919	64692	6568	85	4286351	t/y	0.34049	kg/t	0.10062	kg/t	0.010	kg/t	-	-	-	4	98	8.6	-	-
East pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	179161	52943	5375	85	4713742	t/y	0.25339	kg/t	0.07488	kg/t	0.008	kg/t	-	-	-	4	98	6.4	-	-
West pit - unloading waste to dump	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.06335	kg/t	0.01872	kg/t	0.002	kg/t	-	-	-	4	98	1.6	-	-
West pit - hauling ore to high grade stockpile	86549	25576	2596	85	4286351	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 1	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	0	0	0	85	0	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	295286	87259	8859	85	8572702	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	107159	36863	2572	0	8572702	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	101	48	7	0	51000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	2423	716	73	85	51000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	101	48	7	0	51000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	99952	49976	7496	0	114	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	25492	12746	1912	0	29	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	12019	6009	901	30	20	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	25141	12571	1886	0	29	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	101704	50852	7628	10	129	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	30397	15199	2280	0	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	16699	5904	183	50	54264	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	2005859	663351	113361																	

Sunrise MOD 7 - Operation Year 10	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	127781	37760	3833	85	3984510	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
East pit - unloading waste to dump	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	2990	1414	214	0	1515578	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	47524	14044	1426	85	1212462	t/y	0.26131	kg/t	0.07722	kg/t	0.008	kg/t	-	-	-	4	98	7	-	-
East pit - hauling ore to high grade stockpile	16201	4788	486	85	303116	t/y	0.35633	kg/t	0.1053	kg/t	0.011	kg/t	-	-	-	4	98	9	-	-
East pit - unloading ore to low grade stockpile	2392	1131	171	0	1212462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	598	283	43	0	303116	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	127781	37760	3833	85	3984510	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
West pit - unloading waste to dump	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	2990	1414	214	0	1515578	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	24482	7235	734	85	1212462	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - hauling ore to high grade stockpile	10081	2979	302	85	303116	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
West pit - unloading ore to low grade stockpile	2392	1131	171	0	1212462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	598	283	43	0	303116	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 10	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	4784	2263	343	0	2424925	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	1196	566	86	0	606231	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	31682	9362	950	85	2424925	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	20882	6171	626	85	606231	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	5980	2828	428	0	3031156	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	5980	2828	428	0	3031156	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	37889	13034	909	0	3031156	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	11878	3510	356	85	250000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	278568	139284	20893	0	318	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	227147	113573	17036	0	259	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	49240	24620	3693	30	80	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	84359	42179	6327	0	96	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	96973	48487	7273	10	123	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	11133	3936	122	50	36176	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	1674884	647687	112547																	

Sunrise MOD 7 - Operation Year 17	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	102822	30385	3085	85	3206220	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
East pit - unloading waste to dump	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	89905	26568	2697	85	2293731	t/y	0.26131	kg/t	0.07722	kg/t	0.008	kg/t	-	-	-	4	98	7	-	-
East pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.35633	kg/t	0.1053	kg/t	0.011	kg/t	-	-	-	4	98	9	-	-
East pit - unloading ore to low grade stockpile	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	102822	30385	3085	85	3206220	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
West pit - unloading waste to dump	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	46315	13686	1389	85	2293731	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
West pit - unloading ore to low grade stockpile	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 17	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	59937	17712	1798	85	4587462	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	0	0	0	85	0	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	57343	19726	1376	0	4587462	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	11878	3510	356	85	250000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	361613	180806	27121	0	413	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	248740	124370	18656	0	284	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	13644	6822	1023	30	22	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	84359	42179	6327	0	96	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	96500	48250	7238	10	122	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	11133	3936	122	50	36176	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	1650221	663104	106363																	

Emission calculations

Sunrise MOD 7 - Rail Siding (Construction)

	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units		Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	744	187	37	50	51300	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-
Dozers working	48867	11897	5131	0	2920	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	2	-	-	-	10	-
Excavator working	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Loading spoil to truck(s)	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Hauling spoil over unsealed surfaces	398	118	12	75	102600	t/y	0.01552	kg/t	0.00459	kg/t	0.000	kg/t	-	-	4	50	0.2	-	-
Unloading spoil from truck(s)	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Wind erosion from exposed areas	4993	2497	374	0	6	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-
Grading roads	899	318	10	50	2920	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	8
Total	56508	15303	5608																

Emission calculations

Sunrise MOD 7 - Rail Siding (Operation)

	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Hauling ammonium sulphate to rail siding	0	0	0	100	100000	t/y	0.05432	kg/t	0.01605	kg/t	0.002	kg/t	-	-	4	50	0.7	-	-
Unloading ammonium sulphate to stockpiles	197	93	14	0	100000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Loading ammonium sulphate to trucks (or trains)	197	93	14	0	100000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Hauling ammonium sulphate off-site	0	0	0	100	100000	t/y	0.05432	kg/t	0.01605	kg/t	0.002	kg/t	-	-	4	50	0.7	-	-
Wind erosion from exposed areas	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-
Total	1271	625	94																

Source allocations
Construction Year 2

```
 --------------------------------       13-May-2021 16:28
  DUST EMISSION CALCULATIONS XL1
 --------------------------------

 Number of dust sources : 60
 Number of activities   : 60

  -----ACTIVITY SUMMARY-----
 ACTIVITY NAME : East pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : East pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : West pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4932 kg/y TSP  2333 kg/y PM10  353 kg/y PM2.5
 FROM SOURCES  : 2
31 32
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling for pond construction
1
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 13857 kg/y TSP  4095 kg/y PM10  416 kg/y PM2.5
 FROM SOURCES  : 2
```

31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling for pond construction
2
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 13857 kg/y TSP 4095 kg/y PM10 416 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16827 kg/y TSP 4972 kg/y PM10 505 kg/y PM2.5
FROM SOURCES : 25
28 31 32 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to pond walls 1
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to pond walls 2
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 22
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 24
31 32 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from borrow pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 17170 kg/y TSP 8585 kg/y PM10 1288 kg/y PM2.5
FROM SOURCES : 3
33 34 35
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion

DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 101704 kg/y TSP 50852 kg/y PM10 7628 kg/y PM2.5
FROM SOURCES : 22
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 30397 kg/y TSP 15199 kg/y PM10 2280 kg/y PM2.5
FROM SOURCES : 8
23 24 25 26 27 28 29 30
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 7189 kg/y TSP 2542 kg/y PM10 79 kg/y PM2.5
FROM SOURCES : 56
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55 56 57 58 59 60
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Operation Year 1

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--------------------------------      13-May-2021 16:38
 DUST EMISSION CALCULATIONS XL1
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Number of dust sources : 107
Number of activities : 60

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : East pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : East pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 156766 kg/y TSP 46326 kg/y PM10 4703 kg/y PM2.5
FROM SOURCES : 19
52 53 54 55 56 62 63 64 65 66 67 68 69 70 71 72 73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 3
73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers shaping dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 3
73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers working in pit
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - loading ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to low grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 21
45 46 48 49 50 51 52 57 58 59 62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to high grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 218919 kg/y TSP 64692 kg/y PM10 6568 kg/y PM2.5
FROM SOURCES : 25
39 40 41 42 43 44 45 48 49 50 51 52 60 61 62 63 64 65 66 67 68 69
70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to low grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
57 58 59
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to high grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 2
60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : West pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 179161 kg/y TSP 52943 kg/y PM10 5375 kg/y PM2.5
FROM SOURCES : 28
5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21 22 23 24 25 26 27 28 29
30 31 32 33
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 3
20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - dozers shaping dump

```
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 117281 kg/y TSP  28552 kg/y PM10  12315 kg/y PM2.5
 FROM SOURCES  : 3
20 21 22
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 117281 kg/y TSP  28552 kg/y PM10  12315 kg/y PM2.5
 FROM SOURCES  : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 8456 kg/y TSP  3999 kg/y PM10  606 kg/y PM2.5
 FROM SOURCES  : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 27
5 6 7 8 9 10 11 12 13 14 15 16 17 18 24 25 26 27 28 29 30 31 32 33
57 58 59
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 86549 kg/y TSP  25576 kg/y PM10  2596 kg/y PM2.5
 FROM SOURCES  : 17
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 60 61
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 3
57 58 59
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 8456 kg/y TSP  3999 kg/y PM10  606 kg/y PM2.5
 FROM SOURCES  : 2
60 61
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to east dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to west dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to TSF
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to east dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to west dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to TSF
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading low grade ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading high grade ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 16911 kg/y TSP  7999 kg/y PM10  1211 kg/y PM2.5
 FROM SOURCES  : 2
60 61
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling low grade ore to ROM
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling high grade ore to ROM
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 295286 kg/y TSP  87259 kg/y PM10  8859 kg/y PM2.5
 FROM SOURCES  : 11
39 40 41 42 43 44 45 46 47 60 61
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - unloading ore to ROM
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 16911 kg/y TSP  7999 kg/y PM10  1211 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading ore to hopper
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 16911 kg/y TSP  7999 kg/y PM10  1211 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - sizing of ore
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 107159 kg/y TSP  36863 kg/y PM10  2572 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling limestone to site
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 16296 kg/y TSP  4816 kg/y PM10  489 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - unloading limestone to ROM
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 3644 kg/y TSP  1724 kg/y PM10  261 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading limestone to hopper
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 3644 kg/y TSP  1724 kg/y PM10  261 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling elemental sulphur to site
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4074 kg/y TSP  1204 kg/y PM10  122 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 1443 kg/y TSP  682 kg/y PM10  103 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - transfer elemental sulphur to plant /
stockpile
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 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4809 kg/y TSP  2274 kg/y PM10  344 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading product to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 131 kg/y TSP  62 kg/y PM10  9 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling product from site
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 2796 kg/y TSP  826 kg/y PM10  84 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Rejects - loading rejects to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 101 kg/y TSP  48 kg/y PM10  7 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Rejects - hauling rejects to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 2423 kg/y TSP  716 kg/y PM10  73 kg/y PM2.5
 FROM SOURCES  : 17
1 2 3 4 20 21 22 23 24 25 26 27 28 29 45 46 47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Rejects - unloading rejects to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 101 kg/y TSP  48 kg/y PM10  7 kg/y PM2.5
 FROM SOURCES  : 3
20 21 22
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from active and inactive pits
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 99952 kg/y TSP  49976 kg/y PM10  7496 kg/y PM2.5
 FROM SOURCES  : 25
5 6 7 8 9 10 11 12 13 14 15 16 17 18 62 63 64 65 66 67 68 69 70 71
72
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from active and shaped dumps
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 25492 kg/y TSP  12746 kg/y PM10  1912 kg/y PM2.5
 FROM SOURCES  : 6
20 21 22 73 74 75
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from initial rehabilitation
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 12019 kg/y TSP  6009 kg/y PM10  901 kg/y PM2.5
 FROM SOURCES  : 8
19 76 77 78 79 80 81 82
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from ore stockpiles
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 25141 kg/y TSP  12571 kg/y PM10  1886 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from ROM pad
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 876 kg/y TSP  438 kg/y PM10  66 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from TSF
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 101704 kg/y TSP  50852 kg/y PM10  7628 kg/y PM2.5
 FROM SOURCES  : 11
83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from topsoil stockpiles
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 30397 kg/y TSP  15199 kg/y PM10  2280 kg/y PM2.5
 FROM SOURCES  : 7
76 77 78 79 80 81 82
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from limestone stockpiles
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 263 kg/y TSP  131 kg/y PM10  20 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Wind erosion from product stockpiles
 ACTIVITY TYPE : Wind erosion
 DUST EMISSION : 88 kg/y TSP  44 kg/y PM10  7 kg/y PM2.5
 FROM SOURCES  : 4
1 2 3 4
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Grading roads
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 16699 kg/y TSP  5904 kg/y PM10  183 kg/y PM2.5
 FROM SOURCES  : 107
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 Pit retention sources:
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Operation Year 10

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 -------------------------------      13-May-2021 16:31
  DUST EMISSION CALCULATIONS XL1
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 Number of dust sources : 153
 Number of activities   : 60

  -----ACTIVITY SUMMARY-----
 ACTIVITY NAME : East pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP  2830 kg/y PM10  163 kg/y PM2.5
 FROM SOURCES  : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP  2124 kg/y PM10  123 kg/y PM2.5
 FROM SOURCES  : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : East pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 7860 kg/y TSP  3718 kg/y PM10  563 kg/y PM2.5
 FROM SOURCES  : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 127781 kg/y TSP  37760 kg/y PM10  3833 kg/y PM2.5
 FROM SOURCES  : 34
71 72 73 74 75 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105
106 107 108 109 110 111 112 113 114 115 116 117 118 119
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 7860 kg/y TSP  3718 kg/y PM10  563 kg/y PM2.5
 FROM SOURCES  : 13
107 108 109 110 111 112 113 114 115 116 117 118 119
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 87961 kg/y TSP  21414 kg/y PM10  9236 kg/y PM2.5
 FROM SOURCES  : 13
107 108 109 110 111 112 113 114 115 116 117 118 119
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 87961 kg/y TSP  21414 kg/y PM10  9236 kg/y PM2.5
 FROM SOURCES  : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 2990 kg/y TSP  1414 kg/y PM10  214 kg/y PM2.5
 FROM SOURCES  : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 47524 kg/y TSP  14044 kg/y PM10  1426 kg/y PM2.5
 FROM SOURCES  : 26
```

67 68 69 70 71 78 79 80 81 82 91 92 93 94 95 96 97 98 99 100 101
102 103 104 105 106
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 16201 kg/y TSP 4788 kg/y PM10 486 kg/y PM2.5
 FROM SOURCES : 31
61 62 63 64 65 66 67 68 69 70 71 83 84 85 86 91 92 93 94 95 96 97
98 99 100 101 102 103 104 105 106
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 2392 kg/y TSP 1131 kg/y PM10 171 kg/y PM2.5
 FROM SOURCES : 5
78 79 80 81 82
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 598 kg/y TSP 283 kg/y PM10 43 kg/y PM2.5
 FROM SOURCES : 4
83 84 85 86
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
 FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
 FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
 HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : West pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
 FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 127781 kg/y TSP 37760 kg/y PM10 3833 kg/y PM2.5
 FROM SOURCES : 51
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
 FROM SOURCES : 22
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
 FROM SOURCES : 22
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
 FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 2990 kg/y TSP 1414 kg/y PM10 214 kg/y PM2.5
 FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 24482 kg/y TSP 7235 kg/y PM10 734 kg/y PM2.5
 FROM SOURCES : 31
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 54 55
56 57 78 79 80 81 82
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 10081 kg/y TSP 2979 kg/y PM10 302 kg/y PM2.5
 FROM SOURCES : 30
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 57 58
59 60 83 84 85 86
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 2392 kg/y TSP 1131 kg/y PM10 171 kg/y PM2.5
 FROM SOURCES : 5
78 79 80 81 82
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 598 kg/y TSP 283 kg/y PM10 43 kg/y PM2.5
 FROM SOURCES : 4
83 84 85 86
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to east dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to west dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling to TSF
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to east dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to west dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - unloading to TSF
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
 FROM SOURCES : 1
1
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading low grade ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4784 kg/y TSP 2263 kg/y PM10 343 kg/y PM2.5
 FROM SOURCES : 5
78 79 80 81 82
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - loading high grade ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 1196 kg/y TSP 566 kg/y PM10 86 kg/y PM2.5
 FROM SOURCES : 4
83 84 85 86
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Processing - hauling low grade ore to ROM
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 31682 kg/y TSP 9362 kg/y PM10 950 kg/y PM2.5
 FROM SOURCES : 15
1 2 3 4 64 65 66 67 78 79 80 81 82 87 88
 HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 20882 kg/y TSP 6171 kg/y PM10 626 kg/y PM2.5
FROM SOURCES : 16
1 2 3 4 62 63 64 65 66 67 83 84 85 86 87 88
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 5980 kg/y TSP 2828 kg/y PM10 428 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 5980 kg/y TSP 2828 kg/y PM10 428 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 37889 kg/y TSP 13034 kg/y PM10 909 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16296 kg/y TSP 4816 kg/y PM10 489 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4074 kg/y TSP 1204 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1443 kg/y TSP 682 kg/y PM10 103 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4809 kg/y TSP 2274 kg/y PM10 344 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 131 kg/y TSP 62 kg/y PM10 9 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2796 kg/y TSP 826 kg/y PM10 84 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 87 88
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11878 kg/y TSP 3510 kg/y PM10 356 kg/y PM2.5
FROM SOURCES : 18
38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 11
38 39 40 41 42 43 44 45 46 47 48
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 278568 kg/y TSP 139284 kg/y PM10 20893 kg/y PM2.5
FROM SOURCES : 38
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and shaped dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 227147 kg/y TSP 113573 kg/y PM10 17036 kg/y PM2.5
FROM SOURCES : 35
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 107 108 109 110 111 112 113 114 115 116 117 118 119
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 49240 kg/y TSP 24620 kg/y PM10 3693 kg/y PM2.5
FROM SOURCES : 21
124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 84359 kg/y TSP 42179 kg/y PM10 6327 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 96973 kg/y TSP 48487 kg/y PM10 7273 kg/y PM2.5
FROM SOURCES : 9
145 146 147 148 149 150 151 152 153
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11133 kg/y TSP 3936 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 153
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Operation Year 17

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 --------------------------------      13-May-2021 16:23
  DUST EMISSION CALCULATIONS XL1
 --------------------------------

 Number of dust sources : 157
 Number of activities   : 60

  -----ACTIVITY SUMMARY-----
 ACTIVITY NAME : East pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP  2830 kg/y PM10  163 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP  2124 kg/y PM10  123 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : East pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 102822 kg/y TSP  30385 kg/y PM10  3085 kg/y PM2.5
 FROM SOURCES  : 35
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 16
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 16
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 89905 kg/y TSP  26568 kg/y PM10  2697 kg/y PM2.5
 FROM SOURCES  : 24
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 152 153
154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 23
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 148 149
150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 5
152 153 154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 4
148 149 150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP  2830 kg/y PM10  163 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP  2124 kg/y PM10  123 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : West pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 102822 kg/y TSP  30385 kg/y PM10  3085 kg/y PM2.5
 FROM SOURCES  : 43
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 23
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 23
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 46315 kg/y TSP  13686 kg/y PM10  1389 kg/y PM2.5
 FROM SOURCES  : 25
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 152 153 154
155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 24
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 148 149 150
151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 5
152 153 154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 4
148 149 150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

ACTIVITY NAME : Evaporation ponds - hauling to east dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to west dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to east dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to west dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 5
152 153 154 155 156
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 4
148 149 150 151
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 59937 kg/y TSP 17712 kg/y PM10 1798 kg/y PM2.5
FROM SOURCES : 14
1 2 3 4 63 64 65 66 67 152 153 154 155 156
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 16
1 2 3 4 60 61 62 63 64 65 66 67 148 149 150 151
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 57343 kg/y TSP 19726 kg/y PM10 1376 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16296 kg/y TSP 4816 kg/y PM10 489 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4074 kg/y TSP 1204 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1443 kg/y TSP 682 kg/y PM10 103 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4809 kg/y TSP 2274 kg/y PM10 344 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 131 kg/y TSP 62 kg/y PM10 9 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2796 kg/y TSP 826 kg/y PM10 84 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11878 kg/y TSP 3510 kg/y PM10 356 kg/y PM2.5
FROM SOURCES : 20
1 2 3 4 42 43 44 45 46 47 48 49 50 51 52 53 54 65 66 67
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 4
42 43 44 45
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 361613 kg/y TSP 180806 kg/y PM10 27121 kg/y PM2.5
FROM SOURCES : 40
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and shaped dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 248740 kg/y TSP 124370 kg/y PM10 18656 kg/y PM2.5
FROM SOURCES : 38

26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 13644 kg/y TSP 6822 kg/y PM10 1023 kg/y PM2.5
FROM SOURCES : 27
110 111 112 113 114 115 116 117 120 121 122 123 124 125 126 127 128
129 130 131 132 133 134 135 136 137 138
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 84359 kg/y TSP 42179 kg/y PM10 6327 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 96500 kg/y TSP 48250 kg/y PM10 7238 kg/y PM2.5
FROM SOURCES : 9
139 140 141 142 143 144 145 146 147
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11133 kg/y TSP 3936 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 157
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110
111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
145 146 147 148 149 150 151 152 153 154 155 156 157
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Rail siding construction

--------------------------------- 03-May-2021 10:57
DUST EMISSION CALCULATIONS XL1

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 744 kg/y TSP 187 kg/y PM10 37 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Dozers working
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 48867 kg/y TSP 11897 kg/y PM10 5131 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Excavator working
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Loading spoil to truck(s)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Hauling spoil over unsealed surfaces
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 398 kg/y TSP 118 kg/y PM10 12 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Unloading spoil from truck(s)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from exposed areas
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 4993 kg/y TSP 2497 kg/y PM10 374 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 899 kg/y TSP 318 kg/y PM10 10 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Rail siding operation

--------------------------------- 30-Apr-2021 16:22
DUST EMISSION CALCULATIONS XL1

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Hauling ammonium sulphate to rail siding
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 22
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Unloading ammonium sulphate to stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 197 kg/y TSP 93 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 2
16 17
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Loading ammonium sulphate to trucks (or trains)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 197 kg/y TSP 93 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 6
16 17 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Hauling ammonium sulphate off-site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 22
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from exposed areas
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Appendix C. Tabulated model results

Tabulated Model Results (Mine Site)

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
Maximum 24-hour average PM_{10} (µg/m^3)										
M03	Private	1	17	11	9	57	59	58	58	50
M06	Private	1	14	8	7	57	59	59	59	50
M07	Private	1	10	6	6	57	59	59	59	50
M08	Private	3	35	16	16	58	64	62	63	50
M09	Private	2	11	6	6	57	57	57	57	50
M10	Private	2	11	6	6	58	59	58	58	50
M12	Private	1	14	9	8	57	63	59	58	50
M13	Private	1	14	9	8	57	63	59	59	50
M14	Private	1	4	3	3	57	57	57	57	50
M15	Mine-owned	4	15	8	8	58	61	60	60	50
M16	Private	2	8	5	5	57	57	57	57	50
M17	Private	0	3	2	2	57	58	58	58	50
M19	Private	1	5	4	4	57	57	57	57	50
M20	Private	1	3	3	3	57	57	57	57	50
M21	Private	1	11	7	6	57	57	57	57	50
M22	Private	3	27	19	16	58	58	59	59	50
M23	Private	3	33	15	15	58	63	62	63	50
M26	Private	2	15	9	9	57	62	61	62	50
M27	Private	2	14	9	8	57	62	62	62	50
M28	Private	2	17	9	9	57	66	60	60	50
M29	Private	5	19	11	10	57	58	57	57	50
M31	Mine-owned	3	12	6	6	58	58	58	58	50
M32	Community	2	6	6	6	57	57	57	57	50
M33	Community	2	6	6	6	57	57	57	57	50
M34	Community	2	6	6	6	57	57	57	57	50
M35	Community	2	6	6	6	57	57	57	57	50
F01	Private	2	7	7	7	57	58	57	57	50
F02	Private	2	7	6	7	57	58	57	57	50
F03	Private	2	6	6	7	57	57	57	57	50
F04	Private	2	6	6	6	57	57	57	57	50
F05	Private	2	7	6	6	57	58	57	57	50
F06	Private	2	8	6	7	57	58	58	58	50
F07	Private	2	7	6	7	57	57	57	57	50
F08	Private	2	6	6	7	57	57	57	57	50
F09	Private	2	6	6	7	57	57	57	57	50
F10	Private	2	6	6	6	57	57	57	57	50
F11	Private	2	6	6	6	57	57	57	57	50
F12	Private	2	6	6	6	57	57	57	57	50
F13	Private	2	6	6	6	57	57	57	57	50
F14	Private	2	6	6	6	57	57	57	57	50
F15	Private	2	6	6	6	57	57	57	57	50
F16	Private	2	6	6	6	57	57	57	57	50
F17	Private	2	6	5	6	57	57	57	57	50
Number of days above 50 µg/m^3 PM_{10} (days)										
M03	Private	0	0	0	0	5	5	5	5	-
M06	Private	0	0	0	0	5	5	5	5	-
M07	Private	0	0	0	0	5	5	5	5	-
M08	Private	0	0	0	0	5	5	5	5	-
M09	Private	0	0	0	0	5	5	5	5	-
M10	Private	0	0	0	0	5	5	5	5	-

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M12	Private	0	0	0	0	5	5	5	5	-
M13	Private	0	0	0	0	5	5	5	5	-
M14	Private	0	0	0	0	5	5	5	5	-
M15	Mine-owned	0	0	0	0	5	6	5	5	-
M16	Private	0	0	0	0	5	5	5	5	-
M17	Private	0	0	0	0	5	5	5	5	-
M19	Private	0	0	0	0	5	5	5	5	-
M20	Private	0	0	0	0	5	5	5	5	-
M21	Private	0	0	0	0	5	5	5	5	-
M22	Private	0	0	0	0	5	5	5	5	-
M23	Private	0	0	0	0	5	5	5	5	-
M26	Private	0	0	0	0	5	5	5	5	-
M27	Private	0	0	0	0	5	5	5	5	-
M28	Private	0	0	0	0	5	5	5	5	-
M29	Private	0	0	0	0	5	5	5	5	-
M31	Mine-owned	0	0	0	0	5	5	5	5	-
M32	Community	0	0	0	0	5	5	5	5	-
M33	Community	0	0	0	0	5	5	5	5	-
M34	Community	0	0	0	0	5	5	5	5	-
M35	Community	0	0	0	0	5	5	5	5	-
F01	Private	0	0	0	0	5	5	5	5	-
F02	Private	0	0	0	0	5	5	5	5	-
F03	Private	0	0	0	0	5	5	5	5	-
F04	Private	0	0	0	0	5	5	5	5	-
F05	Private	0	0	0	0	5	5	5	5	-
F06	Private	0	0	0	0	5	5	5	5	-
F07	Private	0	0	0	0	5	5	5	5	-
F08	Private	0	0	0	0	5	5	5	5	-
F09	Private	0	0	0	0	5	5	5	5	-
F10	Private	0	0	0	0	5	5	5	5	-
F11	Private	0	0	0	0	5	5	5	5	-
F12	Private	0	0	0	0	5	5	5	5	-
F13	Private	0	0	0	0	5	5	5	5	-
F14	Private	0	0	0	0	5	5	5	5	-
F15	Private	0	0	0	0	5	5	5	5	-
F16	Private	0	0	0	0	5	5	5	5	-
F17	Private	0	0	0	0	5	5	5	5	-
Annual average PM_{10} (µg/m^3)										
M03	Private	0.1	1.4	1.0	0.9	12	14	13	13	25
M06	Private	0.1	1.6	1.0	0.9	12	14	13	13	25
M07	Private	0.1	1.5	1.0	1.0	12	14	13	13	25
M08	Private	0.4	5.5	3.7	3.6	13	18	16	16	25
M09	Private	0.2	1.1	0.8	0.8	12	13	13	13	25
M10	Private	0.2	0.9	0.5	0.6	12	13	13	13	25
M12	Private	0.1	1.3	0.9	0.9	12	14	13	13	25
M13	Private	0.1	1.4	0.9	0.9	12	14	13	13	25
M14	Private	0.1	0.3	0.2	0.2	12	13	12	12	25
M15	Mine-owned	0.4	2.1	1.2	1.3	13	14	13	14	25
M16	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
M17	Private	0.0	0.3	0.2	0.2	12	13	13	13	25
M19	Private	0.1	0.6	0.4	0.4	12	13	13	13	25
M20	Private	0.1	0.3	0.2	0.2	12	13	12	12	25

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M21	Private	0.2	1.1	0.8	0.8	12	13	13	13	25
M22	Private	0.4	3.7	2.7	2.4	13	16	15	15	25
M23	Private	0.4	5.2	3.5	3.4	13	17	16	16	25
M26	Private	0.2	2.3	1.6	1.5	13	15	14	14	25
M27	Private	0.2	2.2	1.6	1.5	13	15	14	14	25
M28	Private	0.2	2.1	1.5	1.4	12	14	14	14	25
M29	Private	0.6	2.2	1.5	1.4	13	15	14	14	25
M31	Mine-owned	0.3	1.1	0.6	0.6	13	13	13	13	25
M32	Community	0.2	0.7	0.5	0.5	12	13	13	13	25
M33	Community	0.2	0.7	0.5	0.5	12	13	13	13	25
M34	Community	0.2	0.8	0.5	0.5	12	13	13	13	25
M35	Community	0.2	0.8	0.5	0.5	12	13	13	13	25
F01	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F02	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F03	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F04	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F05	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F06	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F07	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F08	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F09	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F10	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F11	Private	0.2	0.7	0.5	0.5	12	13	13	13	25
F12	Private	0.2	0.7	0.5	0.5	12	13	13	13	25
F13	Private	0.2	0.7	0.4	0.5	12	13	13	13	25
F14	Private	0.2	0.7	0.4	0.4	12	13	13	13	25
F15	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
F16	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
F17	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
Maximum 24-hour average $PM_{2.5}$ ($\mu g/m^3$)										
M03	Private	0.4	4.6	3.1	2.4	19	20	20	20	25
M06	Private	0.5	3.9	2.4	1.8	19	20	20	20	25
M07	Private	0.4	2.2	1.6	1.3	19	19	19	19	25
M08	Private	1.1	6.5	5.0	3.9	19	20	20	20	25
M09	Private	0.6	2.5	1.7	1.4	19	19	19	19	25
M10	Private	1.1	2.9	1.9	1.6	19	19	19	19	25
M12	Private	0.5	3.1	2.4	2.0	19	20	19	19	25
M13	Private	0.5	3.2	2.5	2.1	19	20	19	19	25
M14	Private	0.3	1.1	0.7	0.7	19	19	19	19	25
M15	Mine-owned	2.0	3.5	2.1	1.9	20	20	20	20	25
M16	Private	0.7	2.3	1.5	1.2	19	19	19	19	25
M17	Private	0.2	1.0	0.7	0.5	19	19	19	19	25
M19	Private	0.5	1.6	1.1	0.9	19	19	19	19	25
M20	Private	0.3	0.8	0.7	0.7	19	19	19	19	25
M21	Private	0.5	2.5	1.8	1.4	19	19	19	19	25
M22	Private	1.0	7.0	5.4	3.9	19	19	19	19	25
M23	Private	1.0	6.3	4.7	3.6	19	20	20	20	25
M26	Private	0.6	3.7	2.7	2.2	19	19	19	19	25
M27	Private	0.6	3.4	2.6	2.0	19	19	19	19	25
M28	Private	0.7	3.6	2.4	2.1	19	20	19	19	25
M29	Private	1.5	4.8	2.7	2.2	19	19	19	19	25
M31	Mine-owned	1.7	3.2	2.1	1.7	19	19	19	19	25

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M32	Community	0.6	2.2	1.3	1.3	19	19	19	19	25
M33	Community	0.6	2.2	1.3	1.2	19	19	19	19	25
M34	Community	0.6	2.2	1.3	1.3	19	19	19	19	25
M35	Community	0.7	2.3	1.4	1.3	19	19	19	19	25
F01	Private	0.8	2.5	1.5	1.4	19	19	19	19	25
F02	Private	0.8	2.3	1.4	1.4	19	19	19	19	25
F03	Private	0.7	1.9	1.3	1.3	19	19	19	19	25
F04	Private	0.7	1.8	1.2	1.2	19	19	19	19	25
F05	Private	0.8	2.6	1.5	1.2	19	19	19	19	25
F06	Private	0.9	2.7	1.6	1.3	19	19	19	19	25
F07	Private	0.7	2.3	1.4	1.3	19	19	19	19	25
F08	Private	0.7	2.1	1.2	1.3	19	19	19	19	25
F09	Private	0.7	2.0	1.3	1.3	19	19	19	19	25
F10	Private	0.7	2.2	1.3	1.3	19	19	19	19	25
F11	Private	0.6	2.2	1.3	1.3	19	19	19	19	25
F12	Private	0.6	2.2	1.3	1.3	19	19	19	19	25
F13	Private	0.6	2.1	1.3	1.2	19	19	19	19	25
F14	Private	0.6	2.1	1.3	1.2	19	19	19	19	25
F15	Private	0.6	2.0	1.2	1.2	19	19	19	19	25
F16	Private	0.6	1.8	1.2	1.2	19	19	19	19	25
F17	Private	0.6	2.0	1.2	1.1	19	19	19	19	25
Number of days above 25 µg/m^3 $PM_{2.5}$ (days)										
M03	Private	0	0	0	0	0	0	0	0	-
M06	Private	0	0	0	0	0	0	0	0	-
M07	Private	0	0	0	0	0	0	0	0	-
M08	Private	0	0	0	0	0	0	0	0	-
M09	Private	0	0	0	0	0	0	0	0	-
M10	Private	0	0	0	0	0	0	0	0	-
M12	Private	0	0	0	0	0	0	0	0	-
M13	Private	0	0	0	0	0	0	0	0	-
M14	Private	0	0	0	0	0	0	0	0	-
M15	Mine-owned	0	0	0	0	0	0	0	0	-
M16	Private	0	0	0	0	0	0	0	0	-
M17	Private	0	0	0	0	0	0	0	0	-
M19	Private	0	0	0	0	0	0	0	0	-
M20	Private	0	0	0	0	0	0	0	0	-
M21	Private	0	0	0	0	0	0	0	0	-
M22	Private	0	0	0	0	0	0	0	0	-
M23	Private	0	0	0	0	0	0	0	0	-
M26	Private	0	0	0	0	0	0	0	0	-
M27	Private	0	0	0	0	0	0	0	0	-
M28	Private	0	0	0	0	0	0	0	0	-
M29	Private	0	0	0	0	0	0	0	0	-
M31	Mine-owned	0	0	0	0	0	0	0	0	-
M32	Community	0	0	0	0	0	0	0	0	-
M33	Community	0	0	0	0	0	0	0	0	-
M34	Community	0	0	0	0	0	0	0	0	-
M35	Community	0	0	0	0	0	0	0	0	-
F01	Private	0	0	0	0	0	0	0	0	-
F02	Private	0	0	0	0	0	0	0	0	-
F03	Private	0	0	0	0	0	0	0	0	-
F04	Private	0	0	0	0	0	0	0	0	-

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
F05	Private	0	0	0	0	0	0	0	0	-
F06	Private	0	0	0	0	0	0	0	0	-
F07	Private	0	0	0	0	0	0	0	0	-
F08	Private	0	0	0	0	0	0	0	0	-
F09	Private	0	0	0	0	0	0	0	0	-
F10	Private	0	0	0	0	0	0	0	0	-
F11	Private	0	0	0	0	0	0	0	0	-
F12	Private	0	0	0	0	0	0	0	0	-
F13	Private	0	0	0	0	0	0	0	0	-
F14	Private	0	0	0	0	0	0	0	0	-
F15	Private	0	0	0	0	0	0	0	0	-
F16	Private	0	0	0	0	0	0	0	0	-
F17	Private	0	0	0	0	0	0	0	0	-
Annual average $PM_{2.5}$ (µg/m^3)										
M03	Private	0.0	0.4	0.3	0.2	4.1	4.5	4.4	4.3	8
M06	Private	0.1	0.5	0.3	0.2	4.1	4.5	4.3	4.3	8
M07	Private	0.1	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M08	Private	0.2	1.3	1.0	0.9	4.2	5.4	5.1	4.9	8
M09	Private	0.1	0.3	0.2	0.2	4.1	4.4	4.3	4.2	8
M10	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
M12	Private	0.0	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M13	Private	0.0	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M14	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M15	Mine-owned	0.2	0.5	0.3	0.3	4.2	4.5	4.4	4.3	8
M16	Private	0.1	0.3	0.2	0.2	4.1	4.3	4.2	4.2	8
M17	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M19	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.1	8
M20	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M21	Private	0.1	0.3	0.2	0.2	4.1	4.4	4.3	4.2	8
M22	Private	0.1	1.0	0.8	0.6	4.2	5.0	4.8	4.7	8
M23	Private	0.1	1.2	1.0	0.8	4.2	5.3	5.0	4.9	8
M26	Private	0.1	0.6	0.5	0.4	4.1	4.6	4.5	4.4	8
M27	Private	0.1	0.6	0.5	0.4	4.1	4.6	4.5	4.4	8
M28	Private	0.1	0.5	0.4	0.4	4.1	4.6	4.5	4.4	8
M29	Private	0.2	0.6	0.4	0.3	4.3	4.6	4.4	4.4	8
M31	Mine-owned	0.1	0.3	0.2	0.2	4.2	4.3	4.2	4.2	8
M32	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M33	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M34	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M35	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F01	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F02	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F03	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F04	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F05	Private	0.1	0.2	0.2	0.1	4.1	4.3	4.2	4.2	8
F06	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F07	Private	0.1	0.2	0.2	0.1	4.1	4.3	4.2	4.2	8
F08	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F09	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F10	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F11	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F12	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
F13	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F14	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F15	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
F16	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
F17	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
Annual average TSP (µg/m³)										
M03	Private	0.0	0.4	0.3	0.3	55	55	55	55	90
M06	Private	0.0	0.5	0.3	0.3	55	56	55	55	90
M07	Private	0.1	0.8	0.6	0.6	55	56	56	56	90
M08	Private	0.3	3.9	2.9	2.9	55	59	58	58	90
M09	Private	0.1	0.6	0.5	0.5	55	56	56	55	90
M10	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
M12	Private	0.0	0.6	0.5	0.4	55	56	55	55	90
M13	Private	0.0	0.6	0.5	0.4	55	56	55	55	90
M14	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M15	Mine-owned	0.2	1.1	0.7	0.8	55	56	56	56	90
M16	Private	0.1	0.4	0.3	0.4	55	55	55	55	90
M17	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M19	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
M20	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M21	Private	0.1	0.5	0.5	0.5	55	56	55	55	90
M22	Private	0.2	2.0	1.8	1.6	55	57	57	57	90
M23	Private	0.3	3.7	2.8	2.8	55	59	58	58	90
M26	Private	0.2	1.3	1.1	1.0	55	56	56	56	90
M27	Private	0.2	1.3	1.1	1.0	55	56	56	56	90
M28	Private	0.1	1.2	1.0	0.9	55	56	56	56	90
M29	Private	0.5	1.3	1.1	1.0	55	56	56	56	90
M31	Mine-owned	0.1	0.4	0.3	0.3	55	55	55	55	90
M32	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M33	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M34	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M35	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
F01	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F02	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F03	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F04	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F05	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F06	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F07	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F08	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F09	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F10	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F11	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F12	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F13	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F14	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
F15	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
F16	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F17	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
Annual average deposited dust (g/m²/month)										
M03	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M06	Private	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M07	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M08	Private	0.0	0.4	0.3	0.3	3.2	3.6	3.5	3.5	4
M09	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M10	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M12	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M13	Private	0.0	0.1	0.1	0.0	3.2	3.3	3.3	3.2	4
M14	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M15	Mine-owned	0.0	0.2	0.1	0.1	3.2	3.4	3.3	3.3	4
M16	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M17	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M19	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M20	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M21	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M22	Private	0.0	0.2	0.2	0.2	3.2	3.4	3.4	3.4	4
M23	Private	0.0	0.4	0.3	0.3	3.2	3.6	3.5	3.5	4
M26	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M27	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M28	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M29	Private	0.1	0.2	0.2	0.2	3.3	3.4	3.4	3.4	4
M31	Mine-owned	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4
M32	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M33	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M34	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M35	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F01	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
F02	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
F03	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F04	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F05	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F06	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F07	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F08	Private	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4
F09	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F10	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F11	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F12	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F13	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F14	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F15	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F16	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F17	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4

Tabulated Model Results (Rail Siding)

ID	Status	Project		Cumulative		Criteria
		Construction	Operation	Construction	Operation	
Maximum 24-hour average PM_{10} (µg/m^3)						
Q06	Private	10	0	58	57	50
Q22	Mine owned	13	0	60	57	50
Q08	Private	7	0	58	57	50
Q09	Private	4	0	58	57	50
Q19	Private	4	0	58	57	50
Number of days above 50 µg/m^3 PM_{10} (days)						
Q06	Private	0	0	5	5	-
Q22	Mine owned	0	0	5	5	-
Q08	Private	0	0	5	5	-
Q09	Private	0	0	5	5	-
Q19	Private	0	0	5	5	-
Annual average PM_{10} (µg/m^3)						
Q06	Private	1.2	0.0	14	12	25
Q22	Mine owned	1.8	0.0	14	12	25
Q08	Private	0.9	0.0	13	12	25
Q09	Private	0.3	0.0	13	12	25
Q19	Private	0.3	0.0	13	12	25
Maximum 24-hour average $PM_{2.5}$ (µg/m^3)						
Q06	Private	4.4	0.0	20	19	25
Q22	Mine owned	6.1	0.0	22	19	25
Q08	Private	3.4	0.0	19	19	25
Q09	Private	2.0	0.0	20	19	25
Q19	Private	2.0	0.0	20	19	25
Number of days above 25 µg/m^3 $PM_{2.5}$ (days)						
Q06	Private	0	0	0	0	-
Q22	Mine owned	0	0	0	0	-
Q08	Private	0	0	0	0	-
Q09	Private	0	0	0	0	-
Q19	Private	0	0	0	0	-
Annual average $PM_{2.5}$ (µg/m^3)						
Q06	Private	0.6	0.0	4.6	4.0	8
Q22	Mine owned	0.9	0.0	4.9	4.0	8
Q08	Private	0.5	0.0	4.5	4.0	8
Q09	Private	0.2	0.0	4.2	4.0	8
Q19	Private	0.2	0.0	4.2	4.0	8
Annual average TSP (µg/m^3)						
Q06	Private	1.5	0.0	57	55	90
Q22	Mine owned	3.2	0.0	58	55	90
Q08	Private	1.0	0.0	56	55	90
Q09	Private	0.2	0.0	55	55	90
Q19	Private	0.2	0.0	55	55	90
Annual average deposited dust (g/m^2/month)						
Q06	Private	0.1	0.0	3.3	3.2	4
Q22	Mine owned	0.3	0.0	3.5	3.2	4
Q08	Private	0.1	0.0	3.3	3.2	4
Q09	Private	0.0	0.0	3.2	3.2	4
Q19	Private	0.0	0.0	3.2	3.2	4

Appendix D. Modelling for the rail siding

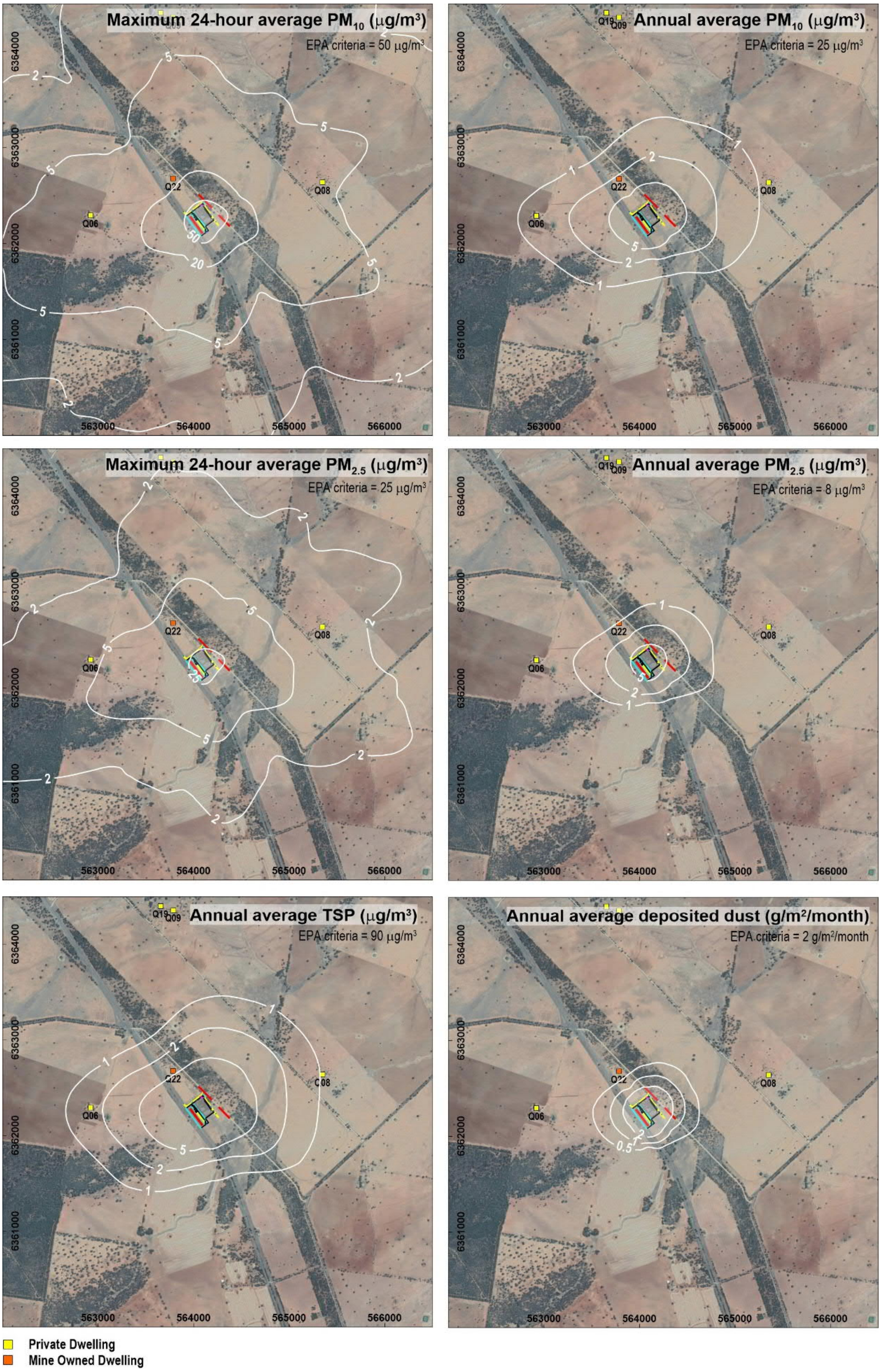


Figure D1 Modelled dust concentrations and deposition levels due to construction of the rail siding

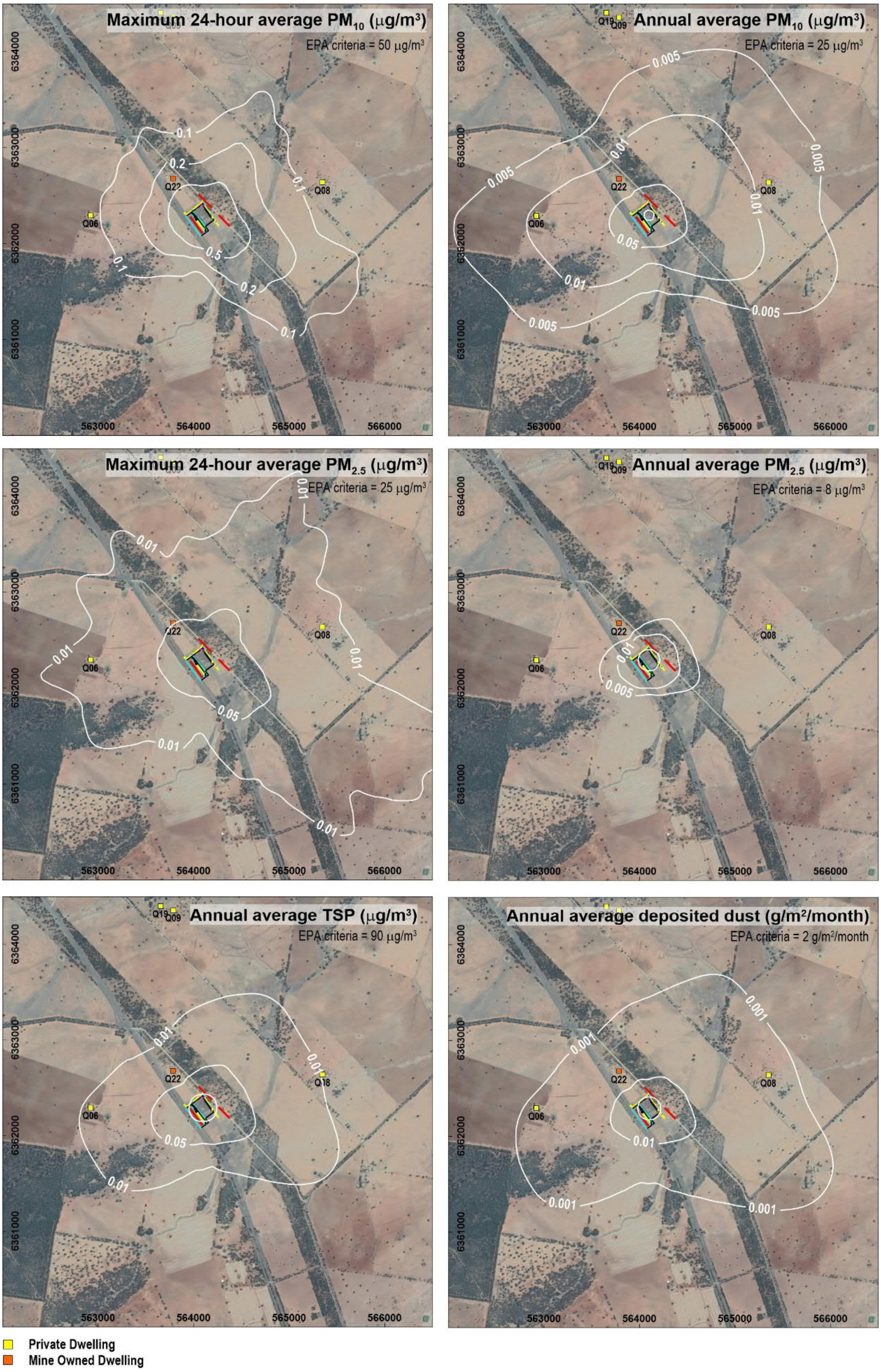


Figure D2 Modelled dust concentrations and deposition levels due to operation of the rail siding

Appendix E. Modelling for the processing facility

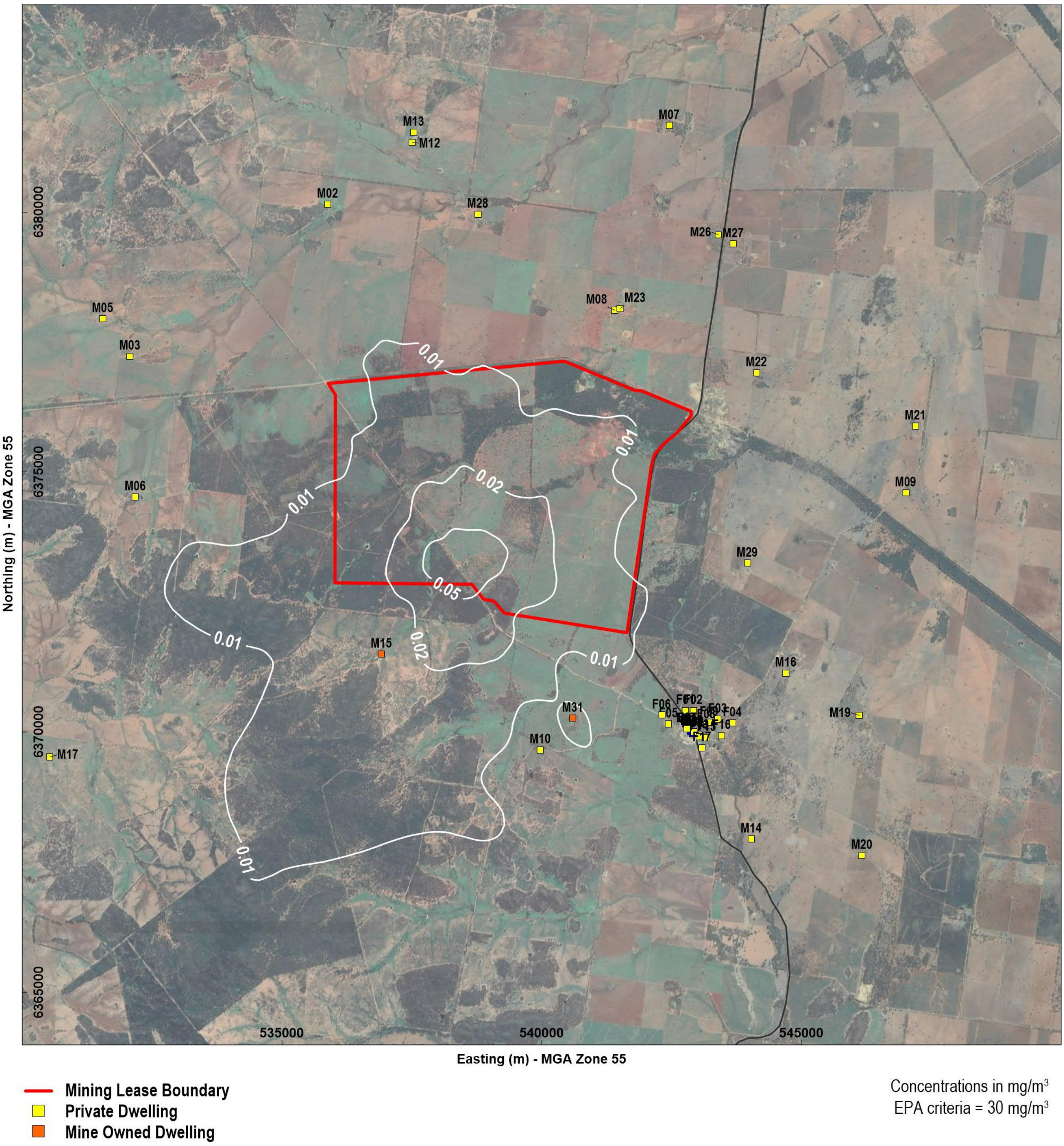


Figure E1 Modelled maximum 1-hour average CO due to the processing facility

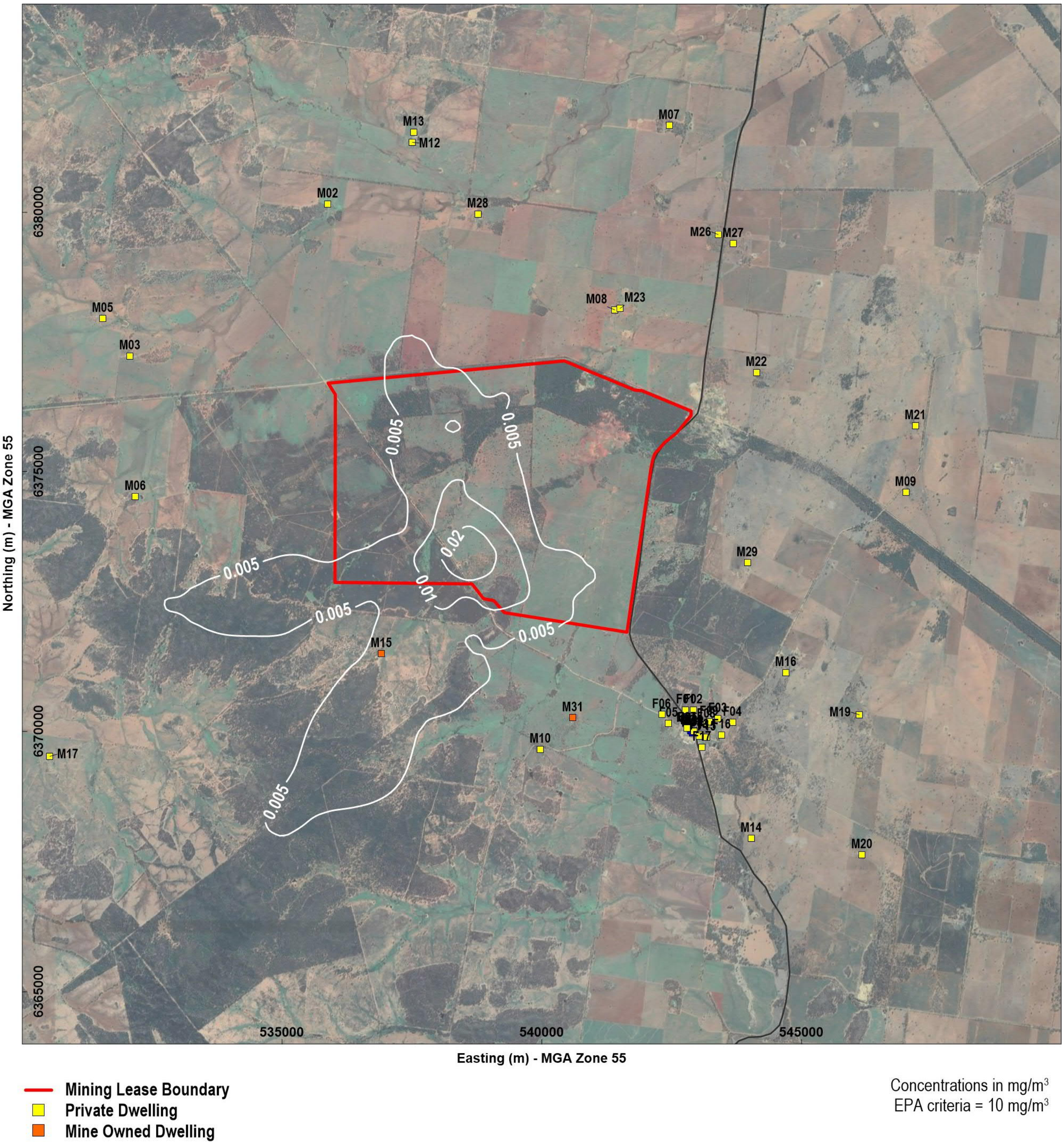


Figure E2 Modelled maximum 8-hour average CO due to the processing facility

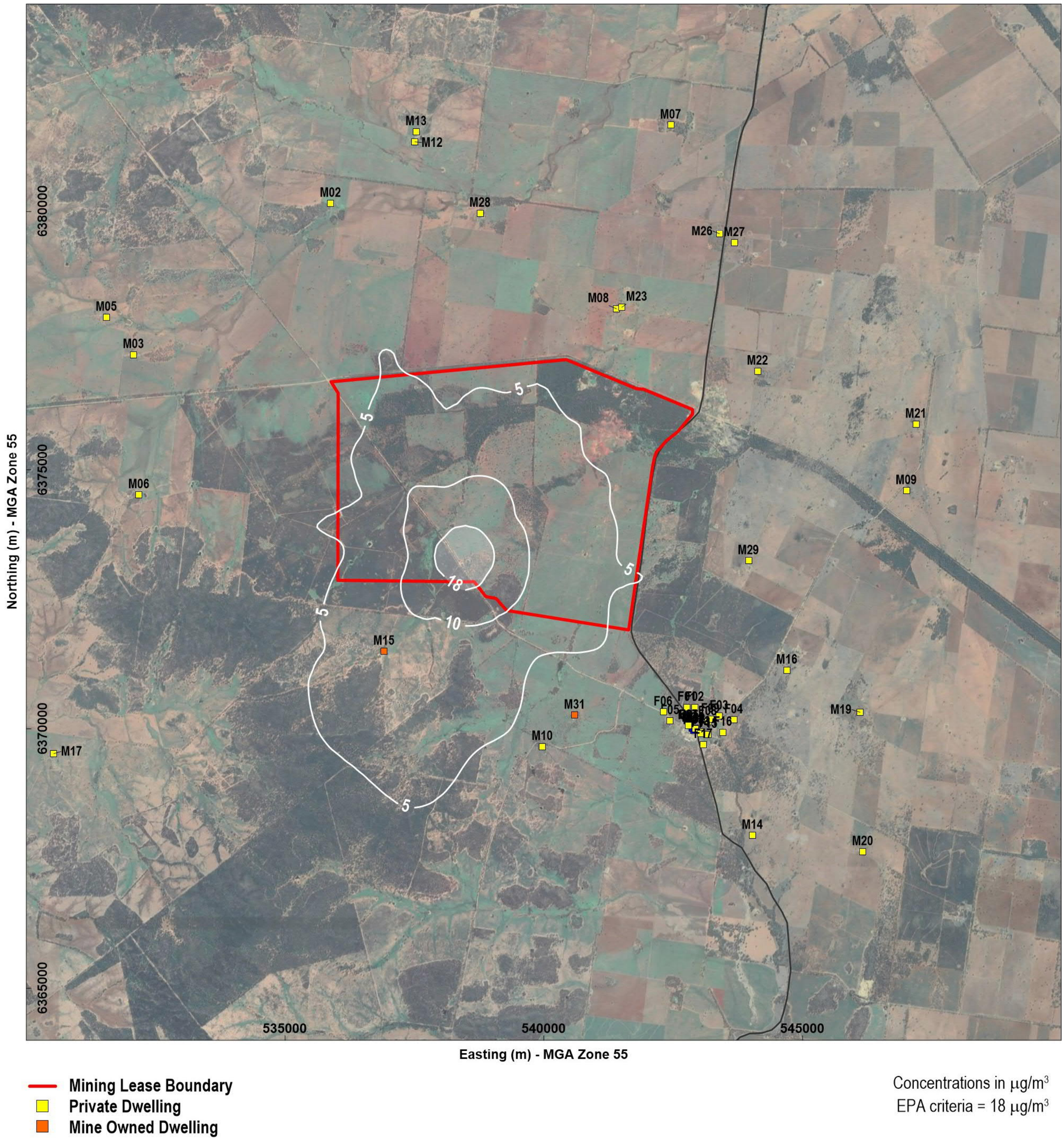


Figure E3 Modelled 99.9th percentile H_2SO_4 due to the processing facility

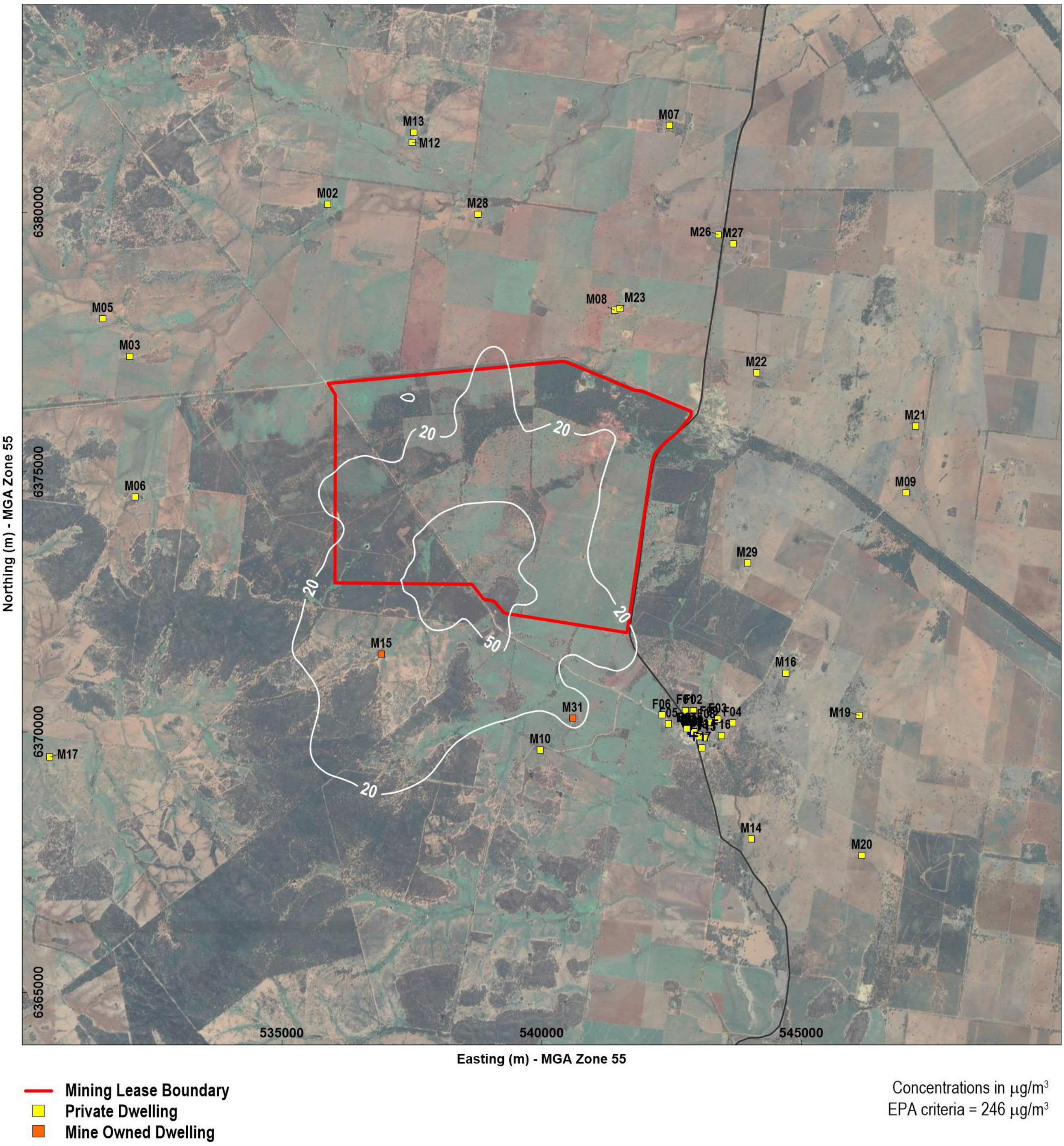


Figure E4 Modelled maximum 1-hour average NO_2 due to the processing facility

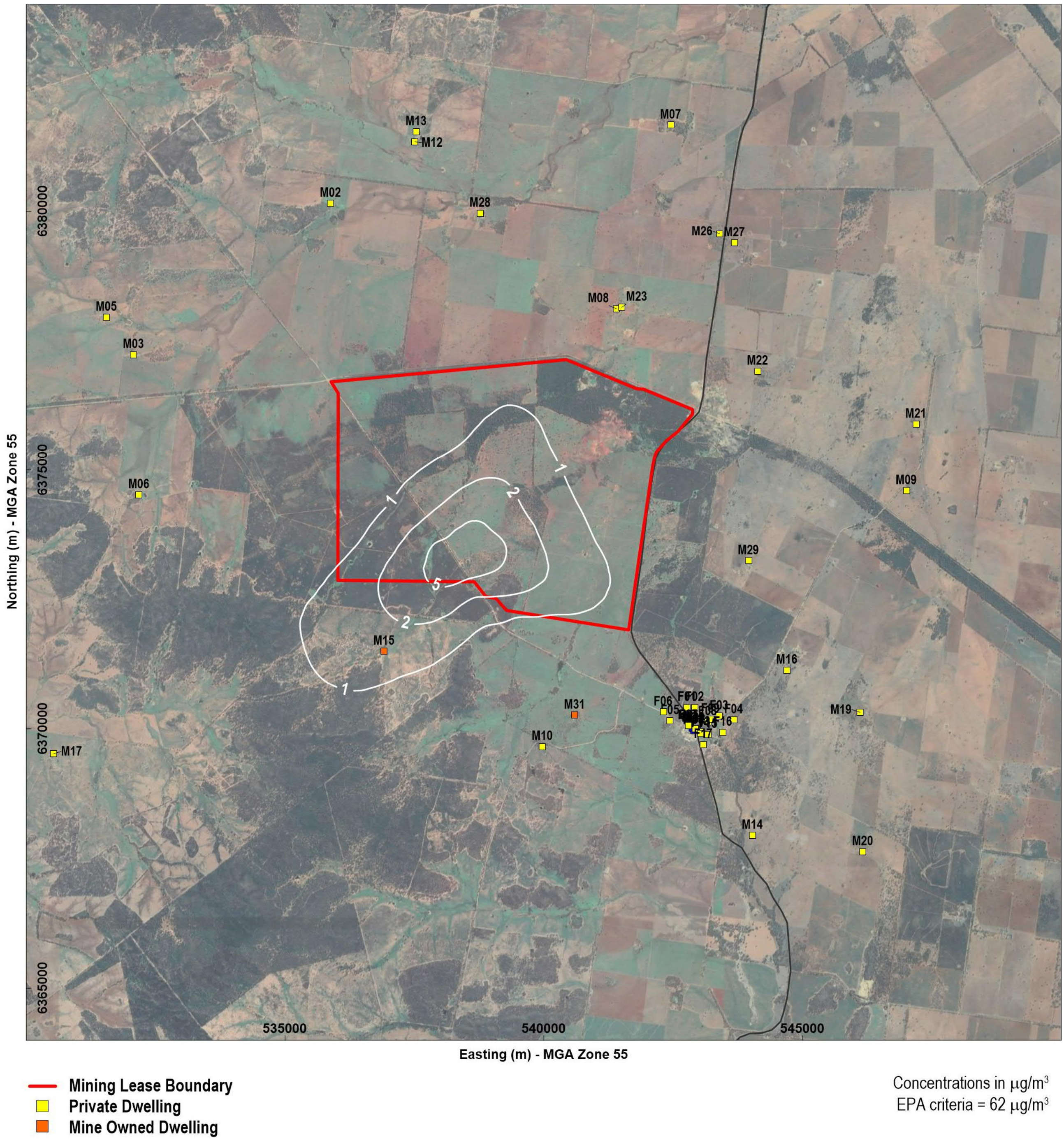


Figure E5 Modelled annual average NO_2 due to the processing facility

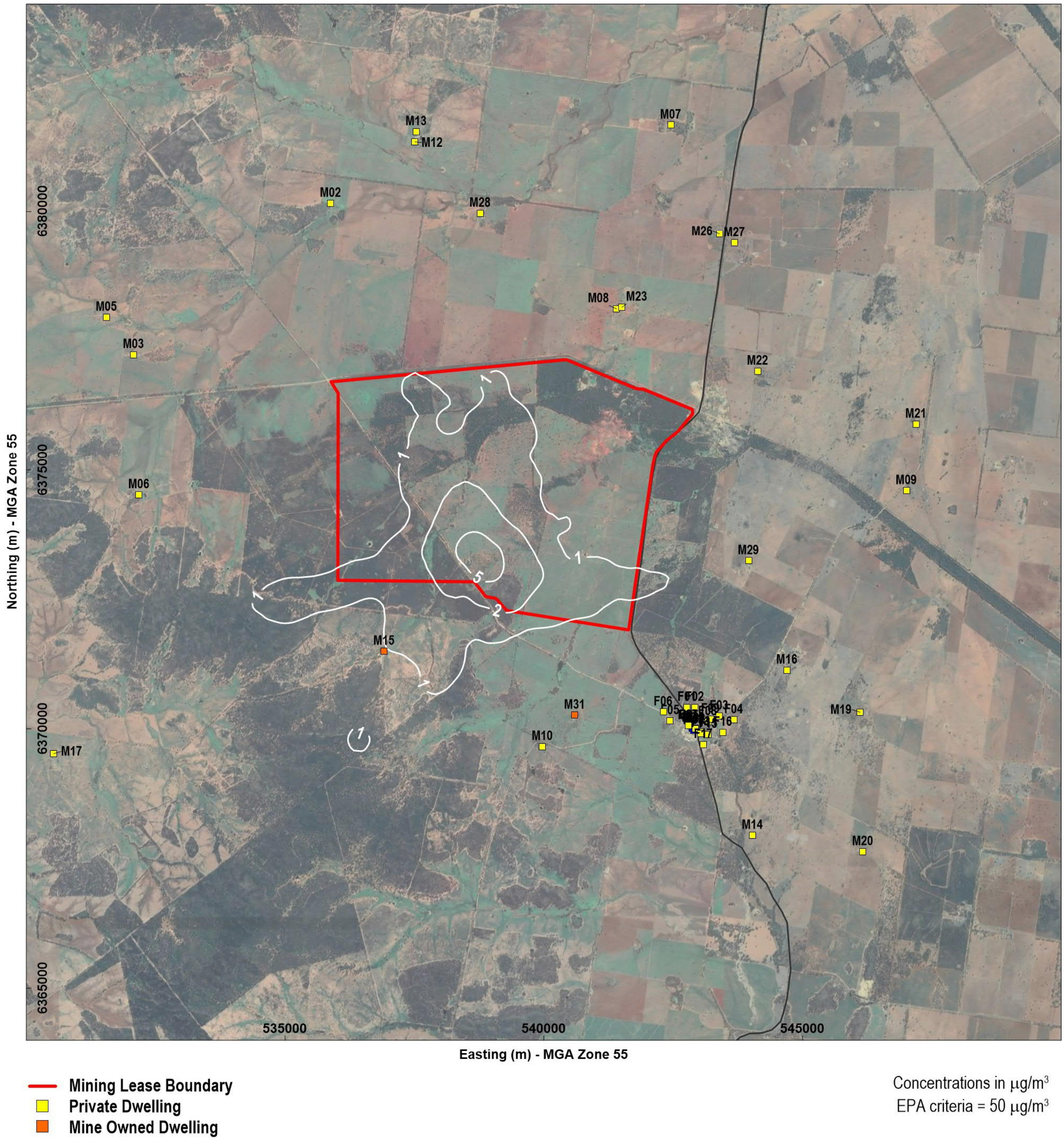


Figure E6 Modelled maximum 24-hour average PM_{10} due to the processing facility

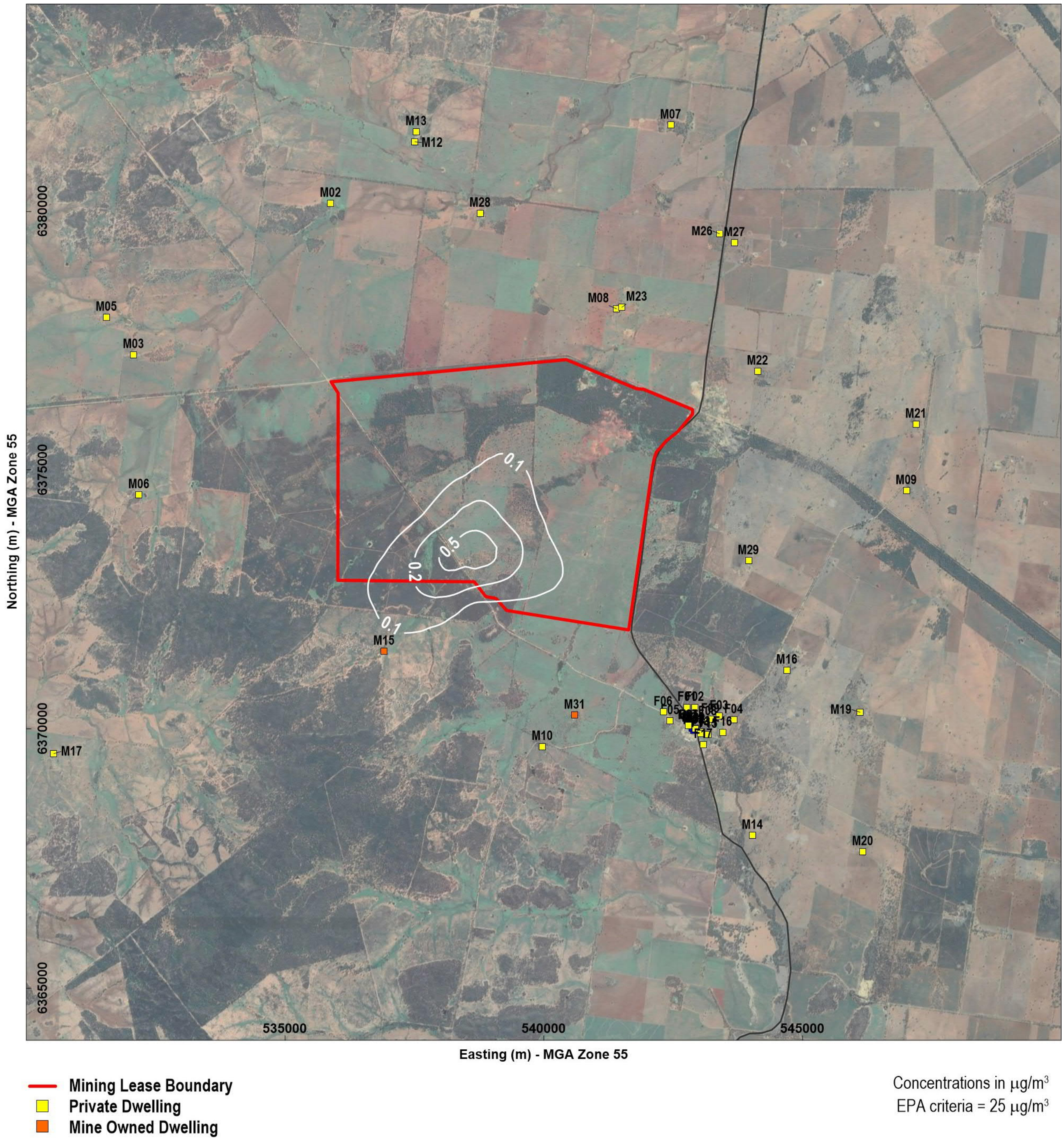


Figure E7 Modelled annual average PM_{10} due to the processing facility

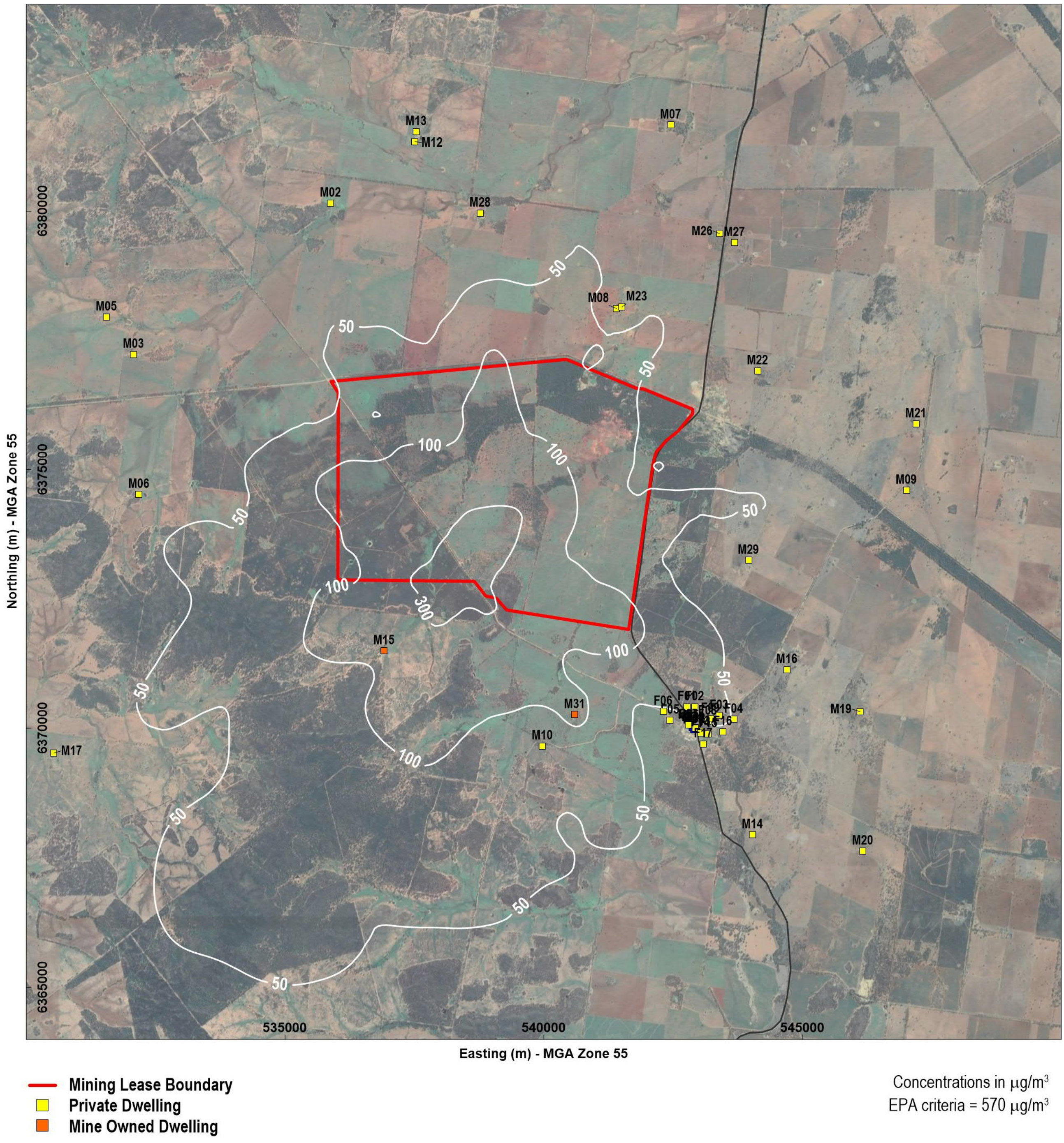


Figure E8 Modelled maximum 1-hour average SO_2 due to the processing facility

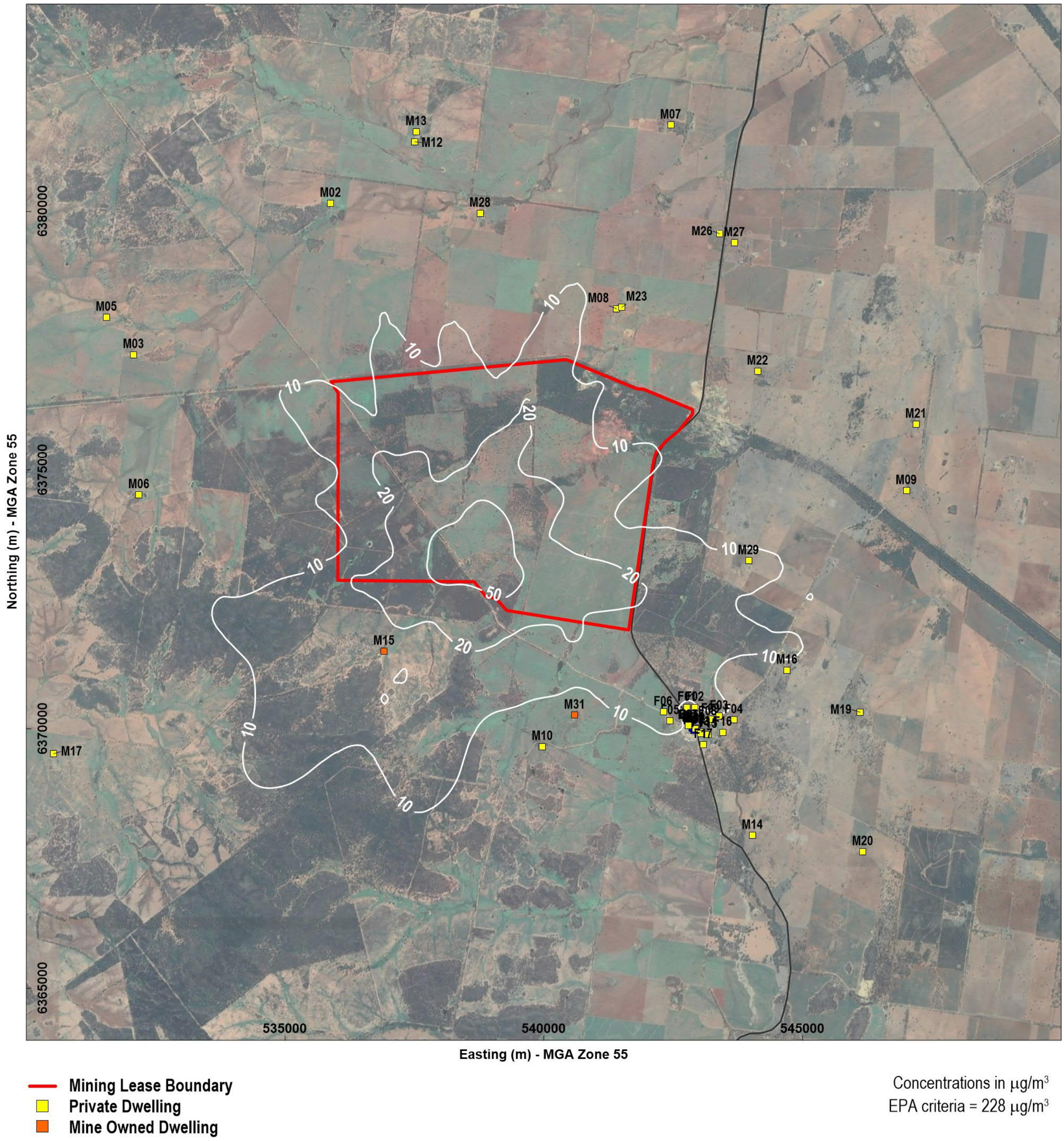


Figure E9 Modelled maximum 24-hour average SO_2 due to the processing facility

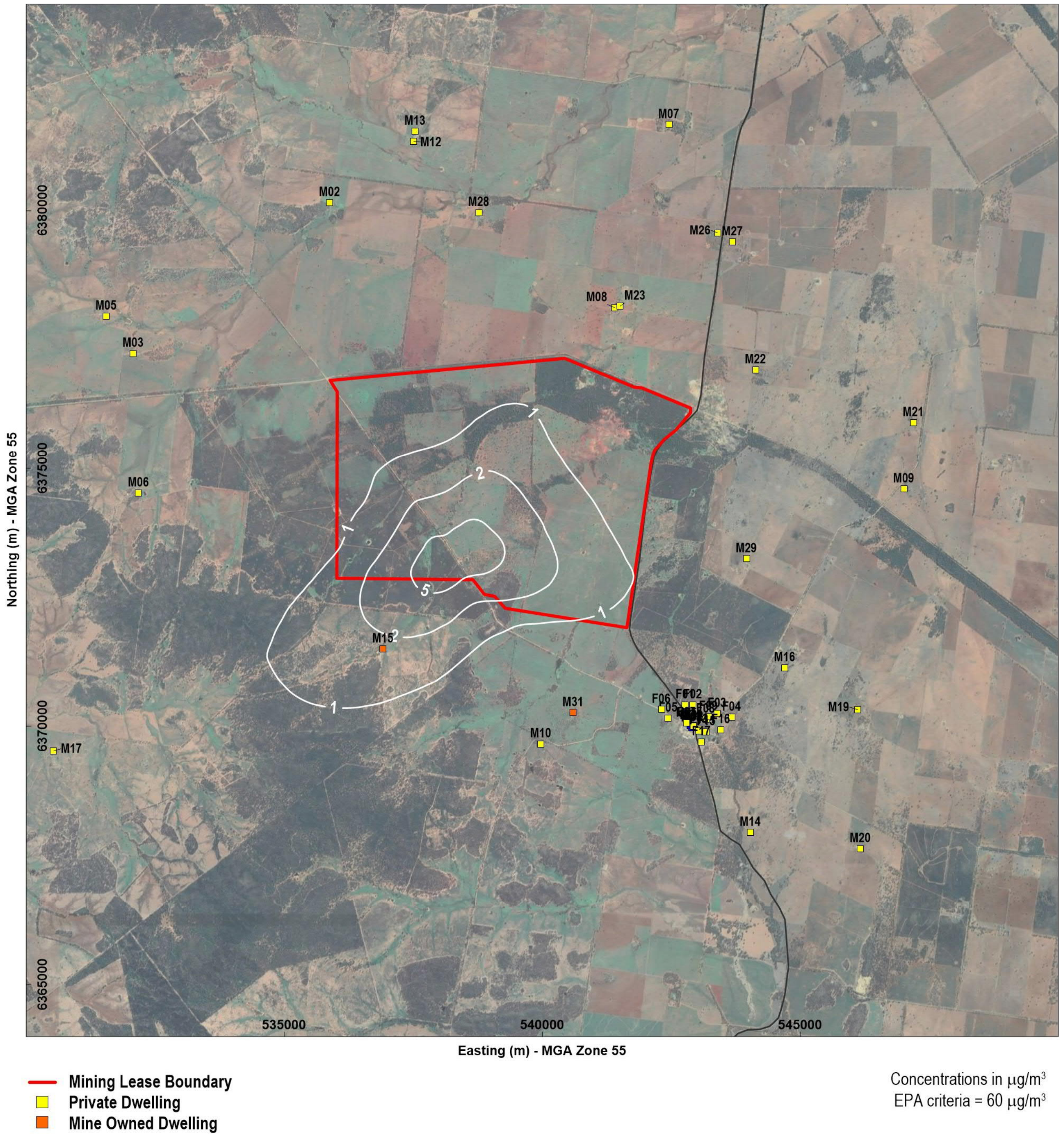
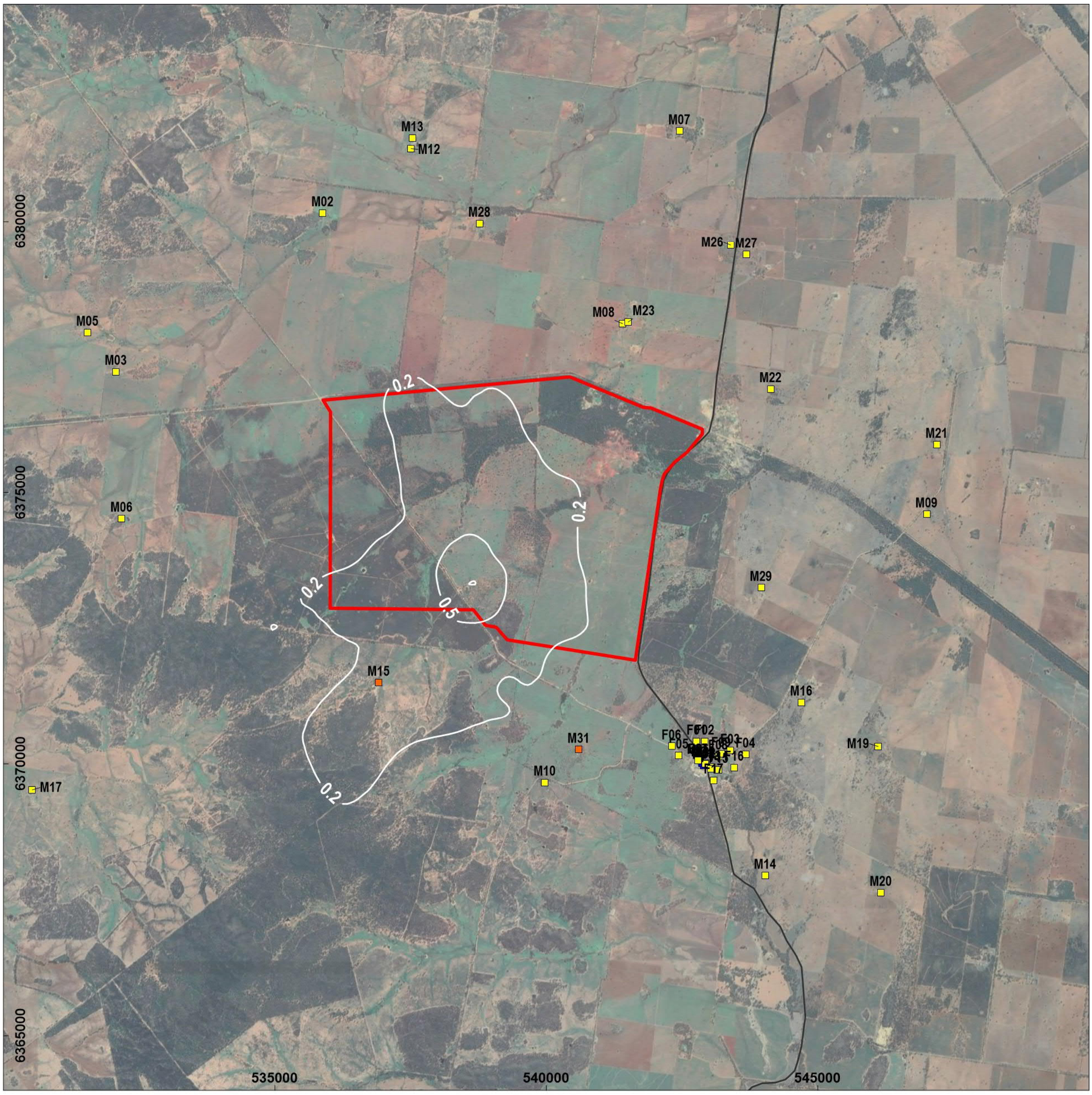


Figure E10 Modelled annual average SO_2 due to the processing facility



Northing (m) - MGA Zone 55

Easting (m) - MGA Zone 55

Mining Lease Boundary
Private Dwelling
Mine Owned Dwelling

Concentrations in µg/m³
EPA criteria = 29 µg/m³

Figure E11 Modelled 99.9th percentile benzene due to the processing facility

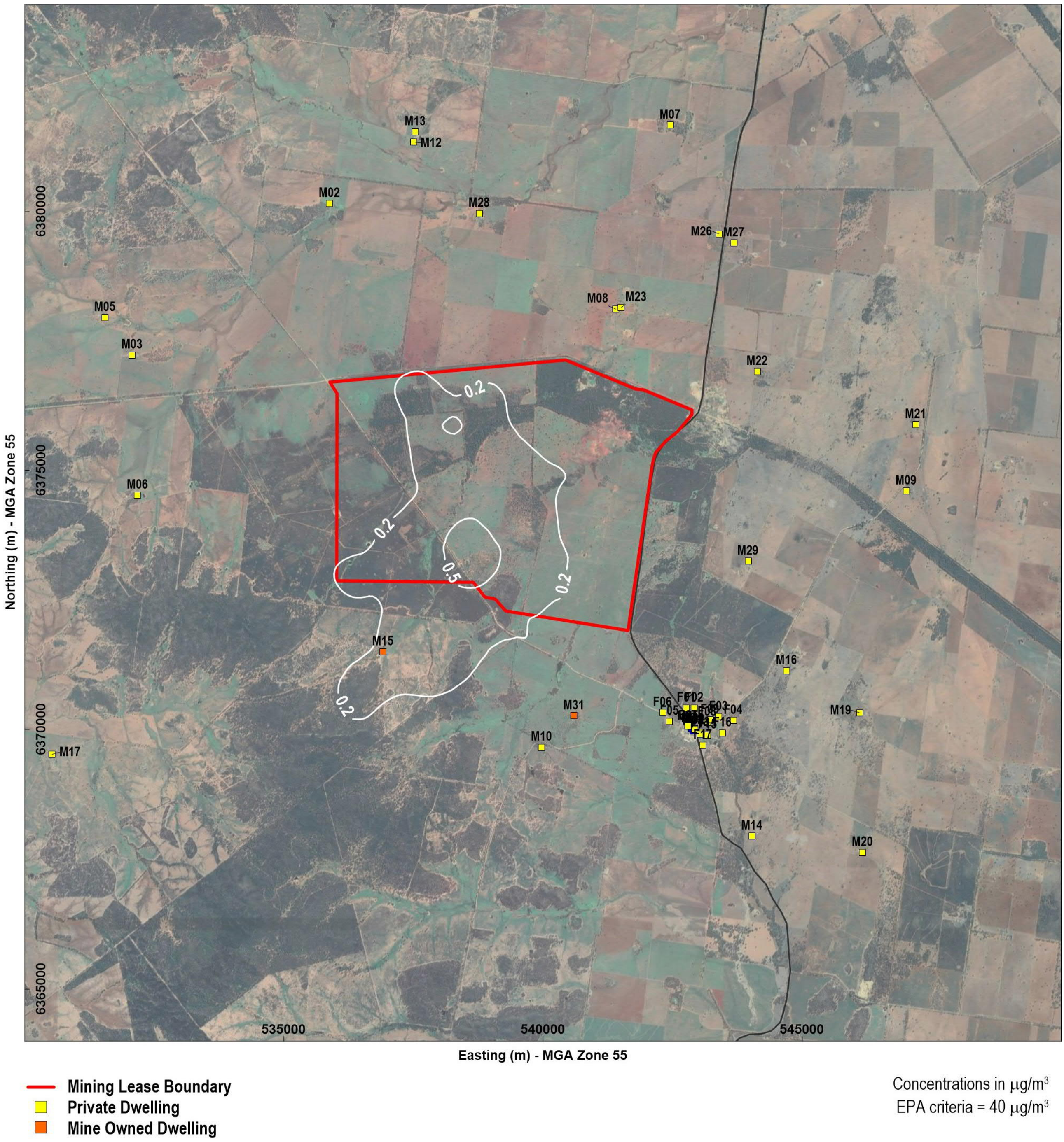


Figure E12 Modelled 99.9th percentile 1-3 butadiene due to the processing facility

Appendix F. Greenhouse gas emissions by activity

Diesel usage (mining)

Source of usage: Clean TeQ

		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	1,059	2721.3	0	138.96	2,883	-	147	3,030
Construction Year 2	1,059	2721.3	0	138.96	2,883	-	147	3,030
Construction Year 3	1,875	2721.3	0	138.96	5,103	-	261	5,364
Operation Year 1	10,425	2721.3	0	138.96	28,370	-	1,449	29,818
Operation Year 2	5,230	2721.3	0	138.96	14,232	-	727	14,959
Operation Year 3	5,040	2721.3	0	138.96	13,715	-	700	14,416
Operation Year 4	6,890	2721.3	0	138.96	18,749	-	957	19,707
Operation Year 5	4,286	2721.3	0	138.96	11,663	-	596	12,259
Operation Year 6	6,878	2721.3	0	138.96	18,717	-	956	19,673
Operation Year 7	4,895	2721.3	0	138.96	13,320	-	680	14,000
Operation Year 8	5,743	2721.3	0	138.96	15,628	-	798	16,427
Operation Year 9	5,041	2721.3	0	138.96	13,719	-	701	14,420
Operation Year 10	7,170	2721.3	0	138.96	19,513	-	996	20,509
Operation Year 11	4,240	2721.3	0	138.96	11,539	-	589	12,128
Operation Year 12	6,515	2721.3	0	138.96	17,728	-	905	18,634
Operation Year 13	6,598	2721.3	0	138.96	17,956	-	917	18,873
Operation Year 14	5,423	2721.3	0	138.96	14,758	-	754	15,512
Operation Year 15	6,876	2721.3	0	138.96	18,711	-	955	19,666
Operation Year 16	5,624	2721.3	0	138.96	15,304	-	781	16,085
Operation Year 17	6,753	2721.3	0	138.96	18,377	-	938	19,316
Operation Year 18	1,875	2721.3	0	138.96	5,103	-	261	5,364
Operation Year 19	1,564	2721.3	0	138.96	4,255	-	217	4,473
Operation Year 20	1,564	2721.3	0	138.96	4,255	-	217	4,473
Operation Year 21	1,564	2721.3	0	138.96	4,255	-	217	4,473
							Average	13,609
							Total	326,607

Diesel usage (limestone delivery from quarry)

Source of usage: Ramboll, 2017

		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	2721.3	0	138.96	-	-	-	-
Construction Year 2	-	2721.3	0	138.96	-	-	-	-
Construction Year 3	180	2721.3	0	138.96	490	-	25	515
Operation Year 1	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 2	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 3	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 4	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 5	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 6	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 7	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 8	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 9	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 10	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 11	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 12	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 13	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 14	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 15	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 16	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 17	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 18	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 19	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 20	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 21	360	2721.3	0	138.96	980	-	50	1,030
							Average	1,006
							Total	22,138

Diesel usage (sulphur delivery from rail siding)

Source of usage: Ramboll, 2017

		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	2721.3	0	138.96	-	-	-	-
Construction Year 2	-	2721.3	0	138.96	-	-	-	-
Construction Year 3	100	2721.3	0	138.96	271	-	14	285
Operation Year 1	199	2721.3	0	138.96	542	-	28	569
Operation Year 2	199	2721.3	0	138.96	542	-	28	569
Operation Year 3	199	2721.3	0	138.96	542	-	28	569
Operation Year 4	199	2721.3	0	138.96	542	-	28	569
Operation Year 5	199	2721.3	0	138.96	542	-	28	569
Operation Year 6	199	2721.3	0	138.96	542	-	28	569
Operation Year 7	199	2721.3	0	138.96	542	-	28	569
Operation Year 8	199	2721.3	0	138.96	542	-	28	569
Operation Year 9	199	2721.3	0	138.96	542	-	28	569
Operation Year 10	199	2721.3	0	138.96	542	-	28	569
Operation Year 11	199	2721.3	0	138.96	542	-	28	569
Operation Year 12	199	2721.3	0	138.96	542	-	28	569
Operation Year 13	199	2721.3	0	138.96	542	-	28	569
Operation Year 14	199	2721.3	0	138.96	542	-	28	569
Operation Year 15	199	2721.3	0	138.96	542	-	28	569
Operation Year 16	199	2721.3	0	138.96	542	-	28	569
Operation Year 17	199	2721.3	0	138.96	542	-	28	569
Operation Year 18	199	2721.3	0	138.96	542	-	28	569
Operation Year 19	199	2721.3	0	138.96	542	-	28	569
Operation Year 20	199	2721.3	0	138.96	542	-	28	569
Operation Year 21	199	2721.3	0	138.96	542	-	28	569
							Average	556
							Total	12,238

Diesel usage (power generation)

Source of usage: Ramboll, 2017

		Emission factor (scaling)			Emissions (t CO2-e/year)			
Year	t CO2-e	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	1	0	0.009	-	-	-	-
Construction Year 2	-	1	0	0.009	-	-	-	-
Construction Year 3	22,785	1	0	0.009	22,785	-	202	22,987
Operation Year 1	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 2	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 3	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 4	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 5	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 6	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 7	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 8	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 9	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 10	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 11	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 12	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 13	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 14	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 15	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 16	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 17	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 18	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 19	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 20	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 21	45,570	1	0	0.009	45,570	-	403	45,973
							Average	44,928
							Total	988,420

Acid plant

Includes PAL vent scrubber stack, partial neutralisation vent scrubber stack, RIP vent scrubber stack (Ramboll, 2017)

		Emission factor (scaling)			Emissions (t CO2-e/year)			
Year	t CO2-e	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	1	0	0	-	-	-	-
Construction Year 2	-	1	0	0	-	-	-	-
Construction Year 3	62,993	1	0	0	62,993	-	-	62,993
Operation Year 1	251,972	1	0	0	251,972	-	-	251,972
Operation Year 2	251,972	1	0	0	251,972	-	-	251,972
Operation Year 3	251,972	1	0	0	251,972	-	-	251,972
Operation Year 4	251,972	1	0	0	251,972	-	-	251,972
Operation Year 5	251,972	1	0	0	251,972	-	-	251,972
Operation Year 6	251,972	1	0	0	251,972	-	-	251,972
Operation Year 7	251,972	1	0	0	251,972	-	-	251,972
Operation Year 8	251,972	1	0	0	251,972	-	-	251,972
Operation Year 9	251,972	1	0	0	251,972	-	-	251,972
Operation Year 10	251,972	1	0	0	251,972	-	-	251,972
Operation Year 11	251,972	1	0	0	251,972	-	-	251,972
Operation Year 12	251,972	1	0	0	251,972	-	-	251,972
Operation Year 13	251,972	1	0	0	251,972	-	-	251,972
Operation Year 14	251,972	1	0	0	251,972	-	-	251,972
Operation Year 15	251,972	1	0	0	251,972	-	-	251,972
Operation Year 16	251,972	1	0	0	251,972	-	-	251,972
Operation Year 17	251,972	1	0	0	251,972	-	-	251,972
Operation Year 18	251,972	1	0	0	251,972	-	-	251,972
Operation Year 19	251,972	1	0	0	251,972	-	-	251,972
Operation Year 20	251,972	1	0	0	251,972	-	-	251,972
Operation Year 21	251,972	1	0	0	251,972	-	-	251,972
							Average	243,382
							Total	5,354,405

Blasting emissions

		Emission factor (t CO2-e/t Explosives)			Emissions (t CO2-e/year)			
Year	Explosives (t)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	0.17	0	0	-	-	-	-
Construction Year 2	-	0.17	0	0	-	-	-	-
Construction Year 3	-	0.17	0	0	-	-	-	-
Operation Year 1	-	0.17	0	0	-	-	-	-
Operation Year 2	-	0.17	0	0	-	-	-	-
Operation Year 3	-	0.17	0	0	-	-	-	-
Operation Year 4	-	0.17	0	0	-	-	-	-
Operation Year 5	-	0.17	0	0	-	-	-	-
Operation Year 6	-	0.17	0	0	-	-	-	-
Operation Year 7	-	0.17	0	0	-	-	-	-
Operation Year 8	-	0.17	0	0	-	-	-	-
Operation Year 9	-	0.17	0	0	-	-	-	-
Operation Year 10	-	0.17	0	0	-	-	-	-
Operation Year 11	-	0.17	0	0	-	-	-	-
Operation Year 12	-	0.17	0	0	-	-	-	-
Operation Year 13	-	0.17	0	0	-	-	-	-
Operation Year 14	-	0.17	0	0	-	-	-	-
Operation Year 15	-	0.17	0	0	-	-	-	-
Operation Year 16	3,134	0.17	0	0	533	-	-	533
Operation Year 17	2,554	0.17	0	0	434	-	-	434
Operation Year 18	2,361	0.17	0	0	401	-	-	401
Operation Year 19	2,491	0.17	0	0	423	-	-	423
Operation Year 20	-	0.17	0	0	-	-	-	-
Operation Year 21	-	0.17	0	0	-	-	-	-
							Average	448
							Total	1,792

Transport of Product (Rail)								
Factor	kg CO2-e/t.km	0.03333	DEFRA 2019 - Freighting goods - Freight train					
Distance	km	500	Assumed distance to port					
		Emission factor (kg CO2-e/t)			Emissions (t CO2-e/year)			
Year	Product (t)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	0	0	0	16.67	-	-	-	-
Construction Year 2	0	0	0	16.67	-	-	-	-
Construction Year 3	0	0	0	16.67	-	-	-	-
Operation Year 1	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 2	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 3	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 4	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 5	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 6	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 7	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 8	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 9	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 10	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 11	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 12	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 13	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 14	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 15	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 16	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 17	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 18	0	0	0	16.67	-	-	-	-
Operation Year 19	0	0	0	16.67	-	-	-	-
Operation Year 20	0	0	0	16.67	-	-	-	-
Operation Year 21	0	0	0	16.67	-	-	-	-
							Average	4,003
							Total	68,044

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