
APPENDIX H

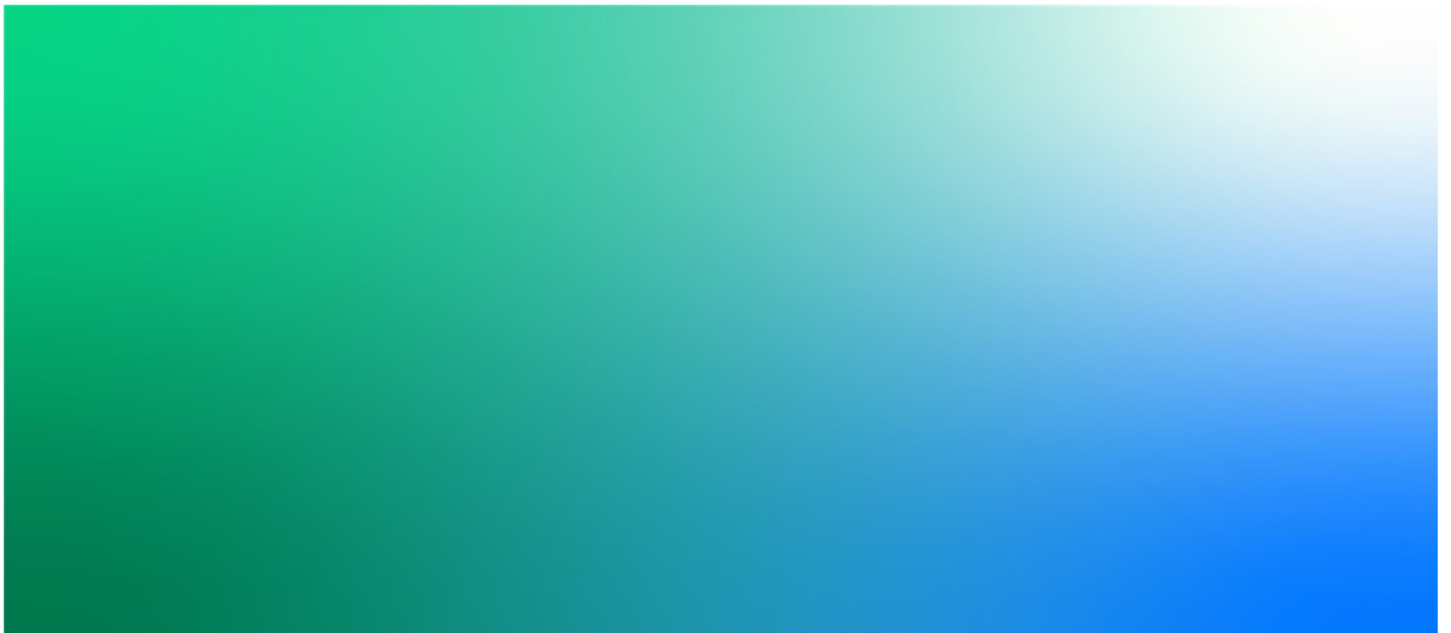
Air Quality and Greenhouse Gas Assessment



Hunter Valley Operations Continuation Project
Air Quality and Greenhouse Gas Assessment

Final | Revision 3
9 November 2022

HV Operations Pty Limited
EMM Consulting Pty Ltd



Hunter Valley Operations Continuation Project

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 Author: Shane Lakmaker
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Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 Level 4, 12 Stewart Avenue
 Newcastle West NSW 2302 Australia
 PO Box 2147 Dangar NSW 2309 Australia
 T +61 2 4979 2600
 F +61 2 4979 2666
 www.jacobs.com

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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
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Approval
DEC	Department of Environment and Conservation
DPE	Department of Planning and Environment (formerly Department of Planning, Industry and Environment or DPIE)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
GHG	Greenhouse gas
HVAS	High volume air sampler
HVO	Hunter Valley Operations
HVO Complex	Hunter Valley Operations North and South operations
HVO JV	Hunter Valley Operations Joint Venture comprising Glencore and Yancoal which own HVO and associated assets
Jacobs	Jacobs Group (Australia) Pty Limited
MIA	Mine Infrastructure Area
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
OEHS	Office of Environment and Heritage, now part of the Department of Planning, Industry and Environment as Environment, Energy and Science
PA	Project Approval
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	<i>Protection of the Environment Operations (POEO) Act 1997</i>
ROM	Run-of-mine
SSD	State Significant Development
TAPM	The Air Pollution Model – a meteorological and air dispersion model developed by CSIRO
TEOM	Tapered Element Oscillating Microbalance
TSF	Tailings storage facility
TSP	Total suspended particulate matter
VLAMP	Voluntary Land Acquisition and Mitigation Policy (NSW Government)

Executive Summary

HV Operations Pty Ltd (HVO) is proposing the continuation of open cut mining beyond the current approved extent, depth and life at the Hunter Valley Operations North and South mines (HVO Complex). The proposal is referred to as the HVO Continuation Project (the Project). Approval is sought under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report provides an assessment of the potential air quality and greenhouse gas impacts of the Project.

The air quality assessment involved identifying the key air quality issues, characterising the existing environment, quantifying emissions to air and modelling the potential impact of the Project on local air quality. The modelling was carried out in accordance with the assessment procedures prescribed by the NSW Environment Protection Authority (EPA). Greenhouse gas emissions were estimated in accordance with the principles of the Greenhouse Gas Protocol.

The key air quality issues were identified as construction dust, operational dust, operational post-blast fume and operational diesel exhaust. These issues were the focus of the assessment.

A detailed review of the existing environment was carried out including an analysis of historically measured concentrations of key quality indicators from representative monitoring stations. This review included an analysis of site-specific monitoring data. The following conclusions were made in relation to the existing environment:

- Meteorological conditions do not vary significantly from year to year, except for rainfall, and conditions in 2014 were identified as most representative of the long term, local conditions around the HVO Complex. Consideration of an alternative representative meteorological year did not change the assessment outcomes.
- Air quality conditions are strongly correlated to the climatic conditions. For example, there was a deterioration in air quality conditions between 2017 and early 2020 that were heavily influenced by drought, dust storms and bushfires. These conditions were not unique to the Hunter Valley.

The key outcomes of the modelling and subsequent assessment are:

- Construction activities have the potential to increase the overall dust emissions in the early phase of the Project (that is, first one to three years) but these increases are not of a magnitude that will change the air quality outcomes determined for private sensitive receptors from modelling of operational dust emissions. Nevertheless, appropriate management and monitoring would need to continue during the construction phase.
- Operational dust emissions due to the ongoing mining activities are not expected to cause adverse air quality impacts at the nearby local communities. Modelling potential impacts led to the following specific outcomes:
 - Maximum 24-hour average PM₁₀ concentrations would be within the range of historically measured days above the criteria, excluding extraordinary events. The review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations recorded between one and six days above the air quality criteria set by the EPA for project assessment purposes. Based on the modelling the Project is not anticipated to change this outcome. The potential for the Project activities to cause exceedances of the criteria can be managed through existing site air quality management measures and this approach has been successfully demonstrated by the site compliance history.
 - Annual average PM₁₀ concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights, however an increased air quality impact risk was identified for one property in Jerrys Plains (308) in the later years of the Project (around Year 11). The modelled non-compliance with EPA assessment criteria at this property was determined as “unlikely to eventuate” based on (1) historical monitoring in this area that show PM₁₀ concentrations 25% lower than the criteria (2) modelled maximum proposed coal extraction rates and (3) a conservative approach to modelling operational controls.

- Maximum 24-hour average PM_{2.5} concentrations would be within the range of historically measured days above the criteria, excluding extraordinary events. The review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations recorded between one and two days above the air quality criteria. Based on the modelling the Project is not anticipated to change this outcome.
 - Annual average PM_{2.5} concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights, however an increased air quality impact risk was identified for one property in Jerrys Plains (308) in the later years of the Project (around Year 11).
 - Annual average TSP concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights. That is, the Project would not be the cause of exceedances.
 - Annual average deposited dust levels would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights. That is, the Project would not be the cause of exceedances.
 - Dust concentrations and deposition levels would comply with NSW Government Voluntary Land Acquisition and Mitigation Policy criteria at all private sensitive receptors not subject to existing air quality acquisition rights however there is potential for criteria (annual average PM₁₀ and PM_{2.5}) to be exceeded on up to two privately owned properties.
- Operational post blast fume emissions are not expected to result in any adverse air quality impacts (as nitrogen dioxide and odour), based on modelling which showed compliance with EPA air quality assessment 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 EPA air quality assessment criteria.
 - The estimated annual average Scope 1 and 2 greenhouse gas emissions from the Project represent approximately 0.25% of Australia's 2020 emissions. Coal produced by HVO is predominantly exported to countries which are either signatories to the Paris Agreement and / or have announced or adopted domestic laws or policies to achieve their emissions targets. Whilst emissions from the end use of the coal have been calculated as Scope 3 emissions for the purposes of the Project assessment, the HVO customers account for these same emissions as Scope 1 emissions and are required to comply with their respective countries' emissions targets.
 - HVO is actively engaged in minimising greenhouse gas emissions associated with their coal operations and supporting the NSW Government objectives of net-zero emissions by 2050.
 - HVO will continue to implement air quality and greenhouse gas emission management measures that are consistent with best practice for the industry. In addition, the existing air quality trigger levels will be reviewed to make sure these will mitigate the potential air quality risks, particularly in the Jerrys Plains area.
 - A review of the existing air quality monitoring locations will be undertaken prior to the commencement of the Project to make sure that the monitoring network provides adequate coverage of the Project area and recognises the potential air quality impacts from this assessment. Any changes to the monitoring network will also be included in a revised Air Quality and Greenhouse Gas Management Plan.

The conclusions outlined above are consistent with the desired performance outcome for the Project which is to minimise air quality and greenhouse gas impacts to reduce risks to human health and the environment to the greatest extent practicable through the design, construction and operation of the Project.

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 and greenhouse gas impacts of the Hunter Valley Operations Continuation 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.

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1. Introduction

1.1 Background

Hunter Valley Operations Pty Ltd is proposing the continuation of open cut mining beyond the current approved extent, depth and life at the Hunter Valley Operations North and South mines (HVO Complex). The proposal is referred to as the HVO Continuation Project (the Project). Approval is sought under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This report provides an assessment of the potential air quality and greenhouse gas impacts of the Project.

1.2 Existing Operations

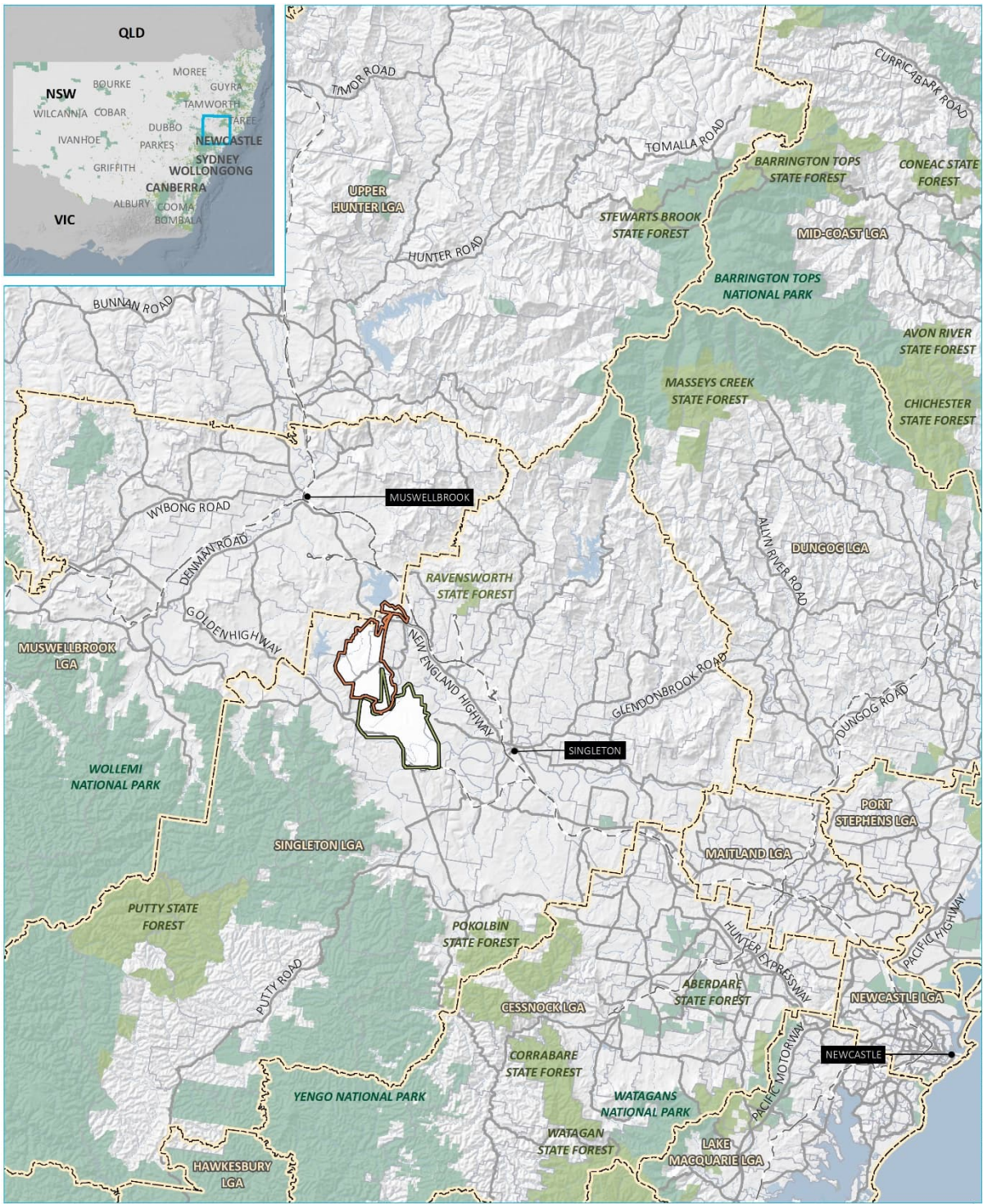
HVO is a multi-pit open cut mining complex approximately 24 kilometres (km) north-west of Singleton in the Hunter Valley of New South Wales (NSW) (**Figure 1**). HVO comprises two mine sites separated by the Hunter River, HVO North and HVO South. While the two mine sites are approved under separate development consents, they are operated as one complex with fully integrated environmental management systems.

The existing HVO North operation comprises the approved mining areas of West Pit, Mitchell Pit and Carrington Pit, as shown in **Figure 2**. It operates under development consent DA 450-10-2003 which allows extraction of up to 22 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 12 June 2025.

HVO South operates under Project Approval (PA) 06_0261 and comprises the approved mining areas of Riverview Pit and Cheshunt Pit, where mining activities currently take place, and the Riverview South East Extension and South Lemington Pits 1 and 2. PA 06_0261 allows the extraction of up to 20 Mtpa of ROM coal until 24 March 2030.

Mining across HVO is undertaken using dragline and truck and shovel methods. ROM coal from HVO North and South is currently processed at the Hunter Valley (HV) Coal Preparation Plant (CPP) and/or the Howick CPP (both at HVO North), from which product coal is predominantly transported via overland conveyor to the HV load point (HVLN) or Newdell LP and via rail to the Port of Newcastle for export. The Lemington CPP (LCPP) and associated rail loop, which is approved under PA 06_0261 and would process and rail coal from HVO South, is yet to be constructed.

HVO is owned by subsidiary companies of Yancoal and Glencore, as participants in the unincorporated HVO Joint Venture (JV). HV Operations Pty Ltd is the appointed manager of the JV.



Source: EMM (2022); HVO (2022); ABS (2021); DFSI (2020, 2021); GA (2011)

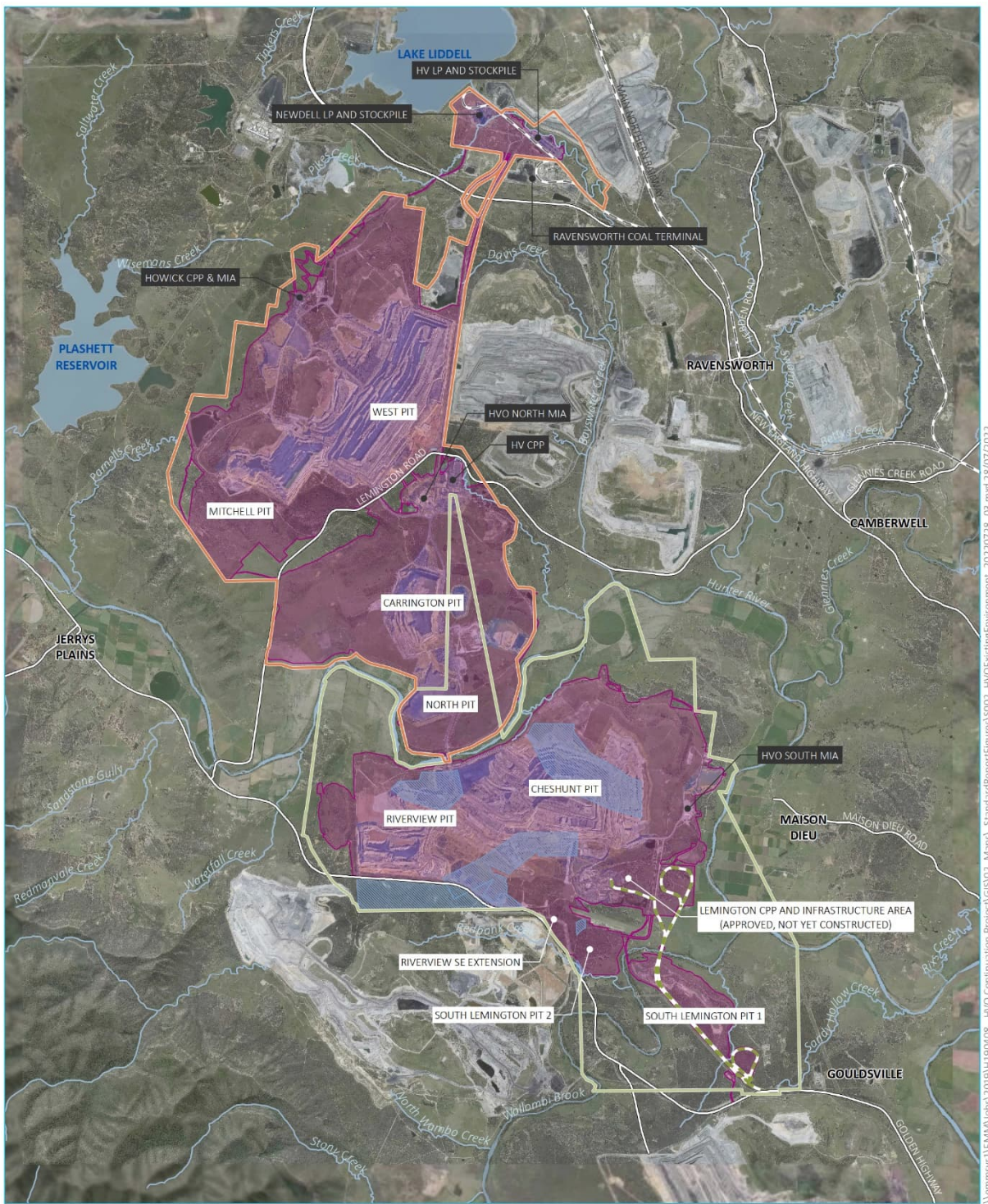
- KEY**
- Existing HVO North development consent boundary (DA 450-10-2003)
 - Existing HVO South project approval boundary (PA 06-0261)
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Suburb boundary
 - Local government area
 - NPWS reserve
 - State forest

Locality plan

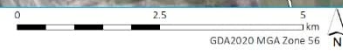
Hunter Valley Operations
HVO Continuation Project
Figure 1



Figure 1 Location of the HVO Complex



Source: EMM (2022); HVO (2022); ESRI (2022); DFSI (2017); GA (2011)



KEY

- | | |
|--|----------------------|
| Existing HVO North development consent boundary (DA 450-10-2003) | Existing environment |
| Existing HVO South project approval boundary (PA 06-0261) | Rail line |
| Existing and approved disturbance area | Major road |
| Approved highwall mining area | Named watercourse |
| South Lemington Rail Loop and haul route (approved, not yet constructed) | Named waterbody |

HVO existing environment

Hunter Valley Operations
HVO Continuation Project
Figure 2



Figure 2 Components of the existing HVO Complex

1.3 Project Description

The HVO Continuation Project (the Project) broadly comprises the continuation of the life of HVO North and HVO South, from the current approved mining completion dates of 2025 and 2030 respectively, to the end of 2050 at HVO North and 2045 at HVO South. The continuation of mining across the HVO Complex will increase resource recovery from the existing operation, predominantly by mining through previously mined areas and to the extent of existing mining tenements and extracting coal from deeper seams at HVO North.

At HVO South an extension to the life of the mine is proposed to facilitate improved mine sequencing outcomes and reduction in mining rate. The Project proposes a reduced mining footprint at HVO South compared to what is approved for extraction, with the previously approved coal extraction in the Riverview South East Extension area and South Lemington Pits 1 and 2 proposed to be removed from mine plan (and future approvals) for the Project. However, some rehabilitation works will be required to be undertaken in the South Lemington Pit 1 area, as part of the mine closure process. The approved shorter rail loop option associated with the LCPP has also been removed from the Project.

A number of infrastructure upgrades and changes are also required to facilitate the Project (and are included as part of it), including realignment of part of Lemington Road, relocation of transmission and telecommunication lines, an upgrade of the Newdell LP including construction of a new product stockpile and train loading bin, an upgrade of the HVLP product stockpile including an extension to the existing coal stockpile, and improvements to Lake James and Parnells Dam.

To enable the Project to proceed, two new State significant development (SSD) consents are required; one for HVO North and one for HVO South, under Part 4, Division 4.1 of the EP&A Act. The Project will seek to maintain separate development consents for HVO North and South, as is currently the case. Given that the two mine sites operate as one complex, one Environmental Impact Statement (EIS) has been prepared to support the two development applications required for the Project.

This air quality and greenhouse gas assessment forms part of the EIS and provides an assessment of the potential impacts of the Project. It also assesses the potential incremental impacts of the continuation of HVO North and HVO South given separate development consents are being sought for each operation. It documents the assessment methods and results, initiatives to avoid and minimise air quality and greenhouse gas impacts and additional mitigation and management measures proposed to address residual impacts not able to be avoided.

The project description is provided in Chapter 4 of the EIS (EMM, 2022). The key components of the Project as they relate to HVO North and HVO South are individually listed below. The proposed conceptual layout of the Project, inclusive of both HVO North and South, is provided in **Figure 3**.

The key changes proposed by the Project to the approved HVO North operations include:

- an extension to the life of the mine until the end of 2050;
- extraction of coal to the base of the Barrett seam across the HVO North mining area. Existing operations are approved to extract coal to the base of the Barrett seam in the West Pit; however, are only approved to the base of the shallower Bayswater seam in Carrington Pit;
- extraction of an additional approximate 400 Million tonnes (Mt) of run of mine (ROM) coal through the extraction of coal from deeper seams and a small increase in the mining extent (between the existing West and Mitchell Pits and Carrington Pit);
- infrastructure upgrades, as listed below:
 - realignment of Lemington Road and new bridge over the Hunter River. While the proposed realigned corridor is partly within the HVO South development consent boundary, the realignment is required to enable the progression of mining from the Mitchell and West pits into the Carrington area at HVO North. The works associated with the road realignment therefore form part of the HVO North Project;

- HVO North site access road relocation off the existing Lemington Road;
 - an increase in the capacity of Parnell's Dam from approximately 1 gigalitres (GL) to 4 GL;
 - realignment of transmission and telecommunication lines that are currently within the proposed mining footprint;
 - HVO North Mine Infrastructure Area (MIA) upgrade;
 - ancillary activities as required to facilitate operations;
 - access roads to facilitate service provider access;
 - use of demountable/temporary buildings in construction compounds as required;
 - upgrade of the existing Newdell LP train loading facility and construction of a new product stockpile; or
 - extension of the HVLP product coal stockpile, including the closure of a section of Liddell Station Road.
- coal haulage from the HVCPP to the Ravensworth ROM pad, via internal haul roads;
 - revised tailings management strategy;
 - amendments to the approved final landform;
 - progressive rehabilitation throughout the mine life; and
 - changes to the development consent boundary to incorporate the changes listed above.

Other than as set out above, all activities that are currently approved under the existing HVO North approval are intended to continue. Key aspects and outcomes of the approved development at HVO North that will remain the same under the Project include the following:

- the maximum allowable annual coal extraction and processing rate;
- annual operational workforce numbers and associated traffic generation;
- approved heights of overburden emplacement areas;
- receipt of ROM coal from HVO South via internal haul roads for processing at all CPP facilities approved for HVO North;
- continued avoidance of the Aboriginal heritage site known as Carrington Mine - Colluvial Deposit 1 (CM-CD1); and
- the ridge between Jerrys Plains and HVO North will remain, continuing to provide an effective amenity barrier.

The key changes proposed by the Project to the existing approved operations at HVO South include:

- an extension of the life of the mine until the end of 2045;
- a reduction in the approved maximum ROM coal extraction rate from 20 Mtpa to 18 Mtpa;
- changes to the approved mine sequencing (although noting that mining within the two primary open cut pits; Riverview and Cheshunt, will remain generally within the same footprint as approved);
- removal of coal extraction from the mine plan from the Riverview South East Extension, South Lemington Pit 1 and South Lemington Pit 2 mining areas;
- infrastructure upgrades and changes to that currently approved, as listed below:
 - removal of the LCPP short rail loop option;
 - removal of the approved conveyor from HVO South to the HVCPP at HVO North (the conveyor has not been constructed);
 - construction of the Cheshunt and Riverview flood protection levees;
 - realignment of transmission lines;

- enlargement of Lake James from approximately 0.7 GL to 2 GL;
- additional tailings pipelines and pumps;
- ancillary activities as required to facilitate operations;
- access roads to facilitate service provider access; and
- use of demountable/temporary buildings in construction compounds as required.
- revision and implementation of the tailings strategy; and
- amendments to final landform due to rescheduling and or infrastructure relocations, progressive rehabilitation will be undertaken throughout the mine life.

Other than as set out above, all activities that are currently approved under the existing HVO South approval are intended to continue. Key aspects of the approved development at HVO South that will remain the same under the Project include the following:

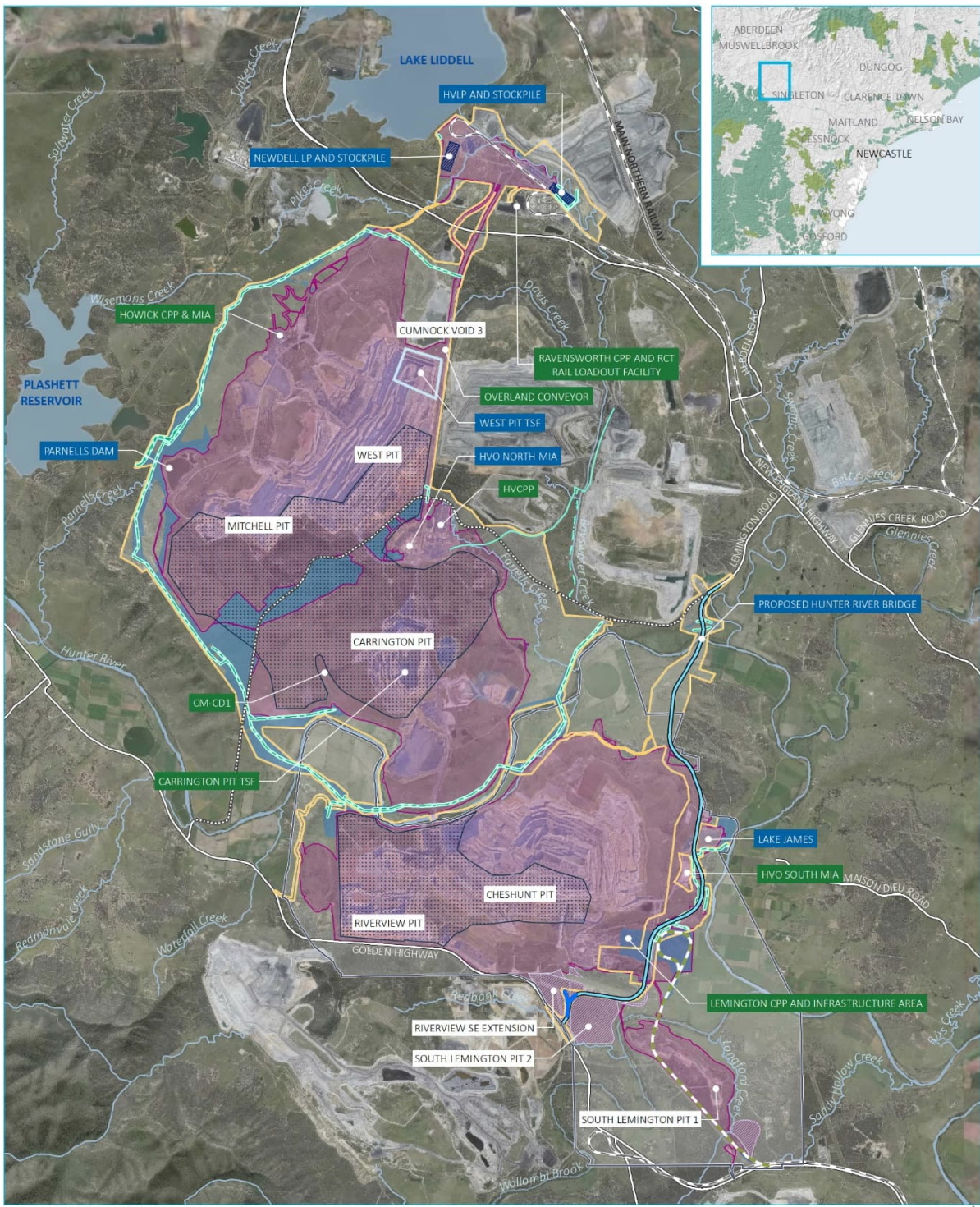
- the coal seams to be extracted (i.e. no increase in the depth of mining);
- the extent of approved mining areas within the Riverview and Cheshunt Pits;
- approved heights of overburden emplacement areas;
- construction of the LCPP and associated rail loop (long option only);
- transfer of coal from HVO South to HVO North for processing; and
- annual workforce numbers and associated traffic generation.

The following key terms are used throughout this assessment to describe the Project:

- **HVO Complex** – comprises both HVO North and HVO South operations.
- **The Project** – the Project in its entirety, encompassing the continuation of the life of the complex; ie, both HVO North and HVO South, within their respective proposed development consent boundaries, as illustrated in **Figure 3**.
- **Project Area** – The area that is the subject of the two development applications, ie, the proposed development consent boundary for HVO North and the proposed development consent boundary for HVO South.
- **Existing and approved disturbance area** – Areas that are disturbed and/or approved to be disturbed under the current development consents that apply to the HVO Complex.
- **Approved mining area** – The areas within the approved disturbance area that have been previously assessed and approved under the NSW EP&A Act for mining operations.
- **Additional disturbance area** – The areas that will be disturbed by the Project that are outside of the existing and approved disturbance area.
- **Proposed mining area, HVO North** – Areas where coal extraction will take place for the Project at HVO North and includes:
 - areas already disturbed by mining that will be re-disturbed to facilitate coal extraction in the deeper Barrett seam;
 - areas not previously approved for mining (eg the area between the Mitchell Pit and Carrington Pit); and
 - areas approved but not yet disturbed (eg the Carrington West Wing area).
- **Proposed mining area, HVO South** – Comprises the Riverview Pit and Cheshunt Pit, where coal extraction will continue under the Project, down to the Bayswater seam.
- **Areas not carried forward** – The HVO South proposed mining footprint does not include the previously approved South Lemington Pit 1, South Lemington Pit 2, or the Riverview South East Extension, as coal

extraction is not proposed in these areas as part of the Project. However, rehabilitation activities will be required in some areas and form part of the Project.

- **Transmission line corridors** – Two categories of transmission line corridors have been defined for the purpose of quantifying the extent of disturbance for the Project:
 - realigned transmission lines (ie new transmission line easements) – the extent of disturbance will be limited to transmission line poles/towers and an access road for maintenance along the alignment, as well as vegetation management to maintain safe powerline clearance; and
 - existing transmission line easements to be decommissioned – disturbance will be confined to existing access tracks and cleared areas.
- **Realigned Lemington Road corridor** – The corridor extends from the Comleroi Road intersection with the Golden Highway at the southern end of the new alignment, along the Comleroi Road alignment around the south-eastern side of HVO South, and then extends in a northerly direction to join the existing Lemington Road at a point approximately 2.3 km south of the New England Highway/Lemington Road intersection. The corridor also allows for two options with respect to the connection to the Golden Highway; one assuming that the Golden Highway is realigned by United Wambo as approved under SSD 7142, and a second option that connects with the current alignment of the Golden Highway.
- **Project disturbance area** – this area is a combination of the additional disturbance area and the existing and approved disturbance area, minus the areas not being carried forward by the Project.



Source: EMM (2022); HVO (2022); DFSI (2017, 2020)

KEY

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> HVO North proposed development consent boundary HVO South proposed development consent boundary Existing and approved disturbance area Previously approved area not retained Existing HVO elements to be maintained South Lemington Rail Loop (approved, not yet constructed) | <ul style="list-style-type: none"> Proposed HVO Continuation Project elements Lemington Road realignment Indicative location of public road closure Haul route to Ravensworth Operations Transmission line relocation Alternative Golden Highway intersection Proposed mining area Product stockpile Additional disturbance area West Pit TSF | <ul style="list-style-type: none"> Existing environment Rail line Major road Ravensworth Operations access road Named watercourse Named waterbody NPWS reserve (refer to inset) State forest (refer to inset) |
|---|--|---|

Project conceptual layout

Hunter Valley Operations
HVO Continuation Project
Figure 3



Figure 3 Proposed conceptual layout of the Project

1.4 Performance Outcome

The desired performance outcome for the Project relating to air quality and greenhouse gas is to minimise air quality and greenhouse gas impacts to reduce risks to human health and the environment to the greatest extent practicable through the design, construction, and operation of the Project.

1.5 SEARs and Relevant Guidelines

This air quality and greenhouse gas assessment has been prepared following the appropriate guidelines, policies and industry requirements, and following consultation with stakeholders including community members and relevant government agencies.

Guidelines and policies referenced in this assessment include:

- Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2022) (Approved Methods)
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA, 2022b)
- Coal Mine Particulate Matter Control Best Practice – Site Specific Determination Guideline (OEH, 2011)
- Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion in the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (TRC, 2011)
- National Greenhouse Accounts Factors (DISER, 2021)
- Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments 2018 (DPIE, 2018)

This assessment has also been prepared in accordance with requirements of the NSW Department of Planning and Environment (DPE). These were set out in the Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 11 March 2021. **Table 1** outlines the SEARs relevant to this assessment along with a reference to where these are addressed.

Table 1 SEARs relevant to air quality and greenhouse gas

Secretary's requirement	Where addressed in this report
Air quality – including:	
<ul style="list-style-type: none"> - a detailed assessment of potential construction and operational air quality impacts, in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, and with a particular focus on particulate matter (PM_{2.5} and PM₁₀) emissions, and having regard to the Voluntary Land Acquisition and Mitigation Policy; - Cumulative – including a detailed assessment of the cumulative impacts of the development, in combination with other existing and approved mining projects in the locality, with a particular focus on air quality, noise, traffic and social impacts, as well as impacts on water resources 	<p>Construction impacts are discussed in Sections 5.1 and 7.1.</p> <p>Operational impacts are discussed in Sections 5.2 to 5.4 and Sections 7.2 to 7.5 including assessment in accordance with the Approved Methods and assessment against the VLAMP.</p>
<ul style="list-style-type: none"> - an assessment of the likely greenhouse gas emissions of the development 	Greenhouse gas emissions are discussed in Sections 3.2, 4.4, 5.5, 8 and 9.5.

To inform the preparation of the SEARs, the DPE invited other government agencies to recommend matters to be addressed in the EIS. The NSW Environment Protection Authority (EPA) raised matters that are relevant to the air quality and greenhouse gas assessment. These matters raised are listed in **Table 2** and have been taken into account in preparing this assessment, as indicated in the table.

Table 2 Agency assessment recommendations relevant to air quality and greenhouse gas

Agency	Where addressed in this report
Environment Protection Authority	
<ul style="list-style-type: none"> - Identify the existing air quality environment and identify applicable air quality goals (i.e. ground level concentrations for pollutants and odour assessment criteria) in line with relevant guidance/standards; 	<p>Applicable criteria are outlined in Section 3.1. The existing environment is discussed in Section 4.</p>
<ul style="list-style-type: none"> - Identify potential air quality and odour sources and impacts (including point source emissions from any site-based plant and equipment and/or fugitive dust or other emissions) during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to minimise point and/or fugitive and/or odour emissions/impacts (with proposed timing), including monitoring, in line with relevant guidance/standards; and 	<p>Key air quality issues have been identified in Section 2. Sources and emissions have been identified in Section 5. Potential impacts have been discussed in Section 7. Monitoring and management measures are outlined in Section 9.</p>
<ul style="list-style-type: none"> - Include an emission inventory of all sources of air emissions. 	<p>Included in Appendix D</p>

1.6 Report Structure

The report is structured as follows:

- **Section 1** – Introduces the Project with a summary of the Project background, Project description, performance outcomes and SEARs.
- **Section 2** – Identifies the key air quality and greenhouse gas issues to be addressed.
- **Section 3** – Outlines the key 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 7** – Provides an assessment of the potential construction and operational air quality impacts including potential cumulative impacts.
- **Section 8** – Provides an assessment of the potential greenhouse gas emissions.
- **Section 9** – Outlines the measures to mitigate or otherwise effectively manage and monitor potential impacts.
- **Section 10** – Provides the conclusions of the assessment.

2. Key Issues

Air quality issues can arise when emissions from an industry or activity lead to deterioration in the ambient air quality. Potential air quality issues have been identified from a review of the Project 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 from the Project could occur from a variety of activities including material handling, material transport, processing and wind erosion from exposed areas. These emissions could occur in both the construction and operational phases of the Project.

The most commonly associated emission to air from open cut coal mining is 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 (PM₁₀)
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less (PM_{2.5})
- Deposited dust

Plant and equipment exhausts 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 (SO₂). Post-blast fume has the potential to generate NO_x emissions which, in turn, can oxidise to the more harmful and odorous nitrogen dioxide (NO₂). Spontaneous combustion of coal also has the potential to cause odour and visible smoke issues.

The area around HVO contains various emission sources that will influence the local air quality. Consequently the potential cumulative impacts are an important issue to address.

The key issues for construction will be:

- Emissions of particulate matter (TSP, PM₁₀, PM_{2.5} and deposited dust) including those from machinery exhausts
- Greenhouse gas emissions

The key issues for operation will be:

- Emissions of particulate matter (TSP, PM₁₀, PM_{2.5} and deposited dust)
- Post-blast fume (NO₂) and odour
- Diesel exhaust (PM₁₀, PM_{2.5} and NO₂)
- Odour and other substances, such as visible emissions or smoke / fine particulates, due to the potential spontaneous combustion of coal
- Greenhouse gas emissions

These issues 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 Project have been identified, from **Section 2**, as particulate matter in various forms and NO₂.

The existing development consents for HVO North (DA 450-10-2003) and HVO South (PA 06_0261) require HVO to “ensure that all reasonable and feasible mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances” of criteria for PM₁₀, PM_{2.5}, TSP and deposited dust. **Table 3** shows the existing development consent criteria. The existing Environment Protection Licence (EPL 640) for HVO does not include specific air quality limits but includes requirements to minimise dust emissions and to monitor air quality.

Table 3 Existing development consent criteria

Air quality indicator	Averaging time	^d Air quality criteria from DA 450-10-2003 (HVO North)	Air quality impact assessment criteria from PA 06_0261 (HVO South)
Particulate matter (PM ₁₀)	24 hour	^b 50 µg/m ³	^b 50 µg/m ³
	Annual	^a 30 µg/m ³	^{a d} 25 µg/m ³
Particulate matter (PM _{2.5})	24 hour	Nil	^b 25 µg/m ³
	Annual	Nil	^{a d} 8 µg/m ³
Particulate matter (TSP)	Annual	^a 90 µg/m ³	^{a d} 90 µg/m ³
^c Deposited dust	Annual (maximum increase)	^b 2 g/m ² /month	Nil
	Annual (maximum total)	^a 4 g/m ² /month	Nil

^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

^b Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

^c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed to by the Secretary.

The EPA has developed criteria for a range of air quality indicators including particulate matter and NO₂ that are used for the assessment of specific projects such as the HVO Continuation Project. These criteria are outlined in the “Approved Methods for the Modelling and Assessment of Air Pollutants in NSW” (EPA, 2022), 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 Environment Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPMs) (NEPC, 2021).

The Project 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 are outlined in **Table 4** and apply to existing and potentially 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 4 EPA air quality assessment criteria

Air quality indicator	Averaging time	Assessment criterion*
Particulate matter (PM ₁₀)	24-hour	50 µg/m ³
	Annual	25 µg/m ³
Particulate matter (PM _{2.5})	24-hour	25 µg/m ³
	Annual	8 µg/m ³
Particulate matter (TSP)	Annual	90 µg/m ³
Deposited dust	Annual (maximum increase)	2 g/m ² /month
	Annual (maximum total)	4 g/m ² /month
Nitrogen dioxide (NO ₂)	1-hour	164 µg/m ³
	Annual	31 µg/m ³

*Source: Table 11 of the Approved Methods.

The EPA air quality assessment criteria 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 needs to be made when using these criteria to assess the potential 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, 2022). **Section 4** provides further discussion of background levels.

In December 2015 the Australian Government announced a National Clean Air Agreement (Agreement). This Agreement aims to reduce air pollution and improve air quality via the following main actions:

- The introduction of emission standards for new non-road spark ignition engines and equipment.
- Measures to reduce air pollution from wood heaters.
- Strengthened ambient air quality reporting standards for particle pollution.

The strengthening of ambient air quality reporting standards for particle pollution is relevant to the Project. Specifically, and at the time, the following was agreed:

"Taking into account the latest scientific evidence of health impacts, Ministers agreed to strengthen national ambient air quality reporting standards for airborne fine particles. Ministers agreed to adopt reporting standards for annual average and 24-hour PM_{2.5} particles of 8 µg/m³ and 25 µg/m³ respectively, aiming to move to 7 µg/m³ and 20 µg/m³ respectively by 2025. Ministers also agreed to establish an annual average standard for PM₁₀ particles of 25 µg/m³. Victoria and the Australian Capital Territory will set, and South Australia will consider setting, a more stringent annual average PM₁₀ standard of 20 µg/m³ in the state, while ensuring nationally consistent monitoring and reporting against the agreed National Environment Protection Measure standards. The decision was also taken to review PM₁₀ standards in 2018. The review will be co-led by the NSW and Victorian governments, in discussion with other jurisdictions."

On 25 February 2016, an amendment to the Ambient Air Quality NEPM entered into force and introduced the new national air quality standards for PM₁₀ and PM_{2.5}, as noted above. The EPA subsequently revised its PM₁₀ and PM_{2.5} assessment criteria as part of an update to the Approved Methods. These revised criteria are reflected in **Table 4** and took effect from 20 January 2017 onwards. There is currently no State legislation regarding the aim to move to more stringent PM_{2.5} criteria by 2025. Accordingly, the Project is assessed against the current criteria detailed in the Approved Methods as these criteria would be applied by the consent authority in accordance with the provisions of Clause 12AB of the *State 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 assessment 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 5** at any residence or workplace on privately owned land.

Table 5 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

* 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 6** 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.

Table 6 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

* 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.

The particulate matter levels for comparison with the criteria in **Table 5** and **Table 6** must be calculated in accordance with the Approved Methods.

3.2 Greenhouse Gas

Greenhouse gases (GHG) is a collective term for a range of trace gases that are known to absorb terrestrial infrared radiation in the atmosphere, where they cause a planetary greenhouse effect. Global warming is warming of the atmosphere caused by increasing quantities of GHGs. GHGs include:

- Carbon dioxide (CO₂); by far the most abundant GHG, primarily released during fuel combustion.
- Methane (CH₄); generated from the anaerobic decomposition of carbon-based material (including enteric fermentation and waste disposal in landfills).
- Nitrous oxide (N₂O); 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 (SF₆); 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 carbon dioxide. 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 carbon dioxide and is known as the global warming potential (GWP). The resulting number is expressed as carbon dioxide equivalent (or CO₂-e).

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)¹ and can be summarised as follows:

- **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).

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.

¹ The Greenhouse Gas Protocol is a collaboration between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The Protocol provides guidance on the calculation and reporting of carbon footprints.

4. Existing Environment

This section provides a description of the environmental characteristics in the study area, including a review of recent and historical meteorological and ambient air quality conditions. In this context the study area has been defined by a 20 km by 22 km region that includes a range of industrial, farming, business, residential and other activities. **Figure 4** shows the study area extent as well as the location of the nearest local communities.

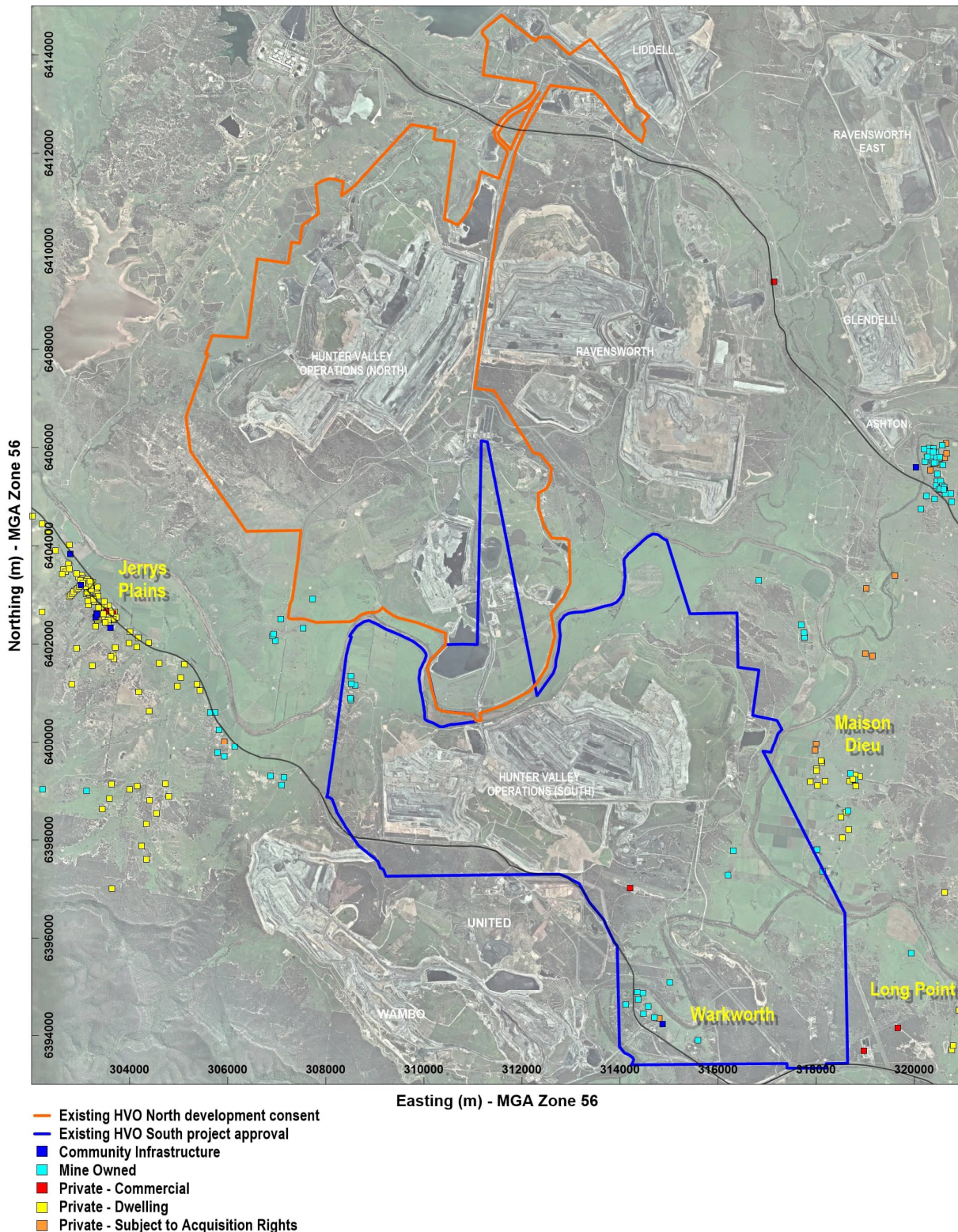


Figure 4 Study area extent and location of nearest local communities

4.1 Local Setting

The HVO Complex is located in a predominantly rural-residential area in the upper Hunter Valley of NSW, approximately 24 kilometres northwest of Singleton. The majority of the HVO Complex is located within the Singleton local government area (LGA) with a small, northern portion located within Muswellbrook LGA.

The HVO Complex is positioned near the floor of the Hunter Valley at elevations that range from approximately 50 to 200 metres (m) above sea level. The ranges of the Hunter Valley rise to over 700 m. **Figure 5** shows a pseudo three-dimensional representation of the local terrain.

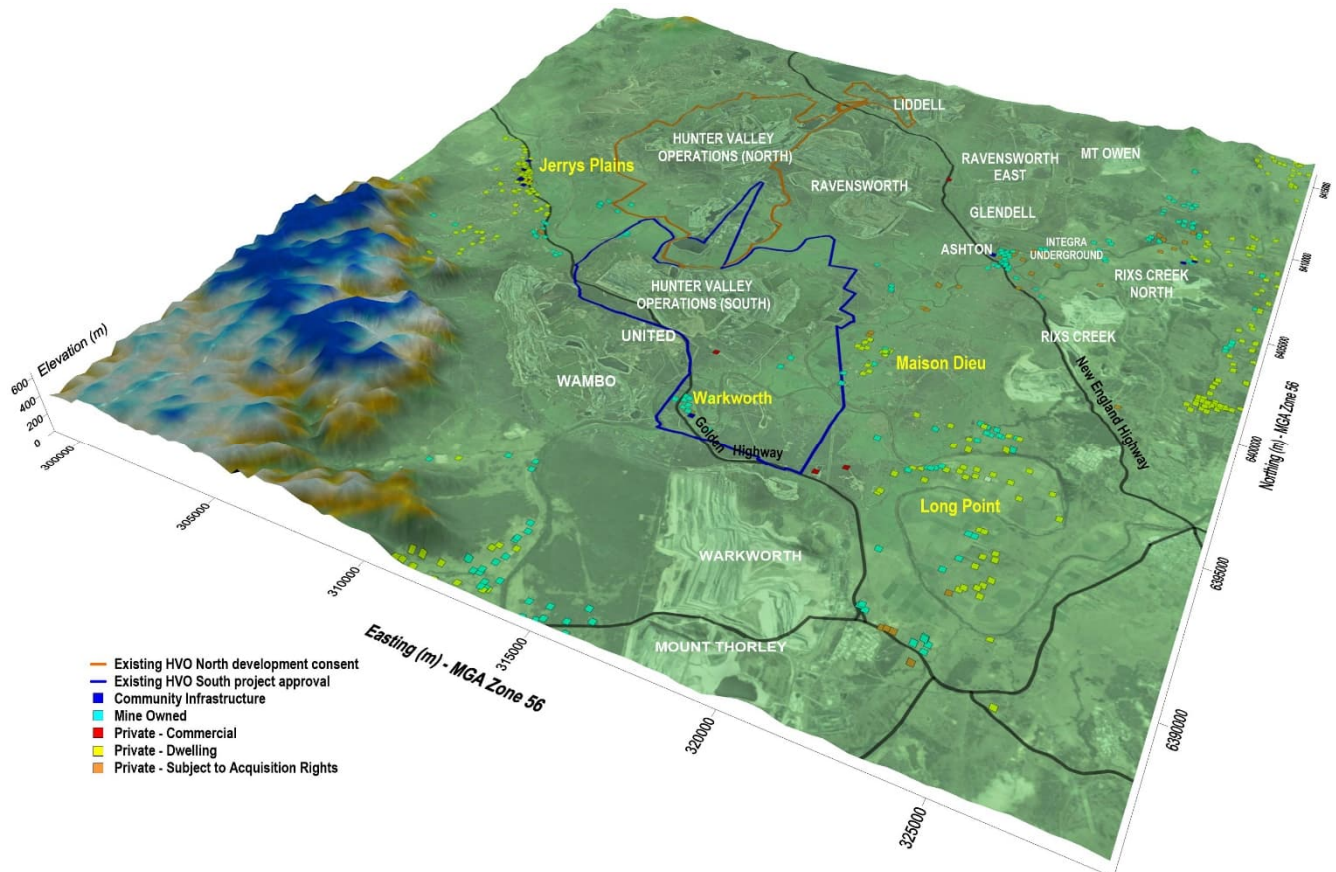


Figure 5 Pseudo three-dimensional representation of the local terrain

Main roads within the study area include the Golden Highway to the southwest and the New England Highway to the northeast. Local industry and agricultural activities include power stations, coal mines, cattle grazing, cropping, horse studs and wineries. The Hunter Valley Gliding Club is located near Warkworth, and neighbouring residential areas near the Project (**Figure 4**) include:

- Jerrys Plains
- Warkworth
- Maison Dieu
- Long Point

4.2 Meteorology

One of the objectives of this review was to develop an understanding of any existing air quality issues and to identify the main factors that have influenced air quality conditions. 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 the meteorological conditions around the HVO Complex and identifies the datasets that are representative of the long term, local conditions.

There is an extensive meteorological monitoring network in the Hunter Valley and most mining companies are required to operate at least one meteorological station as part of their development consent. HVO operates two meteorological stations, referred to as "HVO Corporate" and "Cheshunt". The DPE also conducts meteorological monitoring in the Hunter Valley as part of their Upper Hunter Air Quality Monitoring Network. **Figure 6** shows the location of the HVO and DPE meteorological stations.

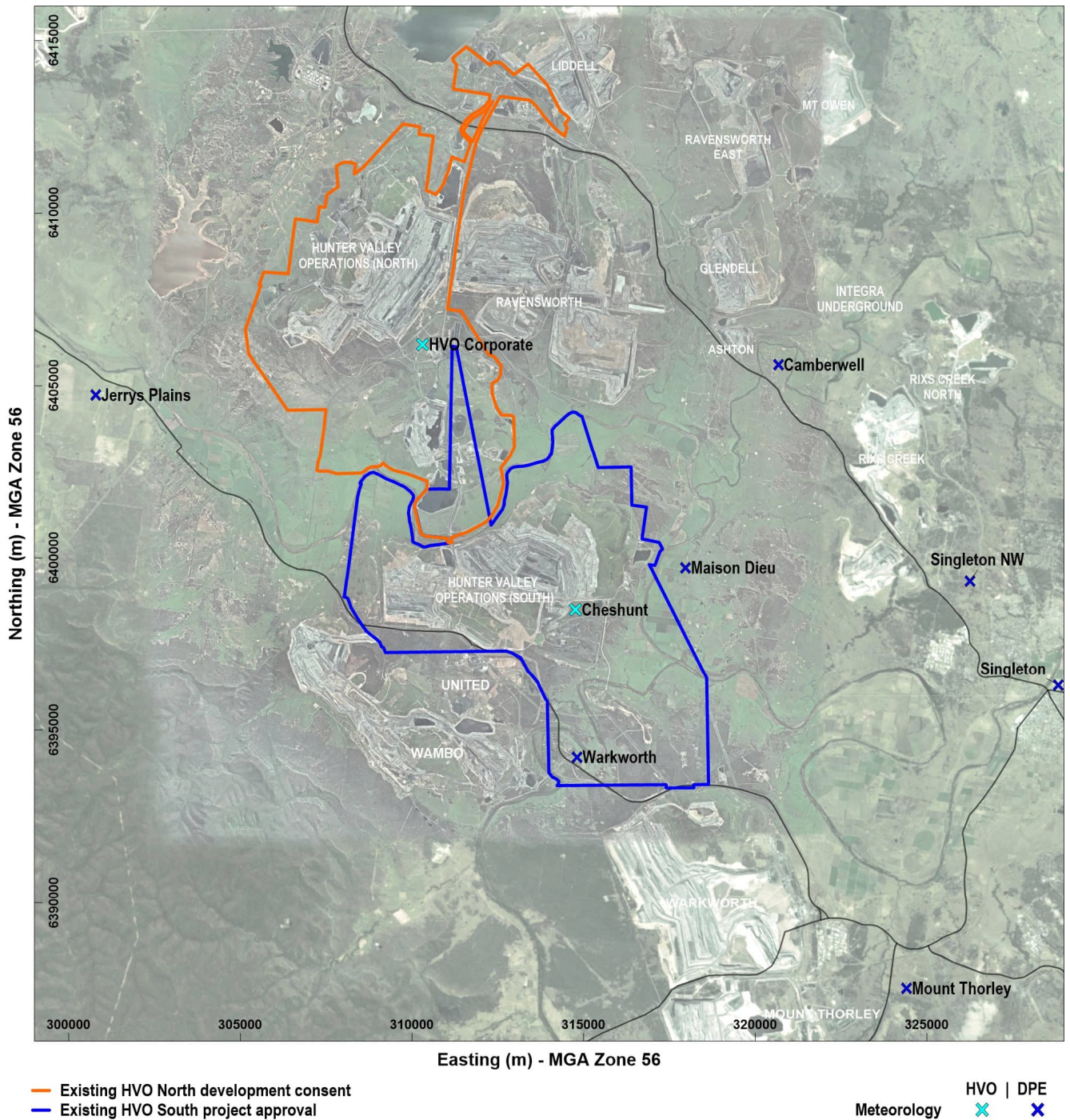


Figure 6 Location of meteorological stations

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, with analysis of a minimum five years or records, the data adequately describe the expected meteorological conditions at the site of interest. From the EPA descriptions (EPA, 2022) there will be multiple meteorological stations collecting data that can be classified as representative of conditions around the HVO Complex.

Data from the two HVO meteorological stations, Corporate and Cheshunt, have been analysed in order to characterise the local conditions and to identify representative datasets. A minimum five years of data is required by the EPA (2022) however this assessment has considered all available data, eight years in total, to provide additional coverage of potential variations. The analysis involved comparing statistics from the data collected at each station for each calendar year to determine a year-long dataset that most closely reflects the longer term, local conditions. Wind data were primarily used for this purpose although rainfall data have also been considered.

Wind-roses have been prepared from the data collected at the Corporate and Cheshunt stations in the most recent eight year period (2013 to 2020 inclusive). The wind-roses (**Figure 7** and **Figure 8**) show the frequency of wind speeds and wind directions based on hourly records for each location. 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 the area are from the southeast and west to northwest. This pattern of winds is common for many parts of the Hunter Valley and reflects the northwest-southeast alignment of the valley. There are seasonal variations in the wind patterns, not shown by **Figure 7** and **Figure 8**, but various other studies (for example Jacobs, 2019) as well as **Appendix A** show that winds in summer are typically from the southeast and winds in winter are typically from the northwest. It is also clear from **Figure 7** and **Figure 8** that, for both locations, the wind patterns were similar across all eight years of data presented. This suggests that wind patterns do not vary significantly from year to year, and potentially the data from any of the years presented could be considered as representative of the longer-term conditions.

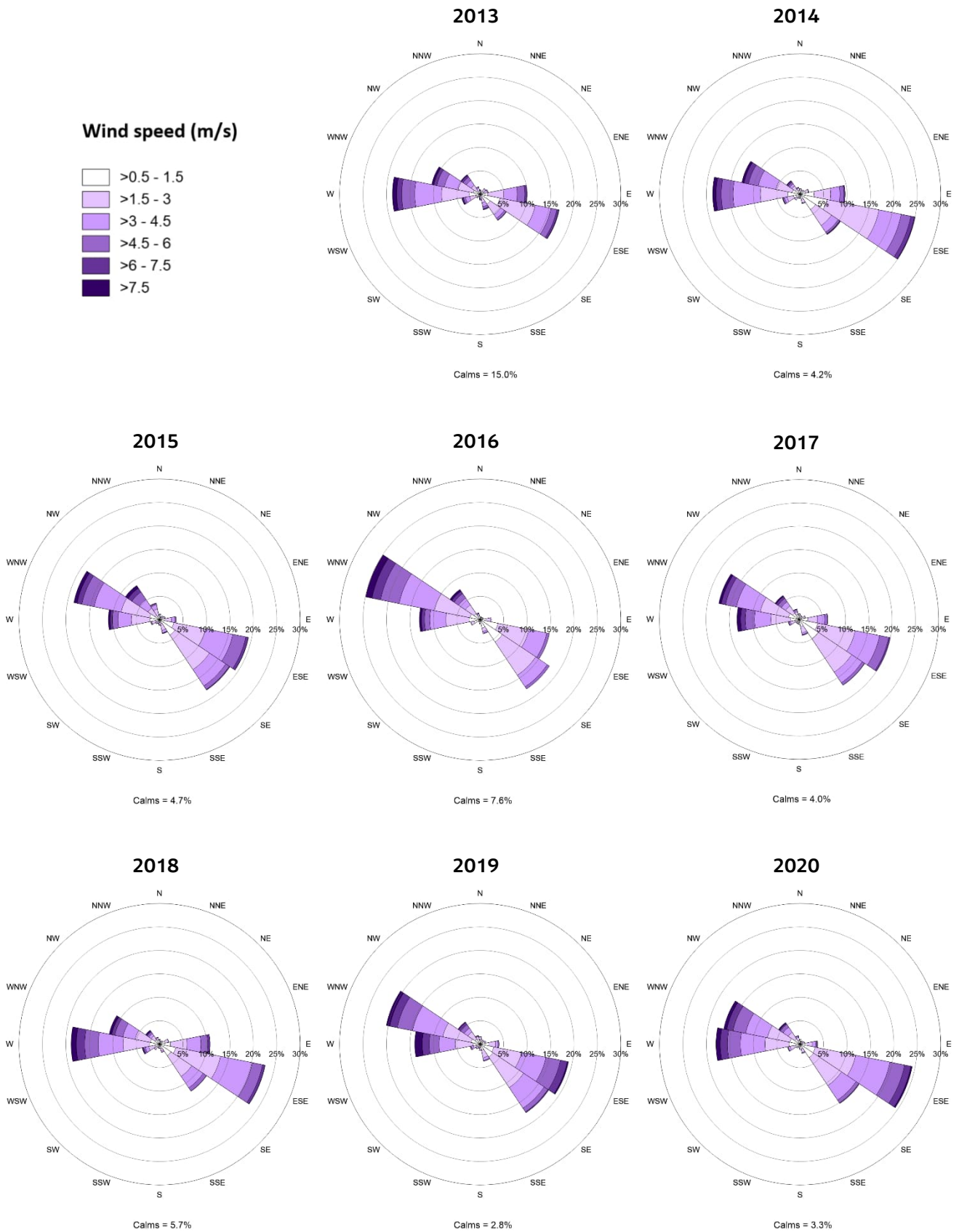


Figure 7 Annual wind-roses for data collected at the HVO Corporate meteorological station

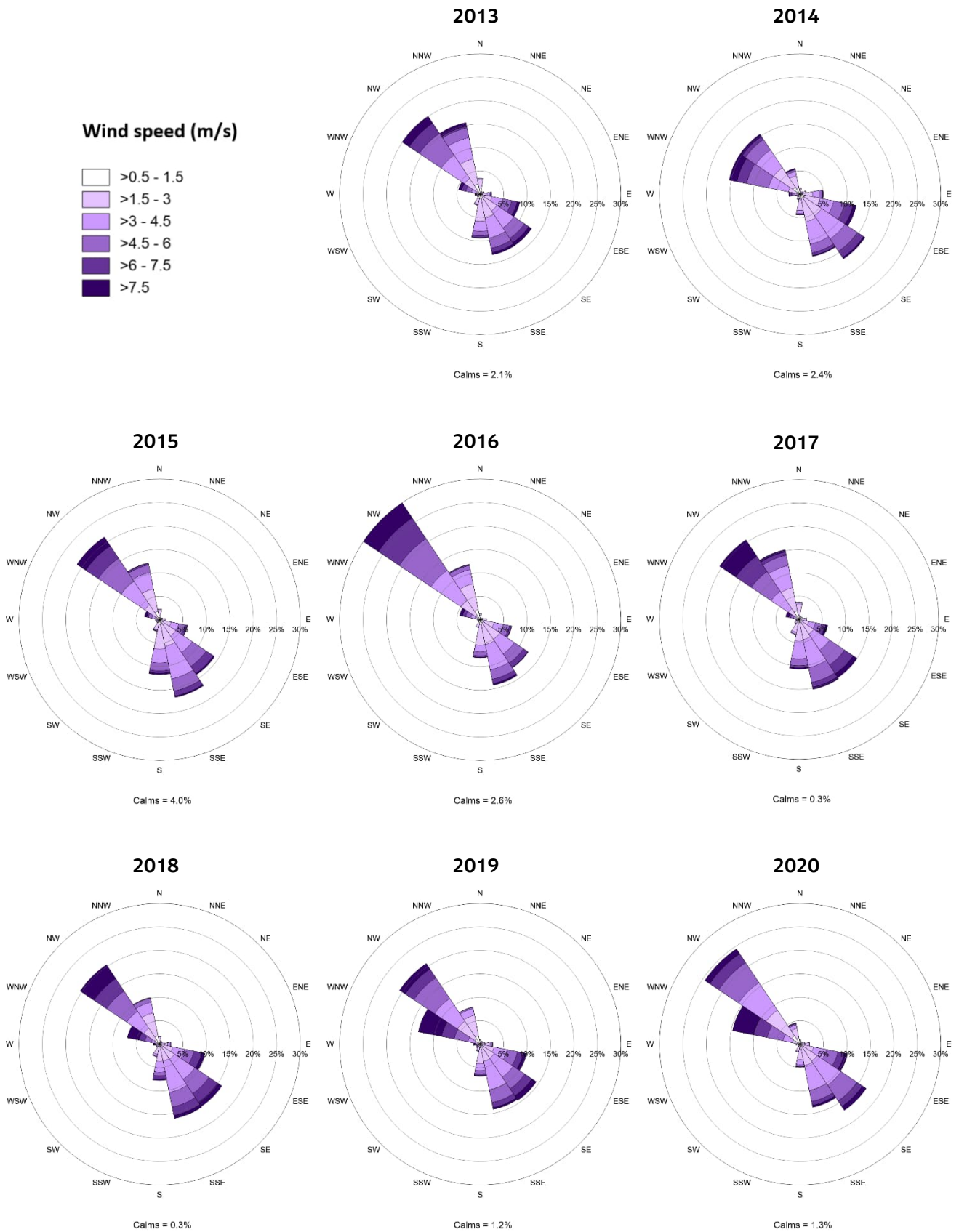


Figure 8 Annual wind-roses for data collected at the Cheshunt meteorological station

Figure 9 shows the hourly wind speed data from HVO Corporate and Cheshunt meteorological stations (some data gaps were observed due to logging issues). These data show that wind speeds are generally lower in autumn and higher in spring with maximum wind speeds reaching around 12 to 14 metres per second. Rainfall data have also been presented. The rainfall data show the effect of the drought from 2017 to 2019, with annual rainfall at least 30 per cent lower than the long-term average of 662 mm (based on 61 years of data collected by the Bureau of Meteorology between 1959 to 2020). Repository issues led to some data gaps in 2015 and 2016.

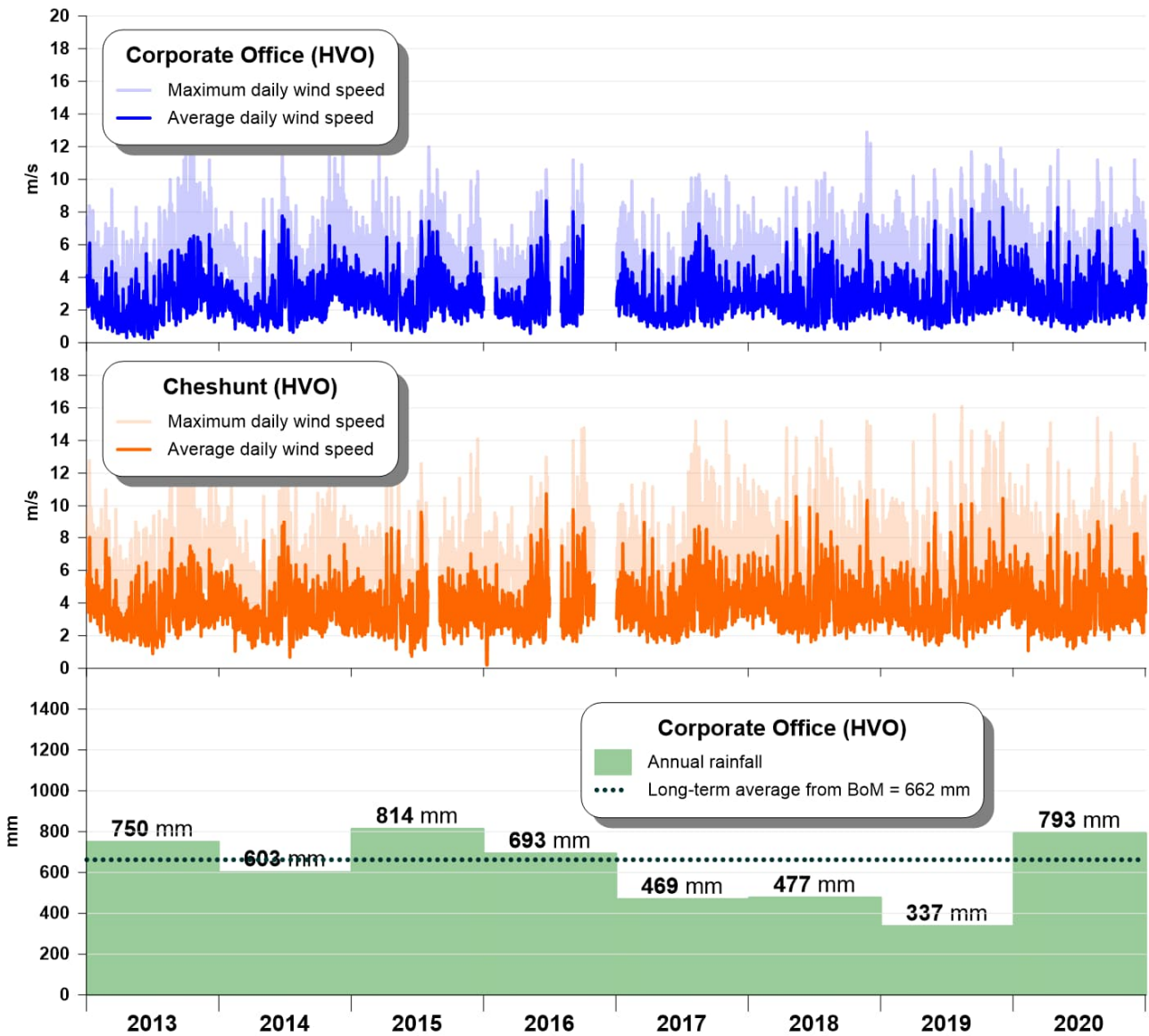


Figure 9 Wind speed and rainfall data collected between 2013 and 2020

Table 7 provides annual wind statistics for the 2013 to 2020 calendar years. The Cheshunt meteorological station recorded higher wind speeds than the HVO Corporate station due to its more exposed location and higher elevation. The only unusual statistic was the percentage of calms at HVO Corporate in 2013; around three times higher than subsequent years. Some data gaps also existed in the 2016 records due to repository issues.

Table 7 Statistics from meteorological data collected between 2013 and 2020

Statistic	2013	2014	2015	2016	2017	2018	2019	2020	2013-2020
Percentage complete (%)									
HVO Corporate	99	100	100	58	100	100	100	99	94
Cheshunt	100	100	91	75	100	100	99	99	95
Mean wind speed (m/s)									
HVO Corporate	2.6	2.7	2.9	2.6	2.7	2.8	3.1	3.0	2.8
Cheshunt	3.7	3.6	3.7	3.8	4.1	4.2	4.2	4.1	3.9
Percentage of calms (<= 0.5 m/s)									
HVO Corporate	15.0	4.2	4.7	7.6	4.0	5.7	2.8	3.3	5.8
Cheshunt	2.1	2.4	4.0	2.6	0.3	0.3	1.2	1.3	1.7
Percentage of wind speeds >6 m/s									
HVO Corporate	5.5	5.3	5.3	5.4	4.7	6.1	8.4	6.9	6.0
Cheshunt	13.4	11.8	12.1	15.7	17.6	20.3	19.0	17.5	16.0
Rainfall (mm)									
HVO Corporate	750	603	814	693	469	477	337	793	

Data from the 2014 calendar year have been identified as being representative of the long term, local conditions around the HVO Complex and suitable for informing the air quality impacts of the Project. This outcome was based on HVO Corporate and Cheshunt data that showed:

- High data capture rate (i.e. 100%), meeting the EPA's requirement for a minimum 90% complete dataset.
- Similar wind patterns to other years.
- Rainfall near the long-term average, and closest to the long-term average of all other years assessed.
- Availability of concurrent air quality monitoring data.

Section 4.3 also shows that air quality conditions in 2014 were similar to other years and not adversely influenced by bushfire activity or extreme conditions. Methods used for incorporating the 2014 data into modelling for the Project are discussed in detail in **Section 5**. Annual and seasonal wind-roses from data collected at HVO Corporate and Cheshunt in 2014 are provided in **Appendix A**.

4.3 Air Quality

There is an extensive air quality monitoring network in the Hunter Valley and most mining companies are required to operate multiple monitoring stations as part of their development consent. The DPE also conducts monitoring as part of their Upper Hunter Air Quality Monitoring Network. This section examines the recent and historical air quality conditions around the HVO Complex and establishes the appropriate background levels to be considered for assessment of the Project.

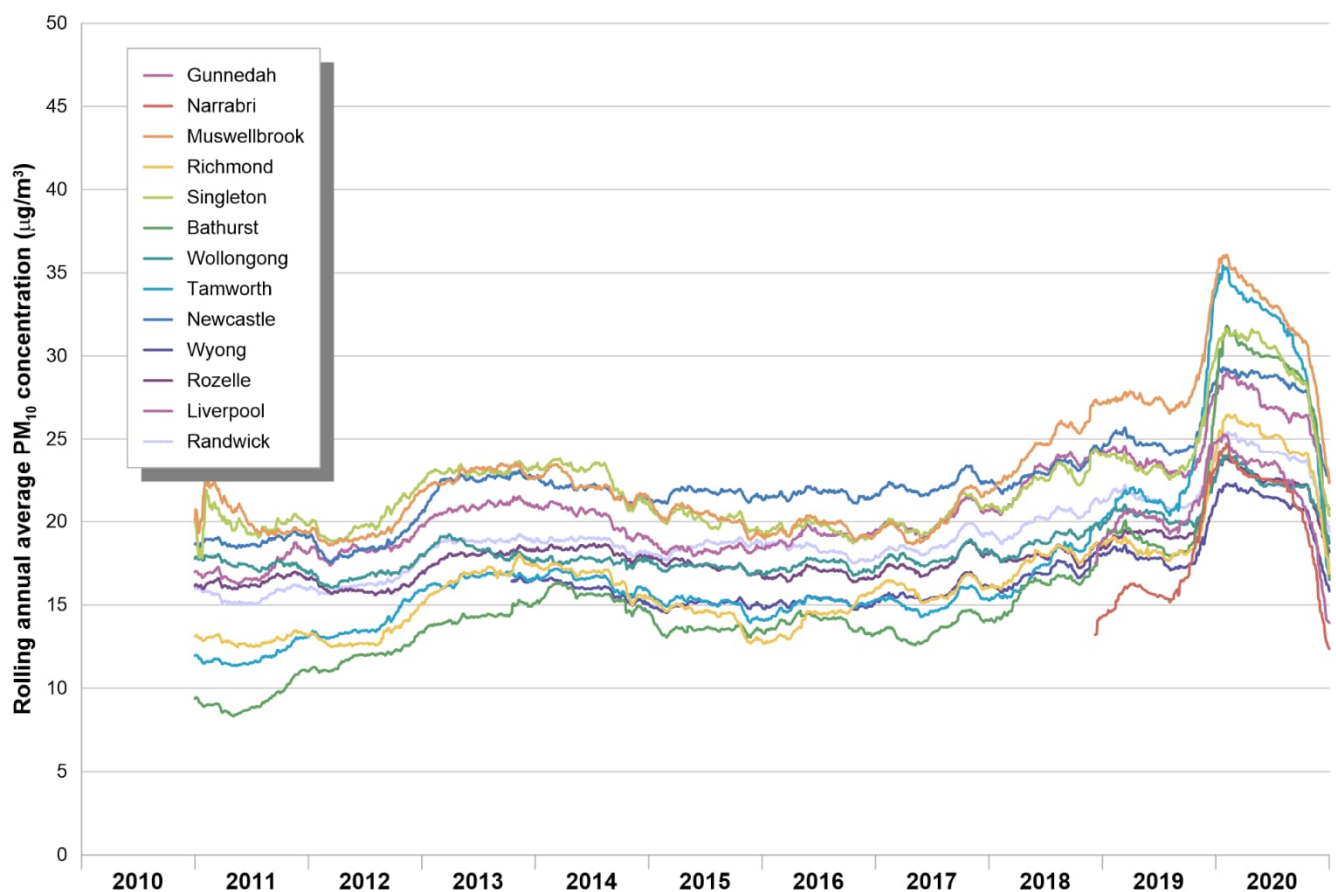
It should be noted that air quality monitoring data represent the contributions from all sources that have at some stage been upwind of each monitor. In the case of particulate matter (as PM₁₀) for example, a measurement may contain contributions from many sources such as from mining activities, construction 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.

4.3.1 Extraordinary Events

Air quality in many parts of NSW, including the Hunter Valley, was adversely influenced by drought conditions between 2017 and early 2020 with lower than average rainfall. A deterioration in air quality conditions in recent years was not unique to the Hunter Valley and extraordinary events, beyond normal conditions, have been identified as part of annual reviews of monitoring data.

In their “Annual Air Quality Statement 2018” the DPE concluded that particle levels increased across NSW due to dust from the widespread, intense drought and smoke from bushfires and hazard reduction burning (OEH, 2019). The DPE subsequently concluded, from their “Annual Air Quality Statement 2019”, that air quality in NSW was greatly affected by the continuing intense drought conditions and unprecedented extensive bushfires during 2019. In addition, the continued “intense drought has led to an increase in widespread dust events throughout the year” (DPIE, 2020).

The influence of drought conditions on air quality is evident in the DPE’s monitoring data. **Figure 10** shows the rolling annual average PM₁₀ concentrations from data collected at various rural and urban air quality monitoring sites since 2011. These data clearly show an increase in PM₁₀ concentrations at all rural and urban locations from 2017 onwards, reflecting the onset of drought conditions, and increased bushfire activity in 2019 and into early 2020.



Source: <https://www.dpie.nsw.gov.au/air-quality/air-quality-data-services/data-download-facility>

Figure 10 Annual average PM₁₀ concentrations from various NSW air quality monitoring sites

Table 8 identifies the numbers of days identified by the DPE as extraordinary events from 2013 to 2020. This information shows that there was an increase in the number of extraordinary (air quality related) events from 2017 through to 2020. These conditions were particularly evident in late 2019 and early 2020 due to a period of unprecedented bushfires in Australia, predominantly across southeast Australia, but also affecting a reported 4 million hectares of land in NSW since early November 2019. The bushfires adversely affected air quality across

many parts of NSW and a total of 66 days in 2019 were subsequently declared as extraordinary events by the DPE.

Table 8 Days declared as extraordinary events

Year	Number of days identified by the DPE as extraordinary events
2013	6
2014	1
2015	4
2016	1
2017	7
2018	15
2019	66
2020	24

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 possible 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.

4.3.2 Particulate Matter (as PM₁₀)

Air quality criteria for PM₁₀ are usually set to protect against adverse health impacts. HVO has a network of PM₁₀ monitors near the HVO Complex to assist with operations management and to determine ongoing compliance with the HVO North development consent and HVO South project approval. Monitoring of PM₁₀ is required under EPL 640 and the DPE also monitors PM₁₀ as part of their Upper Hunter Air Quality Monitoring Network. **Figure 11** shows the HVO and DPE monitoring locations.

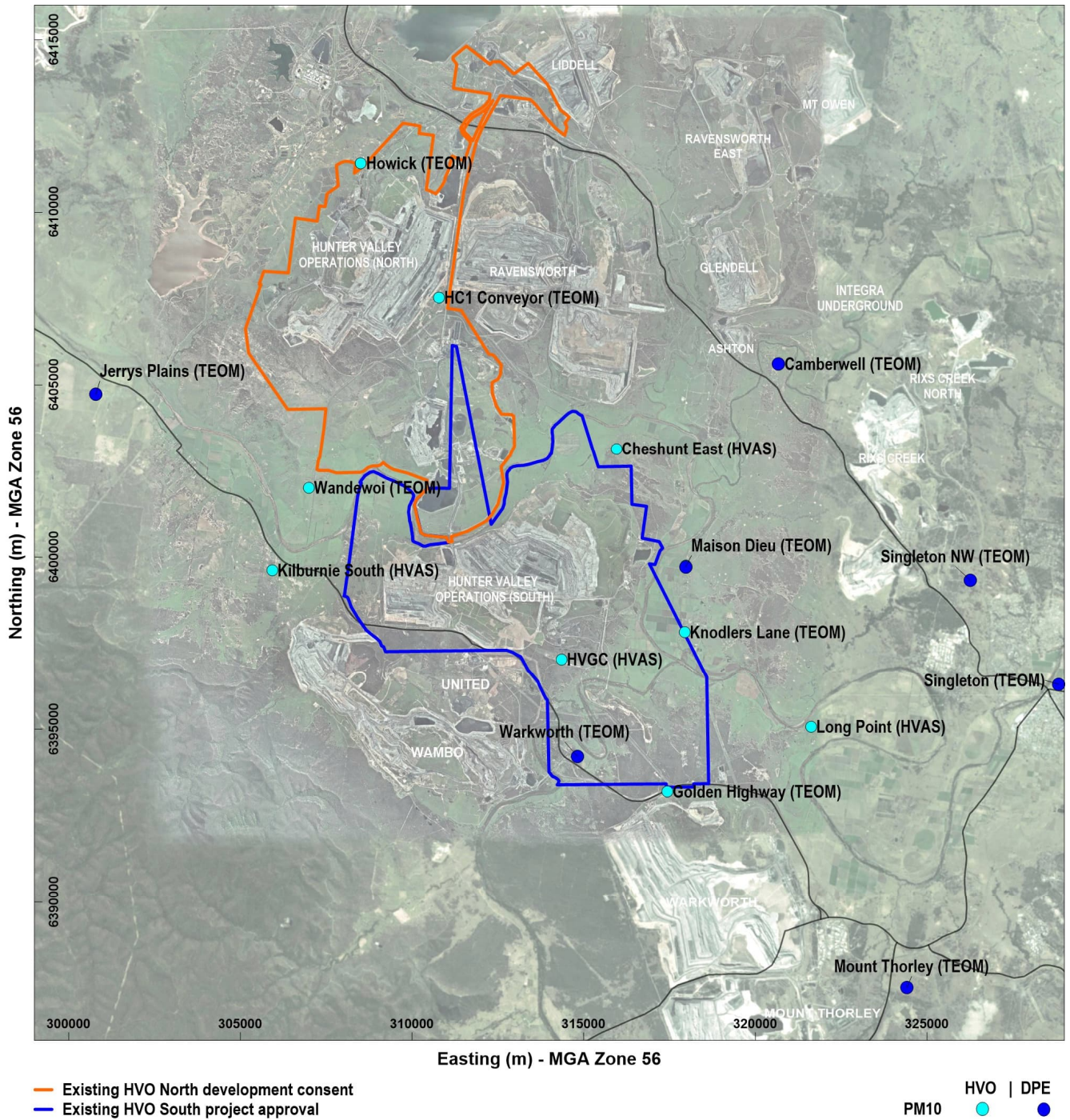


Figure 11 Location of PM₁₀ monitors

The monitors that are most representative of the nearest neighbouring residential areas are:

- Jerrys Plains (DPE)
- Kilburnie South (HVO)
- Knodlers Lane (HVO)
- Long Point (HVO)
- Maison Dieu (DPE)
- Warkworth (DPE)

Figure 12 shows the measured 24-hour average PM₁₀ concentrations from each representative monitoring site for data collected between 2013 and 2020. It is important to note that **Figure 12** shows the EPA criterion that will be used to assess the Project not the criteria from the HVO North development consent and HVO South project approval. As noted in **Section 3.1** the EPA assessment criteria for PM₁₀ relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from Project-specific sources. The PM₁₀ criteria in the HVO North development consent and HVO South project approval relate to the increment of the development. The Annual Reviews explain any data gaps and provide the assessments of the monitoring data against the HVO North development consent and HVO South project approval.

Table 9 provides a summary of all data and **Appendix B** provides additional analysis including discussion of the conditions that have influenced the measured concentrations.

The data can be summarised as follows:

- PM₁₀ concentrations increased from 2017 to 2020 coinciding with drought conditions and lower than average rainfall. These conditions led to increases in the number of days when the 24-hour average PM₁₀ concentration exceeded 50 µg/m³ (the EPA assessment criterion) and increases in the annual average PM₁₀ concentrations. The increases in PM₁₀ concentrations were not unique to the Hunter Valley.
- There are seasonal variations with higher PM₁₀ concentrations generally occurring in the warmer months.
- There are diurnal variations with higher PM₁₀ concentrations generally occurring in the morning (around 9 am) and evening (around 7 pm).
- Each location is unique in terms of the wind directions that are associated with higher PM₁₀ concentrations.

The PM₁₀ monitoring data are reviewed by HVO as part of annual reporting and with consideration of extraordinary events, as outlined in **Section 4.3.1**. These reviews have shown that HVO has complied with the PM₁₀ criteria specified in the HVO North development consent and HVO South project approval over the last nine years (2013 to 2021) except on three occasions; the Hunter Valley Gliding Club (29 July 2017), Knodlers Lane (28 July 2021) and Cheshunt East (12 September 2021).

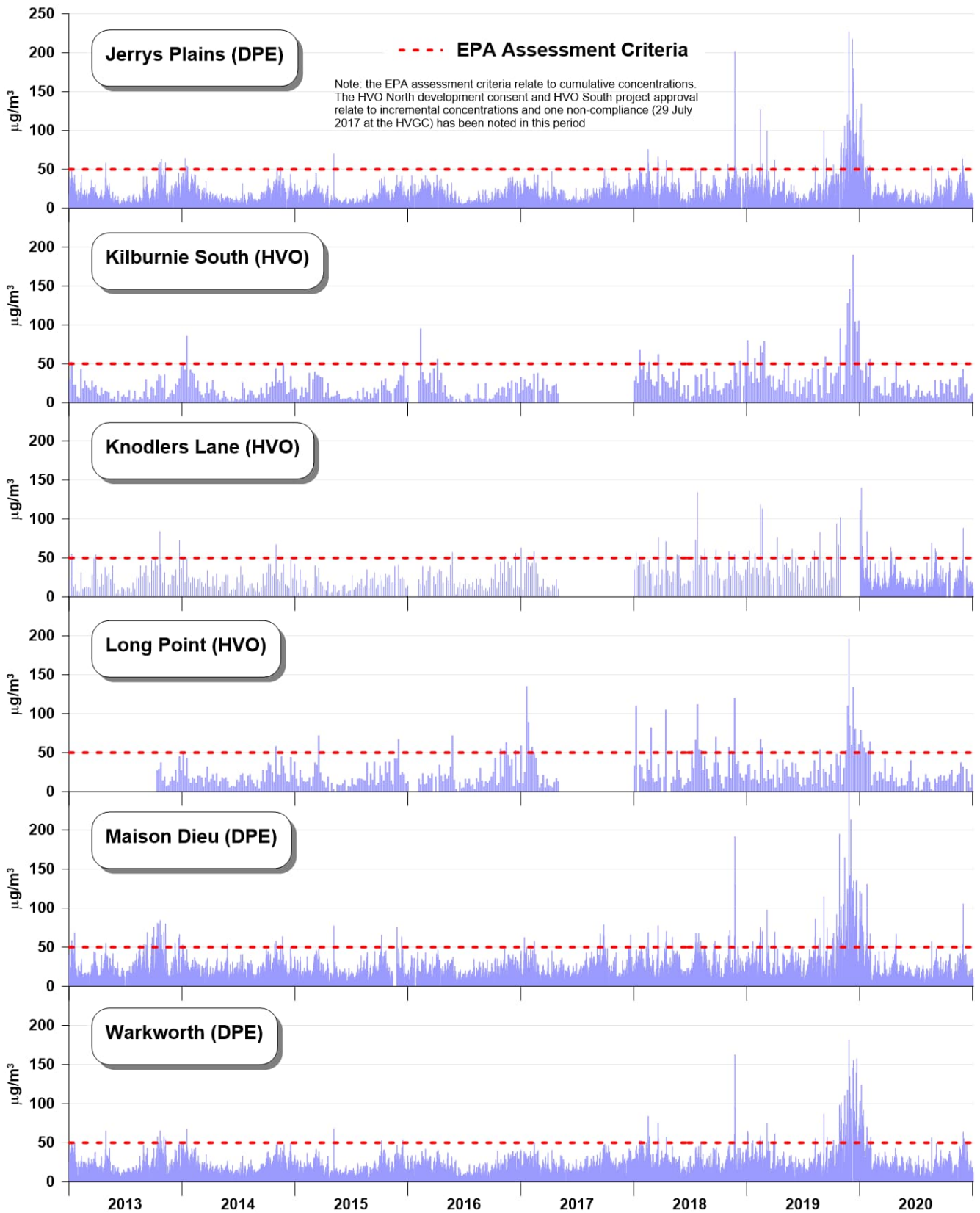


Figure 12 Measured 24-hour average PM₁₀ concentrations

Table 9 Summary of measured PM₁₀ concentrations

Year	Jerrys Plains	Kilburnie South	Knodlers Lane	Long Point	Maison Dieu	Warkworth	EPA assessment criterion	DA 450-10-2003 / PA 06_0261
Maximum 24-hour average in µg/m ³								
2013	63	52	84	45	84	65	50	^b 50 / ^b 50
2014	64	86	67	58	64	68	50	^b 50 / ^b 50
2015	70	53	41	72	77	68	50	^b 50 / ^b 50
2016	43	95	63	72	48	42	50	^b 50 / ^b 50
2017	51	38	58	135	79	51	50	^b 50 / ^b 50
2018	201	68	134	120	192	162	50	^b 50 / ^b 50
2019	227	190	118	134	446	182	50	^b 50 / ^b 50
2020	135	56	140	79	131	124	50	^b 50 / ^b 50
Number of days above 50 µg/m ³								
2013	6	1	5	0	28	8	-	-
2014	6	1	1	2	6	2	-	-
2015	1	1	0	2	5	3	-	-
2016	0	2	4	6	0	0	-	-
2017	1	0	2	3	9	1	-	-
2018	11	4	14	12	23	15	-	-
2019	54	14	12	10	66	57	-	-
2020	18	3	11	5	18	18	-	-
Annual average in µg/m ³								
2013	19	16	25	21	26	21	30	^a 30 / ^a 30
2014	18	19	22	20	23	21	30	^a 30 / ^a 30
2015	15	16	17	19	20	18	30	^a 30 / ^a 30
2016	17	17	23	21	20	19	30	^a 30 / ^a 30
2017	18	20	25	30	23	22	25	^a 30 / ^a 30
2018	24	27	37	33	28	26	25	^a 30 / ^a 25
2019	32	42	42	31	38	33	25	^a 30 / ^a 25
2020	21	20	22	21	23	24	25	^a 30 / ^a 25

^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

^b Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

4.3.3 Particulate Matter (as PM_{2.5})

Air quality criteria for PM_{2.5} are usually set to protect against adverse health impacts. Historically the closest monitoring stations to the HVO Complex that measure PM_{2.5} have been located at Camberwell and Singleton. Both of these stations are operated by the DPE. There has however been an increase in the number of PM_{2.5} monitoring stations near the HVO Complex. HVO commenced monitoring of PM_{2.5} using high volume air samplers at Kilburnie South and Maison Dieu in September 2019 following approval of PA 06_0261 Modification 5. The United Wambo JV also commenced monitoring of PM_{2.5} using beta attenuation monitors in June 2020 at two locations referred to as Kelly and Thelander. **Figure 13** shows the HVO, DPE and United Wambo JV monitoring locations.

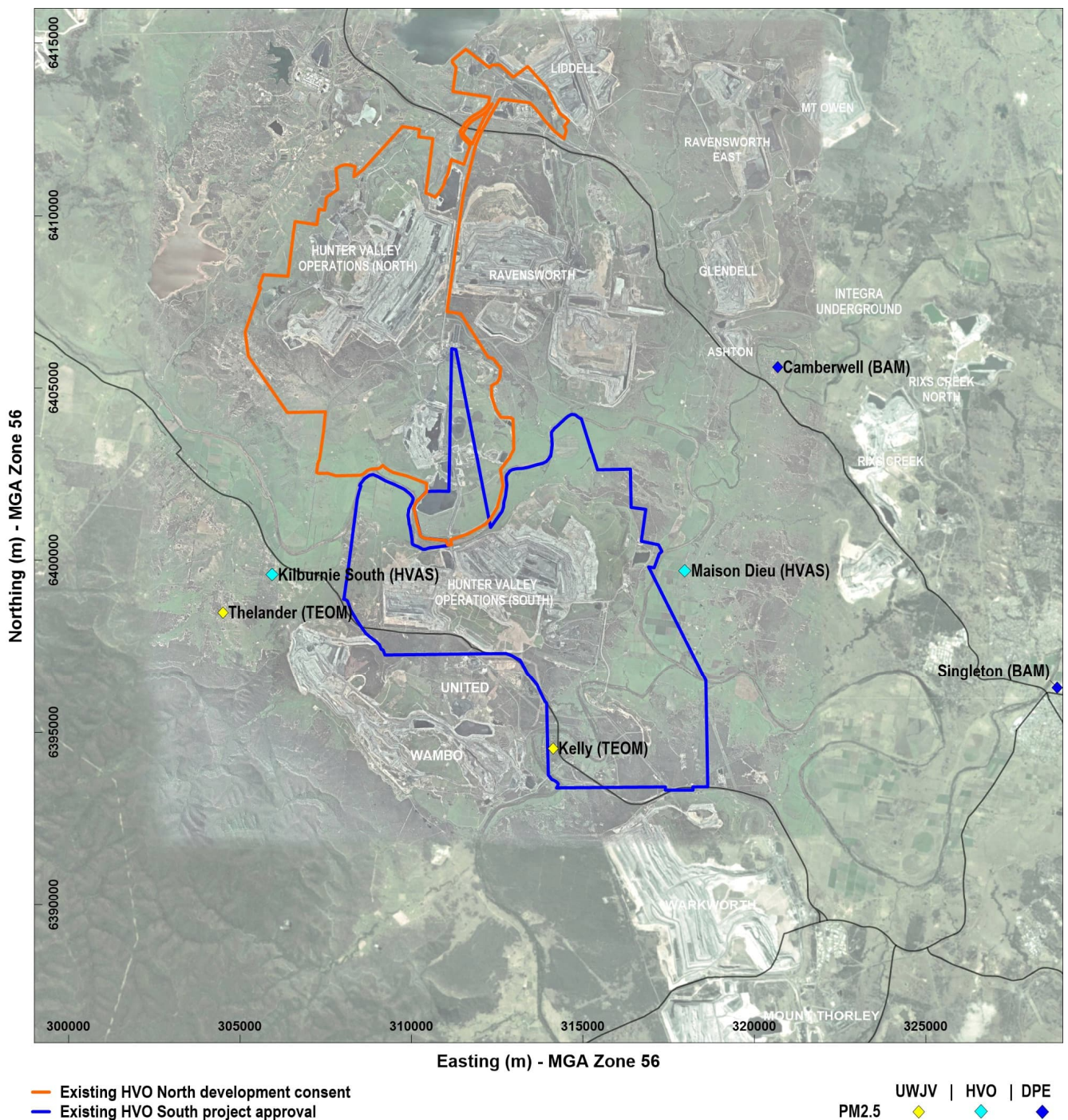


Figure 13 Location of PM_{2.5} monitors

Figure 14 shows the measured 24-hour average PM_{2.5} concentrations from all identified monitoring sites for data collected between 2013 and 2020. The increased bushfire activity in late 2019 and early 2020 is evident in these data with PM_{2.5} concentrations exceeding the EPA assessment criterion at all locations where data were available. The measurements from Kilburnie South and Maison Dieu did not follow the same trends as those from the other monitors so additional analysis was carried out (**Appendix B**). This analysis indicated that the measurements from the Kelly and Thelander locations would be most representative of PM_{2.5} levels near HVO.

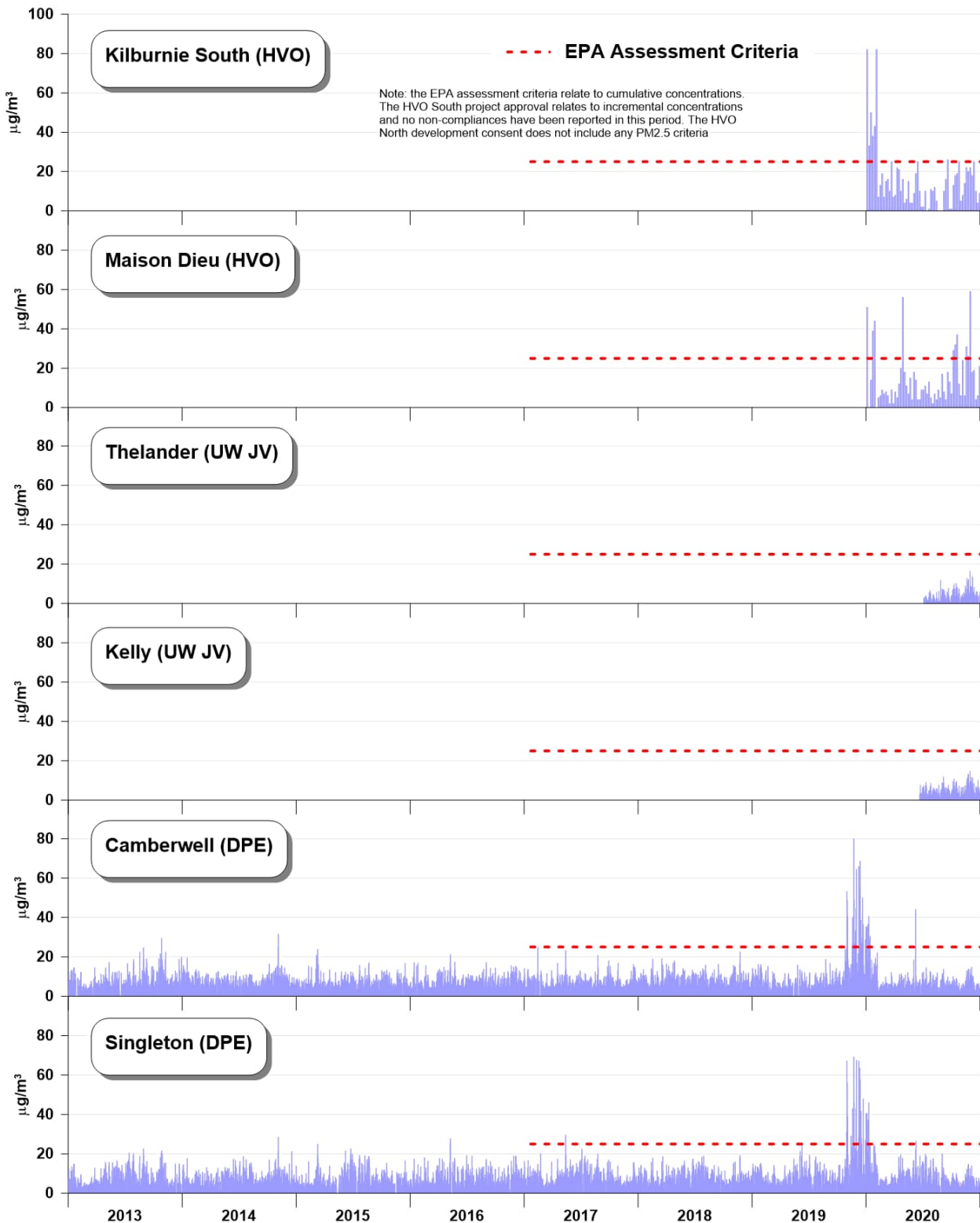


Figure 14 Measured 24-hour average PM_{2.5} concentrations

Table 10 summarises the measured PM_{2.5} concentrations from data collected between 2013 and 2020. Again, these data show the effect of the increased bushfire activity in late 2019 and early 2020 with PM_{2.5} concentrations exceeding the EPA assessment criterion at all locations where data were available. Annual averages have approached or exceeded 8 µg/m³ (the EPA criterion introduced in 2017) in all years of data from Camberwell, Singleton and Newcastle. The more recent data from Kelly and Thelander indicate that PM_{2.5} concentrations are lower near HVO. Based on the analysis from **Appendix B**, and the availability of data points, the measurements from Kelly and Thelander were taken to be the most representative of PM_{2.5} levels near HVO.

Table 10 Summary of measured PM_{2.5} concentrations

Year	Camberwell	Singleton	Kilburnie South ¹	Maison Dieu ¹	Kelly ²	Thelander ²	Newcastle	EPA assessment criterion	DA 450-10-2003 / PA 06_0261
Maximum 24-hour average in µg/m ³									
2013	30	23	-	-	-	-	15	-	- / -
2014	32	29	-	-	-	-	21	-	- / -
2015	24	25	-	-	-	-	30	-	- / -
2016	21	28	-	-	-	-	66	-	- / -
2017	25	30	-	-	-	-	18	25	- / -
2018	23	19	-	-	-	-	20	25	- / ^b 25
2019	80	69	-	-	-	-	96	25	- / ^b 25
2020	44	46	43	59	15	17	79	25	- / ^b 25
Number of days above 25 µg/m ³									
2013	1	0	-	-	-	-	0	-	-
2014	1	1	-	-	-	-	0	-	-
2015	0	0	-	-	-	-	1	-	-
2016	0	2	-	-	-	-	1	-	-
2017	0	1	-	-	-	-	0	-	-
2018	0	0	-	-	-	-	0	-	-
2019	24	20	-	-	-	-	25	-	-
2020	8	5	2	5	0	0	6	-	-
Annual average in µg/m ³									
2013	8.2	7.9	-	-	-	-	8.8	-	- / -
2014	7.8	7.8	-	-	-	-	8.1	-	- / -
2015	7.2	7.6	-	-	-	-	7.9	-	- / -
2016	7.5	7.9	-	-	-	-	7.8	-	- / -
2017	7.4	8.2	-	-	-	-	7.4	8	- / -
2018	8.4	8.1	-	-	-	-	7.8	8	- / ^a 8
2019	10.5	10.9	-	-	-	-	10.9	8	- / ^a 8
2020	7.6	8.4	16.0	14.8	5.2	4.2	8.2	8	- / ^a 8

¹ Data available from September 2019. Analysis from **Appendix B** indicated that these data did not follow expected trends.

² Data available from June 2020.

^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

^b Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

PM_{2.5} concentrations are strongly influenced by combustion-related sources such as bushfires, motor vehicles and wood smoke from domestic heating. The *Upper Hunter Fine Particle Characterisation Study* (OEH, 2013)

investigated the factors which contributed to elevated PM_{2.5} concentrations in the Hunter Valley. This study identified a clear seasonal trend with higher PM_{2.5} concentrations occurring in the cooler months, and predominantly due to wood smoke from domestic heating. Specifically, in Singleton, wood smoke accounted for an average of approximately 14% of the total PM_{2.5}, peaking at around 38% in winter.

4.3.4 Particulate Matter (as TSP)

Air quality criteria for TSP are usually set to protect against nuisance amenity impacts. Monitoring of TSP is carried out by HVO at six locations (Figure 15) and the measurements are used to determine ongoing compliance with the HVO North development consent and HVO South project approval.

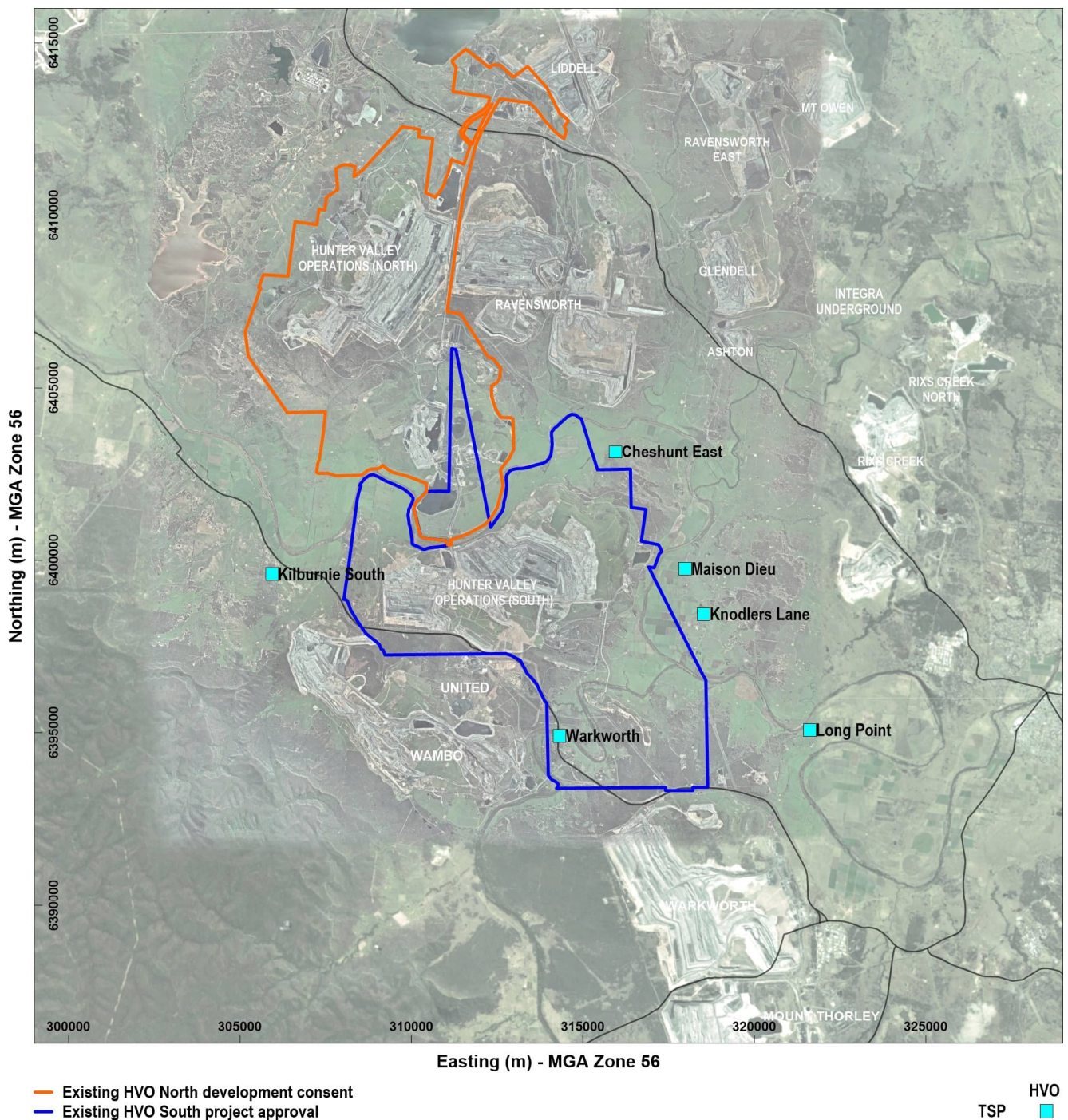


Figure 15 Location of TSP monitors

The monitors that are most representative of the nearest local communities are:

- Kilburnie South (HVO)
- Knodlers Lane (HVO)
- Long Point (HVO)
- Maison Dieu (HVO)
- Warkworth (HVO)

Table 11 shows the annual average TSP concentrations from each representative monitoring site for data collected between 2013 and 2020. Annual average TSP concentrations were clearly higher in 2018 and 2019 than in the preceding five years. Again this outcome was influenced by the drought conditions and lower than average rainfall. The increases in TSP concentrations were not unique to the Hunter Valley.

Table 11 Summary of measured TSP concentrations

Year	Kilburnie South	Knodlers Lane	Long Point	Maison Dieu	Warkworth	EPA assessment criterion	DA 450-10-2003 / PA 06_0261
Annual average in $\mu\text{g}/\text{m}^3$							
2013	49	81	62	65	56	90	^a 90 / ^a 90
2014	57	66	57	62	54	90	^a 90 / ^a 90
2015	58	54	62	53	52	90	^a 90 / ^a 90
2016	54	68	59	50	43	90	^a 90 / ^a 90
2017	75	74	81	58	63	90	^a 90 / ^a 90
2018	108	105	105	83	80	90	^a 90 / ^a 90
2019	145	122	88	125	99	90	^a 90 / ^a 90
2020	83	74	57	63	76	90	^a 90 / ^a 90

^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

The TSP monitoring data are reviewed by HVO as part of annual reporting and with consideration of extraordinary events, as outlined in **Section 4.3.1**. These reviews have shown that HVO has complied with the TSP criteria specified in the HVO North development consent and HVO South project approval.

4.3.5 Deposited Dust

Air quality criteria for deposited dust are usually set to protect against nuisance amenity impacts. Monitoring of deposited dust relates to the collection of particles that settle from the ambient air. Insoluble and soluble matter is 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 HVO at ten locations (**Figure 16**) and the measurements are used to determine ongoing compliance with the HVO North development consent. The HVO South project approval does not contain deposited dust criteria.

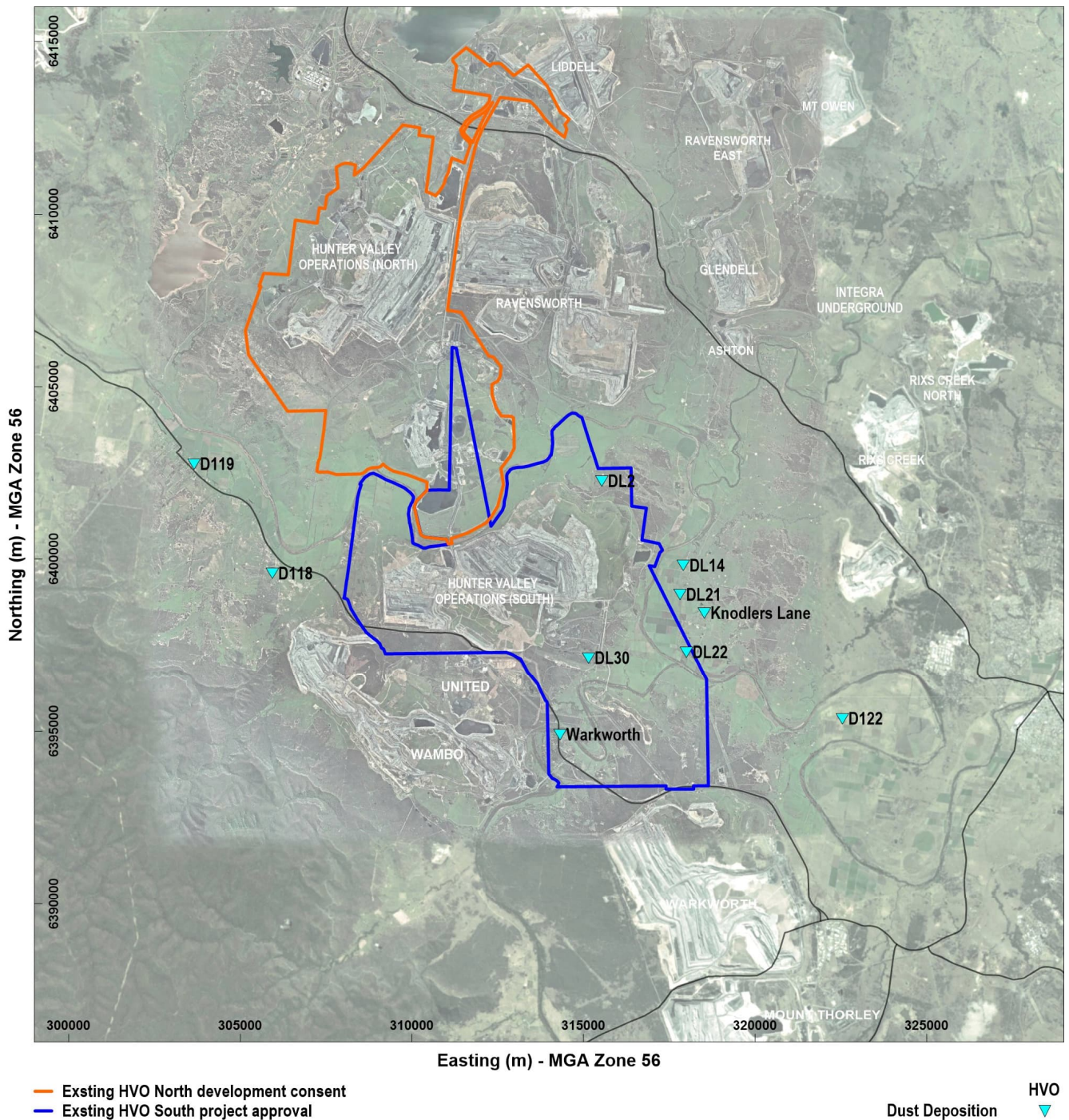


Figure 16 Location of dust deposition monitors

The monitors that are most representative of the nearest neighbouring residential area are:

- D119 at Jerrys Plains
- D118 at Kilburnie South
- Knodlers Lane
- D122 at Long Point
- DL14 at Maison Dieu
- Warkworth

Table 12 shows the annual average deposited dust levels from each representative monitoring site for data collected between 2013 and 2020. Two locations, Kilburnie South and Warkworth, have experienced deposited dust levels above the 4 g/m²/month criterion in one or more of the past eight years. No other location has experienced deposited dust levels above the 4 g/m²/month criterion in the past eight years.

Table 12 Summary of measured deposited dust

Year	Jerrys Plains (D119)	Kilburnie South (D118)	Knodlers Lane	Long Point (D122)	Maison Dieu (DL14)	Warkworth	EPA assessment criterion	DA 450-10-2003 / PA 06_0261
Annual average in g/m ² /month								
2013	2.6	2.2	2.6	3.5	1.9	3.3	4	^a 4 / -
2014	2.5	3	1.4	2.7	2	2.8	4	^a 4 / -
2015	2.9	2.2	1.5	2.6	2.2	3	4	^a 4 / -
2016	1.7	2.4	1.5	3.4	1.3	3.1	4	^a 4 / -
2017	2	2.8	2.3	3.0	2	4.2	4	^a 4 / -
2018	2.4	3.7	2.3	4.0	1.9	4.2	4	^a 4 / -
2019	3.2	4.8	2.2	3.6	2.3	5.3	4	^a 4 / -
2020	3.5	3.8	1.8	3.3	1.8	5.5	4	^a 4 / -

^a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

The deposited dust monitoring data are reviewed by HVO as part of annual reporting and with consideration of extraordinary events, as outlined in **Section 4.3.1**. These reviews have shown that HVO has complied with the deposited dust criteria specified in the HVO North development consent.

4.3.6 Nitrogen Dioxide (NO₂)

Table 13 provides a summary of the measured NO₂ concentrations from Singleton, the closest known air quality monitoring site which records this air quality indicator. These data show that the maximum NO₂ concentrations have not exceeded the, then applicable, EPA's 1-hour average assessment criterion of 246 µg/m³ (now 164 µg/m³). Annual averages have not exceeded the, then applicable, EPA's annual average assessment criterion of 62 µg/m³.

Table 13 Summary of measured NO₂ concentrations

Year	Singleton	EPA assessment criterion
Maximum 1-hour average in µg/m ³		
2013	84	246
2014	74	246
2015	66	246
2016	66	246
2017	74	246
2018	72	246
2019	76	246
2020	68	246
Annual average in µg/m ³		
2013	18	62
2014	16	62
2015	16	62

Year	Singleton	EPA assessment criterion
2016	16	62
2017	17	62
2018	16	62
2019	14	62
2020	12	62

Nitrogen dioxide is a component of NO_x. Emissions of NO_x from combustion related sources will include both nitric oxide (NO) and NO₂. In general, at the point of emission, NO will comprise the greatest proportion of the total NO_x emission. Typically, this is 90% by volume of the NO_x. The remaining 10% will comprise mostly NO₂. Ultimately however, much of the NO emitted into the atmosphere is oxidised to NO₂. The rate at which this oxidation takes place depends on prevailing atmospheric conditions including temperature, humidity and the presence of other substances in the atmosphere such as ozone. It can vary from a few minutes to many hours. The rate of conversion is important because from the point of emission to the point of maximum ground-level concentration there will be an interval of time during which some oxidation will take place. If the dispersion is sufficient to have diluted the plume to the point where the concentration is very low, then the level of oxidation is unimportant. However, if the oxidation is rapid and the dispersion is slow then high concentrations of NO₂ can occur.

The NO_x monitoring data in the Hunter Valley show that percentage of NO₂ in the NO_x is inversely proportional to the total NO_x concentration, and when NO_x concentrations are high, the percentage of NO₂ in the NO_x is typically of the order of 20%. This is demonstrated by **Figure 17** which shows that, for high NO_x concentrations, the NO₂ to NO_x ratio reduces to less than 20%.

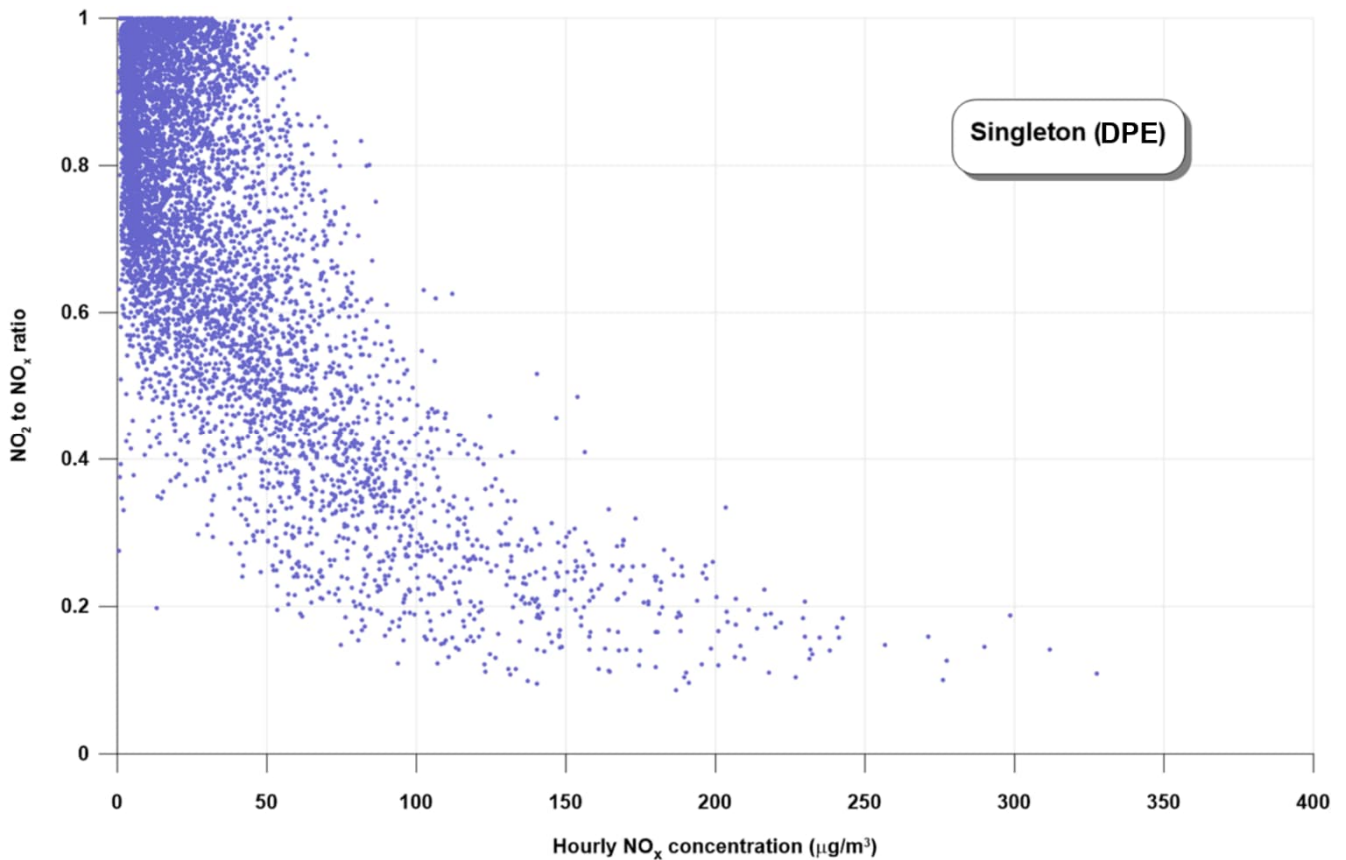


Figure 17 Measured NO₂ to NO_x ratios from hourly average data collected at Singleton in 2014

4.4 Greenhouse Gas

The *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (Measurement Determination) provides methods, criteria and measurement standards for calculating and reporting greenhouse gas emissions and energy data under the NGER Act. It covers scope 1 and scope 2 emissions and energy production and consumption. The Measurement Determination is used for historical reporting of activities.

Greenhouse gas emissions from the HVO Complex are calculated using the Measurement Determination and reported in accordance with the NGER Act. **Table 14** shows the reported GHG emissions for recent years. The decrease in reported Scope 1 emissions after 2014/15 was largely due to HVO adopting a more accurate method of reporting fugitive emissions (i.e. Method 2 instead of Method 1).

Table 14 Reported greenhouse gas emissions

Reporting year	ROM coal production (Mt)	Direct emissions (Mt CO ₂ -e)		Direct emission intensity (Mt CO ₂ -e/Mt ROM)
		Scope 1	Scope 2	
2013/2014	17.67	1.12	0.13	0.07
2014/2015	17.58	1.11	0.12	0.07
2015/2016	17.75	0.48	0.12	0.03
2016/2017	20.48	0.55	0.12	0.03
2017/2018	18.85	0.62	0.11	0.04
2018/2019	18.63	0.58	0.11	0.04
2019/2020	18.80	0.56	0.11	0.04
2020/2021	14.87	0.56	0.09	0.04

4.5 Summary of Existing Environment

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

- Meteorological conditions do not vary significantly from year to year, except for rainfall, and conditions in 2014 were identified as most representative of the long term, local conditions around the HVO Complex.
- Air quality conditions are strongly correlated to the climatic conditions. For example, there was a deterioration in air quality conditions between 2017 and 2019 that were heavily influenced by drought, dust storms and bushfires. These conditions were not unique to the Hunter Valley.

One of the objectives for reviewing the air quality monitoring data was to determine appropriate background levels to be added to Project contributions for the assessment of potential cumulative impacts. For this objective, it was important to identify appropriate data from monitoring stations that are sufficiently close to the Project but not adversely influenced by those sources which are proposed for modification, such as mining operations. This is to avoid double-counting.

For PM₁₀, an hourly variable background concentration dataset was derived by adopting the minimum measured non-zero PM₁₀ average concentration from all DPE monitors near the Project for each hour in the representative year (2014). A key assumption to this approach was that the minimum value from these sites reflected a location that was not being influenced by emissions from the sources or operations in the models for the Project. A similar approach was not possible for PM_{2.5} as representative monitoring only commenced in 2019 onwards and were not being collected in the representative year (2014). It was therefore assumed that the background PM_{2.5} concentrations would follow the same profile as the derived background PM₁₀ concentrations but with an annual average that matched the available and more recently (2020) measured PM_{2.5} concentrations near the Project, at the Kelly monitoring location, as described in **Section 4.3.3**.

Figure 18 shows a graphical representation of the assumed background PM₁₀ and PM_{2.5} concentrations that were used in this assessment and added to the model results for the Project. As can be seen from **Figure 18** these background concentrations have been inferred from the measurement data. The statistics of the resultant datasets (included in **Table 15**) indicate that this approach, and its inherent assumptions, produce estimated background levels which are similar to actual measurements in the study area.

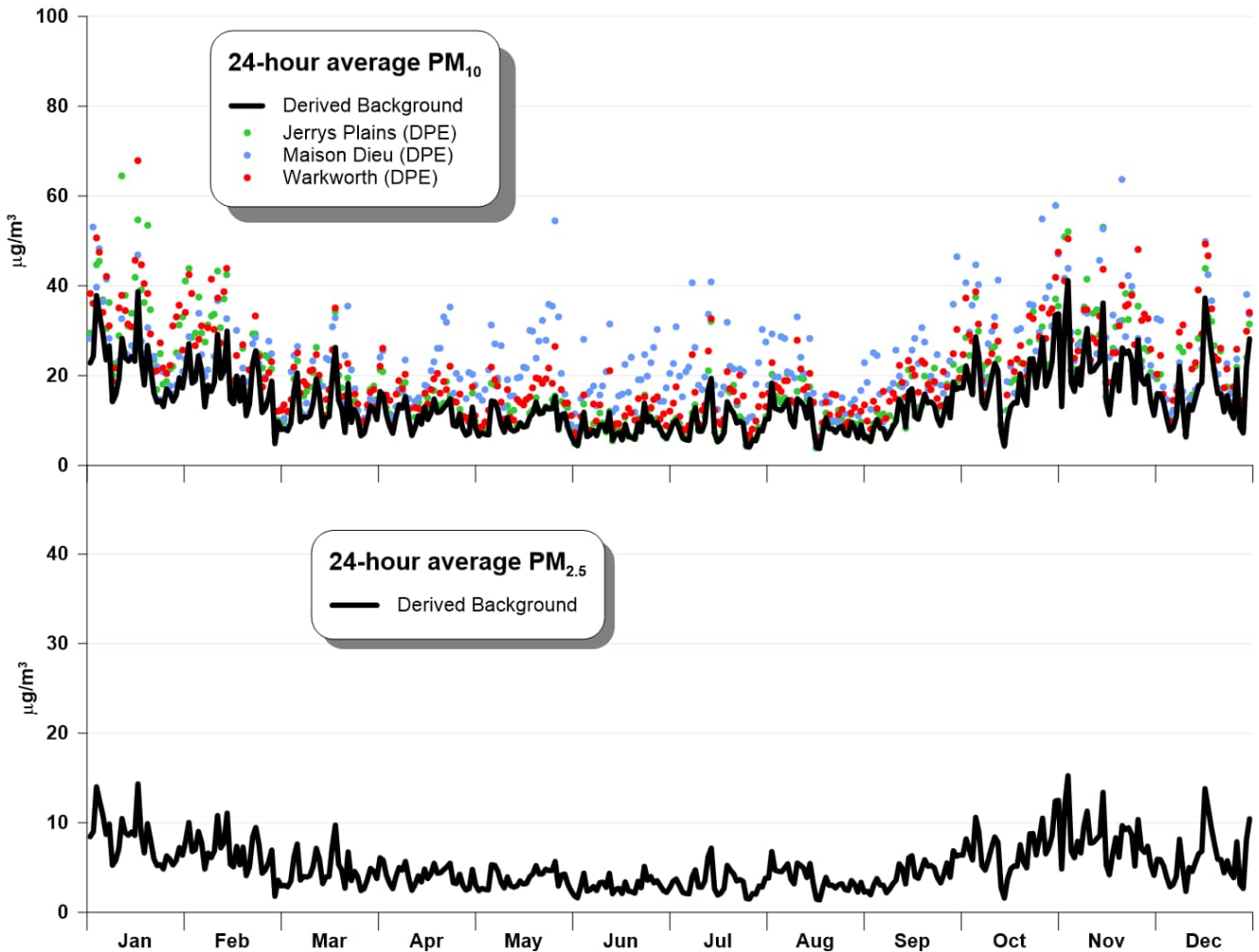


Figure 18 Background PM₁₀ and PM_{2.5} concentrations as inferred from the measurement data

Table 15 shows the assumed background levels that apply at sensitive receptors, taking into account the objectives described above. These levels (or approach) have been added to Project contributions to determine the potential cumulative impacts.

Table 15 Assumed background levels that apply at sensitive receptors

Air quality indicator	Averaging time(s)	Assumed background level that applies at sensitive receptors	Notes
Particulate matter (PM ₁₀)	24-hour Annual	Variable by day (see Figure 18)	<p>An hourly variable background dataset was derived (see Figure 18) and added to the model results. This dataset was created by using the minimum measured non-zero PM₁₀ concentration from all DPE monitors for each hour in the representative year (2014). Statistics from the resultant dataset are as follows:</p> <ul style="list-style-type: none"> - Maximum 24-hour average = 41 µg/m³ - Annual average = 14 µg/m³ <p>The data derived above have been added to the modelled Project contributions for the assessment of potential cumulative impacts, in accordance with EPA guidelines.</p>
Particulate matter (PM _{2.5})	24-hour Annual	Variable by day (see Figure 18)	<p>An hourly variable background dataset was derived (see Figure 18) and added to the model results. It was assumed that the background PM_{2.5} concentrations would follow the same profile as the derived background PM₁₀ concentrations but with an annual average that matched the available and more recently (2020) measured PM_{2.5} concentrations near the Project, as described in Section 4.3.3.</p> <p>Statistics from the resultant dataset are as follows:</p> <ul style="list-style-type: none"> - Maximum 24-hour average = 15.3 µg/m³ - Annual average = 5.2 µg/m³ <p>The data derived above are more conservative than historical estimates (for example, TAS, 2017) and have been added to the modelled Project contributions for the assessment of potential cumulative impacts, in accordance with EPA guidelines.</p>
Particulate matter (TSP)	Annual	57 µg/m ³	Annual average TSP concentration in the representative year (2014) from Kilburnie South, a location least likely to be influenced by contributions from modelled sources.
Deposited dust	Annual	2.5 g/m ² /month	Annual average deposited dust level in the representative year (2014) from Jerrys Plains, a location least likely to be influenced by contributions from modelled sources.
Nitrogen dioxide (NO ₂)	1-hour	74 µg/m ³	Maximum 1-hour average NO ₂ concentration in the representative year (2014) from Singleton.
	Annual	16 µg/m ³	Annual average NO ₂ concentration in the representative year (2014) from Singleton.

5. Assessment Methodology

This assessment has followed the procedures outlined in the Approved Methods (EPA, 2022). 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.

One of the main objectives of this assessment was to determine air quality outcomes for the neighbouring residential areas near the Project. These areas include Jerrys Plains, Warkworth, Maison Dieu and Long Point.

Specific methodologies for each of the identified key issues (from **Section 2**) are described below.

5.1 Construction Dust

Dust emissions from construction works have the potential to cause nuisance impacts if not properly managed. In practice, it is not possible to realistically quantify impacts using modelling. To do so would require knowledge of weather conditions for the period in which work will be taking place in each location on the site. The potential significance and impacts of construction dust have therefore been determined from a qualitative review, taking into consideration the intensity, scale, location and duration of the proposed works. **Section 7.1** provides the assessment of construction dust.

5.2 Operational Dust

Operational dust has 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 locally complex terrain, non-uniform 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 deposition levels due to the Project and other sources. 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 19 shows an overview of the model inputs. **Appendix C** provides details of all model settings.

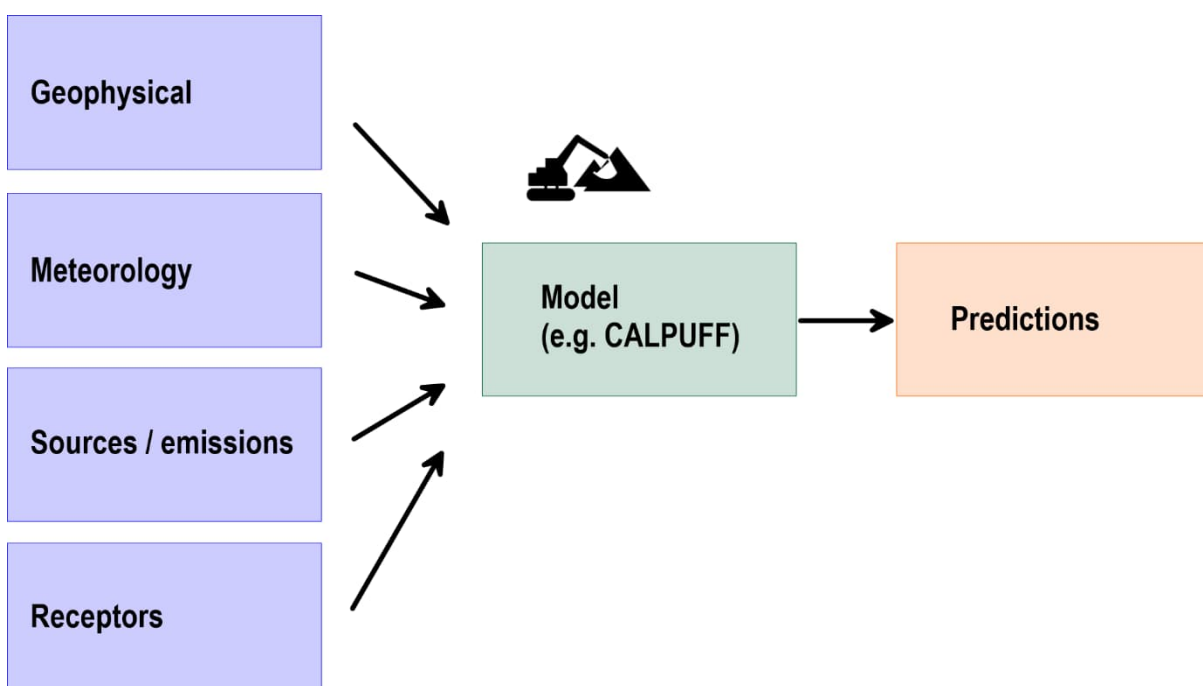


Figure 19 Overview of model inputs

Dust (particulate matter) is the most significant emission to air during the operational phase of the Project and estimates of these emissions are required by the dispersion model. Total dust emissions have been estimated for selected operational scenarios using the material handling schedule, equipment listing and mine plans combined with emission factors from:

- *Emission Estimation Technique Manual for Mining* (NPI, 2012); and
- AP 42 (US EPA 1985 and updates).

The Project production schedule has been used to identify a range of future operational years to be assessed. **Figure 20** shows the estimated ROM coal and overburden movements over the life of the Project. 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.

Five future operational scenarios have been selected; Year 3, Year 7, Year 11, Year 18 and Year 22. These years address the maximum material handling quantities, maximum haul distances, varying proximities to local communities, and combined interactions with other existing or approved mining operations.

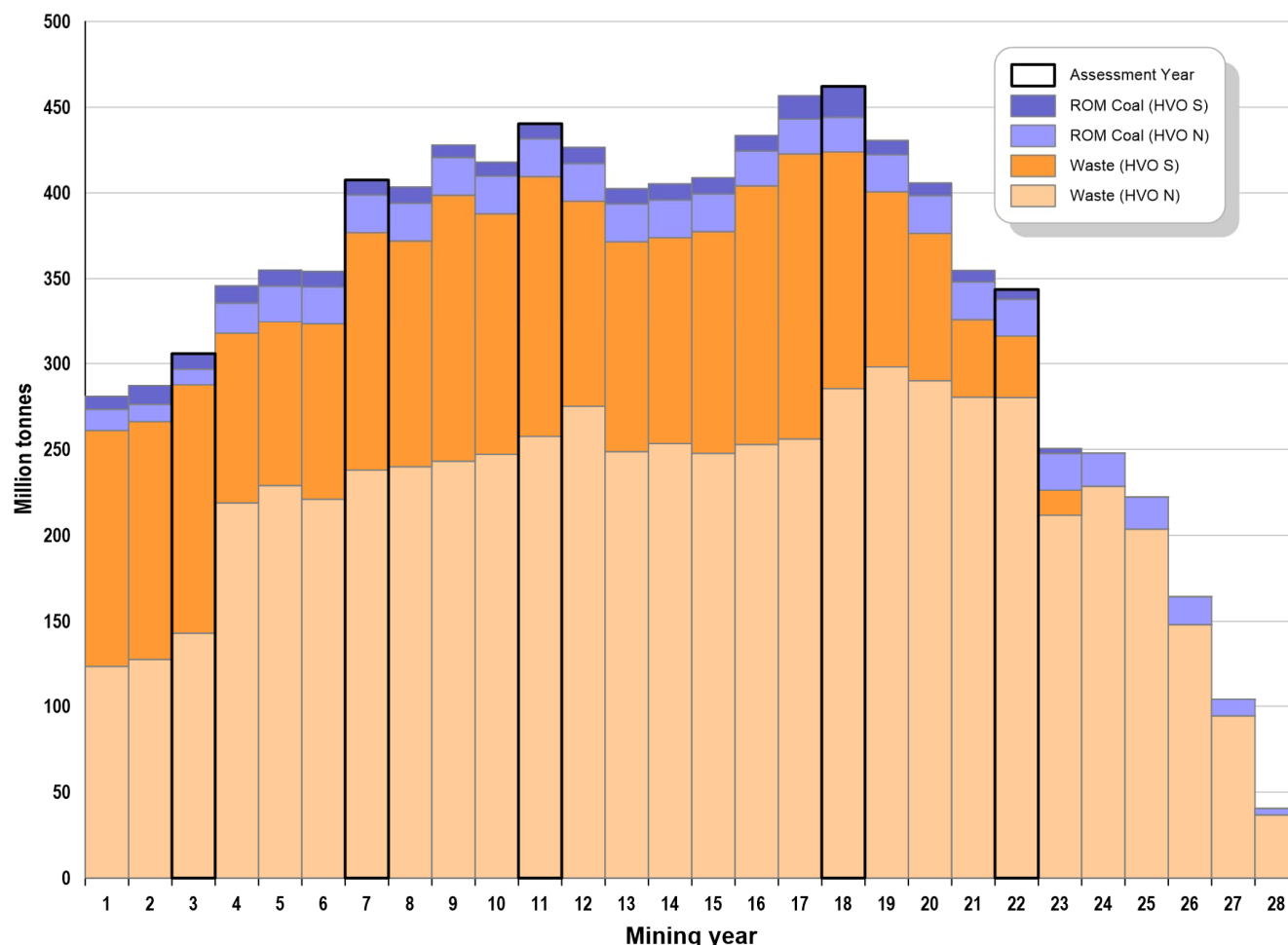


Figure 20 Estimated ROM coal and overburden movements over the life of the Project

A scenario for a historical, representative year (2014) was also developed to evaluate the performance of the model. For this scenario the model results were compared to monitored results to determine the level of confidence that can be assumed for the future scenarios. The assessment focussed primarily on the performance of the model for predicting PM₁₀ as the air quality review (**Section 4.3**) showed that PM₁₀ was a key air quality issue due to a higher number of historical exceedances of EPA assessment criteria. TSP and deposited dust were

also considered. It was not possible to evaluate the performance of the model for predicting PM_{2.5} or NO₂ as there are insufficient PM_{2.5} or NO_x monitors in the model domain to allow for a comparison between measured and modelled levels.

The modelling has considered contributions from the Project as well as from existing, surrounding mining operations, and in the case of future operating scenarios, approved mining operations. **Table 16** shows the assumed ROM coal production data from each operation in the model domain. The data for 2014 were derived from the Annual Review produced by each mining operation and available on their respective websites. The Annual Reviews also included overburden handling quantities and plans showing the mining locations which are important for determining site dust emissions.

Production data and location of mining operations for future mining scenarios have been sourced from publicly available materials including relevant assessment documents (i.e. Environmental Assessments, EIS etc.) for the existing and approved operations. These have been included in the model for future mining scenarios reflective of their current approved life and maximum approved production limit in accordance with the development consent in place at the time of completing this assessment. Estimated production quantities for the Project were provided by HVO.

Table 16 Assumed ROM coal production from each mining operation in the model domain

Operation	ROM coal production (Mtpa). Future calendar years are indicative					
	2014	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
HVO North (DA 450-10-2003)	9.4	Figure 20	Figure 20	Figure 20	Figure 20	Figure 20
HVO South (MP 06_0261)	8.6	Figure 20	Figure 20	Figure 20	Figure 20	Figure 20
Ashton Coal Underground (DA 309-11-2001-i) ***	2.8	-	-	-	-	-
Glendell Mine* (SSD-9349)	4.4	10	10	10	10	10
Integra Underground (PA 08_0101) **	0.8	4.5	4.5	4.5	-	-
Liddell Mine (DA 305-11-01)	6.7	-	-	-	-	-
Mt Owen Mine (SSD-5850)	10	10	10	10	-	-
Mt Thorley Mine (SSD 6465)	6.3	10	10	10	-	-
Ravensworth Mine (09_0176)	10.9	16	16	16	16	-
Rixs Creek North Mine (MP 08_0102)	C&M	6	6	6	-	-
Rixs Creek South Mine (SSD 6300)	2.8	3.6	3.6	3.6	3.6	-
United Wambo Mine (SSD-7142)	-	10	10	10	10	-
Wambo Mine (DA 305-7-2003 & DA 177-8-2004)	5.4	17.75	17.75	17.75	17.75	-
Warkworth Mine (SSD 6464)	11.4	18	18	18	-	-

* Application was recently (28/10/22) refused after the completion of modelling for the Project. Model is therefore conservative. ** Likely to close at the end of 2023. Kept in this assessment for conservatism. *** Modification 11 now approved up to the end of 2035. This will not have any material impact on the current assessment outcomes. C&M: operation in care and maintenance.

Table 17, **Table 18** and **Table 19** summarise the estimated annual TSP, PM₁₀ and PM_{2.5} emissions, respectively, due to the Project as well as all other operating, or assumed to be operating, mines in the model domain. 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 Project contributions. Full details on the emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations are provided in **Appendix D**.

Table 17 Estimated TSP emissions

Operation	Annual TSP emissions (kg/y). Future calendar years are indicative					
	2014	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
HVO North	4,676,091	7,346,725	12,253,254	12,819,896	13,416,021	13,445,626
HVO South	7,851,589	7,269,485	6,671,135	6,966,646	6,994,480	2,527,939
Ashton Coal Underground ¹	114,780	-	-	-	-	-
Glendell Mine* ¹	2,411,539	3,274,887	3,274,887	5,017,124	2,992,017	2,992,017
Integra Underground ¹	114,683	115,112	115,112	115,112	-	-
Liddell Mine ¹	3,688,178	-	-	-	-	-
Mt Owen Mine ¹	3,370,232	4,308,656	4,308,656	2,548,849	-	-
- Ravensworth East ¹	1,312,714	-	-	-	-	-
Mt Thorley (inc Warkworth Mine) ²	4,287,021	6,340,276	6,340,276	6,340,276	-	-
Ravensworth Mine ¹	5,941,622	7,440,069	7,440,069	7,440,069	7,440,069	-
Rixs Creek North Mine ¹	210,391	2,163,828	2,163,828	2,163,828	-	-
Rixs Creek South Mine ¹	2,199,466	2,635,613	2,635,613	2,635,613	1,660,436	-
United Wambo Mine (inc Wambo) ²	2,338,708	4,090,555	3,878,712	3,869,962	1,509,285	-

* Application was recently (28/10/22) refused after the completion of modelling for the Project. Model is therefore conservative. ¹ From method outlined in Jacobs, 2019. ² From method outlined in Jacobs, 2018.

 Table 18 Estimated PM₁₀ emissions

Operation	Annual PM ₁₀ emissions (kg/y). Future calendar years are indicative					
	2014	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
HVO North	1,564,716	2,485,357	3,890,963	4,088,883	4,324,304	4,322,811
HVO South	2,487,886	2,431,378	2,160,977	2,273,657	2,225,077	878,496
Ashton Coal Underground ¹	37,909	-	-	-	-	-
Glendell Mine* ¹	721,190	1,037,423	1,037,423	1,522,894	936,928	-
Integra Underground ¹	37,863	38,066	38,066	38,066	-	-
Liddell Mine ¹	1,147,692	-	-	-	-	-
Mt Owen Mine ¹	1,034,433	1,357,907	1,357,907	828,949	-	-
- Ravensworth East ¹	394,549	-	-	-	-	-
Mt Thorley (inc Warkworth Mine) ²	1,436,640	2,046,153	2,046,153	2,046,153	-	-
Ravensworth Mine ¹	1,940,467	2,414,566	2,414,566	2,414,566	2,414,566	-
Rixs Creek North Mine ¹	108,449	691,822	691,822	691,822	-	-
Rixs Creek South Mine ¹	682,901	811,805	811,805	811,805	511,437	-
United Wambo Mine (inc Wambo) ²	784,068	1,350,845	1,265,919	1,295,987	505,434	-

* Application was recently (28/10/22) refused after the completion of modelling for the Project. Model is therefore conservative. ¹ From method outlined in Jacobs, 2019. ² From method outlined in Jacobs, 2018.

Table 19 Estimated PM_{2.5} emissions

Operation	Annual PM _{2.5} emissions (kg/y) . Future calendar years are indicative					
	2014	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
HVO North	265,529	383,166	587,421	620,603	654,496	663,428
HVO South	401,543	381,116	346,319	365,612	352,706	1476,82
Ashton Coal Underground ¹	3,530	-	-	-	-	-
Glendell Mine* ¹	130,163	191,639	191,639	287,474	173,953	173,953
Integra Underground ¹	3,523	3,554	3,554	3,554	-	-
Liddell Mine ¹	180,926	-	-	-	-	-
Mt Owen Mine ¹	150,460	207,027	207,027	134,230	-	-
- Ravensworth East ¹	69,396	-	-	-	-	-
Mt Thorley (inc Warkworth Mine) ²	217,559	305,553	305,553	305,553	-	-
Ravensworth Mine ¹	290,083	345,834	345,834	345,834	345,834	-
Rixs Creek North Mine ¹	15,779	111,572	111,572	111,572	-	-
Rixs Creek South Mine ¹	118,692	133,542	133,542	133,542	84,131	-
United Wambo Mine (inc Wambo) ²	127,642	214,775	204,971	209,031	81,522	-

* Application was recently (28/10/22) refused after the completion of modelling for the Project. Model is therefore conservative. ¹ From method outlined in Jacobs, 2019. ² From method outlined in Jacobs, 2018.

Emission estimates for 2014 were based on the production and material handling quantities contained in the respective Annual Reviews. Estimates for future years were based on the maximum approved production rates as per the relevant development consents with some exceptions as noted in the tables. It has also been assumed that the proposed but not yet approved projects will be operating in the future. These assumptions mean that the model predictions will likely over-state actual impacts as the mines are not likely to operate at their maximum approved production rate in each year.

Emissions from other mining operations were important for quantifying the potential cumulative impacts. Two approaches were considered for estimating emissions from other mining operations. These approaches included:

- Deriving emission estimates from previously published EIS data; or
- Recalculating emissions from other mines in the model domain specifically for this assessment.

The approach of recalculating emissions from other mining operations in the model domain has been chosen for this assessment, where detailed inventories were not available. This approach has been favoured because it maintains consistency in the emission calculation methods for all mining operations. It also has the following advantages over recent EIS data:

- TSP, PM₁₀ and PM_{2.5} can be separated for each activity for each mining operations. To date, most EIS air quality assessments have only calculated TSP emissions, with PM₁₀ and PM_{2.5} emissions derived from regional ratios such as those published by the SPCC (1986).
- The proportions of wind sensitive, wind insensitive and wind erosion activities can be more accurately defined. Historical assessments have often applied fixed ratios of these three activity types, usually based on information from the Mt Arthur Mine EIS (URS 2000).
- Pit retention can be modelled and the adjusted emissions can be made specific to each activity and the hourly wind speed.

- Triggered control factors can be modelled. For example, the effect of rainfall for suppressing dust from exposed areas can be simulated for relevant hours in the year.

There are also disadvantages to the approach of recalculating emissions from other mines. The main disadvantages are potential inconsistencies between the emission estimates and other published EIS emissions data, and the inability to precisely match source locations to future mine plans. However, it will be seen in **Section 7**, that the emission estimation approach combined with model setup assumptions has produced results which do not underestimate average concentrations at the key sensitive receptor locations.

The modelling has assumed that operations will be managed in accordance with the existing Air Quality and Greenhouse Gas Management Plan, however there will be additional operational controls in place at the HVO Complex that will also have a direct effect on emissions to air. Specifically, HVO is committed to the continued implementation of operational controls during adverse weather conditions in order to minimise impacts. The operational controls will result in reduced levels of activity at the HVO Complex relative to the capacity considered as part of the current air quality modelling. In practice these operational controls, which will vary on a daily basis, will lead to lower emissions to air than for unconstrained activities. Consequently the estimated emissions in **Table 17**, **Table 18** and **Table 19** should represent conservative estimates, as these further detailed operational controls are not included, and it follows that the modelled impacts of the Project will also be conservative. That is, the modelled impacts are likely to over-state actual impacts to some extent.

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 at each operations were assigned to one or more of source location (refer to **Appendix D** 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 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 emplacement areas 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. Blasting is allowed from 7 am to 6 pm Monday to Saturday however 9 am to 5 pm has been assumed for the modelling as this is the most common period for blasting. All other activities have been modelled for 24 hours per day.

Pit retention (that is, retention of dust particles within the open pits) has been included in the model simulations. The pit retention calculation determines the fraction of dust emitted in the pit that may escape the pit. The "escaped fraction" is a function of the gravitational settling velocity of the particles and the wind speed and is shown by the following relationship (US EPA, 1995).

Equation 1:

$$\varepsilon = \frac{1}{\left(1 + \frac{v_g}{(\alpha U_r)}\right)}$$

where:

ε = escaped fraction for the particle size category

V_g = gravitational settling velocity (m/s)

U_r = approach wind speed at 10 m (m/s)

α = proportionality constant in the relationship between flux from the pit and the product of U_r and concentration in the pit (0.029)

To model the effect of pit retention, the emissions from mining sources within the open pits have been reduced, as per the calculation above. This approach means that much of the coarser dust would remain trapped in the pits. Typically, five per cent of the PM_{10} emissions are trapped in the pit using this calculation.

Finally, the model results at identified sensitive receptors were then compared with the EPA air quality assessment criteria, previously discussed in **Section 3.1**. Contour plots have also been created to show the spatial distribution of model results. **Section 7.2** provides the assessment of operational dust.

5.3 Operational Post Blast Fume

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 5.2**. 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 comprise of NO_x including NO and NO_2 and from the NO_x monitoring in the Hunter Valley (**Section 4.3.6**) the percentage of NO_2 in the NO_x is 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:

- Blasts modelled as single volume sources in locations indicative of the centre of HVO North and HVO South.
- 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.
- Emissions assumed to occur every hour between 9 am and 5 pm. It is noted that blasting is allowed from 7 am to 6 pm Monday to Saturday however 9 am to 5 pm has been assumed for the modelling as this is the most common period for blasting.
- Blasting could be on any day of the week (a conservative assumption as, in accordance with the current development consent and project approval, blasting cannot occur on Sundays or public holidays unless written approval is obtained from the administering authority).
- NO_x emissions based on data presented in the Queensland *Guidance Note for the management of oxides in open cut blasting* (DEEDI, 2011). It was conservatively assumed that the initial NO_2 concentration in the plume would be 7 ppm (14.4 mg/m^3) based on the Rating 2 Fume Category in the Queensland Guidance Note. Of the 469 blasts that occurred between January 2019 to December 2020, 77% were rated as category 0, 13% were rated as category 1, 9% were rated as category 2 and 1% were rated as category 3. The assumption of a blast fume rating of 2 for every hour is therefore very conservative.

- The initial NO₂ 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:NO₂ ratio was typically 27:1, giving a NO_x:NO₂ ratio of approximately 18.6 g NO_x/g NO₂.
- Calculated emission of 356 g/s of NO_x per blast and an emission release time of 5 minutes.
- 20% of the NO_x is NO₂ at the points of maximum 1-hour average concentrations and at sensitive receptors.

Model results for post-blast fume have been compared to the applicable EPA air quality assessment criterion for NO₂; that is 164 µg/m³ as a 1-hour average and taking background levels into account. **Section 7.2.5** provides the assessment of operational post blast fume.

5.4 Operational 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 the 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 the potential impacts.

The most significant emissions from diesel exhausts are products of combustion including CO, NO_x, PM₁₀ and PM_{2.5}. It is the NO_x, or more specifically NO₂, and PM₁₀ (including PM_{2.5}) which have been assessed. DPE 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 5.2**) 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 PM₁₀ 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 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 highlights that the potential impacts of diesel exhaust emissions (as PM₁₀ and PM_{2.5}) are represented in the model results for operational dust (**Section 7.2**).

Table 20 provides the explicit estimates of PM₁₀ and PM_{2.5} emissions due only to diesel plant and equipment exhausts. Emission factors for "Industrial off-road vehicles and equipment" from the EPA's 2008 Air Emissions Inventory (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 20 Estimated PM₁₀ and PM_{2.5} emissions from diesel engines

Parameter	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
Estimated fuel usage (kL) (source: HVO)	141,420	155,566	193,804	225,416	169,304
PM₁₀ calculations					
Diesel exhaust emission factor (kg/kL)	2.84	2.84	2.84	2.84	2.84
Diesel exhaust emissions - all equipment (kg/y)	401,634	441,807	550,403	640,181	480,823
PM_{2.5} calculations					
Diesel exhaust emission factor (kg/kL)	2.75	2.75	2.75	2.75	2.75
Diesel exhaust emissions - all equipment (kg/y)	389,585	428,553	533,891	620,976	466,398

Emissions of NO_x from diesel exhausts have been estimated using fuel consumption data, provided by HVO, and an emission factor from the EPA's Air Emissions Inventory for 2008 (EPA, 2012). **Table 21** shows the calculations. Again, it has been assumed that there will be no reduction to emissions in the future; a conservative approach.

Table 21 Estimated NO_x emissions from diesel engines

Parameter	Year 3 (2025)	Year 7 (2029)	Year 11 (2033)	Year 18 (2040)	Year 22 (2044)
Estimated fuel usage (kL) (source: HVO)	141,420	155,566	193,804	225,416	169,304
NO_x calculations					
Exhaust emission factor (kg/kL)	40.77	40.77	40.77	40.77	40.77
Exhaust emissions - all equipment (kg/y)	5,765,705	6,342,418	7,901,386	9,190,206	6,902,516

The NO_x emission estimates for Year 18 from **Table 21** have been explicitly modelled to provide an indication of the off-site NO₂ concentrations due to diesel exhaust emissions. **Section 7.4** provides the assessment of operational diesel exhaust.

5.5 Greenhouse Gas Emissions

The GHG inventory in this document has been calculated in accordance with the principles of the GHG Protocol and based primarily on the National Greenhouse Accounts (NGA) Factors as the NGA Factors are referred to in the SEARs for the purposes of project assessment. The NGA Factors is not published for the purposes of reporting under the NGER Act.

The initial actions for a greenhouse gas inventory are to determine the sources of greenhouse gas emissions, assess their likely significance and set a boundary for the assessment. Creating an inventory of the likely GHG emissions associated with the 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 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 (i.e. burning of coal) and services. The inventory for this assessment includes all significant sources of GHGs (Scopes 1, 2 and 3) associated with the Project.

GHG emissions associated with operation of the HVO Complex are well understood, given that the mine is currently operating. Future projections of production, fuel usage and electricity usage (from HVO) were used to determine the additional greenhouse gas emissions from the Project. **Table 22** shows the key emission sources that have been considered in this assessment as well as the greenhouse gas emission estimation methodologies.

Table 22 Greenhouse gas emission sources and estimation methodologies

Activity	Description	Scope(s)	Emission estimation methodology
Construction			
Diesel usage	Combustion of diesel fuel from mobile and stationary plant and equipment.	1, 3	Emission factors from NGA Factors (DISER, 2021).
Vegetation	Loss of carbon sink due to removal of vegetation.	1	Calculated using "Carbon Gauge" developed by the Transport Authorities Greenhouse Group (TAGG, 2013) with total emissions

Activity	Description	Scope(s)	Emission estimation methodology
			distributed over the mine life in proportion to the ROM coal. Vegetation assumed to be "Class D Open woodlands". Biomass class set to "Class 3:100-150 (tonnes of dry matter per hectare [t dry matter/ha])" based on Project location.
Materials	Embodied energy of materials	3	Emission factors from the Infrastructure Sustainability Materials Calculator (ISMC) Version 2.0, developed by the ISCA (ISCA, 2019) including life cycle inventories and weighting factors (LCI, 2016).
Materials transport	Transport of materials to site	3	Emission factors from the Infrastructure Sustainability Materials Calculator (ISMC) Version 2.0, developed by the ISCA (ISCA, 2019) including life cycle inventories and weighting factors (LCI, 2016).
Operation			
Diesel usage	Combustion of diesel fuel from mobile and stationary plant and equipment.	1, 3	Emission factors from NGA Factors (DISER, 2021).
Fugitive	Fugitive emissions from the extraction of coal.	1	Emission factor of 0.014 t CO ₂ -e/t ROM based on historical NGA reporting using Method 2 of Measurement Determination. Fugitive emissions post mining (for open cut mines) will reduce over time as mine voids fill with water, reducing the gas desorption from the coal.
Blasting	Detonation of explosives used for blasting.	1	Emission factors from NGA Factors (DCC, 2008). Blasting emissions are not reported in recent NGA Factors publications.
Electricity	Electricity usage.	2, 3	Emission factors from NGA Factors (DISER, 2021).
Transport (rail)	Transport of product coal by rail to port.	3	Emission factors from the Department for Environment, Food and Rural Affairs (DEFRA) (2019), based on "Freighting goods / freight train". 150 km assumed distance from mine to port.
Transport (shipping)	Transport of product coal by ship to market.	3	Emission factors from DEFRA (2019), based on "Freighting goods / cargo ship, bulk carrier". 8,000 km assumed distance from port to market (nominally South Korea, Japan).
Energy production	Combustion of thermal coal in power generators by end users.	3	Emission factors from NGA Factors (DISER, 2021).
Coking coal	Combustion of coking coal by end users.	3	Emission factors from NGA Factors (DISER, 2021).

Section 8 provides the assessment of greenhouse gas emissions.

6. Air Quality Model Performance

The performance of the model for simulating existing air quality conditions has been evaluated. This involved comparing model results with measurements for the representative year using information on meteorological and operating conditions at the time in order to establish the likely confidence in the model for future operations.

It should be noted that the ROM coal production at HVO in the representative year (2014) was 18 Mt compared to the approved limit of 38 Mt under previous consents (i.e. 40% lower) and that modelling for the future operations has been carried out assuming up to the proposed maximum material handling quantities at HVO. This means that results from modelling actual production in the representative year will be lower than results from modelling maximum approved production in the representative year. The results for potential future operations, based on maximum production, have been assessed in this context.

The model performance has been evaluated for operational dust impacts including:

- Maximum 24-hour average PM₁₀ concentrations;
- Annual average PM₁₀ concentrations;
- Annual average TSP concentrations; and
- Annual average dust deposition.

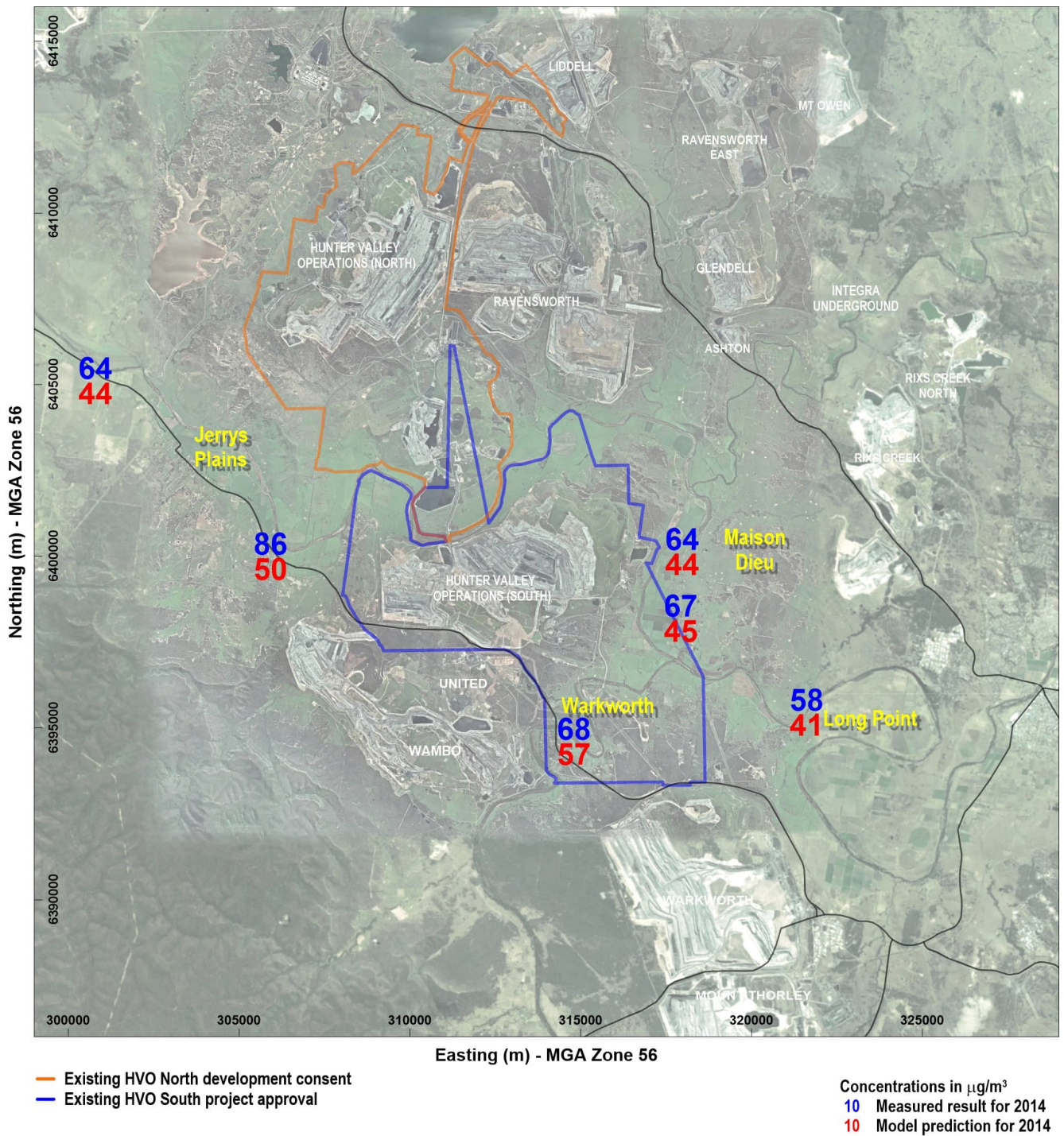
Model performance was not evaluated for PM_{2.5} or NO₂ as there are insufficient monitors in the model domain to allow for a comparison between measured and modelled levels.

Figure 21 shows a comparison of measured and modelled maximum 24-hour average PM₁₀ concentrations, based on conditions in 2014. As noted above, these comparisons are useful for determining the confidence in the model predictions for future operations. It should be noted that only one data point is available for each location (that is, the highest value). **Figure 21** shows that the model results for maximum 24-hour averages are typically 25 percent lower than the measured result, depending on the location. These results highlight the difficulty in modelling short-term (24-hour average) concentrations and the highly variable nature of daily PM₁₀ concentrations that can often be influenced by events that could not be anticipated.

Appendix E provides more detailed comparisons between the measured and modelled results for all percentiles. These comparisons indicated that the modelled maximum 24-hour average PM₁₀ concentrations aligned with the measurements as follows:

- 9th highest measurement from Jerrys Plains.
- 14th highest measurement from Maison Dieu.
- Between 1st and 2nd highest measurement from Warkworth.

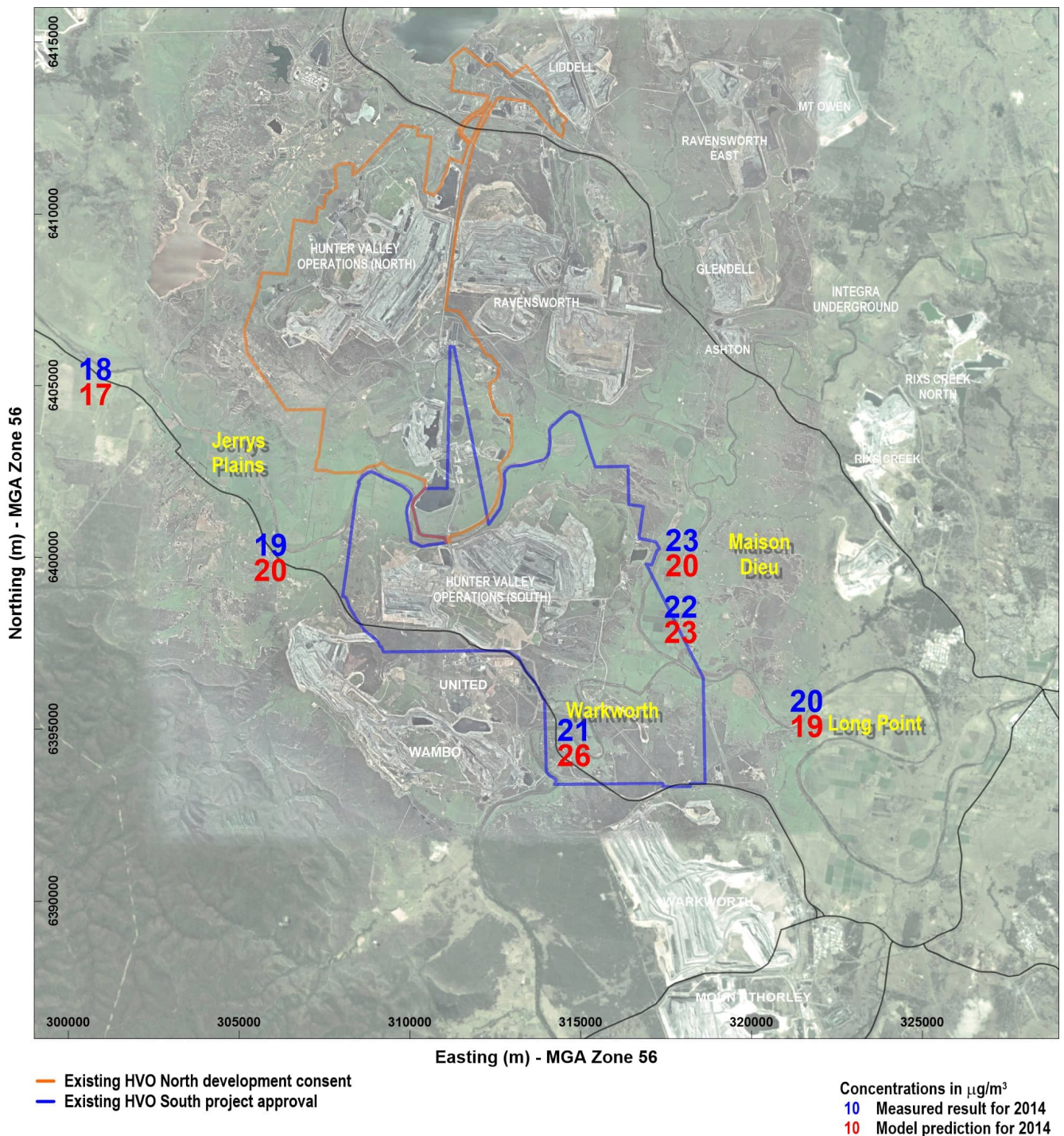
Again, this variability highlights that PM₁₀ concentrations are often influenced by events that cannot be anticipated as seen in **Section 4.3**.



EPA assessment criterion is $50 \mu\text{g}/\text{m}^3$.

Figure 21 Comparison of measured and modelled maximum 24-hour average PM_{10} concentrations

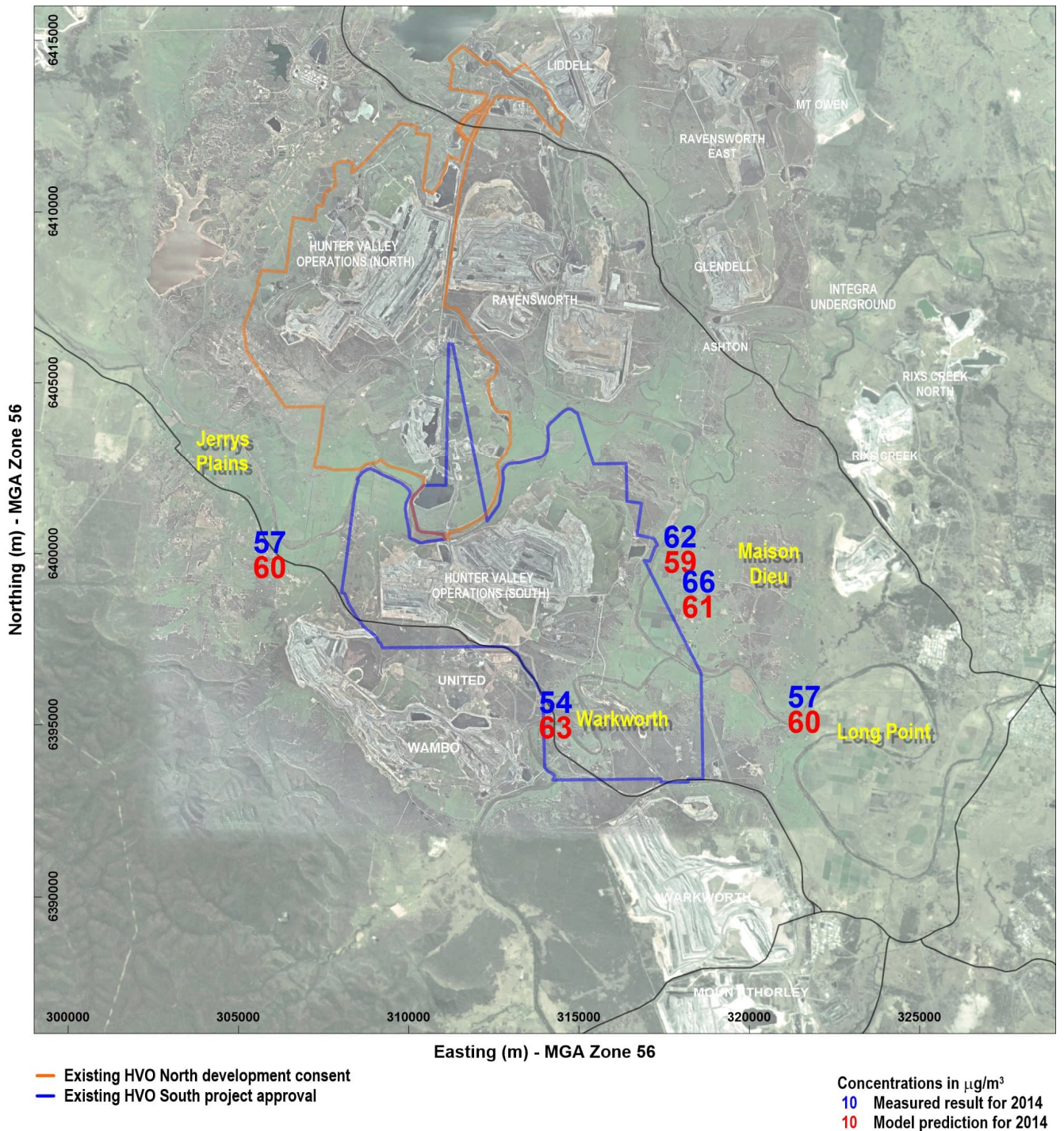
Figure 22 shows a comparison of the measured and modelled annual average PM₁₀ concentrations for 2014. Annual averages are a more reliable statistic than maxima as there are more data points available; that is, 365 days versus one day. The comparison shows that the model results are typically within 1 µg/m³ of the measurements. The exceptions to this are Warkworth, with an over-prediction of 5 µg/m³, and the Maison Dieu monitoring location, with an under-prediction of 3 µg/m³ (although there is also over-prediction at the nearby Knodlers Lane monitor). But overall the comparison indicates that the model is performing well for key sensitive receptor locations. Similar performance may be expected for the simulations of future conditions.



EPA assessment criterion is 25 µg/m³.

Figure 22 Comparison of measured and modelled annual average PM₁₀ concentrations

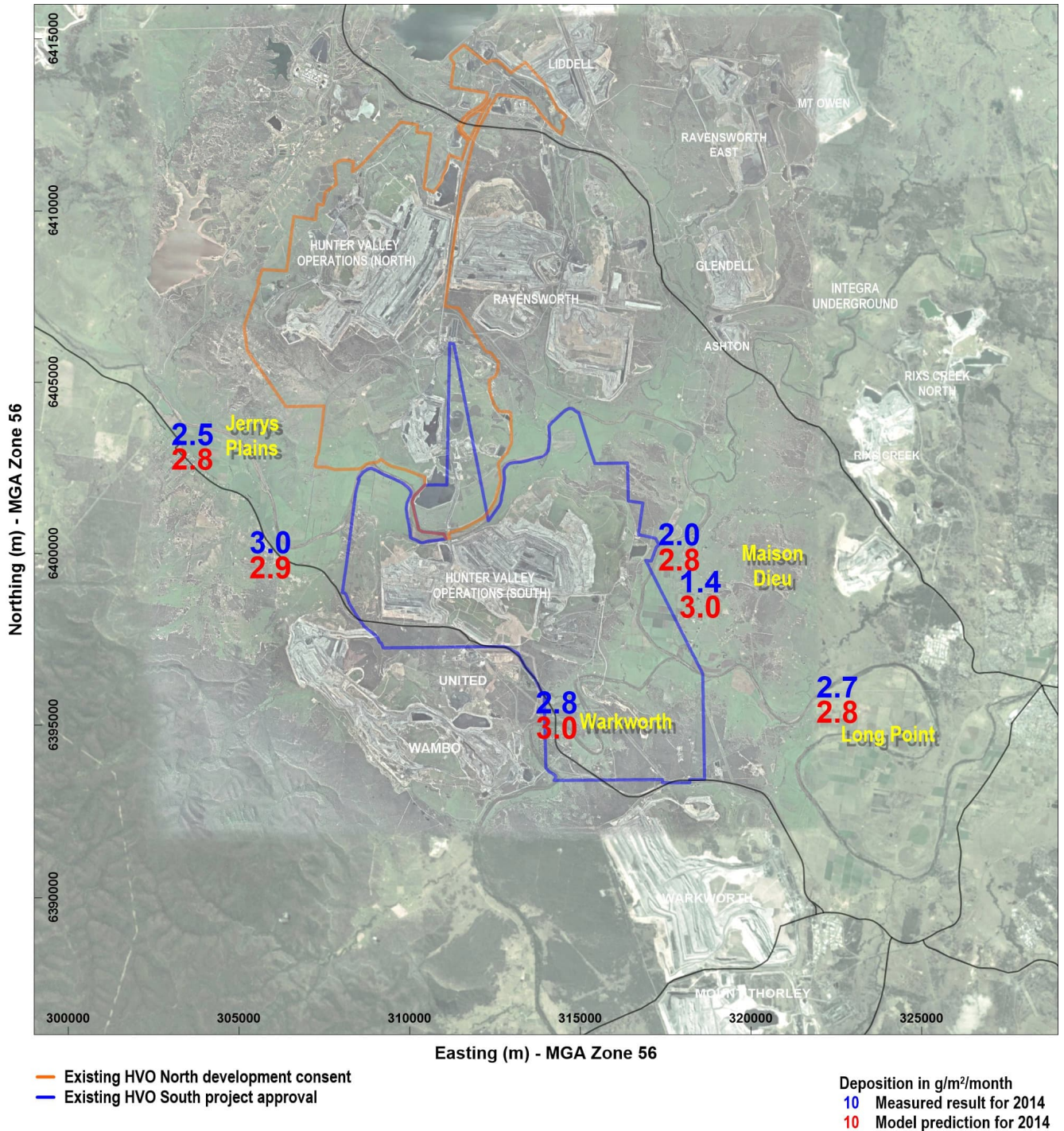
Figure 23 shows a comparison of the measured and modelled annual average TSP concentrations for 2014. This figure shows that the model results range from eight per cent lower to 17 per cent higher than the measurements, depending on the location.



EPA assessment criterion is 90 µg/m³.

Figure 23 Comparison of measured and modelled annual average TSP concentrations

Figure 24 shows a comparison of the measured and modelled annual average dust deposition levels for 2014. The model results are higher than the measurements at all but one location. Similar performance may therefore be expected from the models of future conditions.



EPA assessment criterion is 4 g/m²/month.

Figure 24 Comparison of measured and modelled annual average deposited dust

7. Air Quality Assessment

This section provides an assessment of the identified key air quality issues, from **Section 2**.

7.1 Construction Dust

Air quality impacts during construction would largely result from dust generated during earthworks and other engineering activities associated with the proposed construction works. Specifically, these works will primarily include:

- Upgrade of the existing Newdell LP and train loading facility and construction of a new product stockpile or extension of the HVLP product coal stockpile.
- Realignment of a section of Lemington Road and new bridge over the Hunter River.
- Realignment of sections of transmission and telecommunication lines.
- Construction of various water management infrastructure including flood protection levees, diversion drains, and enlargement of dams (Lake James and Parnells Dam).
- Construction of a haul road to Ravensworth Operations.

Given the uncertainties related to weather conditions, methods, sequences and material handling quantities, modelling of operational dust (**Section 7.2**) has not explicitly included contributions from construction related activities. However, an assessment of the potential cumulative effects between construction activities and mining operations has been undertaken based on indicative estimates of material handling quantities as well as assumptions on how the construction activities may occur.

Table 23 shows indicative estimates of material handling quantities for all key construction works, as supplied by HVO. These estimates include excavation, fill, gravel, concrete, and soil, among other materials necessary for specific activities. It is anticipated that most of the construction works will occur in Year 1 to 3. The estimates in **Table 23** will include doubling counting with mine waste but have, nevertheless, been used to develop a construction dust (TSP, PM₁₀ and PM_{2.5}) emissions inventory for comparison with the Year 3 (2025) mine operational emission inventories.

Table 23 Indicative estimates of construction material handling quantities

Works	Indicative timing Year 1 = approx. 2023	Indicative volume of earth / material moved (cubic metres)
Construction Phase 1		
Tailings pipeline connection (HVO to Liddell)	Year 1-3	117,100
Transmission and telecommunication line relocations	Year 1-3	20,500
HVLP product stockpile extension	Year 1-3	57,400
HV MIA upgrades	Year 1-3	11,100
HVO North access road relocation	Year 1-3	33,800
Lake James enlargement	Year 1-3	584,900
Lemington Road realignment	Year 1-3	923,400
Mitchell Dam (Dam 2N)	Year 1-3	167,400
Mitchell clean water diversion	Year 1-3	143,800
Newdell LP upgrades and new product stockpile	Year 1-3	842,100
North Pit TSF flood protection levee	Year 1-3	154,500
Parnells Dam enlargement	Year 1-3	1,806,300

Works	Indicative timing Year 1 = approx. 2023	Indicative volume of earth / material moved (cubic metres)
Future Construction Works		
Haul road from HVO to Ravensworth Operations	Year 3-4	2,128,100
Cheshunt flood protection levee	Year 8	302,500
Mitchell flood protection levee	Year 10	323,700
Lemington CPP and rail (Year 13-15)	Year 13-15	605,100
Total	-	8,221,700

The material handling quantities from **Table 23** have been used to develop a construction dust emissions inventory based on the following conservative assumptions:

- All construction phase 1 works will occur concurrently.
- The combined total exposed areas of all work sites (approximately 398 ha) will be susceptible to wind erosion.
- Dust generating activities for construction works will include excavators loading to trucks, haulage by trucks of 50 t capacity, unloading trucks, and continuous wind erosion from exposed areas.
- Trucks will transport the estimated material volumes over unsealed routes for approximately one kilometre. Water carts will be used for dust suppression.

Table 24 shows the calculated annual emissions due to construction works including the emission estimates for the general operational mining activities (Year 3) for comparison. A conservative approach was taken for all assumptions listed above meaning that the resultant construction emission estimates in **Table 24** will represent maximum upper limits.

Table 24 Estimated emissions due to construction works for the Project

Air quality indicator	Annual emissions in Year 3 (indicatively 2025) (kg/y)		Construction as a percentage of operation
	Construction	Mining operation	
TSP	477,052	14,616,209	3%
PM ₁₀	216,977	4,916,734	4%
PM _{2.5}	31,105	764,283	4%

Table 24 shows that construction emissions have the potential to increase annual operational emissions in Year 3 by a maximum of 3% for TSP, 4% for PM₁₀ and 4% for PM_{2.5}. These increases are not of a magnitude that will change the air quality outcomes of private sensitive receptors, as described in **Section 7.2**. Consequently, it has been concluded that the proposed construction works are unlikely to cause adverse air quality impacts. However, as for mining operations, it is important that exposed areas be stabilised as quickly as possible and that appropriate dust suppression methods be used to keep dust impacts to a minimum. Dust management will require the use of water carts, the defining of trafficked areas, the imposition of site vehicle speed limits and constraints on work under extreme unfavourable weather conditions, such as dry wind conditions. Monitoring would also need to continue during the construction phase to assess compliance with consent criteria.

7.2 Operational Dust

This section provides an assessment of the Project in terms of operational mining dust, based on the methodology described in **Section 5.2**. Model results have been assessed for each of the key particulate matter classifications. For readability, the results have been presented in terms of the contributions from HVO Complex however the individual contributions from HVO North and HVO South can be found in **Appendix F**.

7.2.1 Particulate Matter (as PM₁₀)

Figure 25 shows the modelled maximum 24-hour average PM₁₀ concentrations due to the Project for each assessment scenario. The EPA does not prescribe a project only assessment criteria for 24-hour average PM₁₀, but the VLAMP refers to 50 µg/m³ for the purposes of determining land acquisition and mitigation. The modelling shows that the 50 µg/m³ criterion would not be exceeded at any private sensitive receptor. It should be noted that Warkworth Hall (ID 102) and the Hunter Valley Gliding Club (ID 833) are not considered to be sensitive receptors as they are not regularly occupied.

Compliance with the EPA's 24-hour average PM₁₀ criterion of 50 µg/m³ has also been assessed. This criterion relates to the total concentration in the air (that is, cumulative) and not just the contribution from the Project. As noted in **Section 4.3**, most locations around the HVO Complex, and in fact NSW, have historically recorded one or more days each year when the 24-hour average PM₁₀ concentration exceeded 50 µg/m³. The model has therefore been configured to show the number of days each year above 50 µg/m³ and an assessment of whether the Project would cause additional exceedances has been made.

Figure 26 shows the modelled number of days above 50 µg/m³ due to HVO, other mining operations and other sources of PM₁₀. These results show that, for a representative year, the residential communities of Jerrys Plains, Maison Dieu and Long Point are expected to experience in the order of between one and five days per year when PM₁₀ concentrations exceed 50 µg/m³. This result is within the range of historically measured days when PM₁₀ concentrations have exceeded 50 µg/m³, with the exception of extraordinary years such as those years with increased occurrence of dust storms and bushfires. The review of recent and historical air quality monitoring data (**Section 4.3**) showed that, in the representative year (2014), all monitoring locations recorded between one and six days above 50 µg/m³. Based on the modelling the Project is not anticipated to change this outcome.

Additional investigation of the potential for the Project to cause an exceedance of the EPA assessment criteria has been carried out. This involved examining contemporaneous background and mining contributions for each day in the modelling year, referred to as a "Level 2" assessment by the Approved Methods.

Figure 27 and **Figure 28** show the time series of 24-hour average PM₁₀ concentrations at the nearest properties around Maison Dieu and Jerrys Plains; the two closest residential areas. At Maison Dieu (**Figure 27**) the modelling indicates that PM₁₀ concentrations are unlikely to exceed 50 µg/m³, not including extraordinary events. At Jerrys Plains (**Figure 28**) the modelled indicates that the highest risk of PM₁₀ concentrations exceeding 50 µg/m³ would be when contributions from background sources and other mines are elevated and predominantly around Year 11. The modelling indicates that the combined contributions of HVO North and HVO South have the potential to cause an exceedance of 50 µg/m³ on up to five days in Year 11, with a maximum combined contribution of 13 µg/m³. It is suggested that the potential to cause exceedances of 50 µg/m³ can be managed through existing HVO air quality management measures, described in **Section 9**. This approach has been demonstrated by the site compliance history.

Figure 29 shows the modelled annual average PM₁₀ concentrations due to the Project. There are no applicable "project only" assessment criteria from the EPA but it can be seen from these results that the contribution of the Project to annual average PM₁₀ concentrations at the nearest local communities would be in the order of 5 µg/m³ or less.

Figure 30 shows the modelled annual average PM₁₀ concentrations due to the Project, other mining operations and other sources of PM₁₀. These results indicate compliance with the EPA's assessment criterion for annual average PM₁₀ (25 µg/m³) at all private sensitive receptors (not subject to air quality acquisition rights) with the

exception of Property 308 in Year 11. This result has been influenced by the combined contributions from the Project (with active mining moving closer to Jerrys Plains in later years), other mining operations and other sources of PM₁₀. Annual average contributions have been modelled to be 5.5 µg/m³ from the combined contributions of HVO North and HVO South. It is suggested that the modelled non-compliance at property 308 is a conservative estimate and will not eventuate given that:

- Historical air quality monitoring (Section 4.3) has shown that annual average PM₁₀ concentrations near this location in non-extraordinary years have not exceeded 21 µg/m³ with levels ranging from 16 to 21 µg/m³.
- Modelling was carried out using a maximum proposed coal extraction rate which, at 18 Mtpa for HVO South, is lower than the approved extraction rate (20 Mtpa).

Nevertheless, continued monitoring of PM₁₀ in the Jerrys Plains area will be required to evaluate the contributions of the Project and, if approved, compliance with development consent criteria.

Table 25 provides a summary of the modelled operational PM₁₀ concentrations at locations representative of the nearest residential areas, reflecting the conclusions outlined above. **Appendix F** provides tabulated results for all locations including the splits between HVO North and HVO South.

Table 25 Modelled operational PM₁₀ concentrations at local communities

Representative receptors (property ID)*	Due to Project (HVO Complex)					Cumulative						Criterion
	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	2014	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	
Maximum 24-hour average PM₁₀ (µg/m³)												
Jerrys Plains (308)	16	17	18	27	18	50	55	53	58	55	47	50
Jerrys Plains (321)	11	14	16	29	23	49	47	48	52	59	51	50
Long Point (139) – off map	16	17	17	18	12	41	42	42	42	41	41	50
Maison Dieu (161)	28	18	19	24	28	44	46	47	47	46	41	50
Warkworth (102)	12	18	25	27	11	56	66	65	65	50	41	50
Number of days exceeding 50 µg/m³ PM₁₀												
Jerrys Plains (308)	0	0	0	0	0	0	3	2	6	2	0	-
Jerrys Plains (321)	0	0	0	0	0	0	0	0	1	1	1	-
Long Point (139) – off map	0	0	0	0	0	0	0	0	0	0	0	-
Maison Dieu (161)	0	0	0	0	0	0	0	0	0	0	0	-
Warkworth (102)	0	0	0	0	0	2	36	27	24	0	0	-
Annual average PM₁₀ (µg/m³)												
Jerrys Plains (308)	2.3	3.2	3.9	5.5	2.9	20	24	23	27	23	17	25
Jerrys Plains (321)	2.6	3.4	3.9	5.3	3.0	19	20	20	22	21	17	25
Long Point (139) – off map	2.7	2.9	2.9	3.0	1.9	19	20	20	20	18	16	25
Maison Dieu (161)	3.2	3.6	4.1	5.0	5.1	20	22	22	22	21	19	25
Warkworth (102)	2.0	2.9	3.8	3.8	1.8	26	38	37	35	21	16	25

* Warkworth Hall (102) and the Hunter Valley Gliding Club (833) are not considered to be sensitive receptors as they are not regularly occupied.

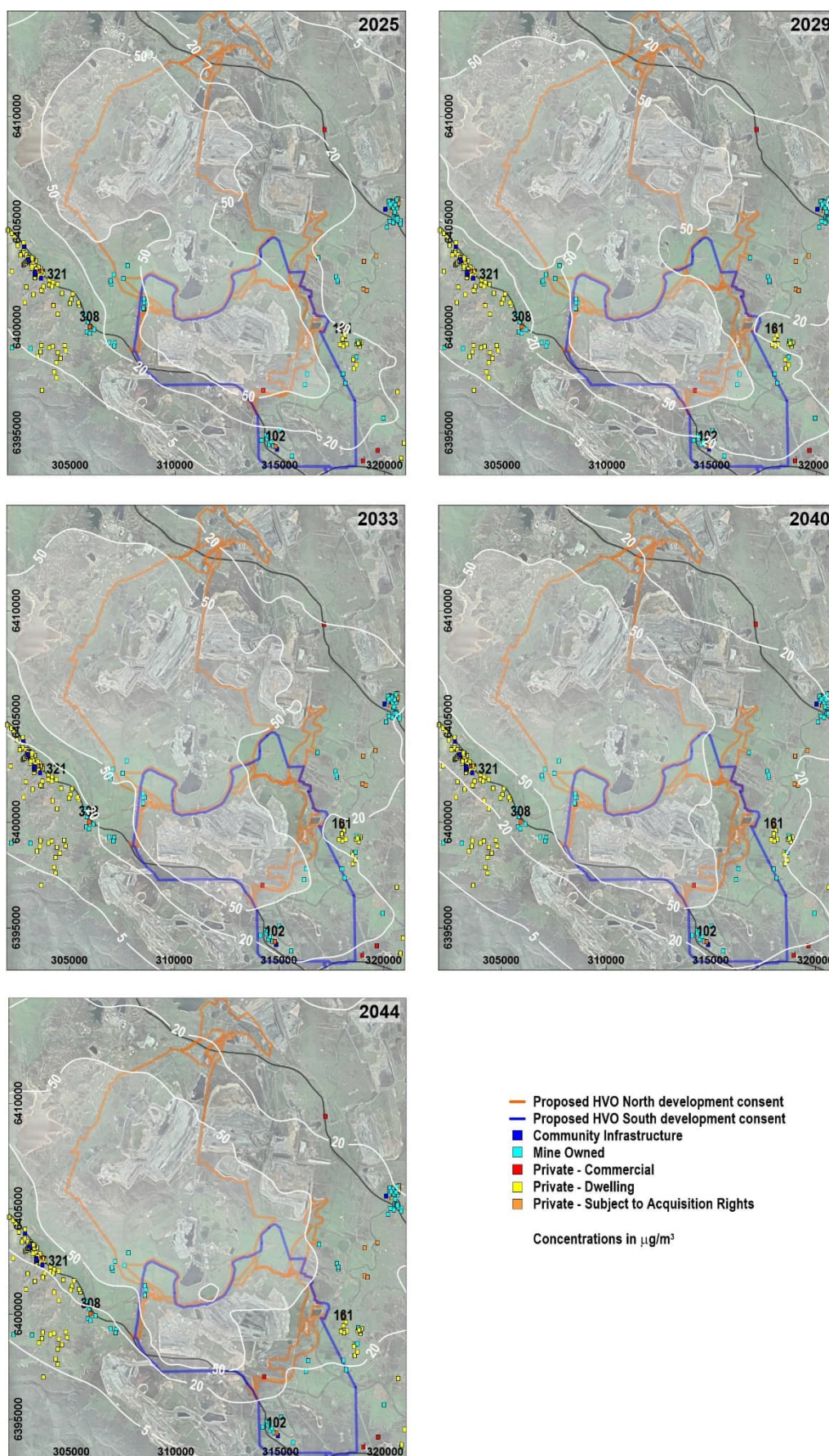


Figure 25 Modelled maximum 24-hour average PM₁₀ due to the Project

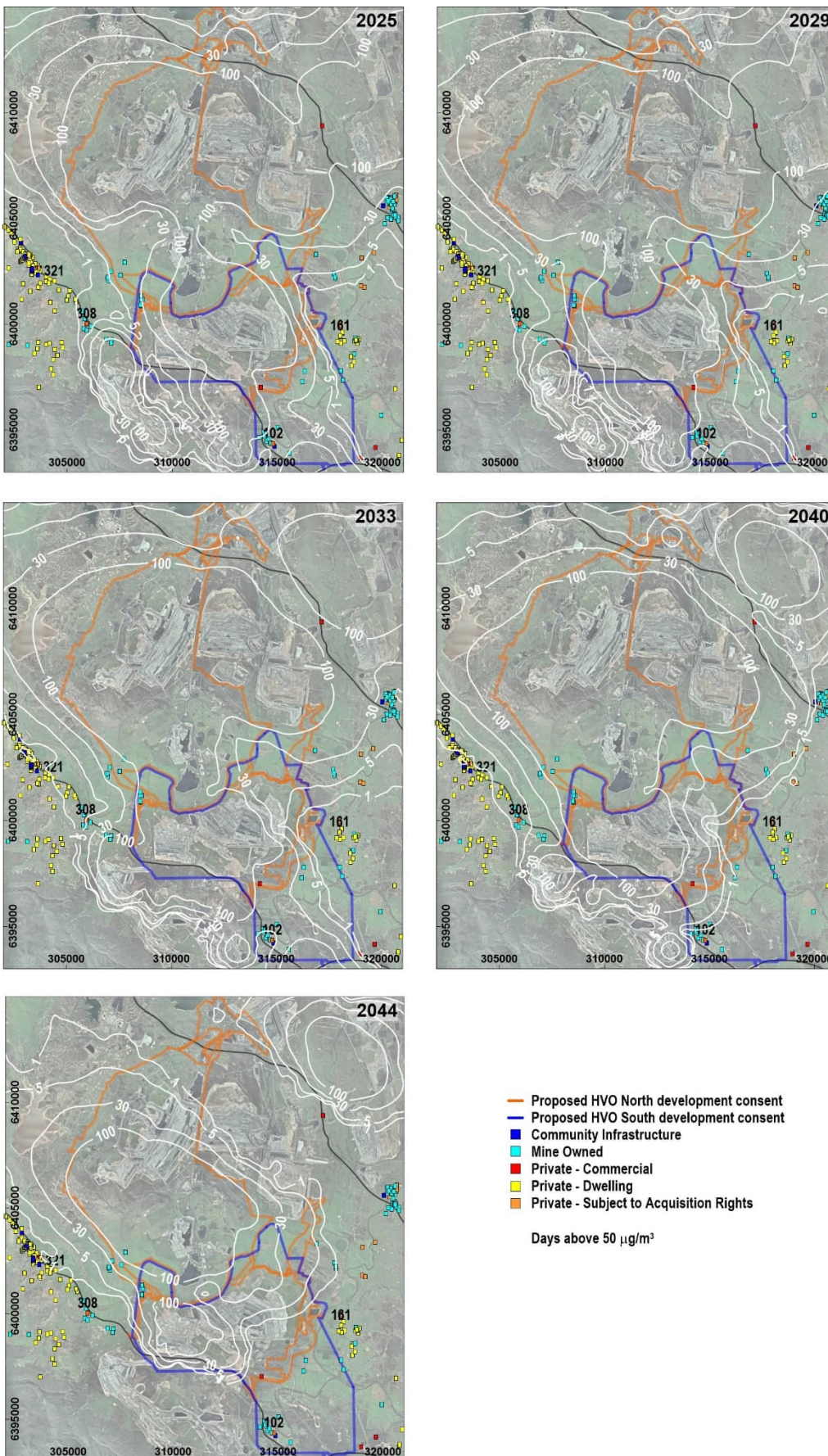


Figure 26 Modelled number of days above 50 µg/m³ PM₁₀ due to the Project and other sources

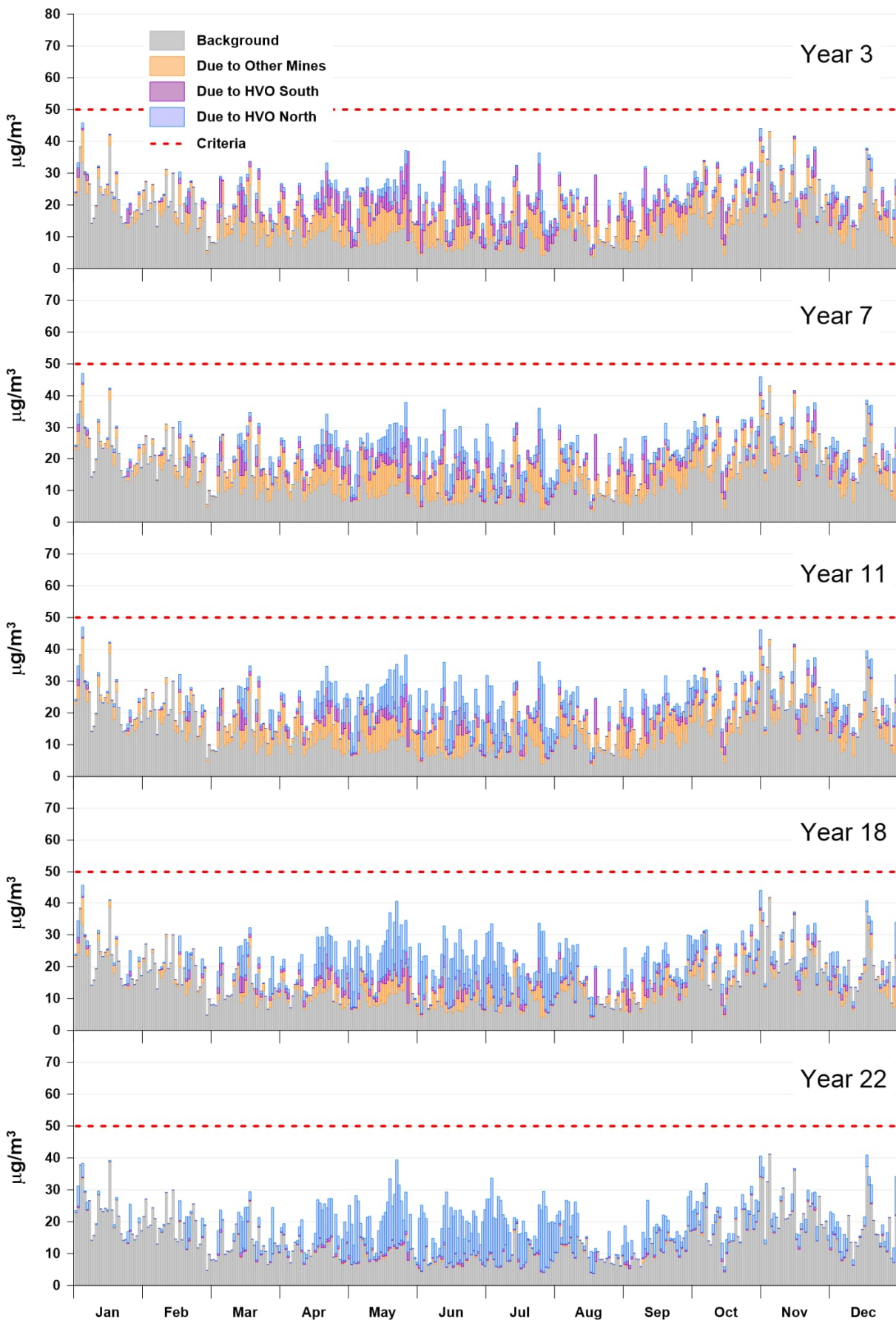


Figure 27 Time series of 24-hour average PM₁₀ at Maison Dieu (property 161)

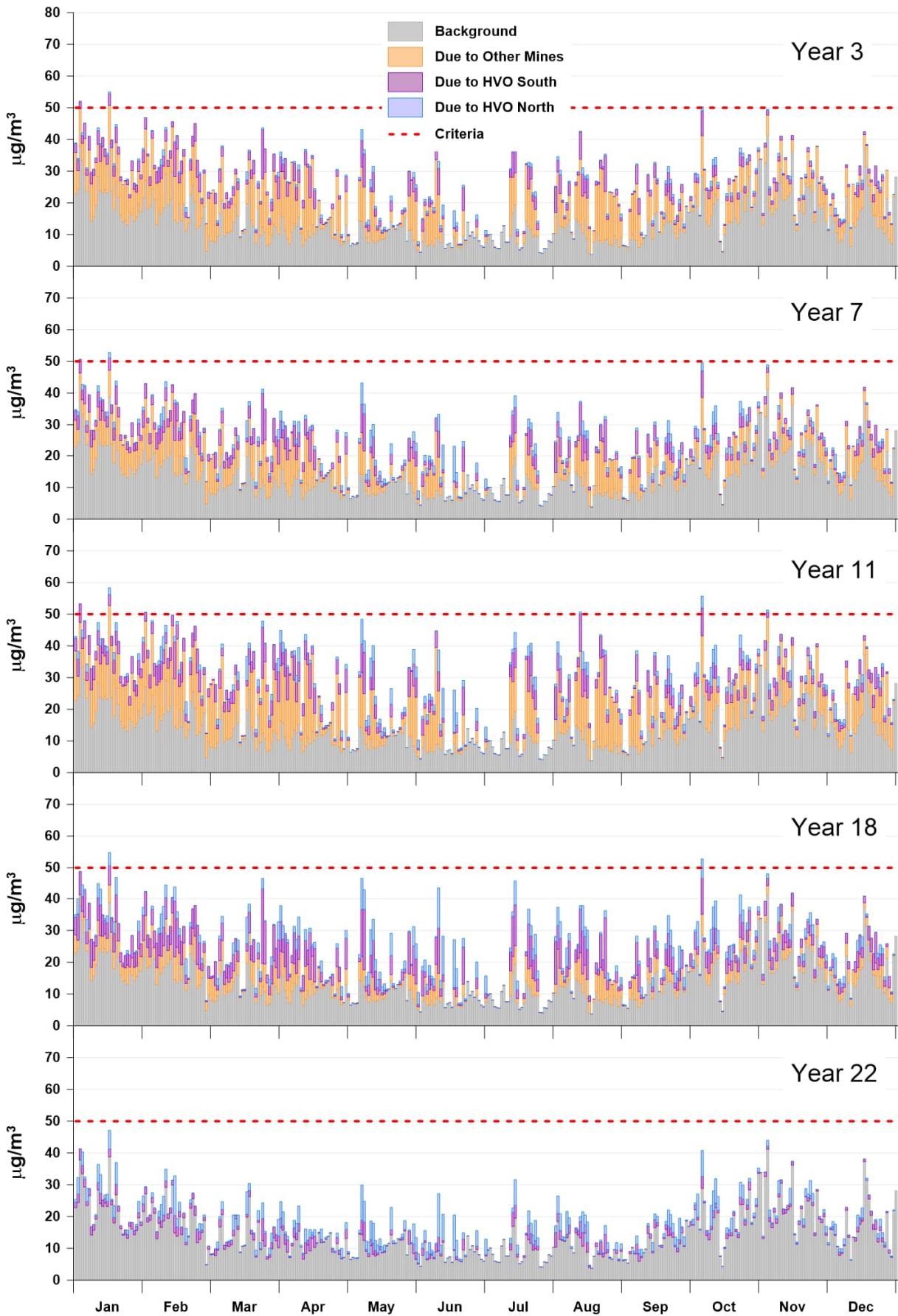


Figure 28 Time series of 24-hour average PM₁₀ at Jerrys Plains (property 308)

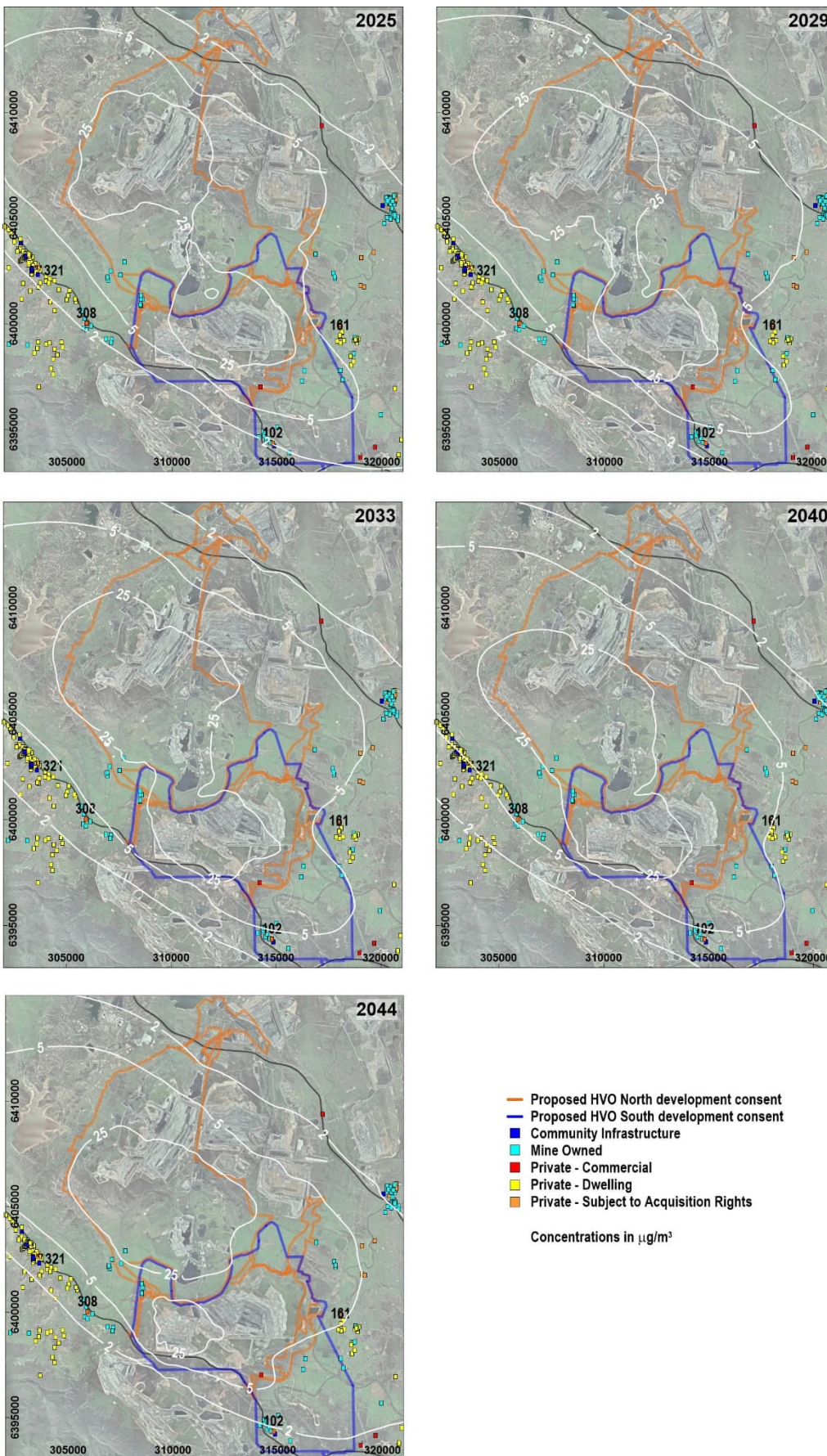


Figure 29 Modelled annual average PM₁₀ due to the Project

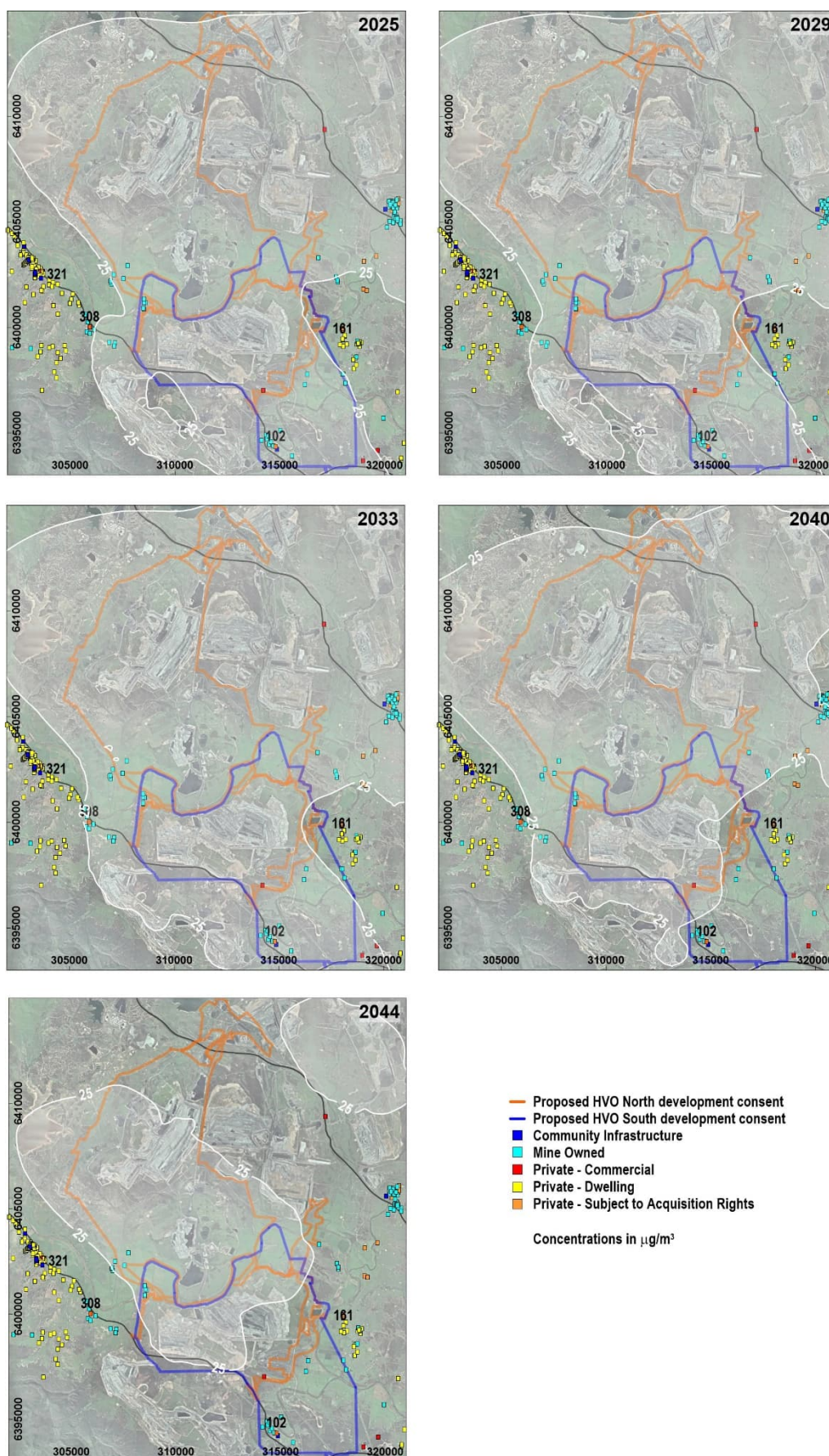


Figure 30 Modelled annual average PM_{10} due to the Project and other sources

7.2.2 Particulate Matter (as PM_{2.5})

Figure 31 shows the modelled maximum 24-hour average PM_{2.5} concentrations due to the Project for each assessment scenario. The EPA does not prescribe a project only assessment criteria for 24-hour average PM_{2.5}, but the VLAMP refers to 25 µg/m³ for the purposes of determining land acquisition and mitigation. The modelling shows that the 25 µg/m³ criterion would not be exceeded at any private sensitive receptor.

Compliance with the EPA's 24-hour average PM_{2.5} criterion of 25 µg/m³ has also been assessed. This criterion relates to the total concentration in the air (that is, cumulative) and not just the contribution from the Project. As noted in **Section 4.3**, most locations around the HVO Complex have historically recorded one or more days each year when the 24-hour average PM_{2.5} concentration exceeded 25 µg/m³. The model has therefore been configured to show the number of days each year above 25 µg/m³ and an assessment of whether the Project would cause additional exceedances has been made.

Figure 32 shows the modelled number of days above 25 µg/m³ due to HVO, other mining operations and other sources of PM_{2.5}. These results show that, for a representative year, the residential communities of Jerrys Plains, Maison Dieu and Long Point are expected to experience one or less days per year when PM_{2.5} concentrations exceed 25 µg/m³. This result is within the range of historically measured days when PM_{2.5} concentrations have exceeded 25 µg/m³, with the exception of extraordinary years such as those years with increased occurrence of dust storms and bushfires. The review of recent and historical air quality monitoring data (**Section 4.3**) showed that, in the representative year (2014), all monitoring locations recorded between one and two days above 25 µg/m³. Based on the modelling the Project is not anticipated to change this outcome.

Figure 33 shows the modelled annual average PM_{2.5} concentrations due to the Project. There are no applicable "project only" criteria from the EPA but it can be seen from these results that the contribution of the Project to annual average PM_{2.5} concentrations at the nearest local communities would be in the order of 1 to 2 µg/m³.

Figure 34 shows the modelled annual average PM_{2.5} concentrations due to the Project, other mining operations and other sources of PM_{2.5}. These results indicate compliance with the EPA's assessment criterion for annual average PM_{2.5} (8 µg/m³) at all private sensitive receptors not subject to air quality acquisition rights, except for property 308 in Year 11 (although 308 is entitled to voluntary noise acquisition rights with the UWJV). It is noted that some distant areas, such as Camberwell, are anticipated to experience annual average PM_{2.5} above 8 µg/m³ however these locations are not directly adjacent to HVO. That is, the primary influence on air quality will be other sources or operations. Nevertheless, continued monitoring of PM_{2.5} will be required to evaluate the contributions of the Project and, if approved, compliance with development consent criteria.

Table 26 provides a summary of the modelled operational PM_{2.5} concentrations at the identified local communities, reflecting the conclusions outlined above. **Appendix F** provides tabulated results for all locations including the splits between HVO North and HVO South.

Table 26 Modelled operational PM_{2.5} concentrations at local communities

Representative receptors (property ID)*	Due to Project (HVO Complex)					2014	Cumulative					Criterion
	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044		Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	
Maximum 24-hour average PM_{2.5} (µg/m³)												
Jerrys Plains (308)	4.1	4.6	4.7	8.3	6.2	17	17	17	19	18	17	25
Jerrys Plains (321)	3.2	4.4	4.7	8.3	7.5	16	16	16	17	18	17	25
Long Point (139) – off map	3.2	3.7	3.8	4.1	2.6	15	15	15	15	15	15	25
Maison Dieu (161)	6.3	4.7	5.1	5.8	5.6	16	16	16	16	16	15	25
Warkworth (102)	3.7	4.5	5.7	5.7	3.1	18	20	19	19	17	15	25
Number of days exceeding 25 µg/m³ PM_{2.5}												
Jerrys Plains (308)	0	0	0	0	0	0	0	0	0	0	0	-

Representative receptors (property ID)*	Due to Project (HVO Complex)					Cumulative						Criterion
	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	2014	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	
Jerrys Plains (321)	0	0	0	0	0	0	0	0	0	0	0	-
Long Point (139) – off map	0	0	0	0	0	0	0	0	0	0	0	-
Maison Dieu (161)	0	0	0	0	0	0	0	0	0	0	0	-
Warkworth (102)	0	0	0	0	0	0	0	0	0	0	0	-
Annual average PM_{2.5} (µg/m³)												
Jerrys Plains (308)	0.5	0.8	0.9	1.3	0.8	6.6	7.0	7.0	8.3	7.3	6.0	8
Jerrys Plains (321)	0.6	0.8	0.9	1.3	0.9	6.4	6.5	6.7	7.1	6.9	6.1	8
Long Point (139) – off map	0.6	0.7	0.7	0.7	0.5	6.4	6.6	6.7	6.7	6.2	5.7	8
Maison Dieu (161)	0.8	0.9	1.0	1.2	1.2	6.9	7.2	7.3	7.3	6.9	6.4	8
Warkworth (102)	0.5	0.7	0.9	0.9	0.5	7.5	10.6	9.9	9.4	6.7	5.7	8

* Warkworth Hall (102) and the Hunter Valley Gliding Club (833) are not considered to be sensitive receptors as they are not regularly occupied.

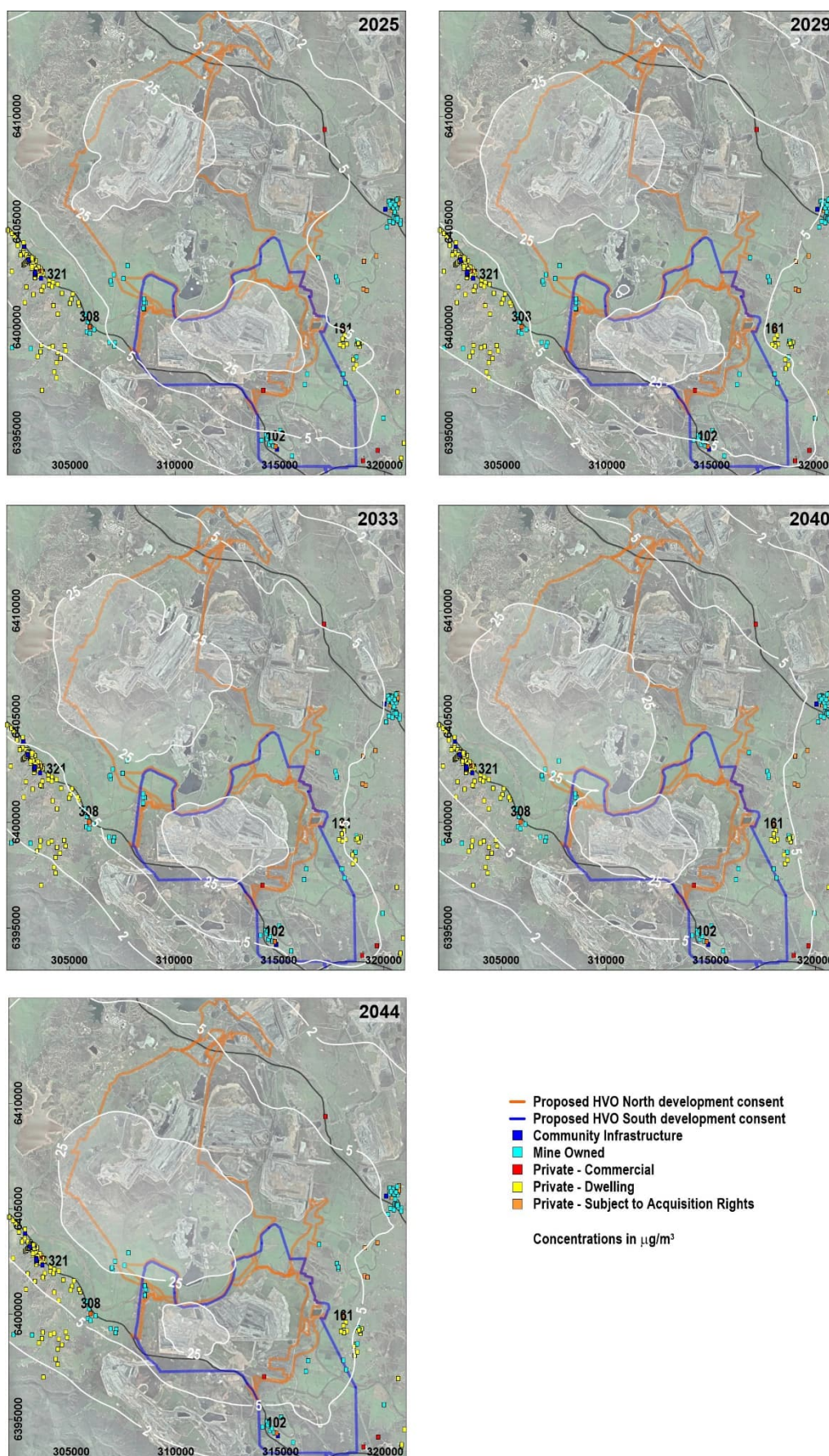


Figure 31 Modelled maximum 24-hour average PM_{2.5} due to the Project

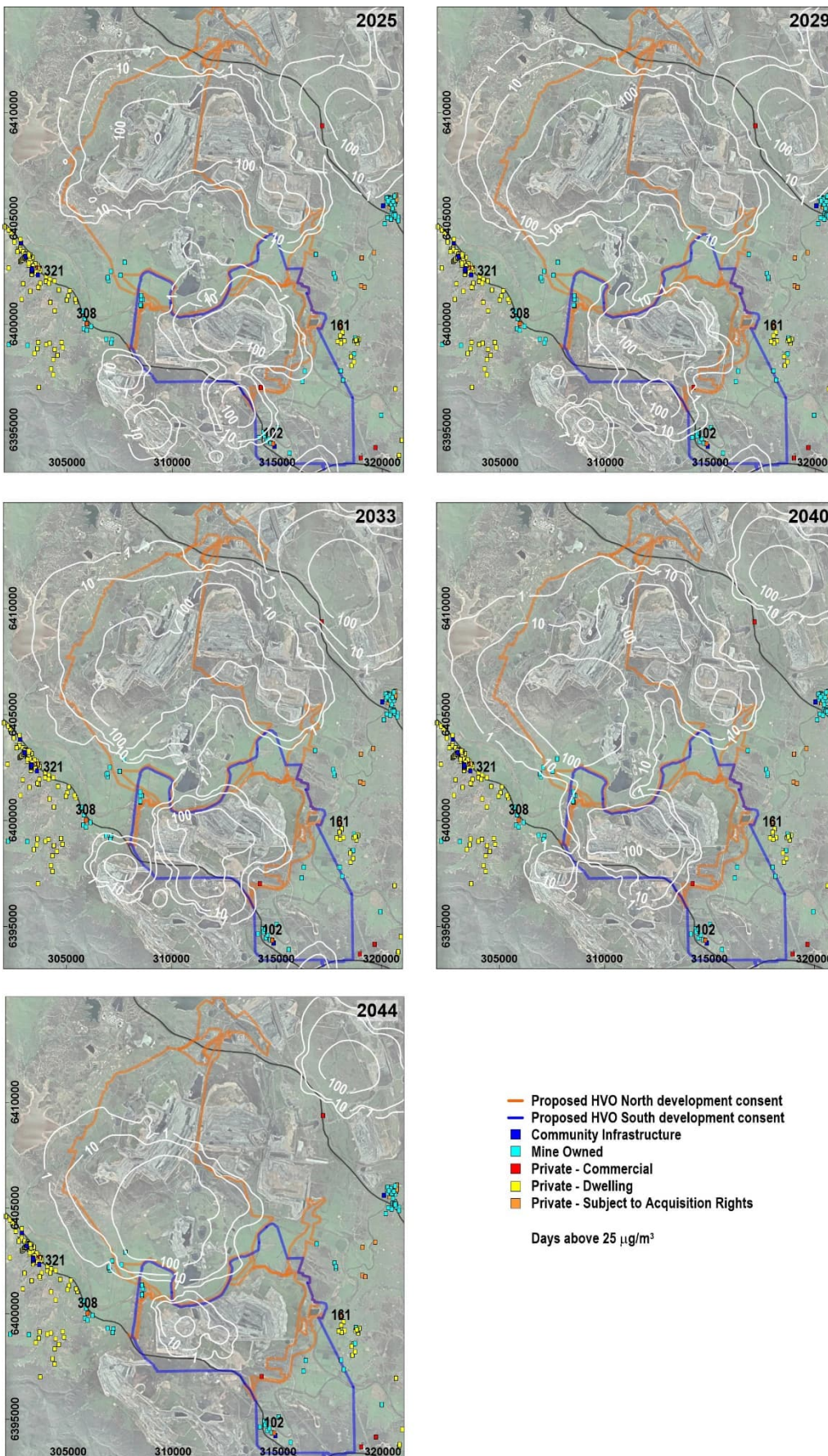


Figure 32 Modelled number of days above 25 µg/m³ PM_{2.5} due to the Project and other sources

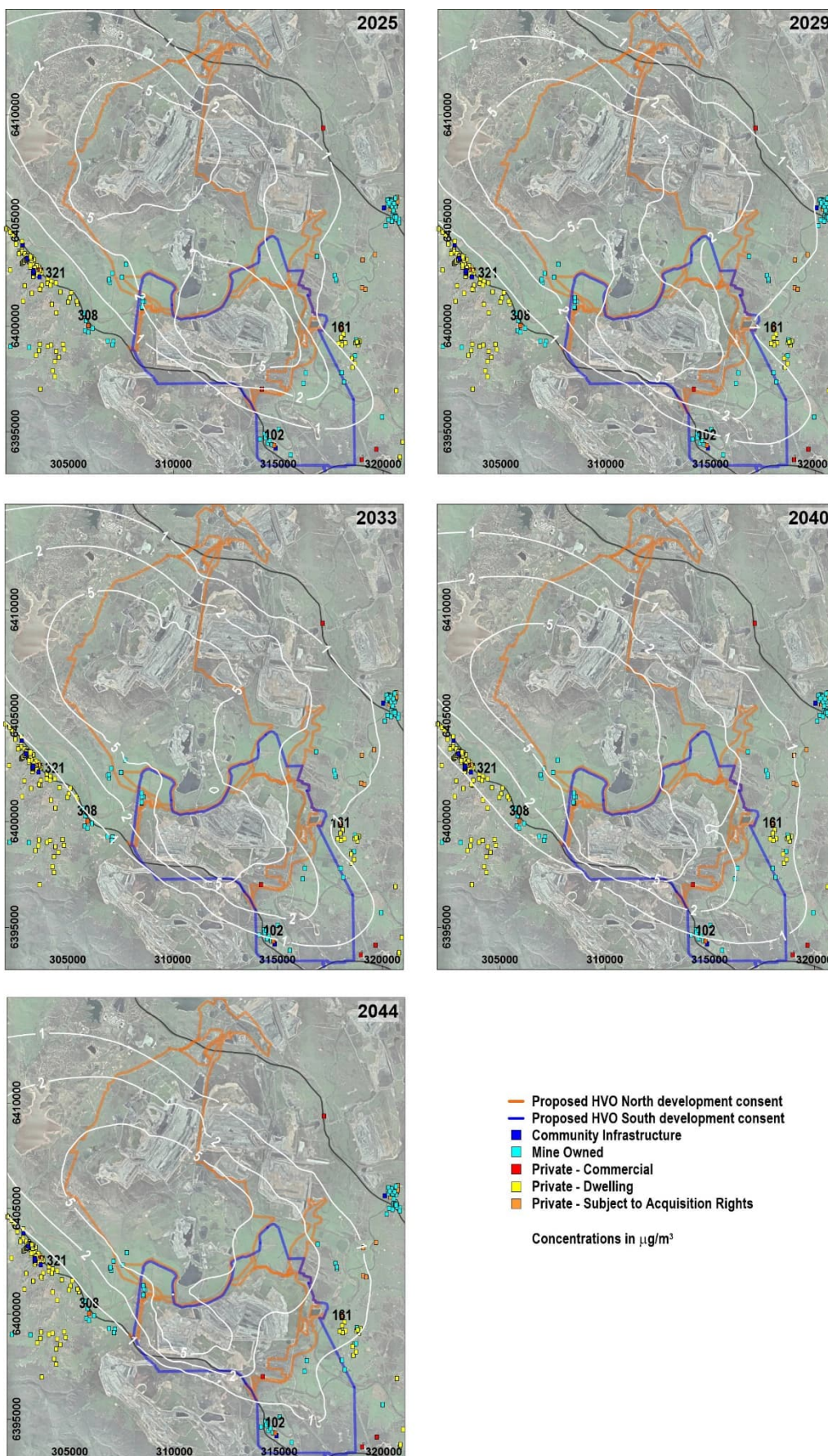


Figure 33 Modelled annual average PM_{2.5} due to the Project

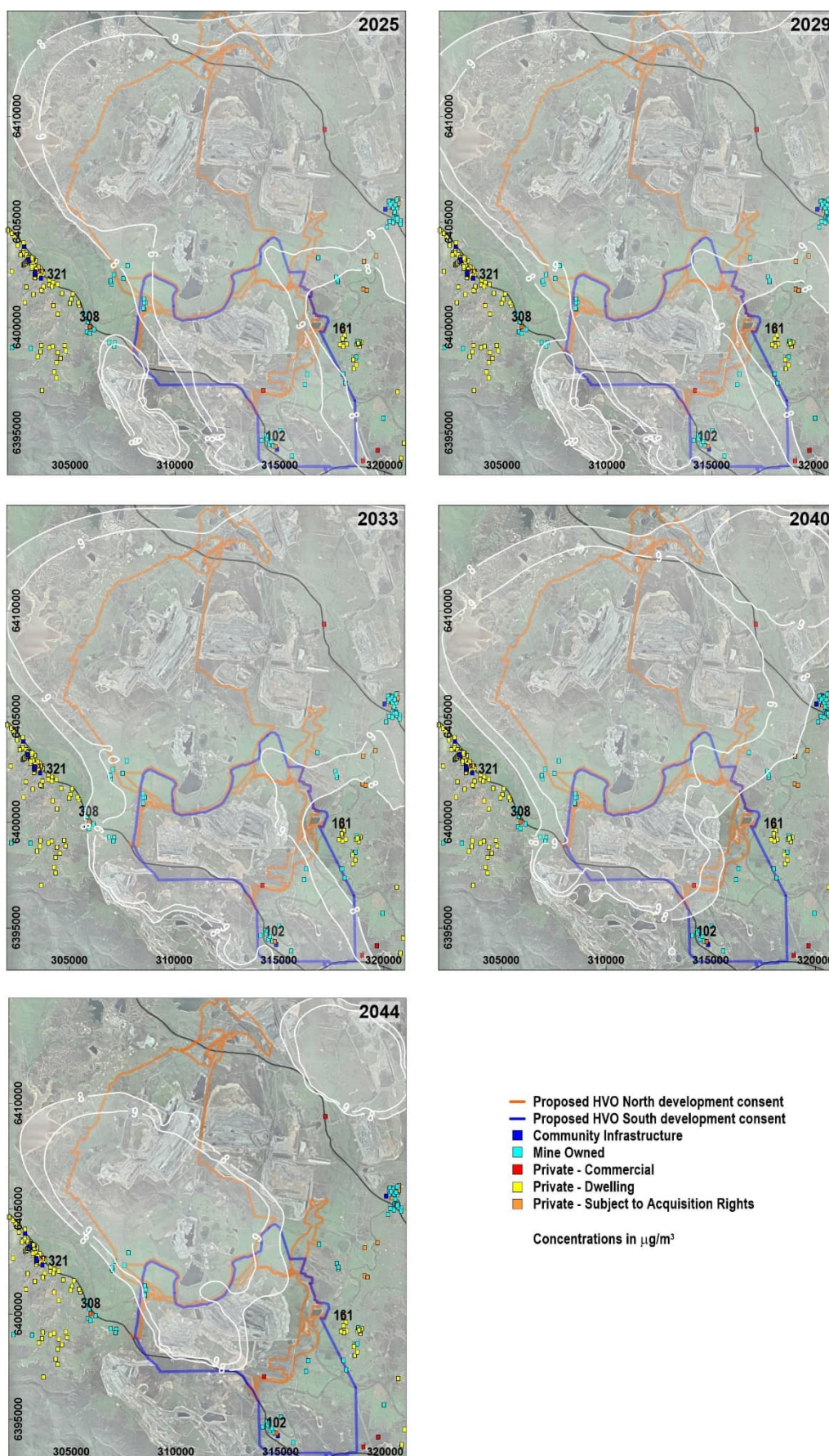


Figure 34 Modelled annual average $\text{PM}_{2.5}$ due to the Project and other sources

7.2.3 Particulate Matter (as TSP)

Figure 35 shows the modelled annual average TSP concentrations due to the Project. There are no applicable “project only” criteria from the EPA but it can be seen from these results that the contribution of the Project to annual average TSP concentrations at the nearest local communities would be in the order of 2 to 5 µg/m³.

Figure 36 shows the modelled annual average TSP concentrations due to the Project, other mining operations and other sources of TSP. These results indicate compliance with the EPA’s assessment criterion for annual average TSP (90 µg/m³) at all private sensitive receptors not subject to air quality acquisition rights. Consequently, the Project is not anticipated to cause adverse air quality impacts in terms of TSP concentrations.

Table 27 provides a summary of the modelled operational TSP concentrations at the identified local communities, reflecting the conclusions outlined above. **Appendix F** provides tabulated results for all locations including the splits between HVO North and HVO South.

Table 27 Modelled operational TSP concentrations at local communities

Representative receptors (property ID)*	Due to Project (HVO Complex)					Cumulative						Criterion
	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	2014	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	
Annual average TSP (µg/m³)												
Jerrys Plains (308)	1.3	1.9	2.6	3.1	1.4	61	62	62	67	63	58	90
Jerrys Plains (321)	1.6	2.0	2.4	2.9	1.4	60	60	60	62	61	58	90
Long Point (139) – off map	2.5	2.4	2.4	2.1	1.0	60	60	60	60	59	58	90
Maison Dieu (161)	2.6	2.0	2.2	2.7	2.7	60	60	60	60	60	60	90
Warkworth (102)	0.7	1.3	2.3	1.8	0.8	63	73	71	71	61	58	90

* Warkworth Hall (102) and the Hunter Valley Gliding Club (833) are not considered to be sensitive receptors as they are not regularly occupied.

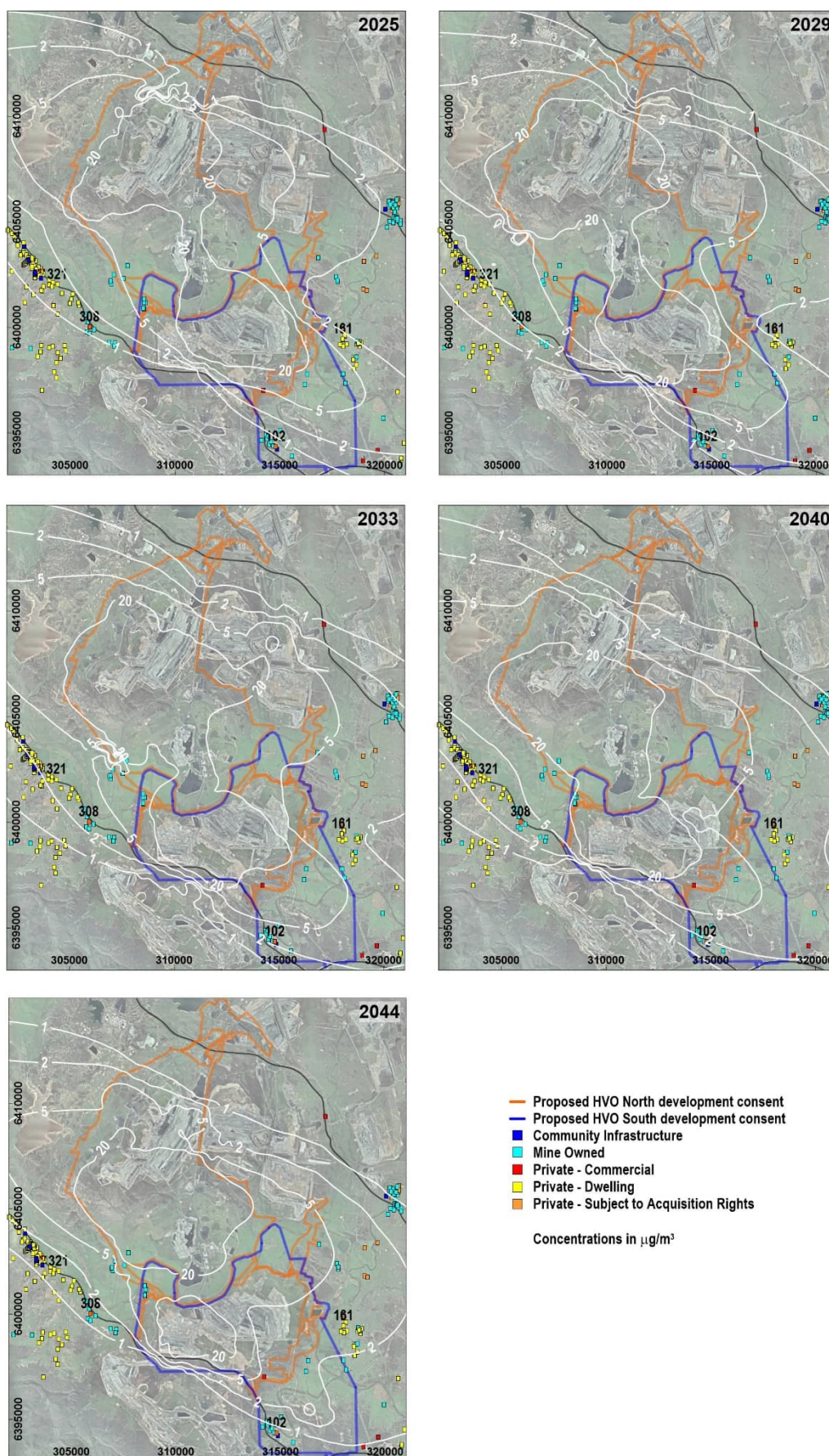


Figure 35 Modelled annual average TSP due to the Project

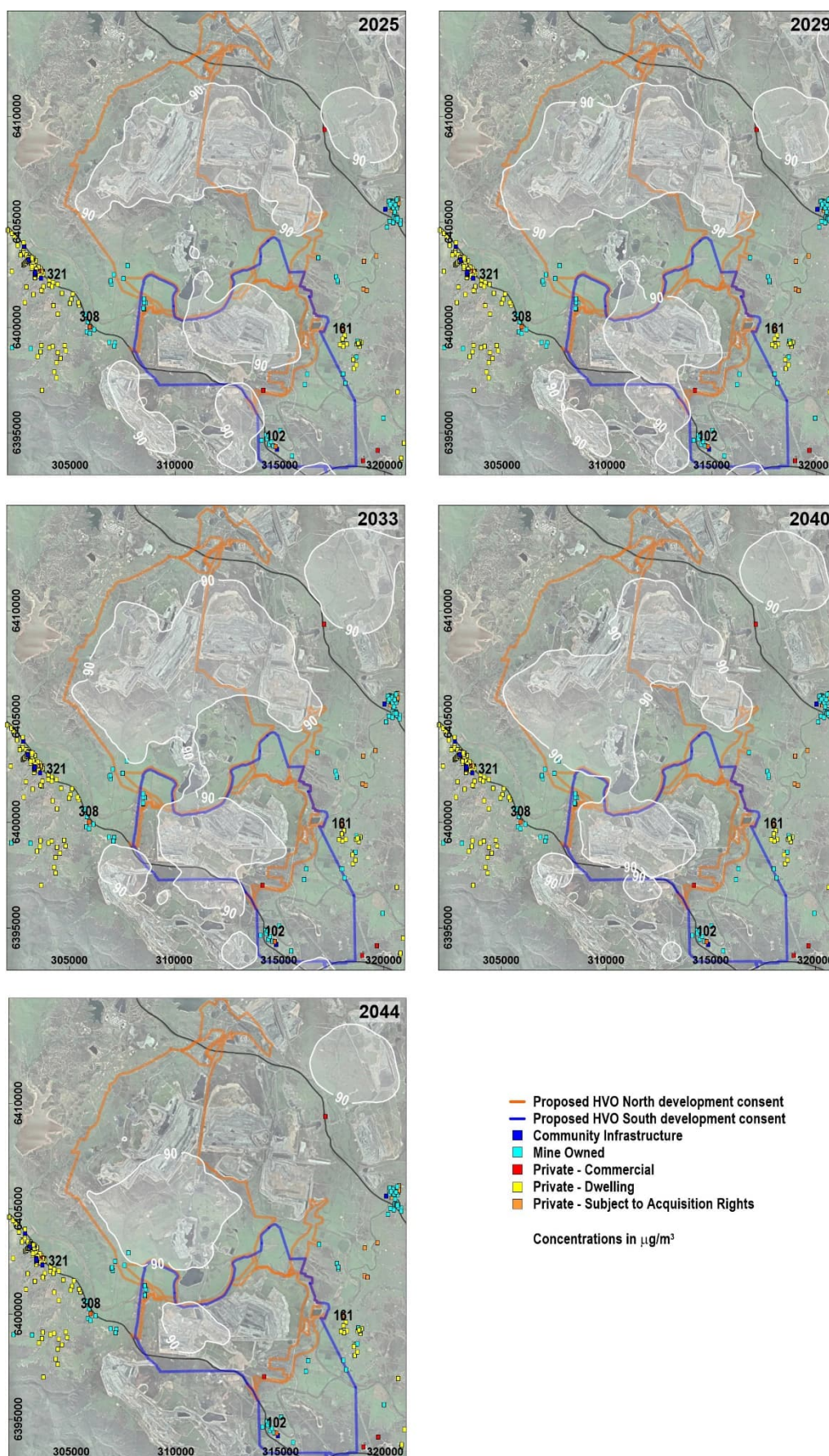


Figure 36 Modelled annual average TSP due to the Project and other sources

7.2.4 Deposited Dust

Figure 37 shows the modelled annual average deposited dust levels due to the Project. These results show that the EPA's assessment criterion for incremental deposited dust due to the Project on its own ($2 \text{ g/m}^2/\text{month}$) will not be exceeded at private sensitive receptors. **Figure 38** shows the modelled annual average deposited dust levels due to the Project, other mining operations and other sources of deposited dust. These results indicate compliance with the EPA's assessment criterion for total deposited dust ($4 \text{ g/m}^2/\text{month}$) at all private sensitive receptors not subject to air quality acquisition rights. Consequently, the Project is not anticipated to cause adverse air quality impacts in terms of deposited dust levels.

Table 28 provides a summary of the modelled operational deposited dust levels at the identified local communities, reflecting the conclusions outlined above. **Appendix F** provides tabulated results for all locations including the splits between HVO North and HVO South.

Table 28 Modelled operational deposited dust at local communities

Representative receptors (property ID)*	Due to Project (HVO Complex)					Cumulative						Criterion **
	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	2014	Y3 2025	Y7 2029	Y11 2033	Y18 2040	Y22 2044	
Annual average deposited dust ($\text{g/m}^2/\text{month}$)												
Jerrys Plains (308)	0.2	0.2	0.3	0.4	0.2	2.9	3.0	3.1	3.5	3.2	2.7	4
Jerrys Plains (321)	0.2	0.2	0.3	0.4	0.2	2.8	2.9	2.9	3.0	2.9	2.7	4
Long Point (139) – off map	0.3	0.3	0.3	0.3	0.1	2.8	2.9	2.9	2.9	2.8	2.6	4
Maison Dieu (161)	0.3	0.2	0.3	0.3	0.3	2.8	2.9	2.8	2.8	2.9	2.8	4
Warkworth (102)	0.1	0.1	0.2	0.2	0.1	3.1	4.1	3.9	3.8	2.9	2.6	4

* Warkworth Hall (102) and the Hunter Valley Gliding Club (833) are not considered to be sensitive receptors as they are not regularly occupied. ** Project only criterion is $2 \text{ g/m}^2/\text{month}$. Cumulative criterion is $4 \text{ g/m}^2/\text{month}$.

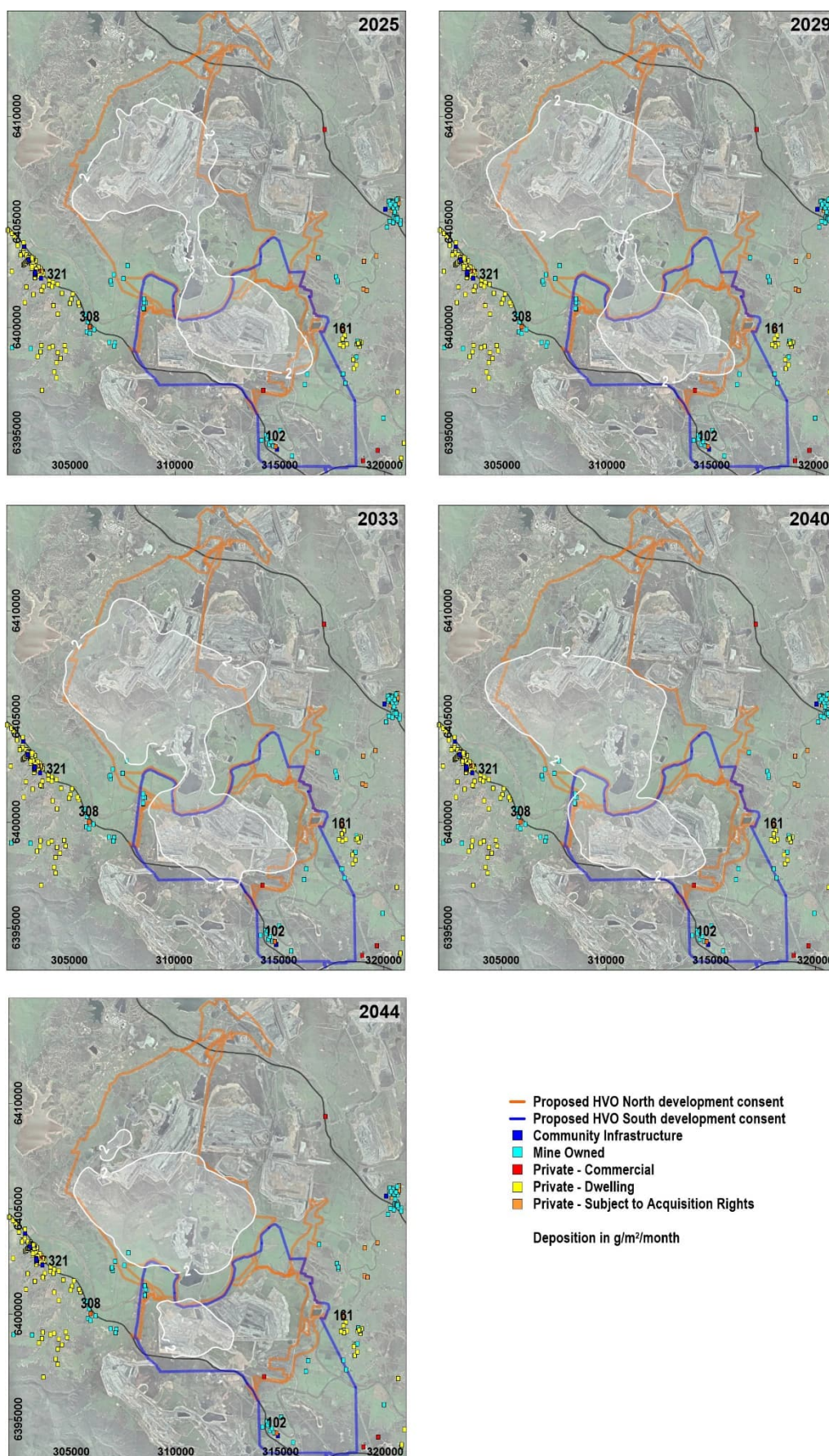


Figure 37 Modelled annual average deposited dust due to the Project

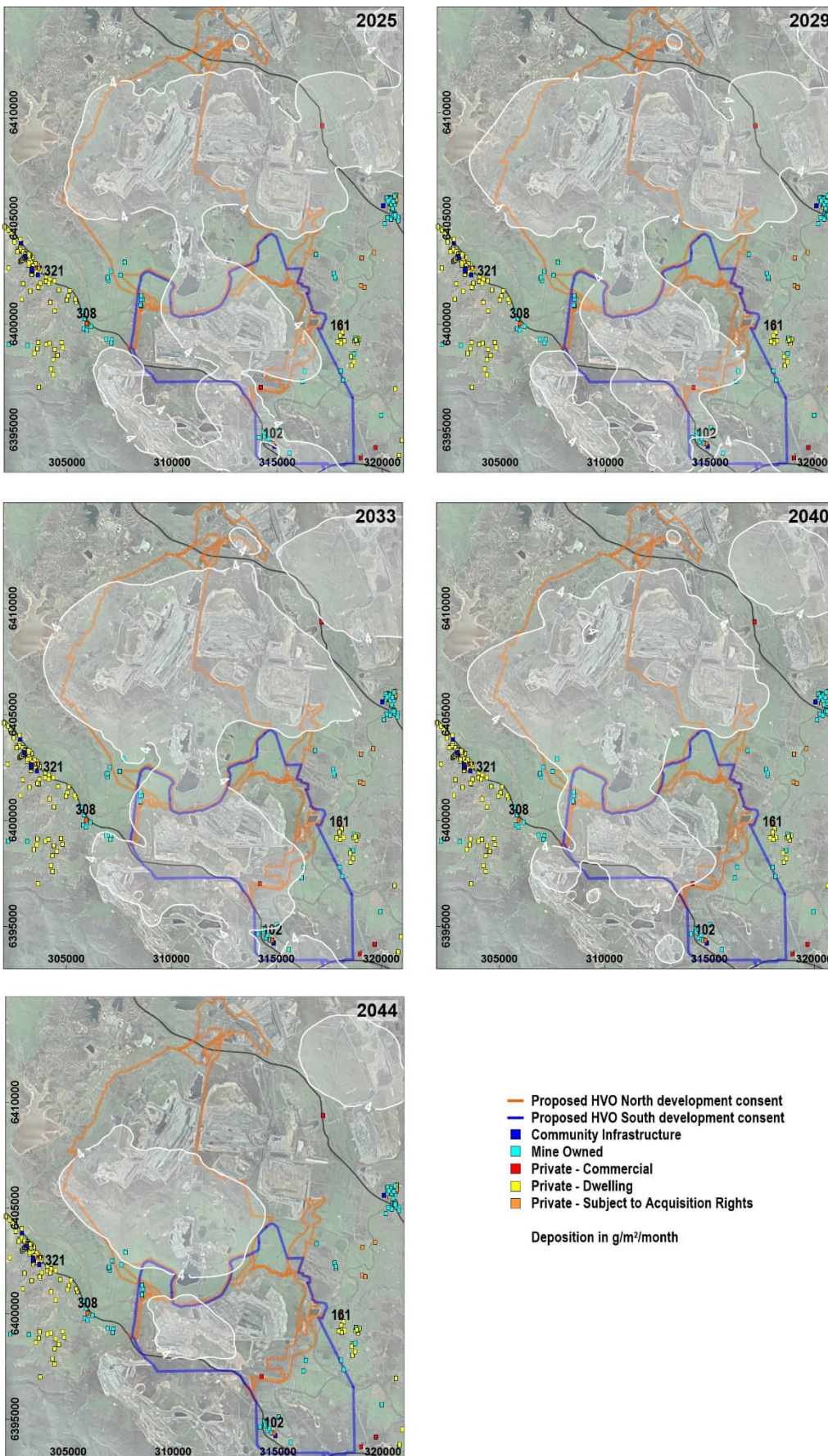


Figure 38 Modelled annual average deposited dust due to the Project and other sources

7.2.5 VLAMP Assessment

As noted in **Section 3.1**, the VLAMP specifies that voluntary acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in **Table 6** 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.

Figure 39 shows the maximum extent of VLAMP criteria based on all assessment years and for all relevant air quality indicators. **Table 29** provides an assessment of the model results against the VLAMP criteria.

Table 29 Assessment against VLAMP criteria

Air quality indicator	Averaging time	Acquisition criterion	Assessment outcome from modelling
PM ₁₀	24-hour	50 µg/m ³ **	Compliance
	Annual	25 µg/m ³ *	Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling for the following landholdings: <ul style="list-style-type: none"> - 3//700476 (Property 308) - 5//251617, 8//3005, 9//3005 (Property 121)
PM _{2.5}	24-hour	25 µg/m ³ **	Compliance
	Annual	8 µg/m ³ *	Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling for the following landholdings: <ul style="list-style-type: none"> - 3//700476 (Property 308) - 5//251617, 8//3005, 9//3005 (Property 121)
TSP	Annual	90 µg/m ³ *	Compliance
Deposited dust	Annual (increase)	2 g/m ² /month**	Compliance
	Annual (total)	4 g/m ² /month*	Compliance

* 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.

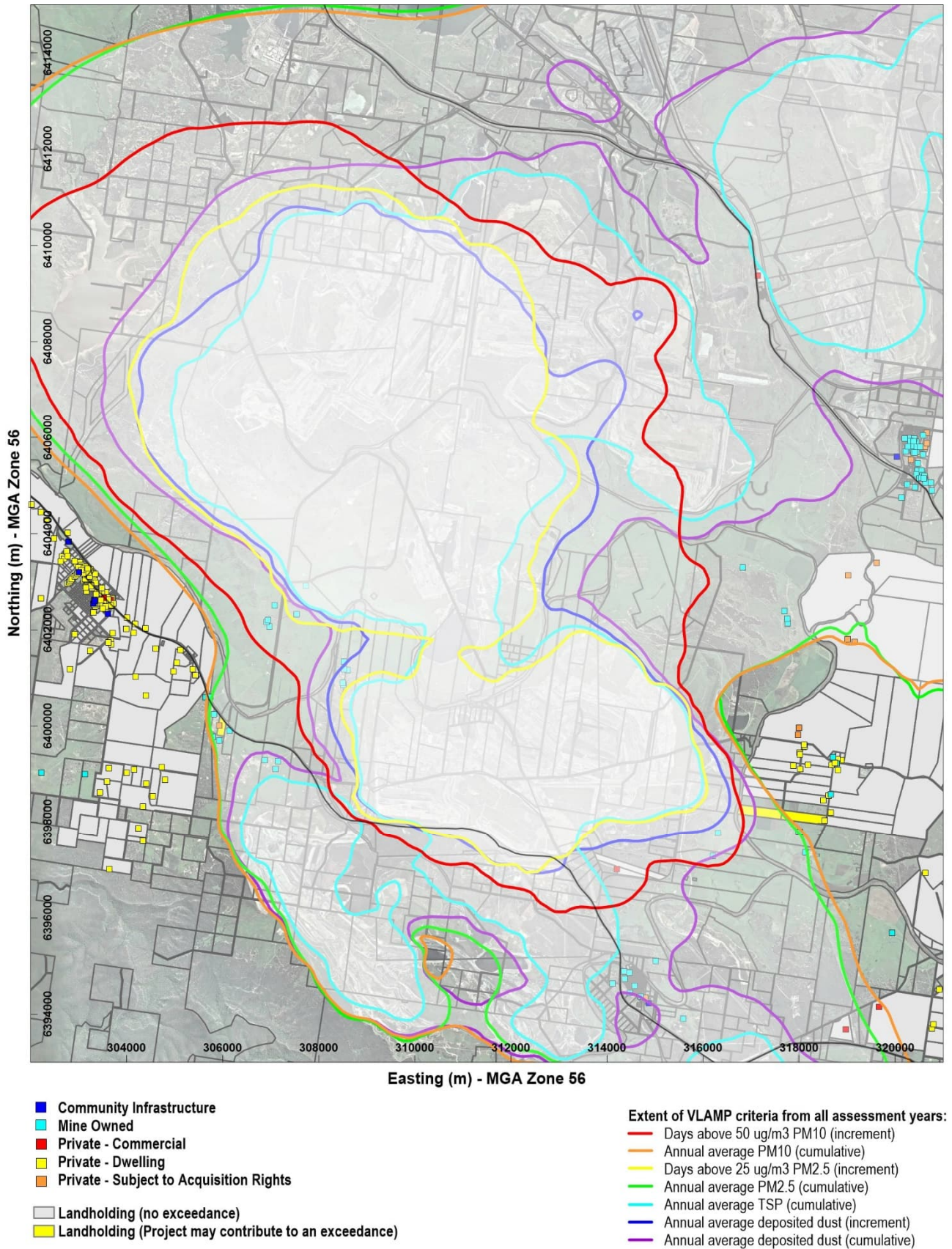


Figure 39 Modelled maximum extent of VLAMP criteria

7.3 Operational Post Blast Fume

Figure 40 shows the modelled maximum 1-hour average NO₂ concentrations due to post-blast fume, based on the methodology outlined in **Section 5.3**. These results show that, under worst-case meteorological conditions with a rated 3 fume, blasting every day between 9 am and 5 pm (the most common period for blasting) and maximum background NO₂ concentrations from Singleton, the maximum 1-hour average NO₂ concentrations will not exceed EPA's assessment criterion of 164 µg/m³ at any off-site sensitive receptor location.

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 proposed mining area. It is acknowledged that moving the assumed blast locations, for example further to the south or west, would lead to a corresponding shift in the contours, potentially changing the modelled extent of impacts. However, this potential will be managed through the design process for each individual blast which will be designed to comply with relevant criteria. The potential for post-blast fume impacts will 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.

HVO has developed a pre-blasting procedure which covers fume management. A site-specific blast management plan will be implemented during operations, including key fume management actions, such as defining the potential risk zone based upon weather patterns and obtaining permissions to fire based on an assessment of real-time weather conditions.

The potential for odour impacts due to blasting has also been considered. This has been done by comparing the odour threshold (concentration) for NO₂ with the modelled NO₂ concentrations due to blasting. The odour threshold for NO₂ has been reported by the World Health Organisation (WHO) to range between 100 µg/m³ and 410 µg/m³. **Figure 41** shows the modelled 99th percentile 1-hour average NO₂ concentrations, due to blasting. The results have been presented in this form as the EPA criteria for odour assessment criteria are frequency based and relate to 99th percentiles. A peak-to-mean ratio of 2.3 was used to convert the model's 1-hour average predictions to nose-response times. The model results of NO₂ at the nearest sensitive receptors are less than 20 µg/m³. These results are at the lower end of the odour threshold range reported by the WHO which suggests that the odour impacts can be managed with appropriate blasting procedures.

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 Project will not lead to adverse air quality impacts with respect to post blast fume. It is noted that historical Annual Reviews have reported that, prior to 2017, there were periodic complaints (up to 5) relating to blast fume and odour. However, more recent Annual Reviews from 2018 onwards have not reported any complaints relating to blast fume and odour.

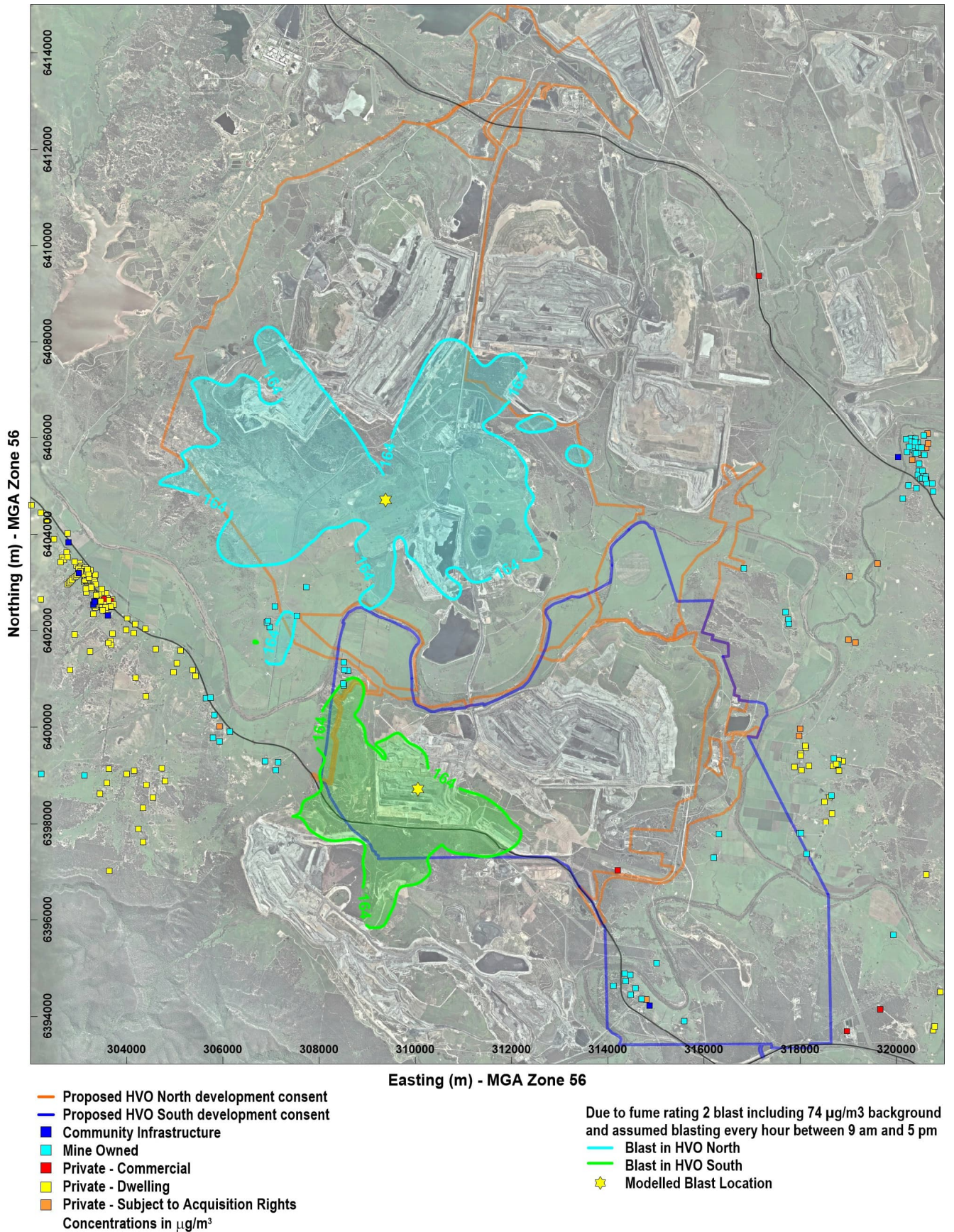


Figure 40 Modelled maximum 1-hour average NO_2 due to blasting (including background levels)

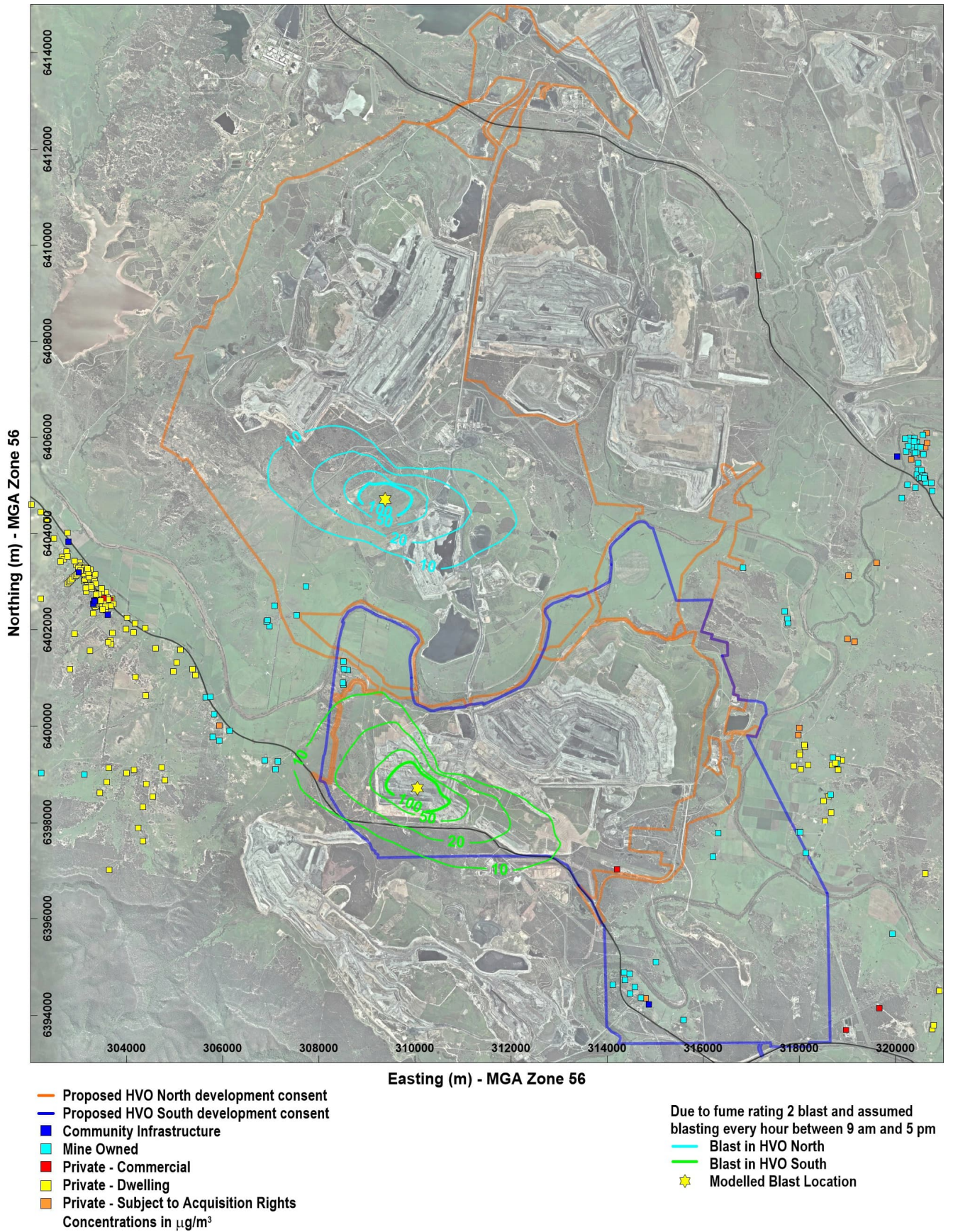


Figure 41 Modelled 99th percentile nose-response time average NO_2 due to blasting

7.4 Operational Diesel Exhaust

Figure 42 shows the modelled maximum 1-hour average NO₂ concentrations due to diesel exhaust emissions at the HVO Complex, based on the methodology outlined in Section 5.4. These results assume that 20% of the NO_x is NO₂ at the locations of maximum ground-level concentrations and a maximum background concentration of 74 µg/m³. The results show compliance with the EPA's 164 µg/m³ assessment criterion at all sensitive receptors.

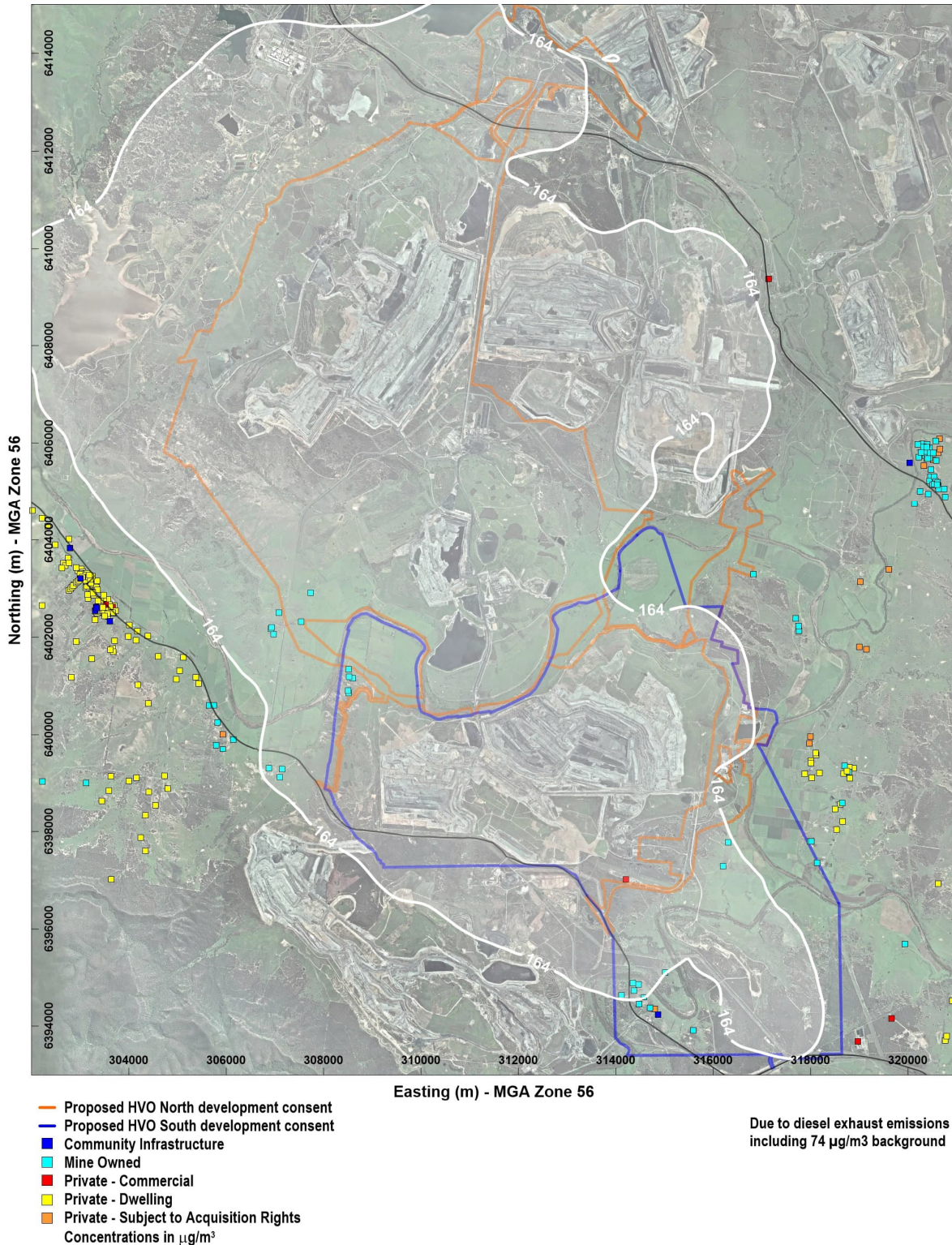


Figure 42 Modelled maximum 1-hour average NO₂ due to diesel exhausts (including background levels)

Figure 43 shows the modelled annual average NO₂ concentrations. These results assume that 79% of the NO_x is NO₂ (the annual average conversion rate), and 16 µg/m³ background levels. The results show compliance with the EPA's 31 µg/m³ assessment criterion at all sensitive receptors. It has therefore been concluded that the Project will not lead to adverse air quality impacts with respect to diesel exhaust.

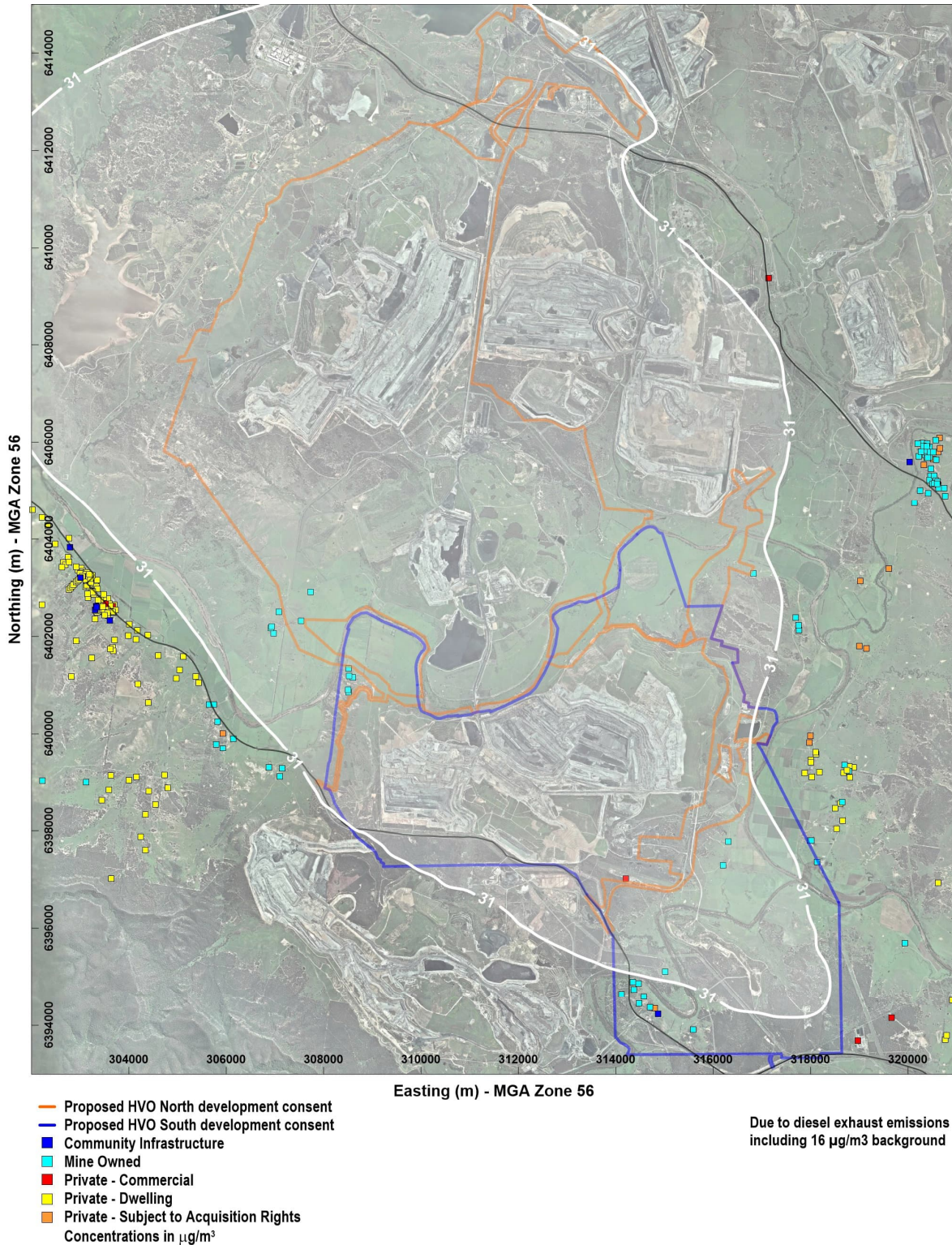


Figure 43 Modelled annual average NO₂ due to diesel exhausts (including background levels)

7.5 Spontaneous Combustion

“Self-heating” occurs when coal and other carbonaceous materials undergo an exothermic reaction when exposed to oxygen in the air, to generate heat. This process causes the temperature of the material to rise which in turn accelerates the oxidation and, in turn, the heat generation process. As the material temperature rises above about 70°C the temperature acceleration is rapid enough to result in ignition of the material. This ignition is referred to as spontaneous combustion.

The propensity of coal (or carbonaceous material) to self-heat and potentially combust is governed by many factors but most commonly by the type of coal, the carbon content, the size of the particles, the material temperature, the presence of oxygen and quantity of coal. Spontaneous combustion results in the emission of noxious gases including carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen sulphide, nitrogen oxides and a range of volatile organic compounds.

The emissions to air have the potential to lead to the following hazards:

- Adverse health effects due to inhalation;
- Nuisance effects due to odour;
- Fire and hot material;
- Subsidence;
- Smoke and effects on visibility.

The only known spontaneous combustion risk area is located near the Newdell LP. This area continues to be actively monitored and managed. HVO will continue to evaluate and manage potential issues associated with spontaneous combustion. **Section 9.4** provides a summary of the relevant management measures.

8. Greenhouse Gas Assessment

8.1 Project Emissions

Table 30 shows the estimated emissions of greenhouse gases due to all identified GHG-generating activities. Over the lifetime of the Project, from 2023 to 2050, Scope 1 and 2 emissions (i.e. direct emissions as per shaded cells) are estimated to average 1.26 Mt CO₂-e per year. **Appendix G** provides more detailed breakdowns of the estimated emissions for each activity by mining year including breakdowns by construction and operation.

Table 30 Summary of estimated greenhouse gas emissions

Period	Estimated greenhouse gas emissions (Mt CO ₂ -e)		
	Scope 1	Scope 2	Scope 3
Annual average	1.19	0.07	41.67
Total over life of Project (2023-2050)	33.28	1.88	1,166.86

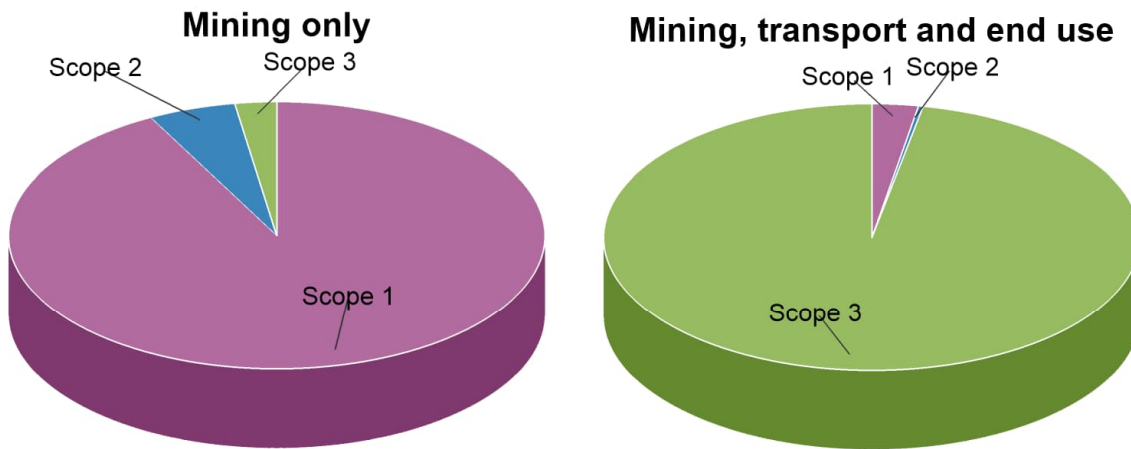
Table 31 provides a breakdown of the greenhouse gas emissions by operation including estimates of the emission intensities and comparisons to other operations. These data show that the direct (Scope 1 and 2) emission intensity of the HVO Complex would be, on average, 0.05 t CO₂-e/t ROM coal. This result is within the range of emission intensities published by other operations (i.e. 0.03 to 0.07 t CO₂-e/t ROM coal). Some differences can also be explained by the features of each operation. For example, there is generally a higher emission intensity for operations that mine deeper seams, such as HVO.

Table 31 Greenhouse gas emission intensity and comparisons with other operations

Operation	ROM (Mt/y)	Scope 1 and 2 (Mt CO ₂ -e/y)	Intensity (t CO ₂ -e/t ROM)
Project (2023-2050)			
HVO North	18.87	0.78	0.04
HVO South	7.44	0.48	0.06
HVO Complex	26.31	1.26	0.05
Other operations for comparison			
Mt Pleasant	16	0.54	0.03
Mangoola	13.5	0.46	0.03
Warkworth	18	0.47	0.03
Bengalla	15	0.77	0.05
Mt Arthur	32	2.2	0.07

Figure 44 shows the estimated direct and indirect emissions by scope and by activity. These estimates show that fugitive emissions from coal extraction and diesel usage would be the most significant direct (Scope 1) emissions. As diesel fuel consumption represents nearly half of estimated direct emissions, the existing measures are generally focused on minimising greenhouse gas emissions through the efficient use of diesel (see **Section 9.5**). **Section 9** outlines the management measures for the Project including those relevant to the minimisation of greenhouse gas emissions.

Breakdown by scope



Breakdown by activity

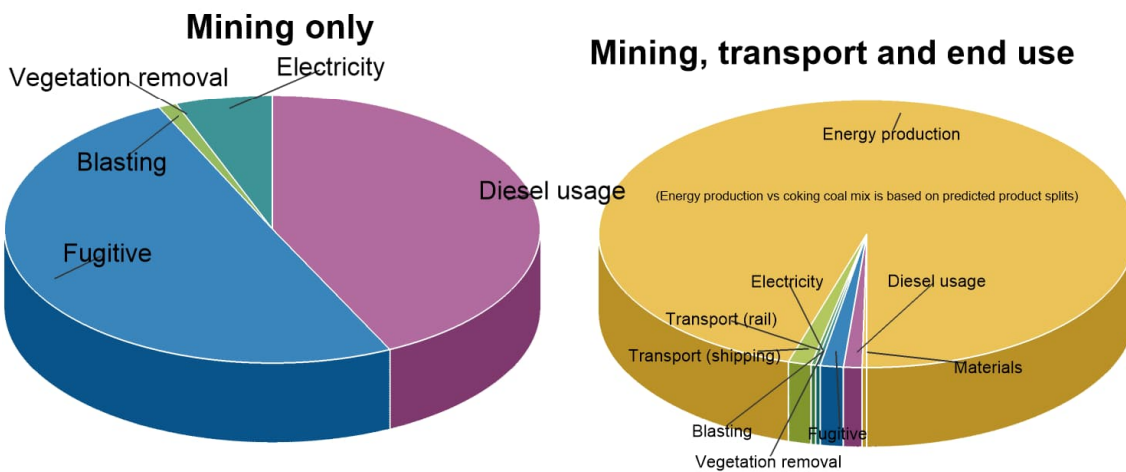


Figure 44 Summary of greenhouse gas emissions by scope and activity

8.2 Potential Impacts of the Project

The Commonwealth Department of Industry, Science, Energy and Resources (DISER) (2022) 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 annual data through the inventory is from 2020.

Table 32 presents these national and state figures in context with the projected emissions from the Project. The convention is to compare the Project emissions with the national and state figures however the national and state figures will already include contributions from the approved operation. This means that it would be more relevant to present the Project increment. Nevertheless, the estimated annual average Scope 1 and 2 emissions from the Project (1.26 Mt CO₂-e) represent approximately 0.25% of Australia’s 2020 emissions.

Table 32 Greenhouse gas emissions in the National and State context

Parameter	Value
National and State statistics	
2020 Total Australia GHG emissions (Mt CO ₂ -e)	497.7
2020 Total NSW GHG emissions (Mt CO ₂ -e)	132.4
Project statistics	
Average projected GHG emissions per year (Mt CO ₂ -e)	1.26
Proportion of 2020 total Australia emissions	0.25%
Proportion of 2020 total NSW emissions	0.95%

In addition to the direct emissions associated with the Project, the following emissions sources are relevant to operations:

- Rail and sea transport of the product coal to customers; and
- Combustion of the product coal by customers.

The indirect sources listed above have been classified as Scope 3 for the Project as the emissions, while a result of the activities at HVO, are from sources not owned or operated by HVO. As noted in **Section 3.2** 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. Coal produced by HVO is predominantly exported to Asian markets. These countries are either signatories to the Paris Agreement and / or have announced or adopted domestic laws or policies to achieve their emissions targets.

To gain an understanding of the Project in the context of the global coal market and global greenhouse gas emissions, the Project's annual coal production volume can be compared to the current global coal demand and the Project's greenhouse gas emissions can be compared to total estimated anthropogenic greenhouse gas emissions. The International Energy Agency (IEA) estimates the current global coal demand to be in the order of 5,644 Mt of coal per annum (in 2021 according to the IEA, 2022). The proposed peak production rate of the Project (HVO North and HVO South) of just under 40 Mt ROM or 28 Mt of product represents approximately 0.5% of the current estimated global coal demand. Demand for coal will vary over the life of the Project. Under the various scenarios, the IEA predicts that future demand for coal will range from 3,024 to 5,149 Mt in 2030, and from 539 to 3,828 Mt in 2050. In all scenarios the production from HVO will continue to represent a relatively low percentage at less than 0.8% by 2030 and less than 0.5% by 2050.

The Projects contribution to global climate change effects would be proportional to its contribution to global greenhouse gas emissions. These emissions would be small in the context of global greenhouse gas emissions (approximately 50 gigatonnes CO₂-e). It is acknowledged that all sources of greenhouse gas emissions will contribute in some way towards the potential global, national, state and regional effects of climate change.

8.3 Potential Impacts on the Project

The potential impacts of climate change on the Project cannot be determined with a high degree of confidence. This is because of inherent uncertainties associated with the climate change projections. For example, Dowdy et al. (2015) project a generally drier climate, whereas NARClIM (2015) projects a wetter climate. Nevertheless, average temperatures are likely to rise in the Project area, with more frequent extreme temperature events. Rainfall has the potential to both increase and decrease with heavier rainfall events likely to become more frequent.

8.4 Greenhouse Gas Policies

The NSW Government's "Strategic Statement on Coal Exploration and Mining in NSW" (2020) notes that:

"Ending or reducing NSW thermal coal exports while there is still strong long-term global demand would likely have little or no impact on global carbon emissions. Most coal consumers would be likely to source their coal from elsewhere, and much of this coal would be lower quality compared to NSW coal."

That is, should the Project be rejected, global coal demand would be satisfied by alternative sources of coal of lower quality that would otherwise be consumed.

One of the Federal Government's key policy measures, designed to achieve a 43% emissions reduction below 2005 levels by 2030 target from the recently commenced *Climate Change Act 2022*, is the proposed amendments to the safeguard mechanism. The safeguard mechanism is a component of the Emissions Reduction Fund; the Australian Government's central climate change policy tool administered by the Clean Energy Regulator. The aim of the safeguard mechanism is to ensure emissions reductions purchased through the Emissions Reduction Fund are not displaced by significant increase in emissions elsewhere in the economy.

The safeguard mechanism applies to 215 designated large facilities (facilities that emit more than 100,000 t CO₂e Scope 1 emissions per year) and requires that the net covered emissions of GHG from the operation of a designated large facility do not exceed the baseline applicable to the facility. HVO is a designated large facility as defined by the NGER Act. The safeguard mechanism therefore applies to HVO, and HVO will be subject to the emissions reduction requirements contained within it.

9. Monitoring and Management

Monitoring and management is discussed below in the context of the identified air quality and greenhouse gas issues for the Project.

9.1 Particulate Matter

Table 33 summarises the standard emission management measures, currently implemented at the HVO Complex in accordance with the approved Air Quality and Greenhouse Gas Management Plan. These measures will continue to be adopted as part of the Project.

The dust management measures proposed for the Project have been compared to the measures outlined in the “NSW Coal Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining” (Donnelly et al, 2011). This comparison, as per **Table 33**, shows that the proposed measures are consistent with best practice dust mitigation measures. In some instances Donnelly *et al* (2011) identified control measures that were not common practice, or reasonable and/or feasible to apply at any mine in NSW. For example, air extraction to bag filters for drilling operations.

Table 33 Particulate matter emission management measures

Activity	Emission management measures	Assumed emission control (%) (NPI, 2012, Donnelly et al, 2011)	Measures identified from Donnelly et al (2011)	Consistent with best practice
Topsoil stripping	Watering of haul routes Restricting vehicle speeds Ceasing operations when visible dust is generated Minimise advance clearing to reduce exposed area for wind erosion	50	Control measures for this activity are not specifically identified but can be inferred from the bulldozer information below.	Y
Drilling	Use of water suppression during drilling Dust curtains Ceasing operations when excessive visible dust is sustained.	70	“Best practice control measures include air extraction to a bag filter. No mines were found to use this practice.”	N
Blasting	Pre-blast checks including review of meteorological conditions	0	“Best practice control measures include delaying shot to avoid unfavourable weather conditions and minimising the area blasted”	Y
Hauling overburden / coal	Watering of haul routes Regular maintenance of haul routes Restricting vehicle speeds Clearly marked haul routes Fleet optimisation to reduce vehicle kilometres travelled	85	“Control measures include watering, grading, well-defined haul routes, speed limits to 40 km/h and/or the use of suppressants.”	Y

Activity	Emission management measures	Assumed emission control (%) (NPI, 2012, Donnelly et al, 2011)	Measures identified from Donnelly et al (2011)	Consistent with best practice
Loading and unloading of overburden	<p>Minimisation of material drop height during loading</p> <p>Having less wind exposed dump locations to use during high wind conditions</p> <p>Modifying or ceasing operations during adverse dust conditions</p>	0	"Current practices adopted to control emissions from loading and dumping overburden were found to be water application, minimisation of drop heights and suspension or modification of activities during adverse weather conditions. Best practice control measures were identified as minimising drop heights and / or the application of water".	Y
Unloading coal to ROM hoppers	Water sprays	70	"Best practice control measures for minimising emissions from the ROM hopper is enclosure with air extraction to a fabric filter or other control device. No mines in the GMR adopt this approach."	N
Handling coal at CHPP	Water sprays	70	Control measures for this process are not specifically identified.	N/A
Dozers on coal stockpiles	<p>Modify or cease operations during dusty conditions</p> <p>Reduced travel speed during dusty conditions</p>	50	"Best practice control measures include minimising the travel speed and distance travelled by bulldozers and the application of water to keep travel routes moist"	Y
Conveyors	<p>Covered / enclosure</p> <p>Belt cleaning</p> <p>Water sprays</p>	70	"The use of wind shielding on conveyor sides, water sprays at conveyor transfers, enclosure of transfer points, and, soft-loading chutes."	Y
Wind erosion	Primary rehabilitation and temporary seeding/ stabilisation of long term inactive overburden dumps.	60	"Control measures include watering exposed areas, minimising areas of disturbance, progressive rehabilitation and use of suppressants"	Y
Wind erosion from product stockpiles	Water sprays used in adverse wind conditions	50	Control measures include avoidance, surface stabilisation, enclosure, wind speed reduction.	Y

The key measures that will continue to be implemented as part of the Project include:

- minimising the area of disturbed land at any one time, in line with the approved Rehabilitation Management Plan
- implementation of timely progressive rehabilitation
- adopting controls for haul road dust emissions
- review of meteorological conditions prior to blasting
- consideration of meteorological conditions in planning the loading and unloading of overburden
- applying water and using dust curtains when drilling blast patterns
- minimising fall distance during loading and unloading of overburden
- utilising water carts on ROM coal stockpile areas
- maintaining the existing covered conveyors and belt cleaning
- maintaining and servicing machinery, exhaust systems and plant equipment in accordance with contemporary maintenance practices
- implementation of the Trigger Action Response Plan (TARP) process and investigating dust levels when the TARP process is enacted to identify likely sources of dust
- using temporary rehabilitation and stabilisation measures on long term inactive overburden areas that are not ready for final rehabilitation.

In addition to the measures listed above, both proactive and reactive dust control strategies informed by real-time dust and meteorological monitoring systems are currently implemented at the HVO Complex. Reactive air quality management will continue to assess the need to modify the activities in response to the following triggers:

- visual conditions, such as excessive visible dust
- meteorological conditions, such as dry, strong wind conditions
- ambient air quality conditions (that is, elevated short-term PM₁₀ concentrations).

Proactive air quality management involve the discussion and planning of activities in advance of potentially adverse conditions. Specifically, the pro-active air quality management approach includes:

- a system that provides personnel with a daily forecast of expected dust risk in the vicinity of the operation
- communication of the dust forecast at daily operational meetings
- alerting operations of the potential requirement to modify the planned mining activities, as appropriate, to minimise or avoid the potential dust impacts.

As part of the implementation of the Project the existing Air Quality and Greenhouse Gas Management Plan will be reviewed and updated. The Air Quality and Greenhouse Gas Management Plan will be revised to detail the implementation of monitoring and management controls to manage air quality impacts associated as required.

A review of the existing air quality monitoring locations will be undertaken prior to the commencement of the Project to make sure that the monitoring network provides adequate coverage of the Project area, particularly in areas identified by the modelling with a potential for increased air quality impact risk. Any changes to the monitoring network will also be included in a revised Air Quality and Greenhouse Gas Management Plan.

It is anticipated that the existing EPL will be revised under the *Protection of the Environment (Operations) Act 1997* (POEO Act). Relevant to air quality, the EPL includes requirements to minimise dust 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 (among other sources). Motor vehicle emissions would be addressed by regular maintenance of all vehicles associated with the Project.

9.2 Post Blast Fume

HVO applies a pre-blasting risk assessment process which covers fume management. A site-specific blast management plan will be implemented during operations, including key fume management actions, such as defining the potential risk zone based upon weather patterns and obtaining permissions to fire based on an assessment of real-time weather conditions.

9.3 Diesel Exhaust

The proposed mitigation measures to manage diesel combustion emissions aim to address the equipment maintenance and engine replacement strategies from the *NSW Coal Mining Benchmarking Study: Best practice measures for reducing non-road diesel exhaust emissions*" (EPA, 2014).

The emission control measures proposed by HVO include:

- Servicing all machinery in accordance with original equipment manufacturer recommendations for maintenance.
- Targeting the maintenance to ensure, as far as reasonably practical, equipment remains fit for purpose over its whole life cycle.

9.4 Spontaneous Combustion

HVO will continue to evaluate and manage potential issues associated with spontaneous combustion as documented in the approved Air Quality and Greenhouse Gas Management Plan.

HVO is committed to the management of potential air quality issues associated with spontaneous combustion. This commitment is demonstrated by the application of a hierarchy of management controls. HVO's hierarchy of controls applied to spontaneous combustion will continue to be as follows:

- **Elimination** – Where possible, processing and shipping of coal for its end use before the oxidation reaction that leads to spontaneous combustion occurs.
- **Separation** – Where material has or is showing signs of spontaneous combustion it is stockpiled separate from other inert coals to avoid spreading the heating.
- **Engineering** – Controls that minimise the impact of hot material such as selective digging and/or burying.
- **Procedures** – Including early identification of spontaneous combustion; dealing with heated materials; provision of protective or first response capacity; and preparing for / cleaning up after spontaneous combustion.

9.5 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. The mitigation measures to reduce the level of future GHG emissions from HVO are documented in the Air Quality and Greenhouse Gas Management Plan.

It is anticipated that the Clean Energy Regulator will set a calculated emissions baseline determination under the provisions of the National Greenhouse and Energy Reporting (Safeguard) Rule 2015, and likely based on calculated emissions from the Project (see **Table 14**). Any limits on fugitive emissions should relate to the rate of coal extraction rather than to annual predictions of emissions and should allow for some deviation in emission rates from predicted emissions. HVO will acknowledge the baseline determination and performance measures and modify operations, where reasonable and feasible, to minimise greenhouse gas emissions.

10. Conclusions

This report has provided an assessment of the potential air quality and greenhouse gas impacts of the HVO Continuation Project. In summary, the air quality assessment involved identifying the key air quality issues, characterising the existing environment, quantifying emissions to air and modelling the potential impact of the Project on local air quality. The modelling was carried out in accordance with the assessment procedures prescribed by the EPA. Greenhouse gas emissions were estimated in accordance with the principles of the Greenhouse Gas Protocol.

The key air quality issues were identified as construction dust, operational dust, operational post-blast fume and operational diesel exhaust. These issues were the focus of the assessment.

A detailed review of the existing environment was carried out including an analysis of historically measured concentrations of key quality indicators from representative monitoring stations. This included analysis of eight years of site-specific monitoring data. The following conclusions were made in relation to the existing environment:

- Meteorological conditions do not vary significantly from year to year, except for rainfall, and conditions in 2014 were identified as most representative of the long term, local conditions around the HVO Complex. Consideration of an alternative representative meteorological year does not change the assessment outcomes.
- Air quality conditions are strongly correlated to the climatic conditions. For example, there was a deterioration in air quality conditions between 2017 and early 2020 that were heavily influenced by drought, dust storms and bushfires. These conditions were not unique to the Hunter Valley.

The key outcomes of the modelling and subsequent assessment are:

- Construction activities have the potential to increase the overall dust emissions in the early phase of the Project (that is, first one to three years) but these increases are not of a magnitude that will change the air quality outcomes determined for private sensitive receptors from modelling of operational dust emissions. Nevertheless, appropriate management and monitoring would need to continue during the construction phase.
- Operational dust emissions due to the ongoing mining activities are not expected to cause adverse air quality impacts at the nearby local communities. Modelling potential impacts led to the following specific outcomes:
 - Maximum 24-hour average PM_{10} concentrations would be within the range of historically measured days above the criteria, excluding extraordinary events. The review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations recorded between one and six days above the air quality criteria set by the EPA for project assessment purposes. Based on the modelling the Project is not anticipated to change this outcome. The potential for the Project activities to cause exceedances of the criteria can be managed through existing site air quality management measures and this approach has been successfully demonstrated by the site compliance history.
 - Annual average PM_{10} concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights however an increased air quality impact risk was identified for one property in Jerrys Plains (308) in the later years of the Project (around Year 11). The modelled non-compliance with EPA assessment criteria at this property was determined as "unlikely to eventuate" based on (1) historical monitoring in this area that show PM_{10} concentrations 25% lower than the criteria (2) modelled maximum proposed coal extraction rates and (3) a conservative approach to modelling operational controls.
 - Maximum 24-hour average $PM_{2.5}$ concentrations would be within the range of historically measured days above the criteria, excluding extraordinary events. The review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations recorded between

one and two days above the air quality criteria. Based on the modelling the Project is not anticipated to change this outcome.

- Annual average PM_{2.5} concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights, however an increased air quality impact risk was identified for one property in Jerrys Plains (308) in the later years of the Project (around Year 11).
 - Annual average TSP concentrations would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights. That is, the Project would not be the cause of exceedances.
 - Annual average deposited dust levels would comply with EPA air quality assessment criteria at all private sensitive receptors not subject to existing air quality acquisition rights. That is, the Project would not be the cause of exceedances.
 - Dust concentrations and deposition levels would comply with NSW Government VLAMP criteria at all private sensitive receptors not subject to existing air quality acquisition rights however there is potential for criteria (annual average PM₁₀ and PM_{2.5}) to be exceeded on up to two privately owned properties where a dwelling could be built under existing planning controls.
- Operational post blast fume emissions are not expected to result in any adverse air quality impacts (as nitrogen dioxide and odour), based on modelling which showed compliance with EPA air quality assessment 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 EPA air quality assessment criteria.
 - The estimated annual average Scope 1 and 2 greenhouse gas emissions from the Project represent approximately 0.25% of Australia's 2020 emissions. Coal produced by HVO is predominantly exported to countries which are either signatories to the Paris Agreement and / or have announced or adopted domestic laws or policies to achieve their emissions targets. Whilst emissions from the end use of the coal have been calculated as Scope 3 emissions for the purposes of the Project assessment, the HVO customers account for these same emissions as Scope 1 emissions and are required to comply with their respective countries' emissions targets.
 - HVO is actively engaged in minimising greenhouse gas emissions associated with their coal operations and supporting the NSW Government objectives of net-zero emissions by 2050.
 - HVO will continue to implement air quality and greenhouse gas emission management measures that are consistent with best practice for the industry. In addition, the existing air quality trigger levels will be reviewed to make sure these will mitigate the potential air quality risks, particularly in the Jerrys Plains area.
 - A review of the existing air quality monitoring locations will be undertaken prior to the commencement of the Project to make sure that the monitoring network provides adequate coverage of the Project area and recognises the potential air quality impacts from this assessment. Any changes to the monitoring network will also be included in a revised Air Quality and Greenhouse Gas Management Plan.

The conclusions outlined above are consistent with the desired performance outcome for the Project which is to minimise air quality and greenhouse gas impacts to reduce risks to human health and the environment to the greatest extent practicable through the design, construction and operation of the Project.

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Appendix A. Annual and seasonal wind-roses

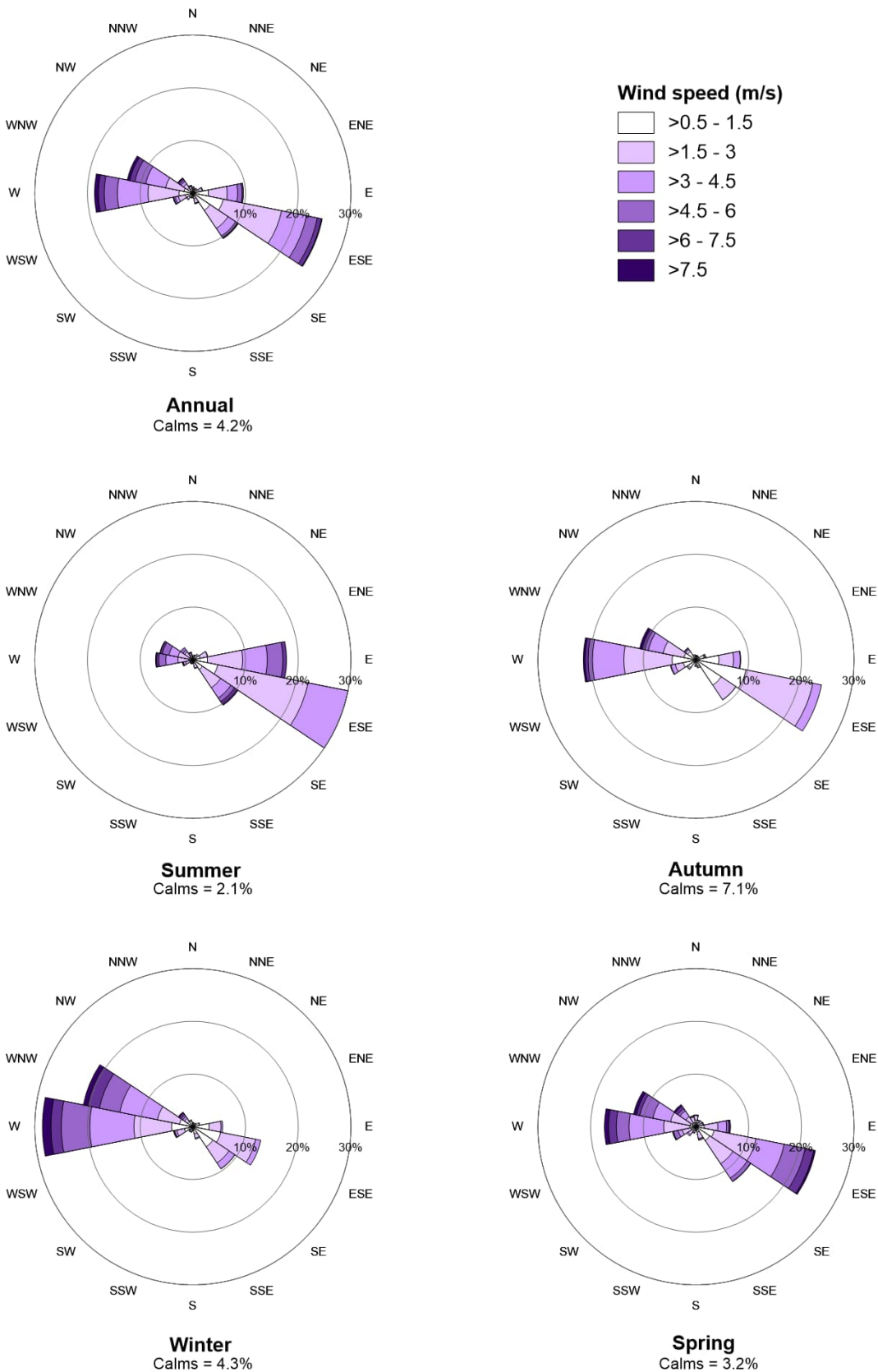


Figure A1 Annual and seasonal wind-roses for data collected at the HVO Corporate meteorological station in 2014

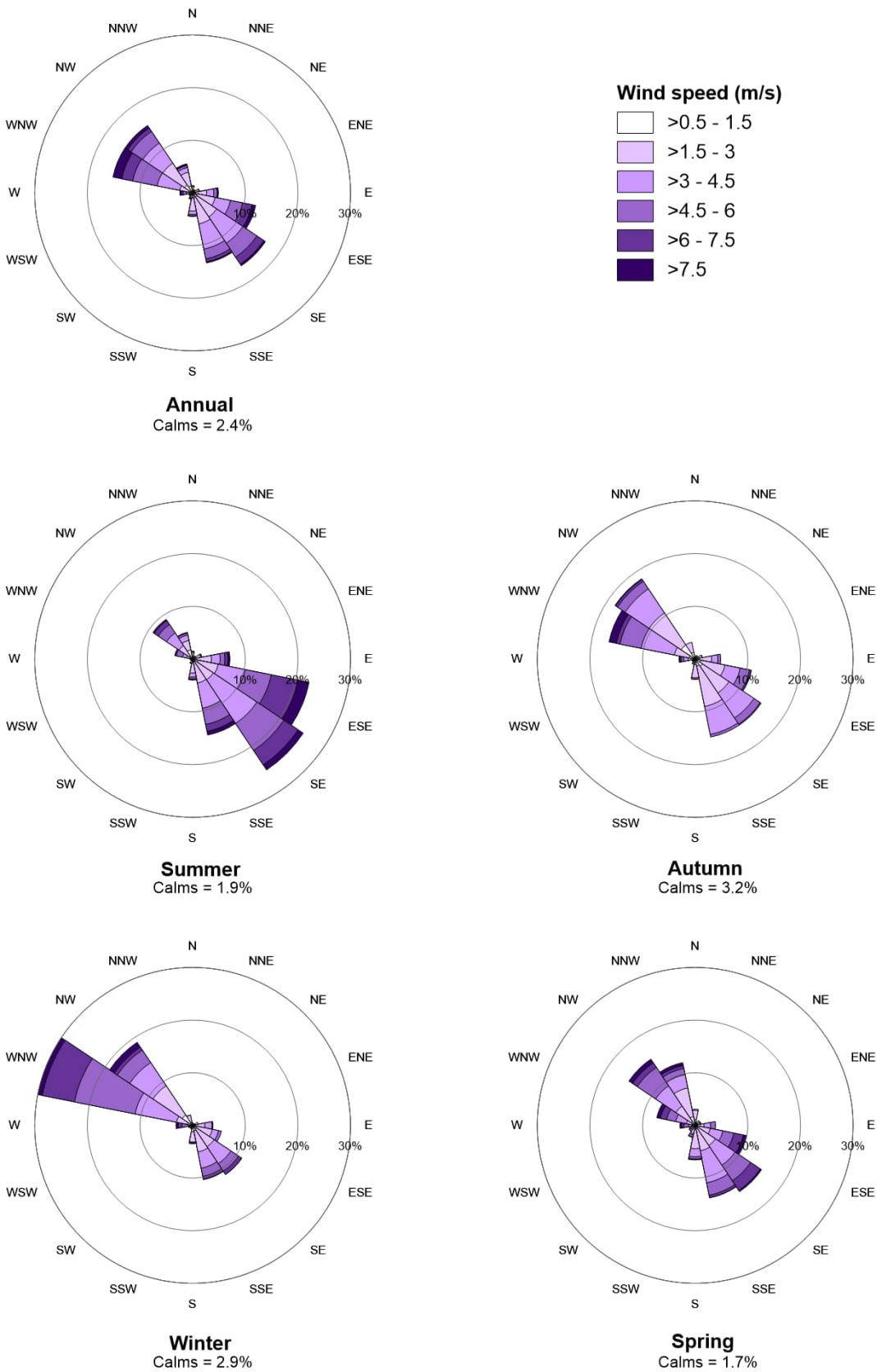


Figure A2 Annual and seasonal wind-roses for data collected at the Cheshunt meteorological station in 2014

Appendix B. Air quality data analysis

Figure B1 shows the measured PM_{10} concentrations by time of day and wind speed. The highest short-term (1-hour average) PM_{10} concentrations could be at any time of day but, on average, the concentrations are typically highest in the morning (around 9 am) and evening (around 7 pm). This pattern may be explained by poorer dispersion conditions in the morning and evening whereby any dust emissions disperse more slowly and allow higher concentrations to exist for extended periods of time. Also, the higher average concentrations in the morning and evening may be associated with increased anthropogenic (human) activity at these times, for example the use of wood heaters.

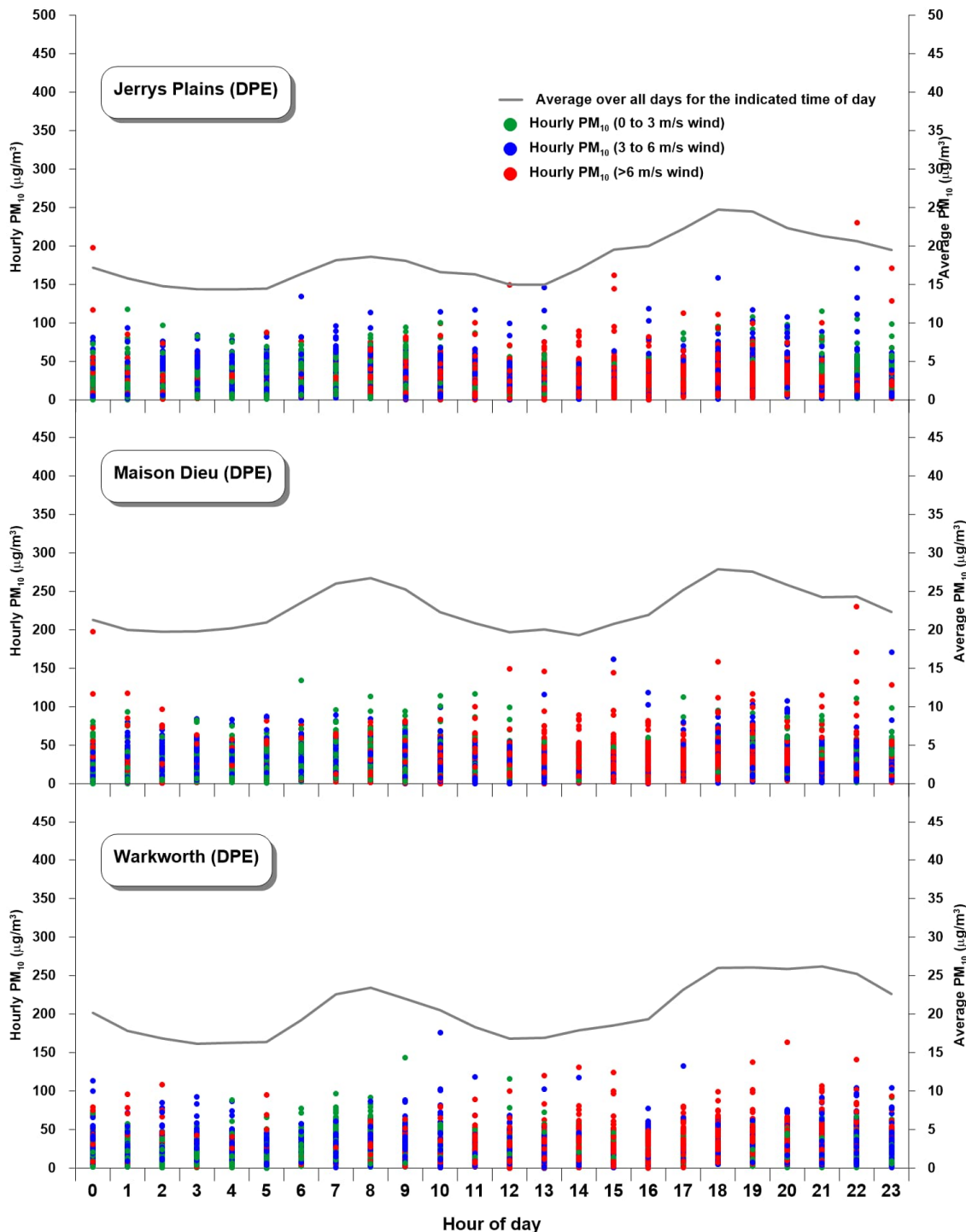


Figure B1 Measured PM_{10} concentrations by time of day and wind speed (2014 data)

Figure B2 shows the measured PM₁₀ concentrations by wind direction. Each location is unique in terms of the wind directions that are associated with higher PM₁₀ concentrations.

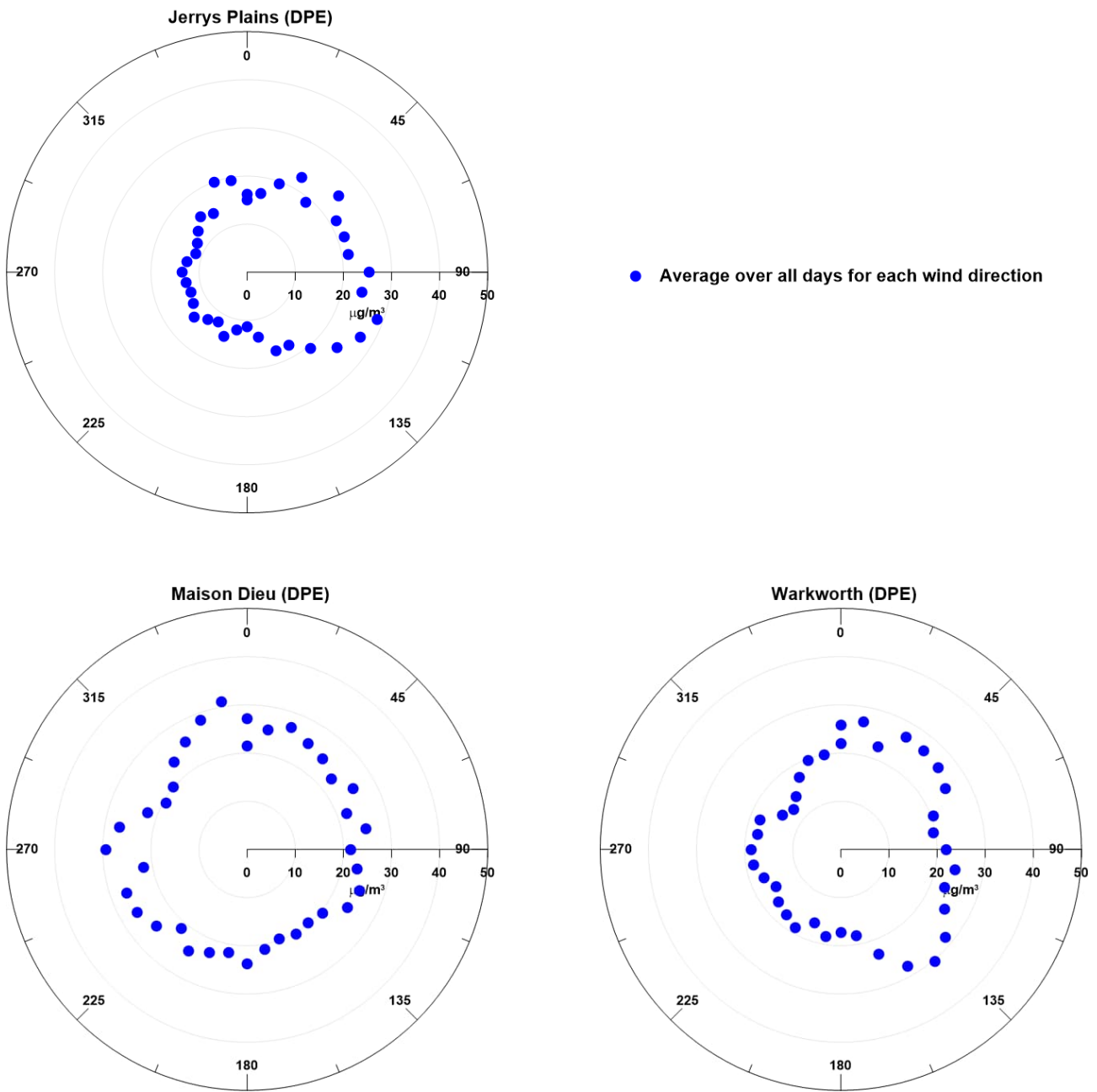


Figure B2 Measured PM₁₀ concentrations by wind direction (2014 data)

Figure B3 shows the measured 24-hour average PM_{2.5} concentrations from various locations in 2020. The instrumentation was as follows:

- High Volume Air Samplers at Kilburnie South and Maison Dieu.
- Beta Attenuation Monitors at Camberwell, Singleton, Newcastle, Kelly and Thelander.

The data from **Figure B3** indicates that the measured PM_{2.5} concentrations at Kilburnie South and Maison Dieu were unusual and did not follow the same trends that were measured by the other monitors. In particular, it would have been anticipated that the measurements from Kilburnie South and Thelander were more closely aligned given their close proximity. Based on these observations, and the availability of more data points, the measurements from Kelly and Thelander were taken to be more representative of PM_{2.5} levels near HVO than the measurements from Kilburnie South and Maison Dieu.

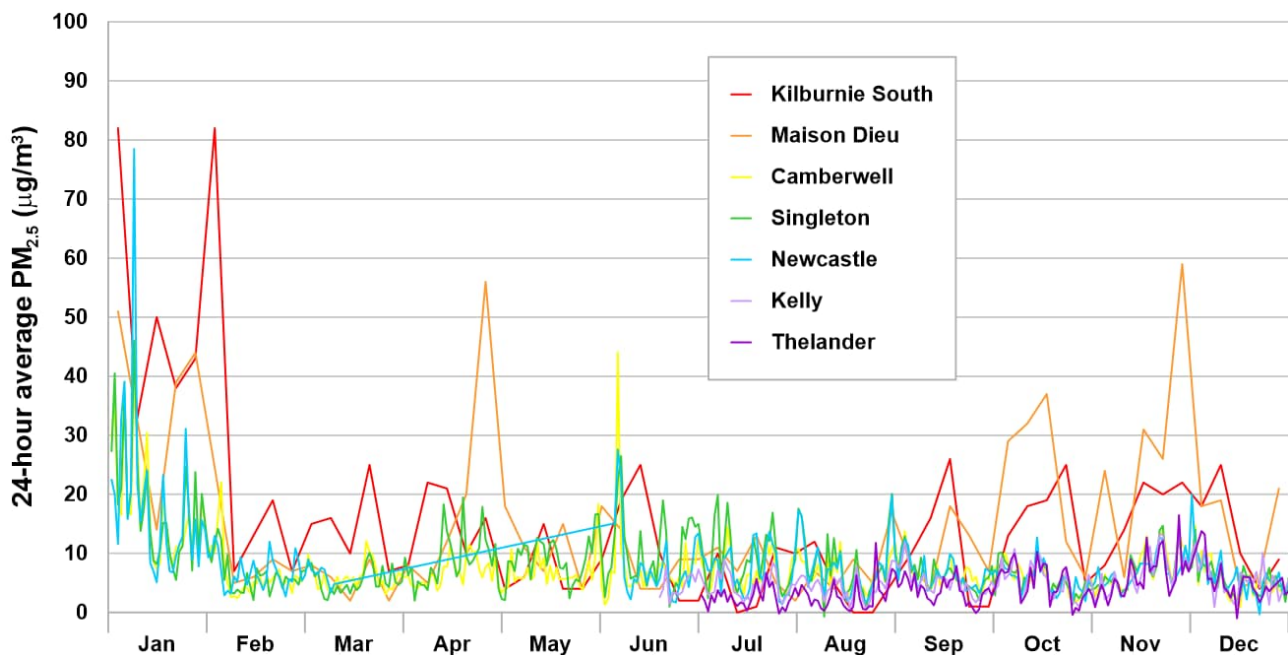


Figure B3 Measured 24-hour average PM_{2.5} concentrations in 2020

Appendix C. Model settings and setup

Geophysical

Figure C1 shows the model grid, land-use and terrain information, as used by CALMET. It is noted that the extent of some land-uses will change over time, such as mining areas, however the model sensitivity has been tested and changes from grassland to barren land (i.e. mining areas) were found to have very little influence on the dispersion modelling results.

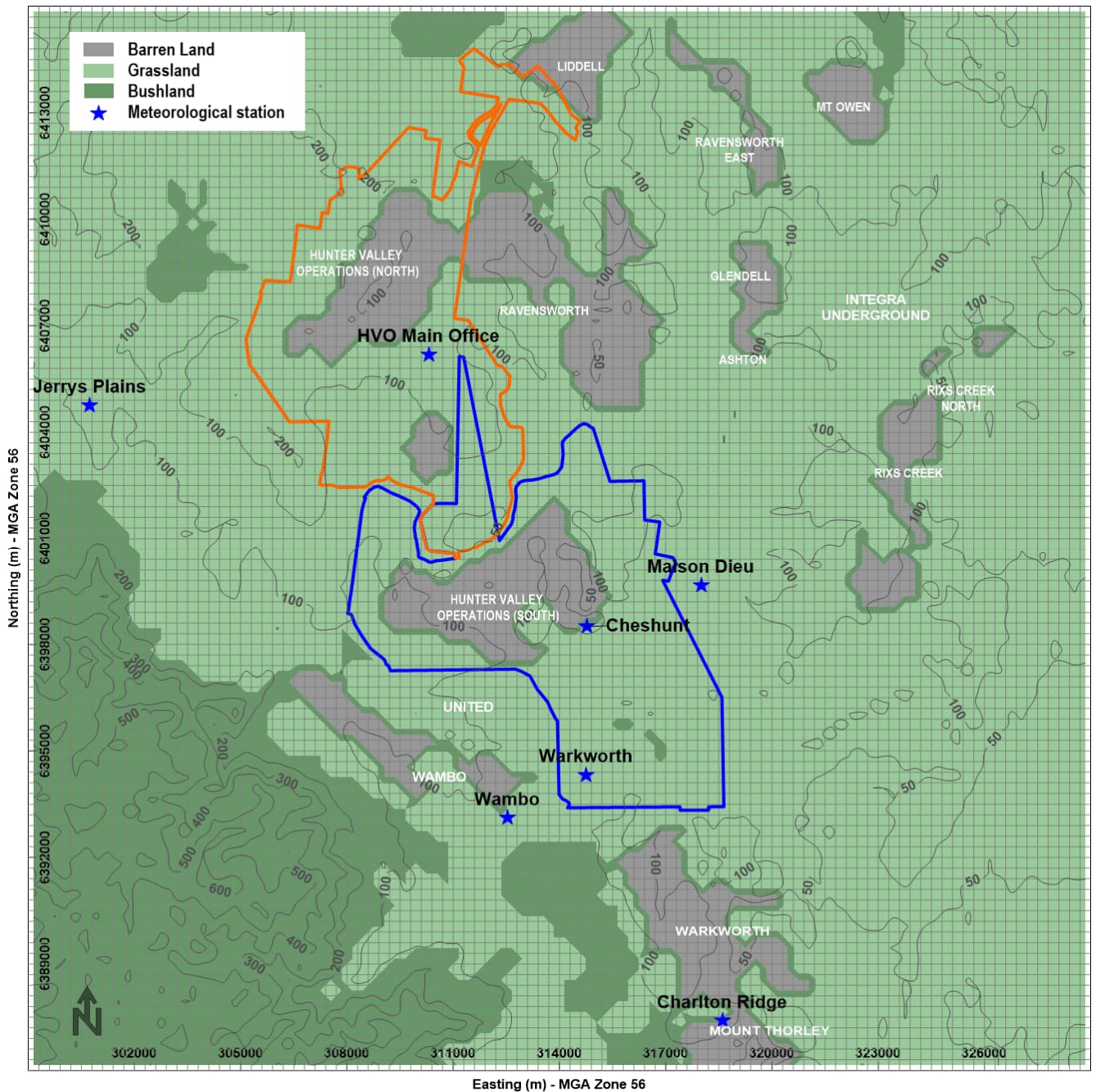


Figure C1 Model domain, grid, land use and terrain information

Figure C2 shows a snapshot of winds at 10 metres above ground-level as simulated by the CALMET model under stable conditions. This plot shows the effect of the topography on local winds, for this particular hour, and highlights the non-uniform wind patterns in the area, further supporting the use of a non-steady-state model such as CALPUFF.

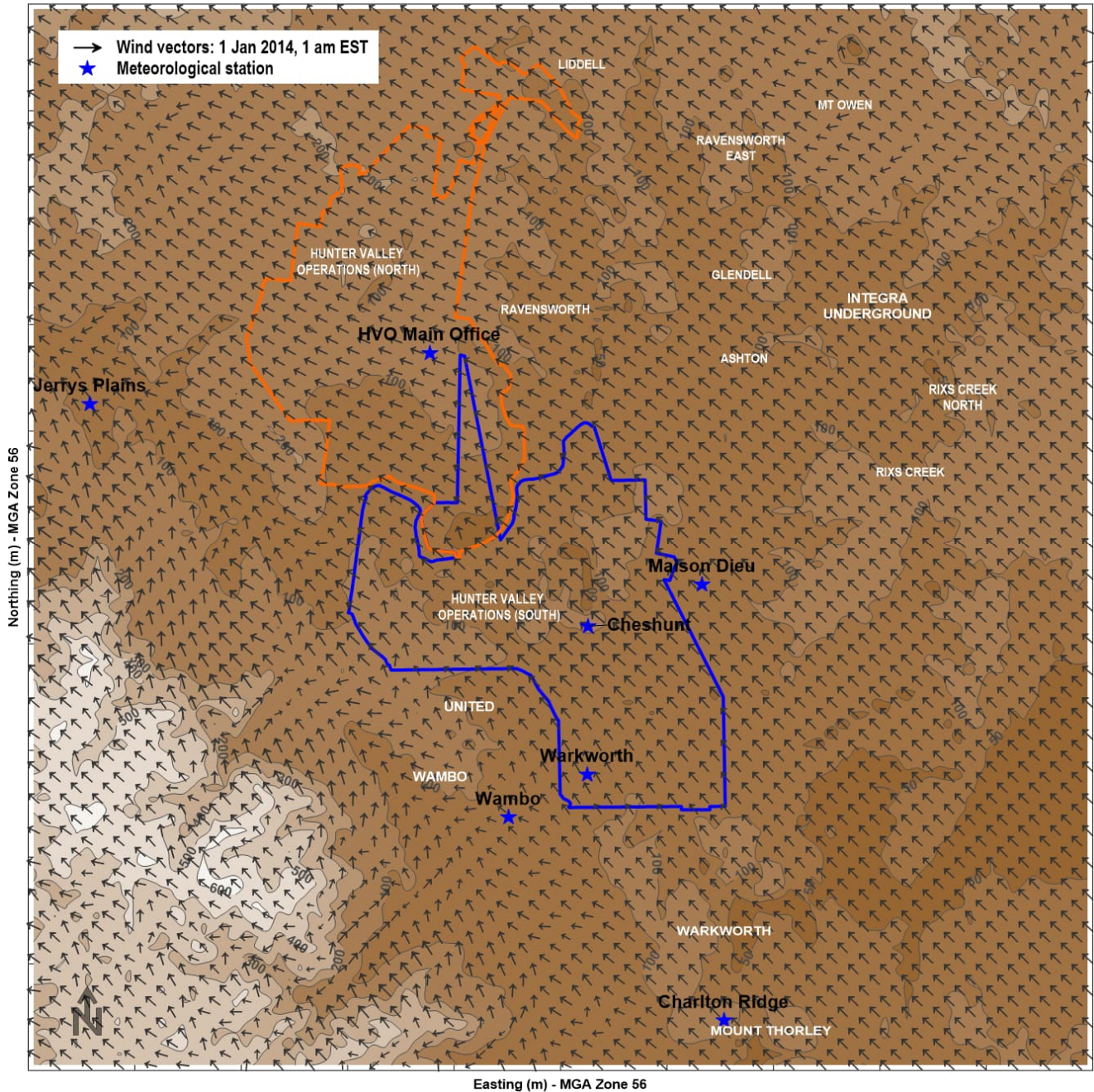


Figure C2 Example of CALMET simulated ground-level wind flows

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 local weather stations. 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 C1 Model settings and inputs for TAPM

Parameter	Value(s)
Model version	4.0.5
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)
Number of grids point	35 x 35 x 25
Year(s) of analysis	2014
Centre of analysis	32°29' S, 151°00' E
Terrain data source	30 m Shuttle Research Topography Mission (SRTM)
Land use data source	Default
Meteorological data assimilation	Corporate meteorological station. Radius of influence = 10 km. Number of vertical levels for assimilation = 4

Table C2 Model settings and inputs for CALMET

Parameter	Value(s)
Model version	6.334
Terrain data source(s)	30 m SRTM and Project DEM. Higher resolution topographical data were not necessary in order to develop wind fields that reflect the influence of terrain and effects that are important for dispersion of emissions from the Project to the sensitive receptor areas.
Land use data source(s)	Digitised from aerial imagery
Meteorological grid domain	30 km x 30 km
Meteorological grid resolution	0.3 km
Meteorological grid dimensions	100 x 100 x 9 grid points
Meteorological grid origin	299000 mE, 6386000 mN. MGA Zone 56
Surface meteorological stations	Charlton Ridge: wind speed, wind direction, temperature and humidity Cheshunt: wind speed, wind direction, temperature and humidity HVO Corporate: wind speed, wind direction, temperature and humidity Jerrys Plains: wind speed, wind direction, temperature and humidity Maison Dieu: wind speed, wind direction, temperature and humidity Wambo: wind speed, wind direction and temperature Warkworth: wind speed, wind direction, temperature and humidity TAPM (at location of HVO Corporate): ceiling height, cloud cover and air pressure
Upper air meteorological stations	Upper air data file for the location of the HVO Corporate meteorological station, derived by TAPM. Biased towards surface observations (-1, -0.8, -0.6, -0.4, -0.2, 0, 0, 0, 0)
Simulation length	8760 hours (1 Jan 2014 to 31 Dec 2014)
R1, R2	0.5, 1
RMAX1, RMAX2	5, 20
TERRAD	5

Table C3 Model settings and inputs for CALPUFF

Parameter	Value(s)
Model version	6.42
Computational grid domain	100 x 100
Chemical transformation	None
Dry deposition	Yes
Wind speed profile	ISC rural

Parameter	Value(s)
Puff element	Puff
Dispersion option	Turbulence from micrometeorology
Time step	3600 seconds (1 hour)
Terrain adjustment	Partial plume path
Number of volume sources	See below. Height = 5 m, SY = 20 m, SZ = 10 m.
Number of discrete receptors	1003. See below.

Sources

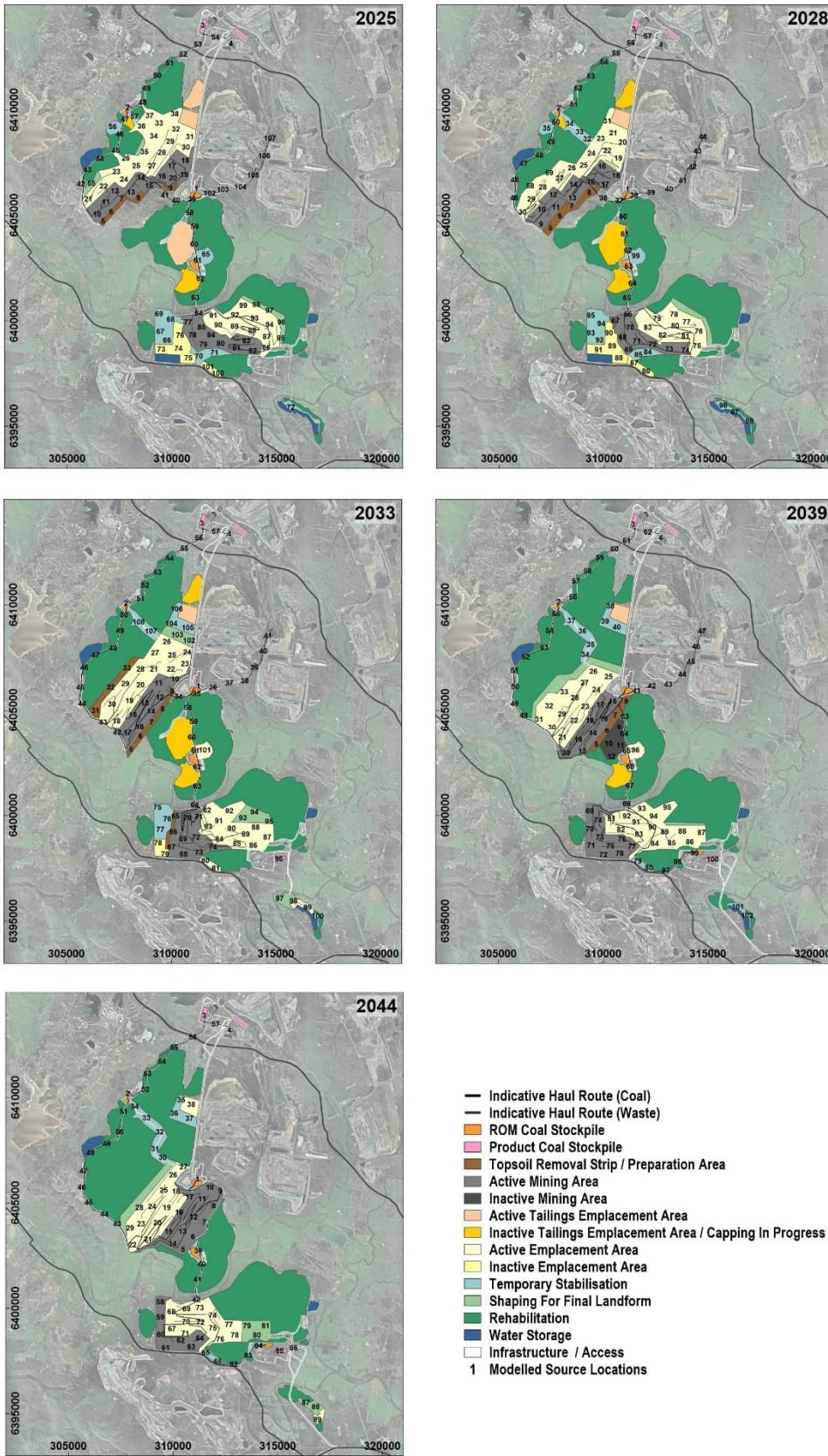


Figure C3 Location of modelled sources of operational dust emissions

Receptors

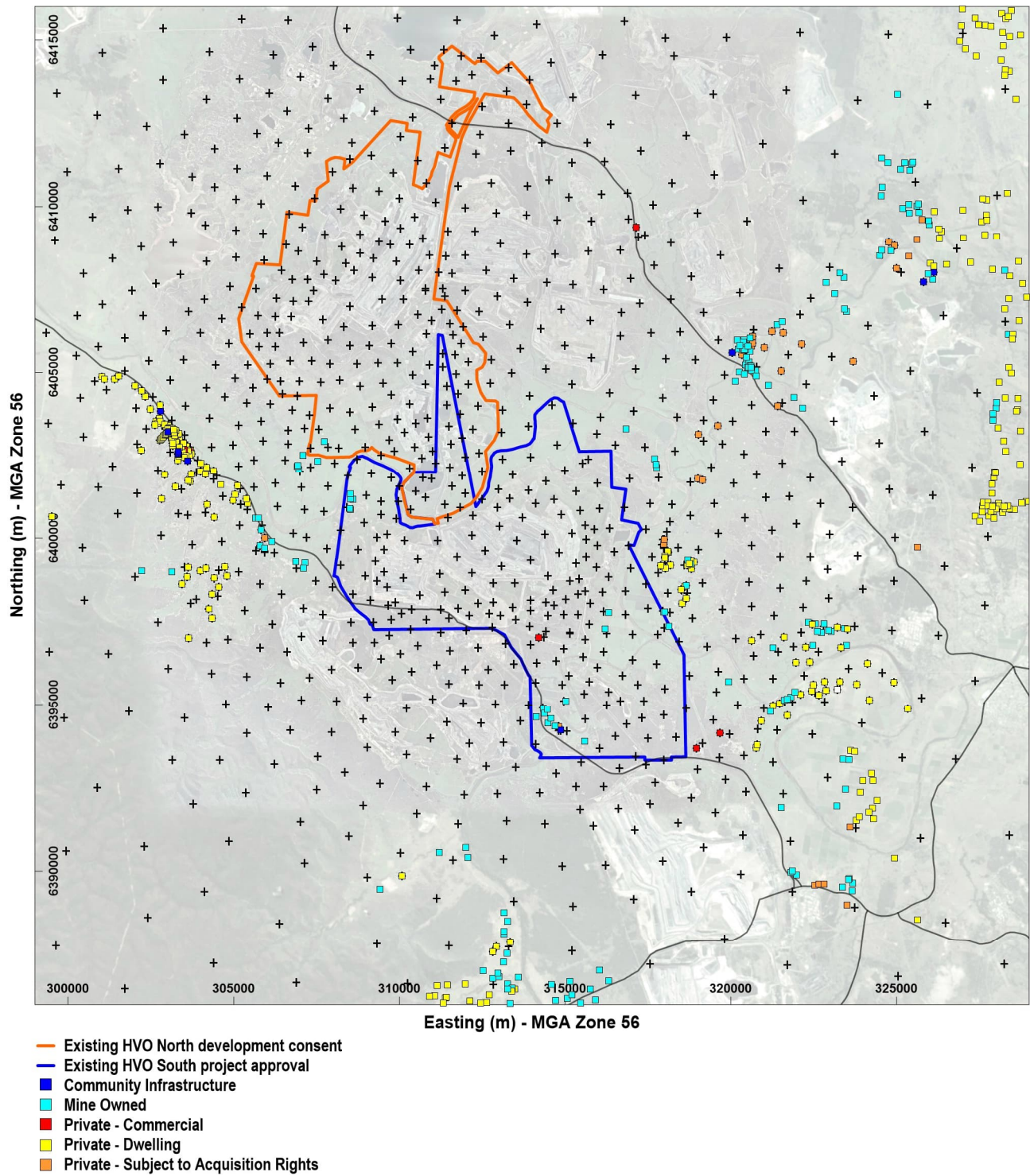


Figure C4 Location of model receptors

Appendix D. Emission calculations

Emission factors

Activity	Emission factor			Units	Source
	TSP	PM ₁₀	PM _{2.5}		
Stripping topsoil	$E_{TSP} = 0.029$	$E_{PM10} = 0.0073 \times E_{TSP}$	$E_{PM2.5} = 0.05 \times E_{TSP}$	kg/t	US EPA / NPI
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 material / dumping overburden	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	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 shaping overburden	$E_{TSP} = 2.6 \times (S^{1.2}/M^{1.3})$	$E_{PM10} = 0.3375 \times (S^{1.5}/M^{1.4})$	$E_{PM2.5} = 0.105 \times E_{TSP}$	kg/hour	US EPA / NPI
Dozers working on coal	$E_{TSP} = 35.6 \times (S^{1.2}/M^{1.3})$	$E_{PM10} = 6.33 \times (S^{1.5}/M^{1.4})$	$E_{PM2.5} = 0.022 \times E_{TSP}$	kg/hour	US EPA / NPI
Loading coal	$E_{TSP} = 0.58 / M^{1.2}$	$E_{PM10} = 0.0447 / M^{0.9}$	$E_{PM2.5} = 0.019 \times E_{TSP}$	kg/t	US EPA / NPI
Unloading coal	$E_{TSP} = 0.01$	$E_{PM10} = 0.0042$	$E_{PM2.5} = 0.019 \times E_{TSP}$	kg/t	NPI
Miscellaneous transfer	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	kg/t	US EPA / NPI
Loading product coal to trains	$E_{TSP} = 0.0004$	$E_{PM10} = 0.00017$	$E_{PM2.5} = 0.05 \times E_{TSP}$	kg/t	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 (m²)
 U = wind speed (m/s)
 M = moisture content (%)
 S = silt content (%)
 s = speed (km/h)

Emission inventory
HVO North 2014

Activity	Annual emissions (kg/y)				TSP			PM10		PM2.5		Variables									
	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	7029	1769	351	50	484782	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-
Drilling overburden (or coal)	8352	4343	251	70	47185	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-
Blasting overburden (or coal)	77692	40400	2331	0	89	blasts/y	874.2	kg/blast	454.6	kg/blast	26.2	kg/blast	25087	-	-	-	-	-	-	-	-
Excavators loading overburden to trucks	107454	50823	7696	0	70898855	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	-
Hauling overburden from pit to dump	1203508	355647	36105	85	70898855	t/y	0.11317	kg/t	0.03344	kg/t	0.003	kg/t	-	-	-	-	4	240	7	-	-
Unloading overburden to dump inc rejects	113380	53626	8120	0	74808855	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	-
Dozers shaping overburden	755629	183955	79341	0	45152	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Dozers working on overburden for rehabilitation	29379	7152	3085	0	1756	h/y	16.7	kg/h	4.07415	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-
Dozers working on coal	142453	41050	3134	0	10661	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	-
Loading ROM coal to trucks	272165	39142	5171	0	5690000	t/y	0.04783	kg/t	0.00688	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	92928	27461	2788	85	3095650	t/y	0.20013	kg/t	0.05914	kg/t	0.006	kg/t	-	-	-	-	4	190	9.8	-	-
Hauling ROM coal from pit to ROM pad (Howick CPP)	66131	19542	1984	85	1269944	t/y	0.34716	kg/t	0.10259	kg/t	0.010	kg/t	-	-	-	-	4	190	17	-	-
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	10083	2980	302	85	156743	t/y	0.42884	kg/t	0.12673	kg/t	0.013	kg/t	-	-	-	-	4	190	21	-	-
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	-	4	190	0	-	-
Unloading ROM coal to hopper / ROM pad (HVCPP)	9287	3901	176	70	3095650	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Unloading ROM coal to ROM pad (Howick CPP)	3810	1600	72	70	1269944	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Unloading ROM coal to hopper / ROM pad (RCPP)	470	197	9	70	156743	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (HVCPP)	18574	7801	353	0	1857390	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (Howick CPP)	12699	5334	241	0	1269944	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-
Transferring ROM coal by conveyor to HVCPP	202	96	14	70	3095650	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Transferring ROM coal by conveyor to Howick CPP	83	39	6	70	1269944	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Handling coal at HVCPP inc rejects	2080	984	30	70	6373192	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Handling coal at Howick CPP inc rejects	415	196	6	70	1269944	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-
Dozers / loaders on ROM coal stockpiles	84852	24452	1867	50	12700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	-
Dozers on product coal stockpiles	31693	8542	697	50	8474	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	-	4	-
Conveyer to product stockpiles	618	292	44	70	12927949	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-	-
Hauling product from Howick CPP to Newdell LP	131881	38972	3956	85	981930	t/y	0.89538	kg/t	0.26459	kg/t	0.027	kg/t	-	-	-	-	4	65	15	-	-
Loading product coal to trains	5564	2365	278	0	13909879	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-
Wind erosion from active and inactive pits	365196	182598	27390	0	417	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from active, inactive and shaped dumps	649063	324531	48680	0	741	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from temporary stabilisation	0	0	0	60	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from ROM coal stockpiles	7943	3972	596	50	18	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Wind erosion from product coal stockpile	12300	6150	923	50	28	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-
Grading roads	42404	14992	465	50	137794	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-
Total	4265317	1454902	236463																		

Production data from HVO (2015)

Emission inventory
HVO South 2014

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	4244	1068	212	50	292702	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t										
Drilling overburden (or coal)	21304	11078	639	70	120361	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole										
Blasting overburden (or coal)	187753	97632	5633	0	192	blasts/y	977.3	kg/blast	508.2	kg/blast	29.3	kg/blast	27022									
Excavators loading overburden to trucks	232282	109863	16636	0	153261145	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t		1.28	2							
Hauling overburden from pit to dump	2601608	768797	78048	85	153261145	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t			4	240	7					
Unloading overburden to dump inc rejects	232282	109863	16636	0	153261145	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t		1.28	2							
Dozers shaping overburden	1632604	397451	171423	0	97554	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h			2				10			
Dozers working on overburden for rehabilitation	63319	15415	6649	0	3784	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h			2				10			
Dozers working on coal	226274	65205	4978	0	16933	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h			8				5			
Loading ROM coal to trucks	588336	84612	11178	0	12300000	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t			8							
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	949035	280448	28471	85	12245949	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t				4	190	25.3				
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t				4	190	0				
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.42884	kg/t	0.126726	kg/t	0.013	kg/t				4	190	21				
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t				4	190	0				
Unloading ROM coal to hopper / ROM pad (HVCPP)	36738	15430	698	70	12245949	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
ROM coal rehandle to hopper (HVCPP)	73476	30860	1396	0	7347570	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t										
Transferring ROM coal by conveyor to HVCPP	799	378	57	70	12245949	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t		1.28	8							
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t		1.28	8							
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t		1.28	8							
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t		1.28	8							
Handling coal at HVCPP inc rejects	3997	1891	57	70	12245949	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t		1.28	8							
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t		1.28	8							
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t		1.28	8							
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t		1.28	8							
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h			8				5			
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h			10				4			
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t		1.28	10							
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t				4	65	15				
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t										
Wind erosion from active and inactive pits	421308	210654	31598	0	481	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y										
Wind erosion from active, inactive and shaped dumps	531235	265617	39843	0	606	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y										
Wind erosion from temporary stabilisation	0	0	0	60	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y										
Wind erosion from ROM coal stockpiles	7366	3683	552	50	17	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y										
Wind erosion from product coal stockpile	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y										
Grading roads	92824	32818	1017	50	301639	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT								8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm			2	7						
Total	7906784	2502762	415723																			

Production data from HVO (2015)

Emission inventory
HVO North 2025

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	12950	3260	648	50	893132	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	-	
Drilling overburden (or coal)	46442	24150	1393	70	262383	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	-	
Blasting overburden (or coal)	333163	173245	9995	0	326	blasts/y	1022.9	kg/blast	531.9	kg/blast	30.7	kg/blast	27857	-	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	226339	107052	16211	0	149340305	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	-	
Hauling overburden from pit to dump	2535052	749129	76052	85	149340305	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-	-	
Unloading overburden to dump inc rejects	231492	109489	16580	0	152739962	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	-	
Dozers shaping overburden	1205202	293402	126546	0	72015	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	-	
Dozers working on coal	227208	65474	4999	0	17003	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	-	
Loading ROM coal to trucks	434094	62430	8248	0	9075360	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	148217	43799	4447	85	4937459	t/y	0.20013	kg/t	0.059139	kg/t	0.006	kg/t	-	-	4	190	9.8	-	-	-	-	
Hauling ROM coal from pit to ROM pad (Howick CPP)	105476	31169	3164	85	2025519	t/y	0.34716	kg/t	0.102588	kg/t	0.010	kg/t	-	-	4	190	17	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	16082	4752	482	85	250000	t/y	0.42884	kg/t	0.126726	kg/t	0.013	kg/t	-	-	4	190	21	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	4	190	0	-	-	-	-	
Unloading ROM coal to hopper / ROM pad (HVCPP)	14812	6221	281	70	4937459	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Unloading ROM coal to ROM pad (Howick CPP)	6077	2552	115	70	2025519	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Unloading ROM coal to hopper / ROM pad (RCPP)	750	315	14	70	250000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (HVCPP)	29625	12442	563	0	2962475	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (Howick CPP)	20255	8507	385	0	2025519	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to HVCPP	322	152	23	70	4937459	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Transferring ROM coal by conveyor to Howick CPP	132	63	9	70	2025519	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Handling coal at HVCPP inc rejects	2527	1195	36	70	7742780	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Handling coal at Howick CPP inc rejects	661	313	9	70	2025519	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	-	
Dozers / loaders on ROM coal stockpiles	84852	24452	1867	50	12700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	-	
Dozers on product coal stockpiles	31693	8542	697	50	8474	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	-	4	-	
Conveyer to product stockpiles	569	269	41	70	11919928	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-	-	
Hauling product from Howick CPP to Newdell LP	200762	59327	6023	85	1494789	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	4	65	15	-	-	-	-	
Loading product coal to trains	5366	2281	268	0	13414717	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	-	
Wind erosion from active and inactive pits	432523	216261	32439	0	494	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from active, inactive and shaped dumps	810399	405200	60780	0	925	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from temporary stabilisation	42125	21063	3159	60	120	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	15309	7655	1148	50	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	11755	5877	882	50	27	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	-	
Grading roads	67633	23912	741	50	219778	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	-	8	
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	-	
Total	7346725	2485357	383166																			

Production data from HVO

Emission inventory
HVO South 2025

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	0	0	0	50	0	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	26837	13955	805	70	151622	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	219419	114098	6583	0	262	blasts/y	838.4	kg/blast	436.0	kg/blast	25.2	kg/blast	24399	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	228393	108024	16358	0	150695240	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	2558052	755925	76742	85	150695240	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	228393	108024	16358	0	150695240	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	1208199	294131	126861	0	72194	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on coal	167453	48254	3684	0	12532	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Loading ROM coal to trucks	435394	62617	8272	0	9102541	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	702328	207544	21070	85	9062541	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t	-	-	-	4	190	25.3	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.42884	kg/t	0.126726	kg/t	0.013	kg/t	-	-	-	4	190	21	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	27188	11419	517	70	9062541	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	54375	22838	1033	0	5437525	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	592	280	42	70	9062541	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	2958	1399	42	70	9062541	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-		
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-		
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	511922	255961	38394	0	584	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	688263	344132	51620	0	786	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	94167	47083	7063	60	269	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	68694	24287	753	50	223226	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-		
Total	7269485	2431378	381116																			

Production data from HVO

Emission inventory
HVO North 2029

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	16212	4081	811	50	1118048	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-			
Drilling overburden (or coal)	66840	34757	2005	70	377626	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-			
Blasting overburden (or coal)	546229	284039	16387	0	548	blasts/y	997.2	kg/blast	518.6	kg/blast	29.9	kg/blast	27390	-	-	-	-	-	-			
Excavators loading overburden to trucks	376298	177979	26951	0	248284550	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-			
Hauling overburden from pit to dump	4214630	1245458	126439	85	248284550	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-			
Unloading overburden to dump inc rejects	385550	182355	27614	0	254388925	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-			
Dozers shaping overburden	2027713	493639	212910	0	121164	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10			
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10			
Dozers working on coal	406928	117263	8952	0	30453	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5			
Loading ROM coal to trucks	1052308	151338	19994	0	22000000	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-			
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	347135	102581	10414	85	11563863	t/y	0.20013	kg/t	0.059139	kg/t	0.006	kg/t	-	-	-	4	190	9.8	-			
Hauling ROM coal from pit to ROM pad (Howick CPP)	312442	92329	9373	85	6000000	t/y	0.34716	kg/t	0.102588	kg/t	0.010	kg/t	-	-	-	4	190	17	-			
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	271772	80311	8153	85	4436137	t/y	0.40842	kg/t	0.120692	kg/t	0.012	kg/t	-	-	-	4	190	20	-			
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-			
Unloading ROM coal to hopper / ROM pad (HVCPP)	34692	14570	659	70	11563863	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
Unloading ROM coal to ROM pad (Howick CPP)	18000	7560	342	70	6000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
Unloading ROM coal to hopper / ROM pad (RCPP)	13308	5590	253	70	4436137	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
ROM coal rehandle to hopper (HVCPP)	69383	29141	1318	0	6938318	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
ROM coal rehandle to hopper (Howick CPP)	60000	25200	1140	0	6000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-			
Transferring ROM coal by conveyor to HVCPP	755	357	54	70	11563863	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Transferring ROM coal by conveyor to Howick CPP	392	185	28	70	6000000	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Handling coal at HVCPP inc rejects	4989	2360	71	70	15282947	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Handling coal at Howick CPP inc rejects	1959	926	28	70	6000000	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-			
Dozers / loaders on ROM coal stockpiles	84852	24452	1867	50	12700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5			
Dozers on product coal stockpiles	32373	8725	712	50	8656	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4			
Conveyer to product stockpiles	857	405	61	70	17941887	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-			
Hauling product from Howick CPP to Newdell LP	585226	172939	17557	85	4357355	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-			
Loading product coal to trains	8920	3791	446	0	22299242	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-			
Wind erosion from active and inactive pits	318508	159254	23888	0	364	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-			
Wind erosion from active, inactive and shaped dumps	724115	362057	54309	0	827	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-			
Wind erosion from temporary stabilisation	84437	42218	6333	60	241	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-			
Wind erosion from ROM coal stockpiles	15309	7655	1148	50	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-			
Wind erosion from product coal stockpile	14376	7188	1078	50	33	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-			
Grading roads	109887	38851	1204	50	357086	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	8			
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-			
Total	12253254	3890963	587421																			

Production data from HVO

Emission inventory
HVO South 2029

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	1143	288	57	50	78815	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	24892	12944	747	70	140635	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	182916	95116	5487	0	249	blasts/y	733.9	kg/blast	381.6	kg/blast	22.0	kg/blast	22325	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	219641	103884	15731	0	144920821	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	2460031	726959	73801	85	144920821	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	219641	103884	15731	0	144920821	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	1232292	299996	129391	0	73634	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on coal	175333	50525	3857	0	13121	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Loading ROM coal to trucks	416623	59917	7916	0	8710095	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	653783	193198	19613	85	8436137	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t	-	-	-	4	190	25.3	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.40842	kg/t	0.120692	kg/t	0.012	kg/t	-	-	-	4	190	20	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	25308	10630	481	70	8436137	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	50617	21259	962	0	5061682	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	551	260	39	70	8436137	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	2754	1302	39	70	8436137	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-		
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-		
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	281190	140595	21089	0	321	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	543181	271590	40739	0	620	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	66294	33147	4972	60	189	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	68088	24073	746	50	221256	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-		
Total	6671135	2160977	346319																			

Production data from HVO

Emission inventory
HVO North 2033

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	10558	2658	528	50	728115	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	65002	33801	1950	70	367240	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	552841	287477	16585	0	519	blasts/y	1064.8	kg/blast	553.7	kg/blast	31.9	kg/blast	28613	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	407385	192682	29178	0	268795927	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	4562811	1348348	136884	85	268795927	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	416364	196929	29821	0	274720041	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	2141260	521281	224832	0	127948	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	2	-	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	2	-	-	-	-	10	-		
Dozers working on coal	342006	98555	7524	0	25594	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	8	-	-	-	-	5	-		
Loading ROM coal to trucks	1052308	151338	19994	0	22000000	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	369298	109131	11079	85	12302153	t/y	0.20013	kg/t	0.059139	kg/t	0.006	kg/t	-	-	4	190	9.8	-	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	319794	94502	9594	85	6000000	t/y	0.35533	kg/t	0.105002	kg/t	0.011	kg/t	-	-	4	190	17.4	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	222011	65606	6660	85	3697847	t/y	0.40025	kg/t	0.118278	kg/t	0.012	kg/t	-	-	4	190	19.6	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	4	190	8	-	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	36906	15501	701	70	12302153	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	18000	7560	342	70	6000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	11094	4659	211	70	3697847	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	73813	31001	1402	0	7381292	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	60000	25200	1140	0	6000000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	803	380	58	70	12302153	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	392	185	28	70	6000000	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	5272	2493	76	70	16149249	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	1959	926	28	70	6000000	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	84852	24452	1867	50	12700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	8	-	-	-	-	5	-		
Dozers on product coal stockpiles	31788	8567	699	50	8499	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	10	-	-	-	-	4	-		
Conveyer to product stockpiles	868	410	62	70	18165314	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	590399	174468	17712	85	4395871	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	4	65	15	-	-	-		
Loading product coal to trains	9024	3835	451	0	22561185	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	324390	162195	24329	0	370	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	850043	425022	63753	0	970	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	62023	31011	4652	60	177	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	15309	7655	1148	50	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	14377	7188	1078	50	33	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	120090	42458	1316	50	390242	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	2	7	-	-	-	-	-		
Total	12819896	4088883	620603																			

Production data from HVO

Emission inventory
HVO South 2033

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	3939	991	197	50	271632	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	22870	11892	686	70	129208	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	176668	91868	5300	0	221	blasts/y	798.6	kg/blast	415.3	kg/blast	24.0	kg/blast	23619	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	227732	107711	16311	0	150259307	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	2550652	753739	76520	85	150259307	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	227732	107711	16311	0	150259307	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	1284996	312827	134925	0	76783	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on coal	228437	65828	5026	0	17095	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Loading ROM coal to trucks	420820	60521	7996	0	8797847	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	596567	176290	17897	85	7697847	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t	-	-	-	4	190	25.3	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.40025	kg/t	0.118278	kg/t	0.012	kg/t	-	-	-	4	190	19.6	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	23094	9699	439	70	7697847	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	46187	19399	878	0	4618708	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	503	238	36	70	7697847	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	2513	1188	36	70	7697847	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-		
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-		
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	320017	160008	24001	0	365	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	649930	324965	48745	0	742	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	60708	30354	4553	60	173	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	0	0	0	50	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	76425	27020	838	50	248348	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-		
Total	6966646	2273657	365612																			

Production data from HVO

Emission inventory
HVO North 2040

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	16029	4035	801	50	1105425	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	58213	30271	1746	70	328889	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	506326	263290	15190	0	439	blasts/y	1152.9	kg/blast	599.5	kg/blast	34.6	kg/blast	30170	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	451299	213452	32323	0	297770841	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	5054660	1493694	151640	85	297770841	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	463067	219018	33166	0	305535288	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	2178975	530463	228792	0	130202	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on coal	348044	100295	7657	0	26046	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Loading ROM coal to trucks	970962	139640	18448	0	20299363	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	493250	145759	14797	85	16431287	t/y	0.20013	kg/t	0.059139	kg/t	0.006	kg/t	-	-	-	4	190	9.8	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	300218	88717	9007	85	5568713	t/y	0.35941	kg/t	0.106209	kg/t	0.011	kg/t	-	-	-	4	190	17.6	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.39208	kg/t	0.115864	kg/t	0.012	kg/t	-	-	-	4	190	19.2	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	49294	20703	937	70	16431287	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	16706	7017	317	70	5568713	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	98588	41407	1873	0	9858772	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	55687	23389	1058	0	5568713	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	1073	507	77	70	16431287	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	364	172	26	70	5568713	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	6677	3158	96	70	20455695	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	1818	860	26	70	5568713	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	111577	32153	2455	50	16700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Dozers on product coal stockpiles	32356	8720	712	50	8651	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-		
Conveyer to product stockpiles	1128	533	81	70	23607881	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	540057	159591	16202	85	4021042	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-		
Loading product coal to trains	11052	4697	553	0	27628923	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	460807	230403	34561	0	526	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	899204	449602	67440	0	1026	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	78783	39392	5909	60	225	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	15309	7654	1148	50	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	14377	7188	1078	50	33	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	133264	47116	1461	50	433050	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-		
Total	13416021	4324304	654496																			

Production data from HVO

Emission inventory
HVO South 2040

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Variables							
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	0	0	0	50	0	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-
Drilling overburden (or coal)	40561	21092	1217	70	229158	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
Blasting overburden (or coal)	319260	166015	9578	0	362	blasts/y	883.1	kg/blast	459.2	kg/blast	26.5	kg/blast	25257	-	-	-	-	-	-	-
Excavators loading overburden to trucks	219022	103592	15687	0	144512505	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-
Hauling overburden from pit to dump	2453100	724911	73593	85	144512505	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-
Unloading overburden to dump inc rejects	219022	103592	15687	0	144512505	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-
Dozers shaping overburden	1235293	300727	129706	0	73813	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
Dozers working on coal	290245	83639	6385	0	21721	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-
Loading ROM coal to trucks	859244	123573	16326	0	17963739	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	276568	81728	8297	85	3568713	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t	-	-	-	4	190	25.3	-	-
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.39208	kg/t	0.115864	kg/t	0.012	kg/t	-	-	-	4	190	19.2	-	-
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	350	103	10	85	14275	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-
Unloading ROM coal to hopper / ROM pad (HVCPP)	10706	4497	203	70	3568713	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
Unloading ROM coal to hopper / ROM pad (LCPP)	43	18	1	70	14275	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (HVCPP)	21412	8993	407	0	2141228	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
ROM coal rehandle to hopper (LCPP)	86	36	2	0	8565	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-
Transferring ROM coal by conveyor to HVCPP	233	110	17	70	3568713	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Transferring ROM coal by conveyor to LCPP	1	0	0	70	14275	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Handling coal at HVCPP inc rejects	1165	551	17	70	3568713	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Handling coal at LCPP inc rejects	5	2	0	70	14275	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-
Wind erosion from active and inactive pits	313265	156633	23495	0	358	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from active, inactive and shaped dumps	590540	295270	44290	0	674	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from temporary stabilisation	20683	10342	1551	60	59	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM coal stockpiles	3487	1743	262	50	8	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product coal stockpile	3937	1968	295	50	9	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	69393	24534	761	50	225497	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-
Total	6994480	2225077	352706																	

Production data from HVO

Emission inventory
HVO North 2044

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP			PM10			PM2.5			Variables						
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)	
Stripping topsoil by scraper	0	0	0	50	0	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-		
Drilling overburden (or coal)	69597	36191	2088	70	393205	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-		
Blasting overburden (or coal)	603025	313573	18091	0	538	blasts/y	1120.7	kg/blast	582.8	kg/blast	33.6	kg/blast	29606	-	-	-	-	-	-	-		
Excavators loading overburden to trucks	443030	209541	31730	0	292314347	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Hauling overburden from pit to dump	4962036	1466323	148861	85	292314347	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-		
Unloading overburden to dump inc rejects	451607	213598	32345	0	297973754	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-		
Dozers shaping overburden	2344071	570655	246128	0	140067	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-		
Dozers working on coal	351144	101188	7725	0	26278	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Loading ROM coal to trucks	1052308	151338	19994	0	22000000	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-		
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	528333	156127	15850	85	17600000	t/y	0.20013	kg/t	0.059139	kg/t	0.006	kg/t	-	-	-	4	190	9.8	-	-		
Hauling ROM coal from pit to ROM pad (Howick CPP)	231820	68505	6955	85	4400000	t/y	0.35124	kg/t	0.103795	kg/t	0.011	kg/t	-	-	-	4	190	17.2	-	-		
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.38392	kg/t	0.11345	kg/t	0.012	kg/t	-	-	-	4	190	18.8	-	-		
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	0	0	0	85	0	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-		
Unloading ROM coal to hopper / ROM pad (HVCPP)	52800	22176	1003	70	17600000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to ROM pad (Howick CPP)	13200	5544	251	70	4400000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Unloading ROM coal to hopper / ROM pad (LCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (HVCPP)	105600	44352	2006	0	10560000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (Howick CPP)	44000	18480	836	0	4400000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
ROM coal rehandle to hopper (LCPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-		
Transferring ROM coal by conveyor to HVCPP	1149	543	82	70	17600000	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to Howick CPP	287	136	21	70	4400000	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Transferring ROM coal by conveyor to LCPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at HVCPP inc rejects	6994	3308	100	70	21426508	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at Howick CPP inc rejects	1436	679	21	70	4400000	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Handling coal at LCPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-		
Dozers / loaders on ROM coal stockpiles	111577	32153	2455	50	16700	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	5	-		
Dozers on product coal stockpiles	32918	8872	724	50	8801	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	4	-		
Conveyer to product stockpiles	803	380	58	70	16812937	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-		
Hauling product from Howick CPP to Newdell LP	425996	125885	12780	85	31711791	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-		
Loading product coal to trains	7994	3397	400	0	19984728	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-		
Wind erosion from active and inactive pits	468350	234175	35126	0	535	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from active, inactive and shaped dumps	836034	418017	62703	0	954	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from temporary stabilisation	85984	42992	6449	60	245	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from ROM coal stockpiles	15309	7654	1148	50	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Wind erosion from product coal stockpile	14377	7189	1078	50	33	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-		
Grading roads	136988	48432	1501	50	445151	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8		
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-		
Total	13445626	4322811	663428																			

Production data from HVO

Emission inventory
HVO South 2044

Activity	Annual emissions (kg/y)			Control (%)	Intensity	Units	TSP		PM10		PM2.5		Variables								
	TSP	PM10	PM2.5				Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	Drop distance (m)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)		
Stripping topsoil by scraper	0	0	0	50	0	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-	-	
Drilling overburden (or coal)	6541	3401	196	70	36953	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-	
Blasting overburden (or coal)	58660	30503	1760	0	60	blasts/y	973.3	kg/blast	506.1	kg/blast	29.2	kg/blast	26950	-	-	-	-	-	-	-	
Excavators loading overburden to trucks	49364	23348	3536	0	32570769	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	
Hauling overburden from pit to dump	552889	163383	16587	85	32570769	t/y	0.11317	kg/t	0.033442	kg/t	0.003	kg/t	-	-	4	240	7	-	-	-	
Unloading overburden to dump inc rejects	49364	23348	3536	0	32570769	t/y	0.00152	kg/t	0.00072	kg/t	0.0001	kg/t	-	1.28	2	-	-	-	-	-	
Dozers shaping overburden	436224	106197	45804	0	26066	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Dozers working on overburden for rehabilitation	46859	11408	4920	0	2800	h/y	16.7	kg/h	4.074149	kg/h	1.757	kg/h	-	-	2	-	-	-	-	10	
Dozers working on coal	114770	33073	2525	0	8589	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	
Loading ROM coal to trucks	273762	39371	5201	0	5723390	t/y	0.04783	kg/t	0.006879	kg/t	0.001	kg/t	-	-	8	-	-	-	-	-	
Hauling ROM coal from pit to hopper / ROM pad (HVCPP)	100747	29772	3022	85	1300000	t/y	0.51665	kg/t	0.152675	kg/t	0.015	kg/t	-	-	-	4	190	25.3	-	-	
Hauling ROM coal from pit to ROM pad (Howick CPP)	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	190	0	-	-	
Hauling ROM coal from pit to hopper / ROM pad (RCPP)	0	0	0	85	0	t/y	0.38392	kg/t	0.11345	kg/t	0.012	kg/t	-	-	-	4	190	18.8	-	-	
Hauling ROM coal from pit to hopper / ROM pad (LCPP)	127	38	4	85	5200	t/y	0.16337	kg/t	0.048277	kg/t	0.005	kg/t	-	-	-	4	190	8	-	-	
Unloading ROM coal to hopper / ROM pad (HVCPP)	3900	1638	74	70	1300000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Unloading ROM coal to ROM pad (Howick CPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Unloading ROM coal to hopper / ROM pad (RCPP)	0	0	0	70	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Unloading ROM coal to hopper / ROM pad (LCPP)	16	7	0	70	5200	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (HVCPP)	7800	3276	148	0	780000	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (Howick CPP)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (RCPP) (RSO)	0	0	0	0	0	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
ROM coal rehandle to hopper (LCPP)	31	13	1	0	3120	t/y	0.01	kg/t	0.0042	kg/t	0.000	kg/t	-	-	-	-	-	-	-	-	
Transferring ROM coal by conveyor to HVCPP	85	40	6	70	1300000	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Transferring ROM coal by conveyor to Howick CPP	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Transferring ROM coal by conveyor to RCPP (RSO)	0	0	0	70	0	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Transferring ROM coal by conveyor to LCPP	0	0	0	70	5200	t/y	0.00022	kg/t	0.00010	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Handling coal at HVCPP inc rejects	424	201	6	70	1300000	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Handling coal at Howick CPP inc rejects	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Handling coal at RCPP (RSO)	0	0	0	70	0	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Handling coal at LCPP inc rejects	2	1	0	70	5200	t/y	0.00109	kg/t	0.00051	kg/t	0.0000	kg/t	-	1.28	8	-	-	-	-	-	
Dozers / loaders on ROM coal stockpiles	0	0	0	50	0	h/y	13.4	kg/h	3.9	kg/h	0.294	kg/h	-	-	8	-	-	-	-	5	
Dozers on product coal stockpiles	0	0	0	50	0	h/y	7.5	kg/h	2.0	kg/h	0.165	kg/h	-	-	10	-	-	-	-	4	
Conveyer to product stockpiles	0	0	0	70	0	t/y	0.00016	kg/t	0.00008	kg/t	0.0000	kg/t	-	1.28	10	-	-	-	-	-	
Hauling product from Howick CPP to Newdell LP	0	0	0	85	0	t/y	0.89538	kg/t	0.264594	kg/t	0.027	kg/t	-	-	-	4	65	15	-	-	
Loading product coal to trains	0	0	0	0	0	t/y	0.00040	kg/t	0.00017	kg/t	0.0000	kg/t	-	-	-	-	-	-	-	-	
Wind erosion from active and inactive pits	200337	100168	15025	0	229	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from active, inactive and shaped dumps	583974	291987	43798	0	667	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from temporary stabilisation	9321	4661	699	60	27	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from ROM coal stockpiles	3487	1743	262	50	8	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Wind erosion from product coal stockpile	3937	1968	295	50	9	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-	
Grading roads	25318	8951	277	50	82274	km	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8	
Dragline(s) working on overburden	0	0	0	0	0	bcm/y	0.03	kg/bcm	0.01	kg/bcm	0.002	kg/bcm	-	-	2	7	-	-	-	-	
Total	2527939	878496	147682																		

Production data from HVO

Appendix E. Model performance evaluations

This section provides information on the performance of the model for predicting measured PM₁₀ concentrations. The performance evaluation has been carried out by modelling PM₁₀ concentrations for the 2014 calendar year (based on mining and activities in 2014) and comparing these results to measurement data.

Figure E1 shows quantile-quantile plots of measured and modelled 24-hour average PM₁₀ concentrations at Jerrys Plains, Maison Dieu and Warkworth. These plots show the measured data and model results paired by highest to lowest, and not matched in time. Dispersion models often encounter difficulties when trying to reproduce monitoring results for a single point, especially for the extreme statistics such as the maximum 24-hour average. The most significant factor is the limitation of using computers to model large, complex systems (this would be the case even if all the physics were perfectly correct). In addition, there are often extraordinary events that could not be anticipated. The quantile-quantile plots in **Figure E1** do however show that the model results are well within a factor of two for all percentiles.

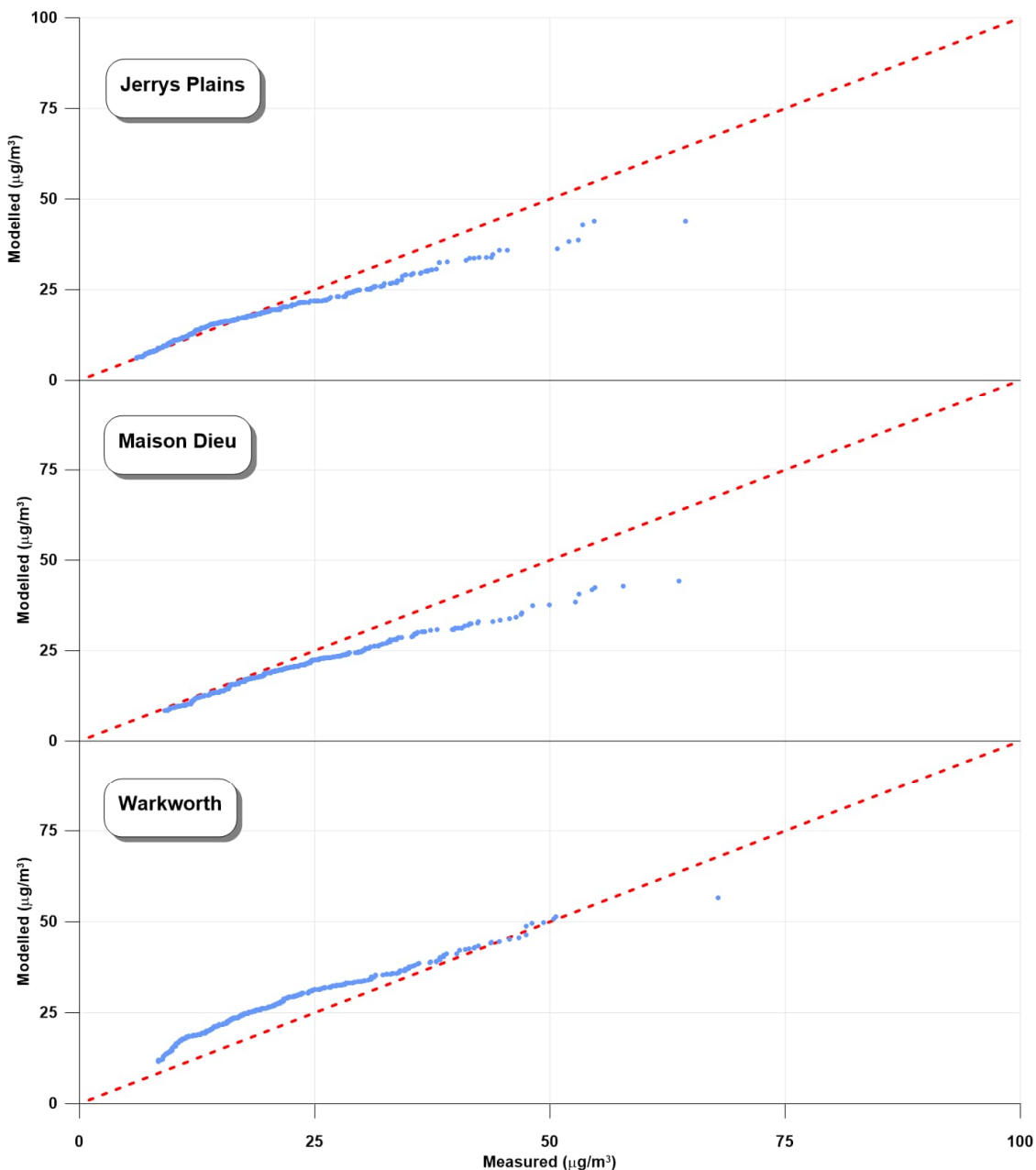


Figure E1 Quantile-quantile plots of measured and modelled 24-hour average PM₁₀ concentrations

Figure E2 shows a comparison of measured and modelled PM_{10} concentrations by wind direction. The model has reproduced similar PM_{10} concentration patterns to the measured data from each location, with some differences in magnitudes depending on the direction. At most the differences range from approximately 36 per cent lower to 66 per cent higher and are well within a factor of two for all wind directions.

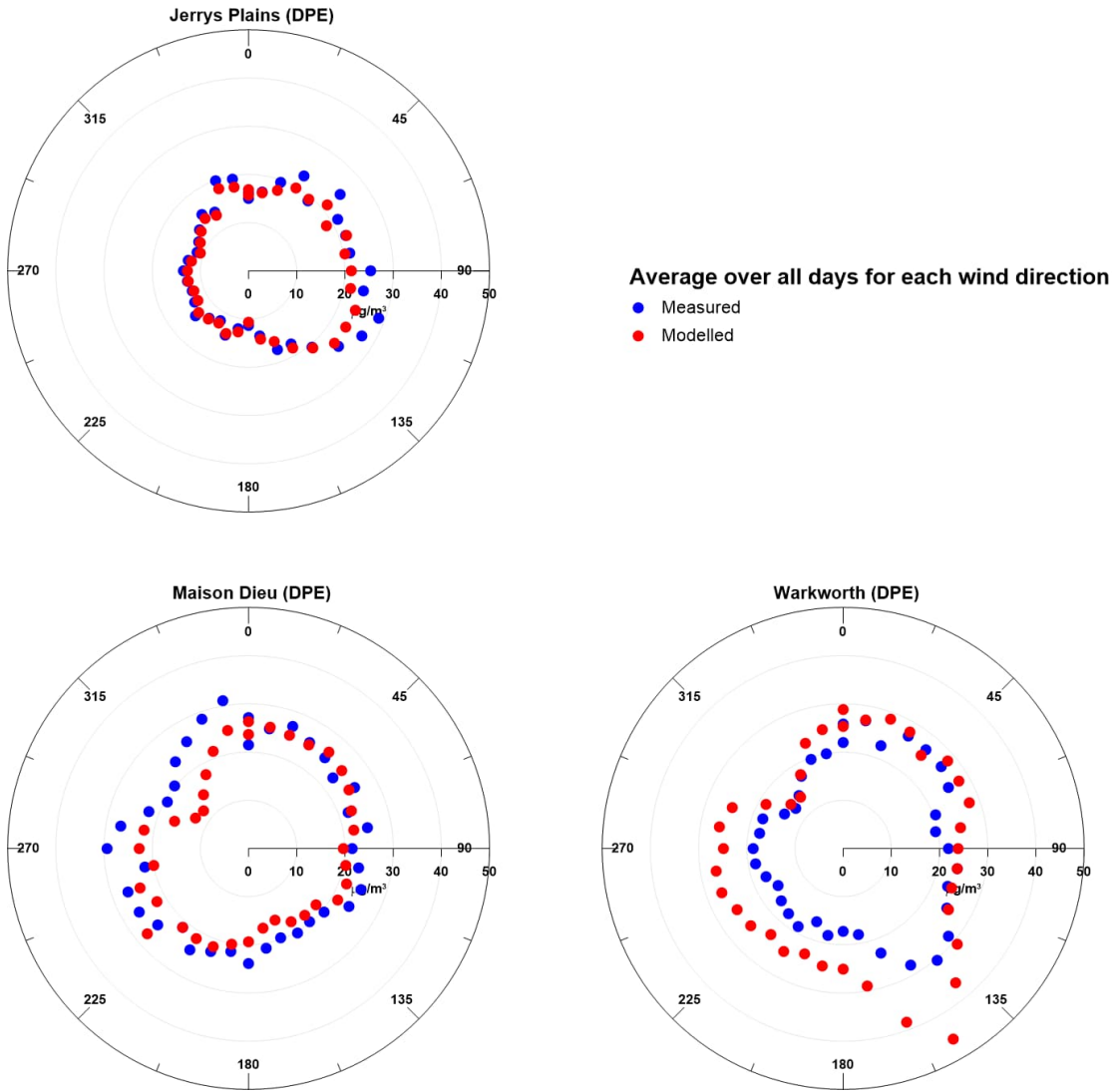


Figure E2 Comparison of measured and modelled PM_{10} concentrations by wind direction

Figure E3 shows a comparison of measured and modelled PM₁₀ concentrations by hour of day. The model has reproduced similar PM₁₀ concentration patterns to the measured data from each location, including the morning and afternoon peaks. There is a clear over-prediction at Warkworth during night-time hours.

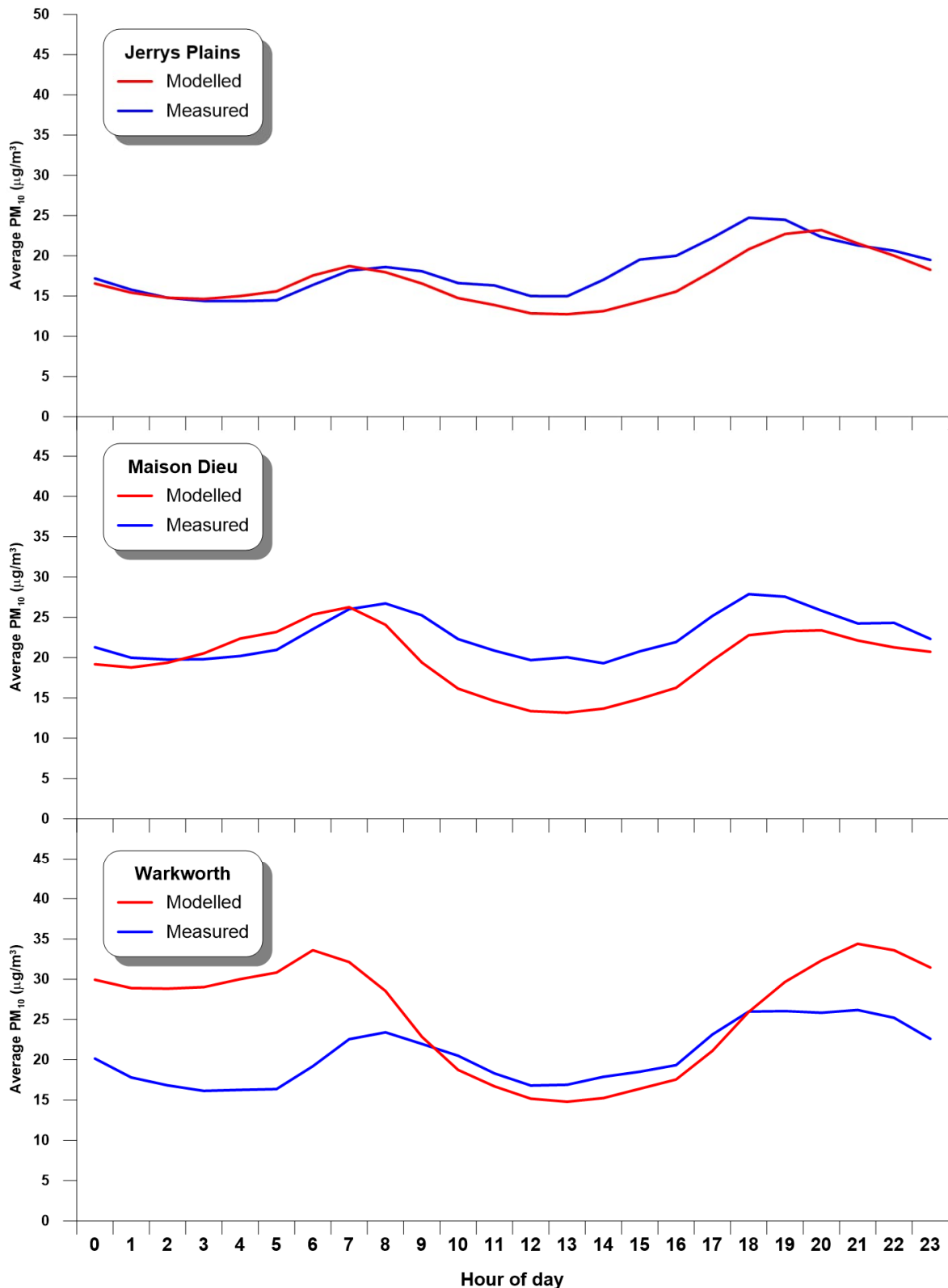


Figure E3 Comparison of measured and modelled PM₁₀ concentrations by hour of day

Appendix F. Tabulated model results

Modelled maximum 24-hour average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria					
				2014	2025	2029	2033	2040	2014	2025	2029	2033	2040	2014	2025	2029	2033	2040	2014	2025	2029	2033	2040						
D119	Monitor	-	-	2	4	10	13	23	25	13	11	11	11	13	4	13	11	13	17	28	28	47	46	48	52	58	51	50	
DL14	Monitor	-	-	3	7	15	18	23	29	23	25	14	12	10	3	23	25	16	19	24	29	44	45	46	46	45	41	50	
Warkworth	Monitor	-	-	1	2	3	4	6	7	21	15	18	28	29	10	21	16	20	31	32	13	53	103	83	67	56	42	50	
D118	Monitor	-	-	2	6	9	11	13	17	11	13	17	23	16	7	16	18	23	16	20	16	50	53	53	50	45	46	50	
Knodlers Lane	Monitor	-	-	3	6	12	15	18	22	27	26	23	19	16	3	27	26	23	19	20	22	43	44	45	45	44	41	50	
DL22	Monitor	-	-	2	4	8	10	15	18	31	36	29	24	18	4	32	38	33	29	25	18	45	48	45	45	44	41	50	
DL21	Monitor	-	-	3	6	12	16	21	25	33	30	23	18	15	3	33	30	23	18	23	26	43	44	45	46	44	41	50	
D122	Monitor	-	-	2	5	9	10	10	12	13	12	10	10	10	2	13	15	15	15	16	12	41	41	42	42	41	41	50	
DL30	Monitor	-	-	1	3	5	7	11	12	43	54	54	56	45	12	44	54	57	61	53	20	61	81	80	74	64	42	50	
DL2	Monitor	-	-	6	14	28	36	41	69	34	40	25	18	13	3	34	42	30	38	43	61	53	61	61	60	60	68	50	
Warkworth	Monitor	-	-	1	2	3	4	6	7	21	15	18	28	29	10	21	16	20	31	32	13	53	103	83	67	56	42	50	
Cheshunt East	Monitor	-	-	8	18	34	38	40	55	21	24	17	13	10	2	22	27	37	41	42	56	62	68	77	83	85	69	50	
Long Point	Monitor	-	-	2	4	8	10	11	12	15	14	13	12	3	16	17	18	18	13	13	16	41	42	42	43	41	41	50	
Kilburne South	Monitor	-	-	2	5	9	11	13	12	23	15	16	23	7	23	16	18	18	26	16	50	55	53	58	54	46	50		
Wandewai	Monitor	-	-	2	5	9	11	13	12	23	15	16	23	7	23	16	18	18	26	16	50	55	53	58	54	46	50		
Jerrys Plains	Monitor	-	-	2	5	10	13	20	19	8	6	6	8	2	8	7	12	17	23	30	44	46	47	47	46	41	50		
Golden Highway	Monitor	-	-	1	1	3	3	5	5	13	14	15	15	4	14	12	17	18	19	9	101	155	155	155	155	155	155	41	50
HCl Conveyor	Monitor	-	-	67	263	288	400	137	135	26	28	23	21	17	4	68	270	289	406	143	137	94	330	382	523	253	157	50	
Maison Dieu	Monitor	-	-	3	7	15	18	23	29	24	25	14	12	10	3	24	25	16	19	24	29	44	46	47	47	46	41	50	
Warkworth	Monitor	-	-	1	1	3	4	5	5	17	10	15	22	23	8	18	12	17	24	26	11	57	65	65	65	49	41	50	
Knodlers Lane	Monitor	-	-	2	5	9	12	18	21	30	32	23	19	4	30	34	27	23	22	22	45	46	45	45	44	41	50		
Jerrys Plains	Monitor	-	-	2	5	10	13	20	19	8	6	6	8	2	8	7	12	17	23	30	44	46	47	47	46	41	50		
Cheshunt East	Monitor	-	-	8	18	34	38	40	55	21	24	17	13	10	2	22	27	37	41	42	56	62	68	77	83	85	69	50	
HVGC	Monitor	-	-	1	3	6	7	9	12	54	58	62	58	65	21	55	61	67	64	72	28	74	94	100	89	85	44	50	
Long Point	Monitor	-	-	2	4	8	10	11	12	15	14	13	12	3	16	17	18	18	13	13	16	41	42	42	43	41	41	50	
Kilburne South	Monitor	-	-	2	5	9	11	13	12	23	15	16	23	7	23	16	18	18	26	16	50	55	53	58	54	46	50		
Maison Dieu	Monitor	-	-	2	5	9	11	13	11	23	15	16	16	23	7	23	16	18	18	26	16	50	55	53	58	54	46	50	
Maison Dieu	Monitor	-	-	3	7	15	18	23	28	25	25	15	12	10	3	25	25	16	19	24	29	44	46	47	47	46	41	50	
Knodlers Lane	Monitor	-	-	3	7	15	18	23	29	24	25	14	12	10	3	24	25	16	19	24	29	44	46	47	47	46	41	50	
17	Private - Dwelling	-	-	0	0	1	1	1	1	1	1	1	1	1	0	1	1	2	2	2	2	43	43	43	43	41	41	50	
19	Private - Dwelling	-	-	0	0	1	1	1	1	1	1	1	1	1	0	1	1	2	2	2	2	43	43	43	43	41	41	50	
37	Private - Dwelling	-	-	0	0	1	1	1	1	1	1	1	1	1	0	1	1	2	2	2	2	43	43	43	43	41	41	50	
102	Private - Subject to Acquisition Rights	Warkworth (Noise & AQ) (SSD6464)	Warkworth (Noise & AQ) (SSD6464)	1	2	3	4	5	6	18	11	16	23	24	8	18	12	18	25	27	11	56	66	65	65	50	41	50	
120	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	3	6	12	15	18	22	28	26	23	19	16	3	28	26	23	19	20	22	43	44	45	45	44	41	50	
121	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	2	5	11	14	18	22	23	23	21	17	4	23	23	23	21	20	22	43	44	45	45	44	41	50		
122	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	3	6	13	16	18	22	28	26	23	18	15	3	28	26	23	18	20	22	43	44	45	45	44	41	50	
123	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	2	5	12	15	18	22	25	24	23	20	16	4	25	24	23	20	20	22	43	44	45	45	44	41	50	
124	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	3	6	13	16	18	22	28	26	22	18	15	3	28	26	22	18	20	22	43	44	45	45	44	41	50	
126	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	1	2	5	6	7	7	12	12	13	13	4	13	14	17	18	18	10	43	46	44	44	42	41	50		
127	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	3	6	12	14	16	15	15	15	12	3	15	17	16	16	18	17	17	44	44	45	45	43	41	50		
128	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	1	3	7	8	9	10	15	14	15	15	15	4	16	17	18	18	12	42	43	44	44	41	41	50		
130	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	2	4	8	9	10	12	16	15	14	13	3	16	17	19	19	13	11	41	42	43	43	41	41	50		
134	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	2	4	8	9	11	12	15	15	13	12	3	16	17	18	18	19	13	41	42	42	42	41	41	50		
139	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	2	4	8	9	10	11	14	14	14	13	12	3	15	16	17	17	17	12	41	42	42	42	41	41	50	
141	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	7	12	13	13	15	14	13	13	10	3	14	13	13	14	16	15	41	42	43	43	41	41	50		
160	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	6	13	17	22	26	32	30	21	16	13	3	32	30	21	18	23	27	43	44	46	46	45	41	50	
161	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	7	15	18	22	27	28	28	17	14	11	3	28	28	18	19	24	28	44	46	47	47	46	41	50	
162	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	7	15	18	22	27	28	28	18	14	11	3	29	28	18	18	23	28	44	46	47	47	46	41	50	
163	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	7	15	18	22	27	25	26	18	12	11	3	25	26	18	19	23	28	44	46	47	47	46	41	50	
167	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	6	12	12	14	12	11	11	9	2	12	12	12	13	15	14	14	41	42	43	43	41	41	50		
169	Private - Dwelling	HVOS (Noise) [06_0261]	-	3	6	11	12	12	14	13	14	11	10	9	2	13	14	14	14	16	14	41	42	43					

Modelled maximum 24-hour average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria				
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044
368	Private - Dwelling	-	-	2	5	11	14	23	27	12	10	10	9	13	4	12	10	14	17	30	30	47	46	47	52	57	49	50
369	Private - Dwelling	-	-	2	4	10	13	22	27	12	10	10	10	13	4	12	11	13	17	30	30	47	46	47	52	57	49	50
370	Private - Dwelling	-	-	2	5	11	13	21	26	12	9	10	9	12	4	12	10	14	17	29	28	46	46	47	52	57	48	50
371	Private - Dwelling	-	-	2	4	10	13	22	26	12	10	10	10	13	4	12	11	13	17	29	29	47	46	47	52	57	49	50
372	Private - Dwelling	-	-	2	5	11	13	21	24	12	9	10	9	11	3	12	10	14	16	27	26	46	46	47	51	56	48	50
373	Private - Dwelling	-	-	2	5	11	13	21	25	12	10	10	10	12	4	12	10	14	17	28	28	46	46	47	52	57	49	50
374	Private - Dwelling	-	-	2	5	10	13	21	25	12	9	10	10	12	4	12	10	13	16	28	27	47	46	47	51	56	49	50
375	Private - Dwelling	-	-	2	5	10	13	21	25	12	9	10	10	12	4	12	10	14	16	27	27	47	46	47	51	56	49	50
376	Private - Dwelling	-	-	2	4	10	13	22	26	12	10	11	10	13	4	13	11	13	17	29	28	47	46	47	52	58	50	50
377	Private - Dwelling	-	-	2	4	10	13	22	26	12	10	10	10	13	4	12	11	13	17	29	29	47	46	47	52	57	49	50
380	Private - Dwelling	-	-	2	4	10	12	21	22	12	9	10	10	12	4	13	10	13	16	26	25	47	46	47	51	56	49	50
381	Private - Dwelling	-	-	2	4	10	12	21	23	12	9	10	10	12	4	13	10	13	16	26	26	47	46	47	51	56	49	50
382	Community Infrastructure	-	-	2	4	10	12	21	23	12	9	10	10	12	4	12	10	13	16	26	26	47	46	47	51	56	49	50
383	Private - Dwelling	-	-	2	4	10	12	22	24	12	10	10	10	12	4	13	10	13	16	27	27	47	46	47	52	57	49	50
384	Private - Dwelling	-	-	2	4	10	13	21	24	12	10	10	10	12	4	12	10	13	16	27	26	47	46	47	51	57	49	50
385	Private - Dwelling	-	-	2	4	10	12	21	23	12	9	10	10	12	4	12	10	13	16	26	26	47	46	47	51	56	49	50
386	Community Infrastructure	-	-	2	5	10	12	21	22	12	9	10	10	12	3	12	9	13	15	25	24	46	46	47	50	55	48	50
389	Private - Dwelling	-	-	2	4	10	12	22	24	13	10	11	10	13	4	13	11	13	16	27	27	47	46	47	52	58	50	50
390	Private - Dwelling	-	-	2	4	10	12	22	23	13	10	11	11	13	4	13	11	13	16	27	26	47	46	47	52	57	50	50
391	Private - Commercial	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	11	13	16	26	26	47	46	47	51	57	50	50
392	Private - Dwelling	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	11	13	16	26	26	47	46	47	51	57	50	50
393	Private - Dwelling	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	11	13	16	26	25	47	46	47	51	57	50	50
394	Private - Dwelling	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	11	13	16	26	25	47	46	47	51	57	50	50
395	Private - Dwelling	-	-	2	4	10	12	23	24	13	10	11	11	13	4	13	11	13	16	27	27	47	46	48	52	58	51	50
396	Community Infrastructure	-	-	2	4	9	10	20	19	12	9	10	10	12	4	12	10	12	14	24	22	46	46	47	50	55	48	50
397	Private - Dwelling	-	-	2	4	9	11	22	22	13	10	11	11	13	4	13	10	13	15	26	24	47	46	47	51	57	50	50
398	Private - Dwelling	-	-	2	4	9	11	21	20	12	9	10	10	12	4	12	10	13	15	23	23	47	46	47	50	55	49	50
399	Private - Dwelling	-	-	2	4	9	11	22	22	13	10	11	11	13	4	13	10	13	15	26	24	47	46	47	51	57	50	50
400	Private - Dwelling	-	-	2	4	9	11	22	22	13	10	11	11	13	4	13	10	13	15	26	25	47	46	47	51	57	50	50
401	Private - Dwelling	-	-	2	4	9	11	22	22	13	10	11	11	13	4	13	10	13	15	26	25	47	46	47	51	57	50	50
402	Private - Dwelling	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	10	13	16	26	25	47	46	47	51	57	50	50
403	Private - Dwelling	-	-	2	4	9	12	22	23	13	10	11	11	13	4	13	10	13	16	26	25	47	46	47	51	57	50	50
404	Private - Dwelling	-	-	2	4	9	11	21	21	12	9	10	10	12	4	13	10	13	15	23	23	47	46	47	50	56	49	50
405	Private - Dwelling	-	-	2	4	9	12	22	22	13	10	11	11	13	4	13	10	13	16	26	25	47	46	47	51	57	50	50
406	Private - Dwelling	-	-	2	4	10	12	22	23	13	10	11	11	13	4	13	10	13	16	26	25	47	46	47	51	57	50	50
407	Private - Dwelling	-	-	2	4	10	11	21	21	12	9	10	10	12	4	12	9	13	15	23	23	46	47	50	55	48	50	50
408	Private - Dwelling	-	-	2	4	9	11	20	20	12	9	10	10	12	4	12	9	13	15	24	22	46	46	47	50	55	48	50
409	Private - Dwelling	-	-	2	4	10	11	21	21	12	9	10	10	12	3	12	9	13	15	24	23	46	46	47	50	55	48	50
410	Community Infrastructure	-	-	2	4	10	11	21	21	12	9	10	10	12	3	12	9	13	15	24	24	46	46	47	50	55	48	50
411	Private - Dwelling	-	-	2	4	10	11	21	21	12	9	10	10	12	3	12	9	13	15	25	24	46	46	47	50	55	48	50
412	Community Infrastructure	-	-	2	4	10	11	20	20	12	9	10	10	12	3	12	9	13	15	24	23	46	46	47	50	55	48	50
413	Private - Dwelling	-	-	2	4	10	11	20	20	12	9	10	9	12	3	12	9	13	15	24	22	46	46	47	50	54	48	50
414	Private - Dwelling	-	-	2	4	10	11	20	20	12	9	10	9	12	3	12	9	13	15	24	23	46	46	47	50	55	48	50
415	Private - Dwelling	-	-	2	4	10	11	20	20	12	9	10	9	12	3	12	9	13	15	24	23	46	46	47	50	55	48	50
417	Private - Dwelling	-	-	2	5	11	13	21	26	12	10	10	9	12	4	12	10	14	17	29	28	46	46	47	52	57	49	50
418	Private - Dwelling	-	-	2	5	11	12	21	23	12	9	10	9	11	3	12	9	14	16	26	25	46	46	47	51	56	48	50
419	Private - Dwelling	-	-	2	4	9	10	19	18	11	9	9	9	11	3	12	9	13	14	23	20	46	45	46	49	53	47	50
420	Private - Dwelling	-	-	2	4	9	11	21	20	12	9	10	10	12	4	12	9	13	15	25	23	46	46	47	50	55	48	50
421	Private - Dwelling	-	-	2	4	10	13	22	25	13	10	11	10	13	4	13	11	13	17	28	28	47	46	47	52	58	50	50
422	Private - Dwelling	-	-	2	4	10	13	22	25	13	10	11	10	13	4	13	11	13	17	28	28	47	46	47	52	57	50	50
423	Private - Dwelling	-	-	2	4	10	12	22	24	13	10	11	11	13	4	13	11	13	16	27	27	47	46	47	52	58	50	50
425	Private - Dwelling	-	-	2	4	9	8	15	14	10	7	7	6	9	3	10	8	12	12	19	15	45	45	46	46	48	44	50
426	Private - Dwelling	-	-	2	4	8	8	15	14	10	7	7	7	10	3	10	8	11	19	15	45	45	46	46	47	44	50	50
427	Private - Dwelling	-	-	2	5	9	11	21	20	12	9	10	10	12	4	12	9	13	15	22	18	45	46	47	51	57	49	50
428	Private - Dwelling	-	-	2	5	9	9	18	17	12	9	9	9	12	4	12	9	13	13	23	18	45	45	46	48	51	46	50
429	Private - Dwelling	-	-	2	5	10	10	21	19	13	10	11	11	13	4	14	10	14	15	26	21	47	46	47	50	55	49	50
430	Private - Dwelling	-	-	2	5	9	9	19	17	12	9	9	9	12	4	12	9	13	13	24	19	46	46	47	48	53	47	50
431	Private - Dwelling	-	-	2	6	10	9	21	20	14	10	11	11	14	4	14	10	14	15	26	21	47	47	48	50	56	49	50
432	Private - Dwelling	-	-	2	5	10	8	15	15	12	8	9	9	12	4	12	9	12	13	21	17	46	46	46	48	48	44	50

Modelled maximum 24-hour average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria				
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044
619	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	7	12	17	19	18	19	4	4	3	3	3	1	8	12	18	20	19	19	62	51	56	49	45	41	50
621	Private - Subject to Acquisition Rights	Rix Creek North (Noise & AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]; Ashton (AQ) [DA309-11-2001-1]	8	13	21	19	19	24	5	4	4	4	4	1	8	13	22	19	21	25	57	60	61	60	52	41	50
623	Community Infrastructure	-	-	8	14	21	20	21	23	4	4	3	3	3	1	9	14	22	21	22	23	67	55	61	56	50	41	50
624	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to all 9 contiguous lots 1/248748, 2/9/758214, 3/9/758214, 4/9/758214, 5/9/758214, 6/9/758214, 7/9/758214, 8/9/758214, 9/9/758214	8	14	21	20	21	23	4	4	3	3	3	1	9	14	21	21	22	23	65	55	61	55	50	41	50
626	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 1/8/758214 and 2/8/758214	8	13	20	21	21	22	4	4	3	3	3	1	8	14	20	22	21	22	68	56	62	55	50	41	50
627	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	8	13	19	21	20	20	4	4	3	3	3	1	8	13	19	22	20	21	68	55	61	54	49	41	50
628	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	8	12	18	20	19	20	4	4	3	3	3	1	8	13	19	21	20	20	68	54	61	53	48	41	50
629	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rix Creek North (AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 103/852484 and 104/852484	8	12	19	21	18	18	4	4	3	3	3	1	8	12	20	22	19	19	72	55	62	53	48	41	50
735	Private - Commercial	-	-	11	16	26	20	13	15	7	7	6	5	3	1	11	16	26	20	14	15	69	132	132	89	55	42	50
797	Community Infrastructure	-	-	12	18	28	23	14	15	7	7	6	5	3	1	12	18	29	24	15	16	76	138	138	93	60	43	50
799	Community Infrastructure	-	-	12	18	28	23	14	15	7	7	6	5	3	1	12	18	29	24	15	16	76	138	138	93	60	43	50
800	Private - Commercial	-	-	12	18	28	23	14	15	7	7	6	5	3	1	12	18	29	24	15	16	76	138	138	93	60	43	50
829	Private - Commercial	-	-	1	2	5	6	7	7	14	14	15	16	16	5	15	17	19	19	20	10	44	47	47	47	43	41	50
830	Private - Commercial	-	-	1	2	4	5	6	6	14	15	15	14	15	5	15	17	18	18	19	9	45	49	49	50	43	41	50
833	Private - Commercial	-	-	1	3	6	7	9	12	56	58	65	60	67	22	57	61	69	66	73	30	75	97	104	92	87	45	50
834	Private - Commercial	-	-	2	4	10	12	22	23	13	10	11	11	13	4	13	11	13	16	27	26	47	46	47	52	58	50	50
834	Private - Commercial	-	-	2	5	11	14	23	28	12	10	10	9	12	4	12	10	14	17	30	30	47	46	47	52	57	49	50
835	Private - Dwelling	-	-	2	5	11	13	21	25	12	9	10	9	12	4	12	10	14	17	28	28	46	46	47	52	56	48	50
836	Private - Dwelling	-	-	2	5	11	13	21	25	12	9	10	9	12	4	12	10	14	17	28	28	46	46	47	52	56	48	50
837	Private - Dwelling	-	-	2	5	11	13	21	26	12	9	10	9	12	4	12	10	14	17	29	28	46	46	47	52	56	48	50
838	Private - Dwelling	-	-	2	4	10	12	22	24	13	10	11	10	12	4	13	10	13	16	27	26	47	46	47	52	57	50	50
839	Private - Dwelling	-	-	2	4	10	11	21	22	12	9	10	10	12	4	12	10	13	15	25	24	46	46	47	51	56	49	50
840	Private - Dwelling	-	-	2	4	10	12	21	22	12	9	10	10	12	4	13	10	13	16	25	24	47	46	47	51	56	49	50
843	Private - Dwelling	-	-	3	6	10	10	10	12	9	9	8	8	7	2	9	9	11	11	13	12	41	42	42	42	41	41	50
846	Private - Dwelling	-	-	4	7	12	12	14	13	12	11	9	8	2	13	12	13	13	14	15	45	45	46	46	43	41	50	
847	Private - Dwelling	-	-	4	7	12	12	14	13	12	11	10	8	2	13	12	13	12	14	15	43	44	45	45	42	41	50	
852	Private - Dwelling	-	-	4	7	13	12	14	14	14	12	11	9	2	14	14	13	13	14	15	42	43	44	44	41	41	50	
855	Private - Dwelling	-	-	2	5	9	10	10	12	12	12	10	10	2	13	15	15	15	16	12	41	41	42	42	41	41	50	
856	Private - Dwelling	-	-	4	7	12	11	11	13	11	11	10	9	8	2	11	11	12	12	14	13	42	43	43	43	41	41	50
860	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise & AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rix Creek North (Noise) [PA08_0102]	7	12	18	17	19	21	4	3	3	3	3	1	7	12	19	18	20	21	57	62	64	60	47	41	50
861	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rix Creek North (Noise) [PA08_0102]	6	9	17	18	16	16	3	3	3	3	3	1	7	10	18	19	16	16	66	64	64	62	47	41	50
862	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]	8	11	21	22	18	18	4	3	3	3	3	1	8	12	21	22	18	18	87	66	71	60	49	41	50
863	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]	7	10	20	21	17	17	4	3	3	3	3	1	7	11	20	21	17	17	84	66	67	57	47	41	50
869	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rix Creek North (Noise) [PA08_0102]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rix Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	7	14	24	23	21	26	8	7	6	6	7	2	8	15	25	24	22	27	50	53	57	55	51	41	50
870	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rix Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	7	13	23	22	21	26	8	7	7	6	6	2	8	14	24	23	21	26	50	53	56	54	50	41	50
947	Private - Subject to Acquisition Rights	Rav Ops (AQ) [DA 09_0176]; HVOS (Noise) [06_0261]	Rav Ops (AQ) [DA 09_0176]	4	8	17	19	24	30	17	17	11	10	8	2	17	17	18	20	24	30	44	46	47	47	46	42	50
949	Private - Dwelling	-	-	4	8	17	19	24	30	17	17	11	10	8	2	17	17	18	20	24	30	44	46	47	47	46	42	50
950	Private - Dwelling	-	-	4	8	17	19	24	30	17	17	11	10	8	2	17	17	18	20	24	30	44	46	47	47	46	42	50

Ashton = Ashton Coal Project, HVOS = Hunter Valley Operations (South), HVO N = Hunter Valley Operations (North), MOCO = Mt Owen Continued Operations, IUG = Integra Underground, UWJV = United Wambo JV. Rav Ops = Ravensworth Surface Operations

Modelled annual average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria				
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044
DL19	Monitor	-	-	0.2	0.6	1.3	1.5	2.2	2.2	2.8	1.9	2.1	2.3	2.9	0.9	3.0	2.5	3.4	3.8	5.1	3.1	1.8	1.9	2.0	2.1	2.0	17	25
DL14	Monitor	-	-	0.5	1.1	2.3	3.0	4.2	5.1	1.9	1.9	1.3	1.1	0.9	0.2	2.3	3.0	3.6	4.2	5.1	5.3	2.0	2.1	2.2	2.1	2.0	20	25
Warkworth	Monitor	-	-	0.1	0.2	0.5	0.6	0.9	1.0	1.3	1.3	2.3	3.2	4.4	4.0	1.3	3.6	2.5	3.7	5.1	4.8	3.2	2.5	2.6	2.7	2.5	46	25
DL18	Monitor	-	-	0.2	0.4	0.8	1.0	1.4	1.4	2.8	1.5	1.8	2.4	3.2	1.0	3.0	1.9	2.2	3.4	4.7	2.5	3.0	2.3	2.2	2.6	2.2	17	25
Knodlers Lane	Monitor	-	-	0.3	0.8	1.7	2.2	3.1	3.7	2.9	3.0	2.0	1.6	1.3	0.3	3.2	3.8	3.7	3.8	4.4	4.0	2.0	2.2	2.2	2.2	2.0	18	25
DL22	Monitor	-	-	0.3	0.6	1.2	1.6	2.4	2.7	5.7	6.1	4.8	3.9	2.9	0.7	5.9	6.7	6.1	5.5	5.3	3.4	2.4	2.6	2.5	2.1	18	25	
DL21	Monitor	-	-	0.4	0.8	1.8	2.5	3.6	4.3	3.2	3.3	2.0	1.6	1.3	0.3	3.5	4.2	3.8	4.1	4.9	4.7	2.1	2.2	2.2	2.1	19	25	
DL22	Monitor	-	-	0.2	0.5	1.0	1.2	1.5	1.7	1.9	1.9	1.6	1.4	1.2	0.3	2.1	2.4	2.6	2.6	2.7	2.0	1.8	1.9	2.0	1.9	1.8	16	25
DL30	Monitor	-	-	0.2	0.4	0.9	1.2	1.9	2.2	10.0	10.3	11.9	11.2	9.0	2.3	10.2	10.7	12.8	12.5	10.9	4.5	2.9	3.4	3.6	3.5	2.8	19	25
DL2	Monitor	-	-	0.8	2.0	4.5	6.3	8.9	12.1	4.1	4.4	2.7	2.2	1.5	0.4	4.9	6.3	7.2	8.5	10.3	12.5	2.3	2.6	2.7	2.7	2.7	27	25
Warkworth	Monitor	-	-	0.1	0.2	0.5	0.6	0.9	1.0	3.5	3.2	4.4	4.0	1.3	3.6	2.5	3.7	5.1	4.8	2.5	3.5	2.5	2.4	2.3	2.3	2.3	16	25
Cheshunt East	Monitor	-	-	1.2	2.7	5.8	7.3	8.5	12.0	2.7	2.8	1.9	1.6	1.1	0.3	3.9	5.5	7.8	8.9	9.6	12.3	2.5	2.8	3.0	3.1	3.0	27	25
Long Point	Monitor	-	-	0.2	0.4	0.9	1.1	1.5	1.6	2.4	2.4	2.1	1.9	1.6	0.4	2.6	2.8	3.0	3.0	3.1	2.0	1.9	2.0	2.0	2.0	1.8	16	25
Kilburnie South	Monitor	-	-	0.2	0.4	0.8	1.0	1.4	1.4	2.8	1.5	1.9	2.4	3.3	1.0	3.0	1.9	2.8	3.4	4.7	2.5	2.0	2.3	2.2	2.6	2.2	17	25
Wandewai	Monitor	-	-	0.5	1.3	3.1	4.2	7.0	6.8	10.2	5.3	6.3	8.0	12.3	4.0	10.7	6.7	9.4	12.2	19.3	10.8	2.7	2.5	2.8	3.1	3.5	25	25
Howick	Monitor	-	-	12.6	16.2	17.9	10.4	5.0	5.1	1.1	1.1	0.9	0.7	0.6	0.2	13.6	17.3	18.8	11.1	5.6	5.3	4.4	5.1	5.3	4.5	3.8	20	25
Golden Highway	Monitor	-	-	0.1	0.2	0.5	0.6	0.7	0.8	2.1	1.6	1.9	2.3	2.1	0.7	2.2	1.8	2.4	2.8	2.9	1.5	4.1	5.8	5.8	5.8	18	25	
HCl Conveyor	Monitor	-	-	17.7	79.3	74.8	108.2	20.5	27.8	3.5	2.7	2.4	1.6	0.5	21.2	82.8	77.5	110.5	22.1	28.3	4.5	15.1	14.6	17.9	8.9	4.3	25	25
Maison Dieu	Monitor	-	-	0.5	1.0	2.2	3.0	4.1	5.0	1.9	1.3	1.1	0.9	0.2	2.3	3.0	3.6	4.1	5.0	5.3	2.0	1.9	2.0	2.1	2.1	19	25	
Warkworth	Monitor	-	-	0.1	0.2	0.4	0.6	0.8	0.9	2.5	1.7	2.3	3.0	2.8	0.9	2.6	1.9	2.7	3.6	3.5	1.7	2.6	2.7	2.6	2.5	2.0	16	25
Knodlers Lane	Monitor	-	-	0.3	0.7	1.4	1.9	2.7	3.2	5.4	5.8	4.1	3.2	2.4	0.6	5.7	6.4	5.5	5.0	5.1	3.7	2.3	2.5	2.4	2.1	18	25	
Jerrys Plains	Monitor	-	-	0.3	0.6	1.4	1.8	2.2	2.1	1.7	1.3	1.3	1.4	1.7	0.5	2.0	1.9	2.7	2.9	2.6	1.7	1.7	1.8	1.8	1.9	1.7	17	25
Cheshunt East	Monitor	-	-	1.2	2.7	5.8	7.3	8.5	12.0	2.7	2.8	1.9	1.6	1.1	0.3	3.9	5.5	7.8	8.9	9.6	12.3	2.5	2.8	3.0	3.1	3.0	27	25
HVGC	Monitor	-	-	0.2	0.4	0.9	1.2	1.8	2.0	12.6	9.7	14.4	13.9	13.7	3.9	12.7	10.1	15.3	15.1	15.4	6.0	3.2	3.6	4.0	3.8	3.1	20	25
Long Point	Monitor	-	-	0.2	0.4	0.9	1.1	1.5	1.6	2.4	2.4	2.1	1.9	1.6	0.4	2.6	2.8	3.0	3.0	3.1	2.0	1.9	2.0	2.0	1.8	16	25	
Kilburnie South	Monitor	-	-	0.2	0.4	0.9	1.0	1.4	1.4	2.8	1.6	1.9	2.4	3.3	1.0	3.0	2.8	3.4	4.7	2.5	2.0	2.3	2.2	2.6	2.2	17	25	
Kilburnie South	Monitor	-	-	0.2	0.4	0.8	1.0	1.4	1.4	2.8	1.5	1.9	2.4	3.2	1.0	3.0	1.9	2.8	3.4	4.7	2.5	2.0	2.3	2.2	2.6	2.2	17	25
Maison Dieu	Monitor	-	-	0.5	1.0	2.2	3.0	4.1	5.0	1.9	1.3	1.1	0.9	0.2	2.3	3.0	3.6	4.1	5.0	5.3	2.0	1.9	2.0	2.1	2.1	19	25	
Maison Dieu	Monitor	-	-	0.5	1.0	2.2	3.0	4.1	5.0	1.9	1.3	1.1	0.9	0.2	2.3	3.0	3.6	4.1	5.0	5.3	2.0	1.9	2.0	2.1	2.1	19	25	
Knodlers Lane	Monitor	-	-	0.3	0.8	1.7	2.2	3.1	3.7	2.9	3.0	2.0	1.6	1.3	0.3	3.2	3.8	3.7	3.8	4.4	4.0	2.0	2.2	2.2	2.0	18	25	
17	Private - Dwelling	-	-	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.3	0.2	1.5	1.6	1.6	1.5	1.4	25	25
19	Private - Dwelling	-	-	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.3	0.3	0.3	0.2	1.5	1.6	1.6	1.5	1.4	25	25
37	Private - Dwelling	-	-	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.2	1.6	1.6	1.6	1.5	1.4	25	25
102	Private - Subject to Acquisition Rights	Warkworth (Noise & AQ) (SSD6464)	Warkworth (Noise & AQ) (SSD6464)	0.1	0.2	0.5	0.6	0.8	0.9	2.7	1.8	2.4	3.2	3.0	1.0	2.8	2.0	2.9	3.8	3.8	1.8	2.6	3.8	3.7	3.5	2.1	16	25
120	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.3	0.8	1.7	2.2	3.1	3.7	2.9	3.0	2.0	1.6	1.3	0.3	3.3	3.8	3.7	3.8	4.4	4.0	2.0	2.2	2.2	2.0	18	25	
121	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.3	0.7	1.5	2.0	2.9	3.4	3.6	3.7	2.6	2.0	1.6	0.4	3.9	4.4	4.1	4.1	4.5	3.8	2.1	2.3	2.3	2.2	2.0	18	25
122	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.4	0.8	1.7	2.3	3.2	3.8	2.6	2.7	1.8	1.5	1.2	0.3	3.0	3.5	3.7	4.4	4.1	2.0	2.2	2.2	2.2	2.0	18	25	
123	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.3	0.8	1.6	2.1	3.0	3.5	3.1	3.2	2.2	1.8	1.4	0.4	3.5	4.0	3.8	3.9	4.4	3.8	2.1	2.2	2.2	2.0	18	25	
124	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.4	0.8	1.8	2.3	3.2	3.8	2.5	2.6	1.8	1.4	1.2	0.3	2.9	3.4	3.5	3.7	4.3	4.1	2.0	2.2	2.2	2.2	2.0	18	25
126	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.3	0.6	0.8	1.0	1.1	2.3	2.0	2.2	2.2	2.0	0.6	2.4	2.3	2.8	2.9	3.0	1.7	2.0	2.2	2.2	1.8	16	25	
127	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.3	0.7	1.4	1.7	2.2	2.5	2.4	2.4	1.9	1.6	1.3	0.3	2.7	3.1	3.2	3.3	3.5	2.8	2.0	2.1	2.1	2.1	1.9	17	25
128	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.2	0.4	0.8	0.9	1.3	1.4	2.6	2.5	2.4	2.3	2.1	0.5	2.7	2.9	3.2	3.2	3.3	1.9	2.0	2.1	2.1	2.1	1.8	16	25
130	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.2	0.4	0.9	1.1	1.4	1.6	2.5	2.5	2.3	2.1	1.8	0.5	2.7	2.9	3.2	3.1	3.2	1.9	2.1	2.1	2.1	2.1	1.8	16	25
134	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.2	0.4	0.9	1.1	1.4	1.6	2.4	2.4	2.2	2.0	1.7	0.4	2.6	2.9	3.1	3.0	3.1	2.0	1.9	2.0	2.0	2.0	1.8	16	25
139	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.2	0.4	0.8	1.0	1.3	1.5	2.3	2.3	2.1	1.9	1.7	0.4	2.5	2.7	2.9	2.9	3.0	1.9	1.9	2.0	2.0	2.0	1.8	16	25
141	Private - Dwelling	-	-	0.3	0.7	1.3	1.6	2.0	2.3	1.6	1.6	1.3	1.1	0.9	0.2	1.9												

Modelled annual average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria			
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040
368	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.3	2.2	2.6	1.8	2.0	2.1	2.7	0.8	2.9	2.4	3.3	3.7	5.0	3.1	1.8	1.9	2.0	2.0	17	25
369	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.3	2.2	2.7	1.9	2.0	2.2	2.8	0.8	2.9	2.5	3.3	3.7	5.1	3.1	1.8	1.9	2.0	2.0	17	25
370	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.8	1.9	2.1	2.6	0.4	2.8	2.4	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.0	17	25
371	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.4	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.0	17	25
372	Private - Dwelling	-	-	0.3	0.6	1.3	1.4	2.1	2.0	2.4	1.7	1.8	2.0	2.5	0.8	2.7	2.3	3.1	3.4	4.6	2.8	1.8	1.9	2.0	2.0	17	25
373	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.4	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.0	17	25
374	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.1	2.1	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.4	3.2	3.5	4.8	2.9	1.8	1.9	2.0	2.0	17	25
375	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.1	2.1	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.4	3.2	3.5	4.8	2.9	1.8	1.9	2.0	2.0	17	25
376	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.2	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.5	3.3	3.7	5.1	3.0	1.8	1.9	2.0	2.0	17	25
377	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.3	2.2	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.3	3.7	5.0	3.0	1.8	1.9	2.0	2.0	17	25
380	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.3	3.2	3.5	4.7	2.8	1.8	1.9	2.0	2.0	17	25
381	Private - Dwelling	-	-	0.2	0.6	1.3	1.4	2.1	2.0	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.4	3.2	3.5	4.7	2.8	1.8	1.9	2.0	2.0	17	25
382	Community Infrastructure	-	-	0.2	0.6	1.3	1.4	2.1	2.0	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.4	3.2	3.5	4.7	2.8	1.8	1.9	2.0	2.0	17	25
383	Private - Dwelling	-	-	0.2	0.6	1.3	1.4	2.1	2.1	2.6	1.8	1.9	2.1	2.7	0.8	2.8	2.4	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.0	17	25
384	Private - Dwelling	-	-	0.3	0.6	1.3	1.4	2.1	2.0	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.3	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.0	17	25
385	Private - Dwelling	-	-	0.2	0.6	1.3	1.4	2.1	2.0	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.3	3.2	3.5	4.7	2.8	1.8	1.9	2.0	2.0	17	25
386	Community Infrastructure	-	-	0.2	0.6	1.2	1.4	2.0	1.9	2.4	1.7	1.8	2.0	2.5	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.0	17	25
389	Private - Dwelling	-	-	0.2	0.6	1.3	1.4	2.1	2.1	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.4	3.3	3.7	5.0	2.9	1.8	1.9	2.0	2.1	17	25
390	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.1	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.4	3.3	3.6	4.9	2.9	1.8	1.9	2.0	2.1	17	25
391	Private - Commercial	-	-	0.2	0.6	1.2	1.4	2.1	2.1	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.4	3.3	3.6	4.9	2.9	1.8	1.9	2.0	2.1	17	25
392	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.4	3.3	3.6	4.9	2.9	1.8	1.9	2.0	2.1	17	25
393	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.7	1.9	2.0	2.2	2.9	0.9	2.9	2.4	3.3	3.7	5.0	2.9	1.8	1.9	2.0	2.1	17	25
394	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.7	1.9	2.0	2.2	2.8	0.9	2.9	2.4	3.3	3.6	4.9	2.9	1.8	1.9	2.0	2.1	17	25
395	Private - Dwelling	-	-	0.2	0.6	1.3	1.5	2.2	2.1	2.8	1.9	2.1	2.3	2.9	0.9	3.0	2.5	3.3	3.7	5.1	3.0	1.8	1.9	2.0	2.1	17	25
396	Community Infrastructure	-	-	0.2	0.5	1.1	1.3	1.9	1.8	2.5	1.7	1.9	2.0	2.6	0.8	2.7	2.2	3.0	3.3	4.5	2.6	1.8	1.9	2.0	2.0	17	25
397	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.5	4.8	2.8	1.8	1.9	2.0	2.1	17	25
398	Private - Dwelling	-	-	0.2	0.5	1.2	1.3	1.9	1.9	2.5	1.7	1.9	2.1	2.6	0.8	2.7	2.3	3.1	3.4	4.6	2.7	1.8	1.9	2.0	2.1	17	25
399	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
400	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
401	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
402	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
403	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
404	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	1.9	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.3	3.1	3.4	4.6	2.7	1.8	1.9	2.0	2.1	17	25
405	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
406	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.1	2.0	2.6	1.8	2.0	2.2	2.8	0.8	2.9	2.4	3.2	3.6	4.8	2.8	1.8	1.9	2.0	2.1	17	25
407	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	1.9	1.9	2.5	1.7	1.9	2.0	2.6	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.1	17	25
408	Private - Dwelling	-	-	0.2	0.5	1.2	1.3	1.9	1.9	2.4	1.7	1.9	2.0	2.6	0.8	2.7	2.3	3.0	3.4	4.5	2.6	1.8	1.9	2.0	2.1	17	25
409	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	1.9	1.9	2.4	1.7	1.8	2.0	2.6	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.1	17	25
410	Community Infrastructure	-	-	0.2	0.6	1.2	1.4	2.0	1.9	2.4	1.7	1.8	2.0	2.5	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.1	17	25
411	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	1.9	2.4	1.7	1.8	2.0	2.6	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.1	17	25
412	Community Infrastructure	-	-	0.2	0.6	1.2	1.3	1.9	1.8	2.4	1.7	1.8	2.0	2.5	0.8	2.6	2.2	3.0	3.3	4.4	2.6	1.8	1.9	2.0	2.1	17	25
413	Private - Dwelling	-	-	0.2	0.6	1.2	1.3	1.9	1.8	2.4	1.6	1.8	2.0	2.5	0.8	2.6	2.2	3.0	3.3	4.4	2.6	1.8	1.9	2.0	2.1	17	25
414	Private - Dwelling	-	-	0.2	0.6	1.2	1.3	1.9	1.8	2.4	1.7	1.8	2.0	2.5	0.8	2.6	2.2	3.0	3.3	4.4	2.6	1.8	1.9	2.0	2.1	17	25
415	Private - Dwelling	-	-	0.2	0.6	1.2	1.3	1.9	1.8	2.4	1.7	1.8	2.0	2.5	0.8	2.6	2.2	3.0	3.3	4.4	2.6	1.8	1.9	2.0	2.1	17	25
417	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.4	3.2	3.6	4.8	2.9	1.8	1.9	2.0	2.1	17	25
418	Private - Dwelling	-	-	0.3	0.6	1.3	1.4	2.0	2.0	2.4	1.7	1.8	2.0	2.5	0.8	2.7	2.3	3.1	3.4	4.5	2.7	1.8	1.9	2.0	2.1	17	25
419	Private - Dwelling	-	-	0.2	0.5	1.1	1.3	1.8	1.7	2.2	1.6	1.7	1.9	2.4	0.7	2.5	2.1	2.9	3.1	4.1	2.4	1.8	1.9	2.0	19	16	25
420	Private - Dwelling	-	-	0.2	0.5	1.1	1.2	1.6	1.5	2.1																	

Modelled annual average PM10 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)						Project (HVO S)						Project (HVO Complex)						Cumulative						Criteria
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	
619	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	1.1	1.8	2.8	2.3	1.4	1.4	0.3	0.3	0.3	0.3	0.2	0.1	1.4	2.1	3.1	2.6	1.6	1.4	29	32	33	31	23	16	25
621	Private - Subject to Acquisition Rights	Rix Creek North (Noise & AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]; Ashton (AQ) [DA309-11-2001-1]	1.2	2.1	3.4	3.0	2.0	2.0	0.4	0.4	0.3	0.3	0.3	0.1	1.6	2.5	3.7	3.3	2.3	2.1	31	35	36	35	28	17	25
623	Community Infrastructure	-	-	1.4	2.3	3.6	3.0	1.9	1.8	0.4	0.4	0.3	0.3	0.3	0.1	1.8	2.7	4.0	3.4	2.1	1.9	29	31	32	31	25	17	25
624	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to all 9 contiguous lots 1/248748, 2/9/758214, 3/9/758214, 4/9/758214, 5/9/758214, 6/9/758214, 7/9/758214, 8/9/758214, 9/9/758214	1.3	2.2	3.5	2.9	1.8	1.7	0.4	0.4	0.3	0.3	0.2	0.1	1.7	2.6	3.8	3.2	2.0	1.8	29	32	33	31	25	17	25
626	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 1/8/758214 and 2/8/758214	1.3	2.1	3.4	2.8	1.7	1.6	0.4	0.4	0.3	0.3	0.2	0.1	1.7	2.5	3.7	3.1	1.9	1.7	30	33	34	32	25	17	25
627	Private - Subject to Acquisition Rights	80/952; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	1.2	2.0	3.2	2.6	1.6	1.5	0.4	0.4	0.3	0.3	0.2	0.1	1.6	2.4	3.5	2.9	1.8	1.6	30	32	34	32	24	17	25
628	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]	1.2	2.0	3.1	2.5	1.5	1.5	0.4	0.3	0.3	0.3	0.2	0.1	1.6	2.3	3.4	2.8	1.8	1.5	30	32	33	31	24	16	25
629	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rix Creek North (AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rix Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 103/852484 and 104/852484	1.2	1.9	2.9	2.4	1.5	1.4	0.4	0.3	0.3	0.3	0.2	0.1	1.5	2.2	3.2	2.6	1.7	1.5	30	32	33	31	24	16	25
735	Private - Commercial	-	-	1.2	1.9	2.8	2.2	1.4	1.4	0.4	0.4	0.4	0.3	0.2	0.1	1.7	2.3	3.1	2.5	1.7	1.5	38	47	48	35	26	18	25
797	Community Infrastructure	-	-	1.4	2.1	3.2	2.4	1.6	1.6	0.5	0.5	0.4	0.3	0.3	0.1	1.9	2.6	3.5	2.8	1.8	1.6	40	46	47	36	27	18	25
799	Community Infrastructure	-	-	1.4	2.1	3.2	2.4	1.6	1.6	0.5	0.5	0.4	0.3	0.3	0.1	1.9	2.6	3.5	2.8	1.8	1.6	40	46	47	36	27	18	25
800	Private - Commercial	-	-	1.4	2.1	3.2	2.4	1.6	1.6	0.5	0.5	0.4	0.3	0.3	0.1	1.9	2.6	3.5	2.8	1.8	1.6	40	46	47	36	27	18	25
829	Private - Commercial	-	-	0.1	0.3	0.7	0.8	1.1	1.2	2.8	2.4	2.7	2.7	2.5	0.7	2.9	2.8	3.4	3.5	3.6	1.9	22	25	25	25	19	16	25
830	Private - Commercial	-	-	0.1	0.3	0.6	0.7	0.9	1.0	2.5	2.1	2.4	2.6	2.4	0.7	2.7	2.3	3.0	3.3	3.3	1.8	24	28	29	29	18	16	25
833	Private - Commercial	-	-	0.2	0.4	0.8	1.1	1.7	2.0	13.0	9.6	14.9	14.5	14.5	4.3	13.2	10.0	15.8	15.6	16.2	6.3	32	37	41	39	32	20	25
834	Private - Commercial	-	-	0.2	0.6	1.2	1.4	2.1	2.1	2.7	1.9	2.0	2.2	2.9	0.9	2.9	2.4	3.3	3.7	5.0	2.9	18	19	20	21	20	17	25
835	Private - Dwelling	-	-	0.3	0.6	1.4	1.6	2.3	2.2	2.6	1.8	2.0	2.1	2.7	0.8	2.9	2.4	3.3	3.7	5.0	3.1	18	19	20	20	20	17	25
836	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.7	1.9	2.0	2.6	0.8	2.7	2.3	3.2	3.5	4.8	2.9	18	19	20	20	20	17	25
837	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	2.2	2.1	2.5	1.8	1.9	2.1	2.6	0.8	2.8	2.4	3.2	3.6	4.8	2.9	18	19	20	20	20	17	25
838	Private - Dwelling	-	-	0.2	0.6	1.3	1.4	2.1	2.1	2.6	1.8	2.0	2.1	2.7	0.8	2.9	2.4	3.2	3.6	4.9	2.9	18	19	20	20	20	17	25
839	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	1.9	2.5	1.7	1.9	2.1	2.6	0.8	2.7	2.3	3.1	3.4	4.6	2.7	18	19	20	20	20	17	25
840	Private - Dwelling	-	-	0.2	0.6	1.2	1.4	2.0	2.0	2.5	1.8	1.9	2.1	2.7	0.8	2.8	2.3	3.1	3.5	4.7	2.8	18	19	20	20	20	17	25
843	Private - Dwelling	-	-	0.3	0.6	1.1	1.3	1.6	1.7	1.1	1.1	0.9	0.8	0.7	0.2	1.4	1.6	2.0	2.1	2.2	1.9	18	18	19	19	18	16	25
846	Private - Dwelling	-	-	0.4	0.7	1.4	1.6	1.8	2.0	0.9	0.9	0.7	0.6	0.6	0.1	1.3	1.6	2.2	2.3	2.4	2.2	19	20	20	21	19	16	25
847	Private - Dwelling	-	-	0.3	0.7	1.4	1.6	1.8	2.1	1.0	0.9	0.8	0.7	0.6	0.2	1.3	1.7	2.2	2.3	2.4	2.2	19	19	20	20	19	16	25
852	Private - Dwelling	-	-	0.3	0.7	1.4	1.7	2.0	2.2	1.1	1.1	0.9	0.8	0.7	0.2	1.5	1.8	2.3	2.4	2.6	2.4	18	19	20	20	19	17	25
855	Private - Dwelling	-	-	0.2	0.5	0.9	1.2	1.5	1.7	1.8	1.9	1.6	1.4	1.2	0.3	2.1	2.3	2.5	2.6	2.7	2.0	18	19	19	19	18	16	25
856	Private - Dwelling	-	-	0.3	0.6	1.3	1.5	1.8	2.0	1.1	1.1	0.9	0.8	0.7	0.2	1.5	1.8	2.2	2.3	2.4	2.1	18	19	19	20	18	16	25
860	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise & AQ) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rix Creek North (Noise) [PA08_0102]	1.1	1.8	2.9	2.5	1.5	1.5	0.4	0.3	0.3	0.3	0.2	0.1	1.5	2.2	3.2	2.7	1.8	1.6	29	36	37	36	25	16	25
861	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rix Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rix Creek North (Noise) [PA08_0102]	0.9	1.4	2.2	1.8	1.1	1.1	0.3	0.3	0.2	0.2	0.2	0.1	1.2	1.7	2.5	2.0	1.3	1.1	30	38	39	37	22	16	25
862	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]	1.1	1.8	2.7	2.2	1.3	1.3	0.3	0.3	0.3	0.2	0.2	0.1	1.4	2.1	2.9	2.4	1.5	1.3	35	36	37	35	24	17	25
863	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rix Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rix Creek South (AQ) [SSD 6300]	Rix Creek North (Noise) [PA08_0102]	1.0	1.6	2.5	2.0	1.2	1.2	0.3	0.3	0.2	0.2	0.2	0.1	1.3	1.9	2.7	2.2	1.4	1.2	34	37	38	35	24	17	25
869	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rix Creek North (Noise) [PA08_0102]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rix Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.9	1.8	3.5	4.0	4.1	4.9	0.9	0.9	0.7	0.7	0.5	0.2	1.8	2.7	4.3	4.7	4.6	5.0	22	23	25	25	23	19	25
870	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rix Creek North (Noise) [PA08_0102]; Rix Creek South (AQ) [SSD 6300]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rix Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.9	1.8	3.5	3.9	3.9	4.7	0.9	0.9	0.7	0.6	0.5	0.1	1.8	2.6	4.2	4.5	4.4	4.9	22	23	25	25	23	19	25
947	Private - Subject to Acquisition Rights	Rav Ops (AQ) [DA 09_0176]; HVOs (Noise) [06_0261]	Rav Ops (AQ) [DA 09_0176]	0.5	1.2	2.5	3.2	4.3	5.2	1.5	1.5	1.1	1.0	0.8	0.2	2.0	2.7	3.6	4.2	5.1	5.4	19	21	22	22	21	20	25
949	Private - Dwelling	-	-	0.5	1.2	2.5	3.2	4.3	5.2	1.5	1.5	1.1	1.0	0.8	0.2	2.0	2.7	3.6	4.2	5.1	5.4	19	21	22	22	21	20	25
950	Private - Dwelling	-	-	0.5	1.2	2.5	3.2	4.3	5.2	1.5	1.5	1.1	1.0	0.8	0.2	2.0	2.7	3.6	4.2	5.1	5.4	19	21	22	22	21	20	25

Ashton = Ashton Coal Project, HVO S = Hunter Valley Operations (South), HVO N = Hunter Valley Operations (North), MOCO = Mt Owen Continued Operations, IUG = Integra Underground, UWJV = United Wambo JV, Rav Ops = Ravensworth Surface Operations

Modelled maximum 24-hour average PM2.5 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria					
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044	
D119	Monitor	-	-	1.4	1.4	3.0	3.2	6.5	7.1	1.4	3.0	2.9	2.4	3.5	1.2	4.2	3.0	4.2	4.3	8.0	8.0	16	16	16	17	18	17	25	
DL14	Monitor	-	-	1.9	1.9	3.6	4.2	4.9	5.8	1.9	5.5	3.1	2.6	2.5	0.8	5.8	5.5	4.7	5.2	6.0	5.9	16	16	16	16	15	15	25	
Warkworth	Monitor	-	-	0.5	0.5	1.0	1.3	1.5	2.0	0.4	4.1	4.6	6.6	6.6	2.3	5.4	4.6	5.7	7.6	6.3	3.1	17	35	22	20	19	15	25	
D118	Monitor	-	-	1.6	1.6	3.1	3.7	4.5	4.3	1.6	3.7	4.5	3.8	3.5	2.0	6.0	3.8	4.5	4.7	7.6	5.5	16	16	16	16	15	15	25	
Knollers Lane	Monitor	-	-	1.5	1.5	2.9	3.5	4.0	4.6	1.5	5.5	5.2	4.3	3.6	0.9	6.5	5.5	5.2	4.9	5.4	4.9	15	16	16	16	15	15	25	
DL22	Monitor	-	-	1.2	1.2	2.4	3.1	4.1	4.8	1.2	7.9	6.9	5.7	4.3	1.1	8.3	8.3	7.8	7.2	6.7	5.5	16	16	16	16	15	15	25	
DL21	Monitor	-	-	1.6	1.6	3.2	3.9	4.7	5.4	1.6	6.5	5.3	4.0	3.3	0.8	8.2	6.5	5.3	5.2	5.9	5.7	16	16	16	16	15	15	25	
D122	Monitor	-	-	1.0	1.0	2.0	2.2	2.4	1.0	2.7	2.5	2.2	2.2	0.6	3.1	3.2	3.5	3.4	3.5	2.5	1.5	15	15	15	15	15	15	25	
DL30	Monitor	-	-	0.8	0.8	1.5	2.0	2.9	3.5	0.8	12.8	13.7	14.2	11.3	3.3	12.4	13.6	15.0	15.6	13.4	6.1	20	24	25	23	18	15	25	
DL2	Monitor	-	-	2.9	2.9	5.4	7.0	9.5	12.0	2.8	10.4	8.6	4.8	3.7	1.0	9.9	10.8	8.1	7.4	10.3	12.4	17	18	19	19	19	16	25	
Warkworth	Monitor	-	-	0.5	0.5	1.0	1.3	1.6	2.0	0.5	4.1	4.6	6.6	6.6	2.3	5.4	4.6	5.7	7.6	6.3	3.1	17	35	22	20	19	15	25	
Cheshunt East	Monitor	-	-	3.6	3.6	6.8	7.7	9.1	11.0	3.6	6.3	4.4	3.5	2.8	0.8	6.5	7.5	7.1	8.3	9.6	11.1	19	20	22	22	22	16	25	
Long Point	Monitor	-	-	0.9	0.9	1.8	2.0	2.2	2.5	0.9	3.1	3.1	2.9	2.8	0.8	3.5	3.5	4.0	4.0	4.2	2.7	15	15	15	15	15	15	25	
Kilburnie South	Monitor	-	-	1.6	1.6	3.1	3.7	4.6	4.3	1.6	3.7	4.1	3.8	5.5	2.0	6.0	3.9	4.5	4.4	7.7	5.5	17	17	17	17	19	18	25	
Wandewai	Monitor	-	-	4.0	4.0	8.5	10.3	15.1	24.5	4.0	6.7	7.5	6.1	12.2	5.0	13.0	7.0	10.1	11.0	20.2	26.7	18	17	19	20	26	32	25	
Howick	Monitor	-	-	25.7	25.7	32.3	38.5	45.3	55.7	25.7	2.3	2.1	2.2	2.2	0.7	19.3	20.0	34.0	21.6	14.0	13.0	32	38	43	32	28	20	25	
Golden Highway	Monitor	-	-	0.5	0.5	1.0	1.2	1.6	1.8	0.5	2.7	3.5	3.6	3.8	1.4	3.6	3.1	4.2	4.8	5.4	3.1	22	32	32	32	32	32	25	
HCl Conveyor	Monitor	-	-	40.2	40.2	68.2	102.5	30.7	33.8	40.2	5.2	4.6	4.2	3.8	1.0	15.0	41.4	68.6	103.6	32.1	34.3	25	55	88	126	50	40	25	
Maison Dieu	Monitor	-	-	1.9	1.9	3.6	4.2	4.8	5.7	1.9	5.6	3.1	2.6	2.6	0.8	6.0	5.6	4.6	5.1	5.9	5.8	16	16	16	16	15	15	25	
Warkworth	Monitor	-	-	0.5	0.5	0.9	1.1	1.4	1.7	0.5	3.1	3.5	4.4	3.9	1.9	4.3	3.6	4.3	5.3	5.4	3.0	18	20	19	19	17	15	25	
Knollers Lane	Monitor	-	-	1.4	1.4	2.7	3.4	4.1	5.2	1.4	7.5	5.3	5.1	4.3	1.1	8.0	7.9	6.4	6.1	6.3	5.7	16	16	16	16	15	15	25	
Jerrys Plains	Monitor	-	-	1.6	1.6	3.1	3.4	4.4	5.7	1.6	1.7	1.6	1.3	1.8	0.6	2.5	2.2	3.7	4.1	5.5	6.1	16	16	16	16	16	16	15	25
Cheshunt East	Monitor	-	-	3.6	3.6	6.8	7.7	9.1	11.0	3.6	6.3	4.4	3.5	2.8	0.8	6.5	7.5	7.1	8.3	9.6	11.1	19	20	22	22	22	16	25	
HVGC	Monitor	-	-	0.8	0.8	1.5	1.9	2.6	3.2	0.8	14.3	16.4	15.6	15.1	5.6	15.5	15.1	17.9	17.5	17.1	8.0	22	27	30	27	22	15	25	
Long Point	Monitor	-	-	0.9	0.9	1.8	2.0	2.2	2.5	0.9	3.1	3.1	2.9	2.8	0.8	3.5	3.5	4.0	4.0	4.2	2.7	15	15	15	15	15	15	25	
Kilburnie South	Monitor	-	-	1.6	1.6	3.1	3.7	4.6	4.3	1.6	3.7	4.1	3.8	5.5	2.0	6.0	3.9	4.5	4.4	7.6	5.5	17	17	17	17	19	18	25	
Kilburnie South	Monitor	-	-	1.6	1.6	3.1	3.7	4.6	4.3	1.6	3.7	4.1	3.8	5.5	2.0	6.0	3.9	4.5	4.4	7.6	5.5	17	17	17	17	19	18	25	
Maison Dieu	Monitor	-	-	1.9	1.9	3.6	4.2	4.8	5.7	1.9	5.6	3.1	2.6	2.6	0.8	6.0	5.6	4.6	5.1	5.9	5.8	16	16	16	16	15	15	25	
Maison Dieu	Monitor	-	-	1.9	1.9	3.6	4.2	4.8	5.7	1.9	5.6	3.1	2.6	2.6	0.8	6.0	5.6	4.6	5.1	5.9	5.8	16	16	16	16	15	15	25	
Knollers Lane	Monitor	-	-	1.5	1.5	2.9	3.5	4.0	4.6	1.5	5.5	5.2	4.3	3.6	0.9	6.5	5.5	5.2	4.9	5.4	4.9	15	16	16	16	15	15	25	
17	Private - Dwelling	-	-	0.2	0.2	0.4	0.4	0.5	0.5	0.2	0.5	0.6	0.6	0.5	0.2	0.7	0.6	0.8	0.9	0.9	0.7	16	16	16	16	15	15	25	
19	Private - Dwelling	-	-	0.2	0.2	0.4	0.4	0.5	0.5	0.2	0.5	0.6	0.6	0.5	0.2	0.7	0.6	0.8	0.9	0.9	0.7	16	16	16	16	15	15	25	
37	Private - Dwelling	-	-	0.2	0.2	0.4	0.4	0.5	0.5	0.2	0.5	0.6	0.6	0.5	0.2	0.7	0.6	0.8	0.9	0.9	0.7	16	16	16	16	15	15	25	
102	Private - Subject to Acquisition Rights	Warkworth (Noise & AQ) (SSD6464)	Warkworth (Noise & AQ) (SSD6464)	0.5	0.5	0.9	1.1	1.4	1.7	0.5	3.2	3.7	4.7	4.5	2.0	4.5	3.7	4.5	5.7	5.7	3.1	18	20	19	19	17	15	25	
120	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	1.5	1.5	2.9	3.5	4.0	4.6	1.5	5.5	5.2	4.3	3.6	0.9	6.5	5.5	5.2	4.9	5.4	4.9	16	16	16	16	15	15	25	
121	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	1.4	1.4	2.8	3.3	4.0	4.6	1.4	4.6	5.1	4.8	3.9	1.0	5.0	4.7	5.1	5.1	5.5	5.0	15	16	16	16	15	15	25	
122	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	1.6	1.6	3.0	3.5	4.0	4.5	1.6	5.6	5.1	4.1	3.4	0.8	6.8	5.6	5.1	4.8	5.3	4.8	15	16	16	16	15	15	25	
123	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	1.5	1.5	2.8	3.4	3.9	4.5	1.5	5.0	5.2	4.6	3.8	0.9	5.8	5.0	5.3	4.9	5.4	4.8	15	16	16	16	15	15	25	
124	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	1.6	1.6	3.0	3.5	3.9	4.5	1.6	5.6	5.1	4.0	3.4	0.8	6.9	5.6	5.1	4.7	5.3	4.7	15	16	16	16	15	15	25	
126	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.7	0.7	1.4	1.6	1.9	2.2	0.7	2.9	2.8	2.7	2.6	1.0	3.4	3.7	4.2	4.1	4.1	2.7	15	15	15	15	15	15	25	
127	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	1.3	1.3	2.5	2.8	2.9	3.2	1.3	3.3	3.2	3.3	2.8	0.8	3.6	3.7	4.0	4.1	4.2	3.3	16	16	16	16	15	15	25	
128	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.8	0.8	1.5	1.8	2.1	2.4	0.8	2.8	3.0	3.1	3.2	1.0	3.4	3.6	4.0	3.9	4.3	2.8	15	15	15	15	15	15	25	
130	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.9	0.9	1.7	1.9	2.2	2.4	0.9	3.1	3.2	3.0	3.0	0.9	3.6	3.5	4.1	4.0	4.3	2.7	15	15	15	15	15	15	25	
134	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.9	0.9	1.7	2.0	2.2	2.5	0.9	3.1	3.2	2.9	2.9	0.8	3.5	3.5	4.0	4.0	4.2	2.7	15	15	15	15	15	15	25	
139	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.8	0.8	1.6	1.8	2.1	2.3	0.8	2.9	3.0	2.8	2.8	0.8	3.3	3.2	3.7	3.8	4.1	2.6	15	15	15	15	15	15	25	
141	Private - Dwelling	HVOS (Noise) [06_0261]	-	1.4	1.4	2.5	2.7	2.7	3.0	1.4	2.7	3.0	2.9	2.4	0.7	3.0	2.8	3.2	3.3	3.4	3.0	15	15						

Modelled maximum 24-hour average PM2.5 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria				
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044
368	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.4	7.8	1.5	2.8	2.7	2.1	3.2	1.1	4.0	2.9	4.3	4.4	7.8	8.6	16	16	16	17	18	16	25
369	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.4	7.7	1.5	2.8	2.7	2.2	3.2	1.1	4.0	2.9	4.2	4.3	7.7	8.5	16	16	16	17	18	16	25
370	Private - Dwelling	-	-	1.6	1.6	3.3	3.2	6.3	7.4	1.5	2.8	2.6	2.1	3.1	1.1	3.9	2.9	4.4	4.3	7.5	8.2	16	16	16	17	18	16	25
371	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	7.1	1.5	2.8	2.7	2.1	3.2	1.1	3.9	2.9	4.3	4.2	7.6	7.9	16	16	16	17	18	16	25
372	Private - Dwelling	-	-	1.6	1.6	3.4	3.2	6.2	6.8	1.6	2.7	2.6	2.1	3.1	1.1	3.9	2.8	4.4	4.2	7.4	7.6	16	16	16	17	18	16	25
373	Private - Dwelling	-	-	1.5	1.5	3.3	3.2	6.3	7.1	1.5	2.8	2.7	2.1	3.2	1.1	4.0	2.9	4.3	4.2	7.6	7.9	16	16	16	17	18	16	25
374	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	7.0	1.5	2.8	2.7	2.1	3.2	1.1	4.0	2.9	4.3	4.2	7.6	7.9	16	16	16	17	18	16	25
375	Private - Dwelling	-	-	1.5	1.5	3.3	3.2	6.3	7.0	1.5	2.8	2.7	2.1	3.2	1.1	4.0	2.9	4.3	4.2	7.6	7.8	16	16	16	17	18	16	25
376	Private - Dwelling	-	-	1.5	1.5	3.1	3.2	6.5	7.3	1.5	2.9	2.8	2.3	3.3	1.2	4.1	3.0	4.2	4.2	7.8	8.2	16	16	16	17	18	16	25
377	Private - Dwelling	-	-	1.5	1.5	3.1	3.1	6.3	7.5	1.5	2.8	2.7	2.2	3.2	1.1	4.0	2.9	4.2	4.2	7.7	8.3	16	16	16	17	18	16	25
380	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	6.2	6.3	1.5	2.8	2.8	2.2	3.3	1.2	4.0	2.9	4.3	4.2	7.7	7.2	16	16	16	17	18	16	25
381	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	6.5	1.5	2.8	2.2	3.3	1.2	4.0	2.9	4.3	4.2	7.7	7.4	16	16	16	17	18	16	25	
382	Community Infrastructure	-	-	1.5	1.5	3.2	3.2	6.3	6.5	1.5	2.8	2.7	2.2	3.3	1.2	4.0	2.9	4.3	4.2	7.7	7.4	16	16	16	17	18	16	25
383	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	6.8	1.5	2.8	2.8	2.2	3.3	1.2	4.0	2.9	4.3	4.2	7.7	7.7	16	16	16	17	18	16	25
384	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	6.8	1.5	2.8	2.7	2.2	3.3	1.1	4.0	2.9	4.3	4.2	7.7	7.6	16	16	16	17	18	16	25
385	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.3	6.6	1.5	2.8	2.7	2.2	3.2	1.1	4.0	2.9	4.3	4.2	7.6	7.5	16	16	16	17	18	16	25
386	Community Infrastructure	-	-	1.5	1.5	3.3	3.2	6.1	6.1	1.5	2.8	2.7	2.1	3.2	1.1	3.9	2.9	4.4	4.1	7.5	7.0	16	16	16	17	18	16	25
389	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.4	6.7	1.4	2.9	2.8	2.3	3.4	1.2	4.2	3.0	4.2	4.3	7.9	7.6	16	16	16	17	18	16	25
390	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.4	6.6	1.4	2.9	2.8	2.3	3.4	1.2	4.2	3.0	4.2	4.3	7.9	7.5	16	16	16	17	18	16	25
391	Private - Commercial	-	-	1.4	1.4	3.0	3.1	6.4	6.5	1.4	2.9	2.9	2.3	3.4	1.2	4.2	3.0	4.1	4.3	7.9	7.4	16	16	16	17	18	16	25
392	Private - Dwelling	-	-	1.4	1.4	2.9	3.1	6.4	6.5	1.4	2.9	2.9	2.4	3.4	1.2	4.2	3.0	4.1	4.3	7.9	7.4	16	16	16	17	18	16	25
393	Private - Dwelling	-	-	1.4	1.4	2.9	3.1	6.4	6.5	1.4	2.9	2.9	2.4	3.5	1.2	4.2	3.0	4.1	4.3	7.9	7.3	16	16	16	17	18	16	25
394	Private - Dwelling	-	-	1.4	1.4	2.9	3.1	6.4	6.4	1.4	2.9	2.9	2.4	3.4	1.2	4.2	3.0	4.1	4.3	7.9	7.3	16	16	16	17	18	16	25
395	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.5	6.8	1.4	3.0	2.9	2.4	3.5	1.2	4.2	3.0	4.2	4.3	8.0	7.7	16	16	16	17	18	16	25
396	Community Infrastructure	-	-	1.3	1.3	2.8	2.9	5.9	6.0	1.3	2.8	2.7	2.2	3.3	1.2	3.9	2.9	4.0	4.1	7.4	6.5	16	16	16	17	17	16	25
397	Private - Dwelling	-	-	1.3	1.3	2.9	3.0	6.2	6.3	1.3	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.1	4.2	7.7	7.0	16	16	16	17	18	16	25
398	Private - Dwelling	-	-	1.4	1.4	2.9	3.0	6.0	6.1	1.4	2.8	2.7	2.2	3.3	1.2	4.0	2.9	4.1	4.2	7.5	6.6	16	16	16	17	17	16	25
399	Private - Dwelling	-	-	1.3	1.3	2.9	3.0	6.2	6.3	1.3	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.1	4.2	7.8	7.0	16	16	16	17	18	16	25
400	Private - Dwelling	-	-	1.4	1.4	2.9	3.0	6.2	6.3	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.1	4.2	7.7	7.1	16	16	16	17	18	16	25
401	Private - Dwelling	-	-	1.4	1.4	2.9	3.0	6.3	6.3	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.1	4.2	7.7	7.1	16	16	16	17	18	16	25
402	Private - Dwelling	-	-	1.4	1.4	2.9	3.0	6.3	6.3	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.1	4.2	7.8	7.2	16	16	16	17	18	16	25
403	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.3	6.3	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.2	4.2	7.8	7.2	16	16	16	17	18	16	25
404	Private - Dwelling	-	-	1.4	1.4	3.0	3.0	6.1	6.1	1.4	2.8	2.8	2.2	3.3	1.2	4.0	2.9	4.1	4.2	7.6	6.8	16	16	16	17	18	16	25
405	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.3	6.3	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.2	4.2	7.8	7.2	16	16	16	17	18	16	25
406	Private - Dwelling	-	-	1.4	1.4	3.0	3.1	6.3	6.4	1.4	2.9	2.8	2.3	3.4	1.2	4.1	3.0	4.2	4.2	7.8	7.3	16	16	16	17	18	16	25
407	Private - Dwelling	-	-	1.4	1.4	3.1	3.0	6.1	6.0	1.4	2.8	2.7	2.2	3.2	1.1	4.0	2.9	4.2	4.1	7.5	6.8	16	16	16	17	17	16	25
408	Private - Dwelling	-	-	1.4	1.4	3.0	3.0	6.0	6.0	1.4	2.8	2.7	2.2	3.3	1.1	3.9	2.8	4.1	4.1	7.4	6.5	16	16	16	17	17	16	25
409	Private - Dwelling	-	-	1.5	1.5	3.1	3.1	6.1	6.0	1.5	2.8	2.7	2.1	3.2	1.1	3.9	2.9	4.3	4.1	7.5	6.8	16	16	16	17	17	16	25
410	Community Infrastructure	-	-	1.5	1.5	3.2	3.1	6.1	6.1	1.5	2.8	2.7	2.1	3.2	1.1	3.9	2.9	4.4	4.1	7.5	6.9	16	16	16	17	17	16	25
411	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	6.1	6.0	1.5	2.8	2.7	2.1	3.2	1.1	3.9	2.9	4.3	4.1	7.5	6.9	16	16	16	17	17	16	25
412	Community Infrastructure	-	-	1.5	1.5	3.2	3.1	6.0	5.8	1.5	2.7	2.6	2.1	3.1	1.1	3.9	2.9	4.3	4.1	7.4	6.7	16	16	16	17	17	16	25
413	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	5.9	5.8	1.5	2.7	2.7	2.1	3.2	1.1	3.9	2.8	4.3	4.1	7.3	6.5	16	16	16	17	17	16	25
414	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	6.0	5.8	1.5	2.7	2.6	2.1	3.2	1.1	3.9	2.8	4.3	4.1	7.3	6.6	16	16	16	17	17	16	25
415	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	6.0	5.8	1.5	2.7	2.6	2.1	3.1	1.1	3.9	2.8	4.3	4.1	7.3	6.6	16	16	16	17	17	16	25
417	Private - Dwelling	-	-	1.6	1.6	3.3	3.2	6.3	7.3	1.6	2.8	2.7	2.1	3.1	1.1	3.9	2.9	4.4	4.3	7.5	8.1	16	16	16	17	18	16	25
418	Private - Dwelling	-	-	1.6	1.6	3.5	3.2	6.1	6.5	1.6	2.7	2.6	2.1	3.1	1.1	3.9	2.8	4.5	4.2	7.4	7.4	16	16	16	17	18	16	25
419	Private - Dwelling	-	-	1.4	1.4	3.1	3.0	5.7	5.6	1.4	2.6	2.6	2.0	3.1	1.1	3.7	2.8	4.2	4.0	7.1	6.1	16	16	16	17	17	16	25
420	Private - Dwelling	-	-	1.4	1.4	3.0	3.0	6.1	6.0	1.4	2.8	2.7	2.2	3.3	1.2	4.0	2.9	4.2	4.1	7.5	6.7	16	16	16	17	17	16	25
421	Private - Dwelling	-	-	1.4	1.4	3.1	3.2	6.5	7.1	1.4	2.9	2.8	2.3	3.4	1.2	4.2	3.0	4.2	4.3	7.9	8.0	16	16	16	17	18	16	25
422	Private - Dwelling	-	-	1.5	1.5	3.1	3.2	6.4	7.1	1.5	2.9	2.8	2.3	3.3	1.2	4.1	3.0	4.2	4.2	7.8	7.9	16	16	16	17	18	16	25
423	Private - Dwelling	-	-	1.4	1.4	3.1	3.2	6.4	6.7	1.4	2.9	2.9	2.3	3.4	1.2	4.2	3.0	4.2	4.3	7.9	7.6	16	16	16	17	18	16	25
425	Private - Dwelling	-	-	1.4	1.4	3.0	2.7	4.7	4.7	1.4	2.2	2.1	1.8	2.5	0.9	3.1	2.6	4.0	3.6	6.0	5.2	16	16	16	16	16	16	25
426	Private - Dwelling	-	-	1.3	1.3	2.7	2.5	4.6	4.7	1.3	2.1	2.1	2.0	2.6	0.9	3.2	2.6	3.9	3.6	6.0	5.2	16	16	16	16	16	16	25
427	Private - Dwelling																											

Modelled maximum 24-hour average PM2.5 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)						Project (HVO S)						Project (HVO Complex)						Cumulative						Criteria
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	
619	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	2.6	2.6	3.8	3.7	3.7	3.7	2.6	1.1	0.9	0.8	0.8	0.2	2.1	3.0	4.2	3.9	3.8	3.8	17	17	17	17	16	15	25
621	Private - Subject to Acquisition Rights	Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]; Ashton (AQ) [DA309-11-2001-1]	2.7	2.7	4.3	4.1	3.8	4.7	2.7	1.0	0.9	0.8	0.9	0.3	1.9	2.8	4.3	4.1	4.3	4.8	18	19	19	19	17	15	25
623	Community Infrastructure	-	-	3.0	3.0	4.7	4.3	4.3	4.5	3.0	1.3	1.1	1.0	1.0	0.3	2.4	3.5	5.1	4.9	4.3	4.5	17	18	18	17	16	15	25
624	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to all 9 contiguous lots 1/248748, 2/9/758214, 3/9/758214, 4/9/758214, 5/9/758214, 6/9/758214, 7/9/758214, 8/9/758214, 9/9/758214	3.0	3.0	4.6	4.1	4.2	4.5	3.0	1.2	1.0	1.0	0.9	0.3	2.4	3.4	4.9	4.7	4.3	4.5	18	18	19	17	16	15	25
626	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 1/8/758214 and 2/8/758214	3.0	3.0	4.5	3.9	4.2	4.3	3.0	1.2	1.0	0.9	0.9	0.2	2.4	3.3	4.8	4.5	4.3	4.4	18	18	19	18	16	15	25
627	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	2.9	2.9	4.3	4.0	4.0	4.1	2.9	1.1	1.0	0.9	0.8	0.2	2.3	3.3	4.7	4.3	4.1	4.1	18	18	19	18	16	15	25
628	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	2.8	2.8	4.1	4.0	3.9	4.0	2.8	1.1	0.9	0.9	0.8	0.2	2.3	3.2	4.6	4.2	4.0	4.1	18	17	18	17	16	15	25
629	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek North (AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 103/852484 and 104/852484	2.7	2.7	4.0	4.1	3.8	4.0	2.7	1.1	0.9	0.8	0.8	0.2	2.3	3.2	4.5	4.2	3.8	4.0	18	17	19	17	16	15	25
735	Private - Commercial	-	-	3.6	3.6	5.8	4.4	3.3	3.5	3.6	2.1	1.7	1.5	1.1	0.3	2.5	3.7	5.8	4.5	3.7	3.6	21	42	42	34	17	16	25
797	Community Infrastructure	-	-	4.0	3.9	6.2	5.1	3.5	3.7	4.0	2.2	1.8	1.5	1.1	0.3	2.9	3.9	6.3	5.2	3.9	3.9	23	43	43	33	18	15	25
799	Community Infrastructure	-	-	4.0	3.9	6.2	5.1	3.5	3.7	4.0	2.2	1.8	1.5	1.1	0.3	2.9	3.9	6.3	5.2	3.9	3.9	23	43	43	33	18	15	25
800	Private - Commercial	-	-	4.0	3.9	6.2	5.1	3.5	3.7	4.0	2.2	1.8	1.5	1.1	0.3	2.9	3.9	6.3	5.2	3.9	3.9	23	43	43	33	18	15	25
829	Private - Commercial	-	-	0.8	0.8	1.5	1.7	2.2	2.4	0.8	3.8	3.8	3.5	3.1	1.2	4.2	4.5	5.2	5.2	5.1	3.2	15	16	16	16	15	15	25
830	Private - Commercial	-	-	0.6	0.6	1.3	1.5	2.0	2.2	0.6	3.7	3.9	3.7	3.4	1.2	4.2	4.3	5.2	5.2	5.4	3.2	16	16	16	16	15	15	25
833	Private - Commercial	-	-	0.8	0.8	1.5	1.9	2.6	3.3	0.8	14.2	16.5	16.1	15.4	6.0	15.6	15.0	18.0	17.9	17.3	8.3	22	28	31	28	23	16	25
834	Private - Commercial	-	-	1.4	1.4	3.0	3.1	6.4	6.6	1.4	2.9	2.9	2.4	3.4	1.2	4.2	4.3	7.9	7.6	16	16	16	16	16	17	18	17	25
835	Private - Dwelling	-	-	1.6	1.6	3.3	3.2	6.3	7.9	1.6	2.8	2.7	2.1	3.1	1.1	3.9	2.9	4.3	4.4	7.9	8.6	16	16	16	17	18	16	25
836	Private - Dwelling	-	-	1.6	1.6	3.4	3.2	6.2	7.2	1.6	2.7	2.6	2.1	3.1	1.1	3.9	2.8	4.4	4.3	7.5	8.0	16	16	16	17	18	16	25
837	Private - Dwelling	-	-	1.6	1.6	3.3	3.2	6.2	7.4	1.6	2.8	2.6	2.1	3.1	1.1	3.9	2.9	4.4	4.3	7.5	8.2	16	16	16	17	18	16	25
838	Private - Dwelling	-	-	1.5	1.5	3.2	3.2	6.4	6.7	1.5	2.9	2.8	2.3	3.3	1.2	4.1	3.0	4.3	4.2	7.8	7.6	16	16	16	17	18	16	25
839	Private - Dwelling	-	-	1.5	1.5	3.2	3.1	6.2	6.1	1.5	2.8	2.7	2.2	3.3	1.1	4.0	2.9	4.3	4.2	7.6	7.0	16	16	16	17	18	16	25
840	Private - Dwelling	-	-	1.4	1.4	3.1	3.1	6.2	6.2	1.4	2.8	2.8	2.2	3.3	1.2	4.0	2.9	4.2	4.2	7.6	7.1	16	16	16	17	18	16	25
843	Private - Dwelling	-	-	1.3	1.3	2.2	2.2	2.1	2.4	1.3	1.9	1.9	1.8	1.6	0.4	2.2	2.0	2.3	2.4	2.8	2.6	15	15	15	15	15	15	25
846	Private - Dwelling	-	-	1.6	1.6	2.6	2.5	2.9	1.6	2.7	2.5	2.2	1.9	0.5	3.2	2.7	2.7	2.6	2.9	3.0	16	16	16	16	16	15	15	25
847	Private - Dwelling	-	-	1.5	1.5	2.6	2.5	2.9	1.5	2.8	2.5	2.3	1.9	0.5	3.2	2.8	2.6	2.6	2.8	3.0	16	16	16	16	16	15	15	25
852	Private - Dwelling	-	-	1.5	1.5	2.6	2.6	2.4	2.9	1.5	3.0	2.8	2.5	2.1	0.8	3.5	3.0	2.8	2.8	2.9	3.0	15	15	15	15	15	15	25
855	Private - Dwelling	-	-	1.0	1.0	2.0	2.1	2.1	2.4	1.0	2.6	2.5	2.2	2.1	0.6	3.0	3.2	3.4	3.4	3.5	2.5	15	15	15	15	15	15	25
856	Private - Dwelling	-	-	1.4	1.4	2.4	2.1	2.3	2.6	1.4	2.3	2.3	2.2	1.9	0.5	2.7	2.3	2.5	2.6	2.9	2.8	15	15	15	15	15	15	25
860	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	2.6	2.6	4.1	3.3	3.8	4.1	2.6	1.0	0.8	0.8	0.8	0.2	2.0	2.8	4.1	3.7	4.0	4.2	18	19	19	18	17	15	25
861	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	2.2	2.2	3.3	3.7	3.3	3.2	2.2	0.8	0.7	0.6	0.6	0.2	1.8	2.5	3.5	3.8	3.4	3.3	18	19	20	19	17	15	25
862	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	2.6	2.6	4.0	4.4	3.7	3.7	2.6	1.0	0.8	0.7	0.7	0.2	2.2	3.0	4.2	4.5	3.7	3.8	22	22	23	20	17	15	25
863	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	2.4	2.4	3.8	4.2	3.5	3.5	2.4	0.9	0.8	0.7	0.7	0.2	2.0	2.8	3.9	4.3	3.5	3.6	21	21	22	19	17	15	25
869	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	2.7	2.7	4.6	4.6	4.3	4.9	2.7	1.9	1.6	1.4	1.4	0.4	2.6	2.9	4.6	4.7	4.4	4.9	16	17	17	17	16	15	25
870	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	2.6	2.6	4.5	4.6	4.2	4.8	2.6	1.8	1.5	1.3	1.4	0.4	2.6	2.8	4.6	4.7	4.2	4.8	16	17	17	17	16	15	25
947	Private - Subject to Acquisition Rights	Rav Ops (AQ) [DA 09_0176]; HVOs (Noise) [06_0261]	Rav Ops (AQ) [DA 09_0176]	2.0	2.0	3.7	4.2	4.9	5.8	2.0	3.8	2.4	2.0	2.0	0.6	4.2	3.9	4.5	5.1	5.8	5.9	16	16	16	16	15	15	25
949	Private - Dwelling	-	-	2.0	2.0	3.7	4.2	4.9	5.8	2.0	3.8	2.4	2.0	2.0	0.6	4.2	3.9	4.5	5.1	5.8	5.9	16	16	16	16	15	15	25
950	Private - Dwelling	-	-	2.0	2.0	3.7	4.2	4.9	5.8	2.0	3.8	2.4	2.0	2.0	0.6	4.2	3.9	4.5	5.1	5.8	5.9	16	16	16	16	15	15	25

Ashton = Ashton Coal Project, HVO S = Hunter Valley Operations (South), HVO N = Hunter Valley Operations (North), MOCO = Mt Owen Continued Operations, IUG = Integra Underground, UWJV = United Wambo JV, Rav Ops = Ravensworth Surface Operations

Modelled annual average PM2.5 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria					
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044								
D119	Monitor	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.7	0.4	0.5	0.5	0.6	0.2	0.8	0.6	0.8	0.9	1.2	0.8	6.3	6.4	6.6	6.9	6.7	6.1	8	
DL14	Monitor	-	-	0.1	0.3	0.7	0.9	1.1	0.5	0.5	0.4	0.3	0.3	0.1	0.7	0.8	0.9	1.0	1.2	1.2	6.8	7.1	7.2	7.3	7.0	6.5	8		
Warkworth	Monitor	-	-	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.5	0.7	1.0	0.9	0.3	0.9	0.6	0.9	1.2	1.2	0.6	7.5	13.0	11.2	10.9	7.2	5.9	8	
D118	Monitor	-	-	0.1	0.1	0.3	0.4	0.5	0.7	0.3	0.4	0.5	0.7	0.3	0.7	0.5	0.7	0.8	1.1	0.7	6.6	6.8	6.9	8.2	7.7	5.9	8		
Knodlers Lane	Monitor	-	-	0.1	0.2	0.4	0.5	0.7	0.8	0.8	0.7	0.5	0.4	0.3	0.1	0.9	0.9	0.9	0.9	1.1	0.9	7.0	7.3	7.2	7.2	6.7	6.2	8	
DL22	Monitor	-	-	0.1	0.2	0.3	0.4	0.6	0.7	1.5	1.4	1.2	1.0	0.7	0.2	1.6	1.6	1.5	1.4	1.3	0.9	7.7	8.1	8.0	7.9	6.9	6.1	8	
DL21	Monitor	-	-	0.1	0.2	0.4	0.6	0.8	1.0	0.9	0.8	0.5	0.4	0.3	0.1	1.0	1.1	1.0	1.2	1.1	7.0	7.4	7.3	7.3	6.8	6.3	8		
DL122	Monitor	-	-	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.4	0.3	0.3	0.1	0.5	0.6	0.6	0.6	0.7	0.5	6.3	6.5	6.6	6.6	6.2	5.7	8		
DL30	Monitor	-	-	0.1	0.2	0.4	0.6	0.6	0.6	2.3	2.1	2.7	2.7	2.1	0.7	2.3	2.2	3.0	2.6	1.2	8.6	9.7	10.2	10.1	8.2	6.5	8		
DL2	Monitor	-	-	0.2	0.5	1.0	1.3	1.9	2.5	0.3	1.2	0.7	0.6	0.4	0.1	1.5	1.6	1.7	1.9	2.3	2.6	1.0	8.4	8.5	8.1	7.9	8		
Warkworth	Monitor	-	-	0.0	0.1	0.1	0.2	0.3	0.3	0.8	0.5	0.7	1.0	0.9	0.3	0.9	0.6	0.9	1.2	1.2	0.6	7.5	13.0	11.2	10.0	7.2	5.9	8	
Cheshunt East	Monitor	-	-	0.3	0.6	1.2	1.5	1.9	2.4	0.8	0.7	0.5	0.4	0.3	0.1	1.1	1.3	1.7	2.0	2.2	2.5	8.3	8.8	9.2	9.4	9.0	7.8	8	
Long Point	Monitor	-	-	0.1	0.1	0.2	0.3	0.4	0.6	0.5	0.5	0.5	0.4	0.1	0.6	0.7	0.7	0.7	0.7	0.7	0.5	6.5	6.7	6.8	6.8	6.3	5.7	8	
Kilburnie South	Monitor	-	-	0.1	0.1	0.3	0.3	0.4	0.5	0.7	0.4	0.4	0.5	0.7	0.3	0.7	0.5	0.7	0.8	1.1	0.7	6.6	6.9	6.9	8.2	7.1	5.9	8	
Wandewai	Monitor	-	-	0.2	0.4	0.8	1.1	1.8	1.9	2.3	1.1	1.3	1.5	2.3	0.9	2.4	1.5	2.1	2.6	4.1	2.9	8.1	7.6	8.4	9.1	8.8	8.1	8	
Howick	Monitor	-	-	3.5	4.8	4.9	2.8	1.4	1.4	0.3	0.3	0.2	0.2	0.2	0.0	3.8	4.8	5.1	3.0	1.6	14	12.7	14.4	14.7	12.6	10.7	6.7	8	
Golden Highway	Monitor	-	-	0.0	0.1	0.1	0.2	0.2	0.5	0.4	0.4	0.5	0.5	0.2	0.5	0.4	0.6	0.7	0.4	0.7	0.4	10.7	13.9	14.0	13.9	6.2	5.6	8	
HCI Conveyor	Monitor	-	-	3.8	11.8	16.5	25.9	4.9	6.2	0.8	0.8	0.6	0.5	0.3	0.1	4.7	12.5	17.1	26.4	5.3	6.3	12.2	25.5	30.1	39.4	17.8	11.6	8	
Maison Dieu	Monitor	-	-	0.1	0.3	0.5	0.7	0.9	1.1	0.5	0.5	0.4	0.3	0.3	0.1	0.7	0.8	0.9	1.0	1.2	1.2	6.8	7.1	7.2	7.3	6.9	6.5	8	
Warkworth	Monitor	-	-	0.0	0.1	0.1	0.2	0.2	0.3	0.6	0.4	0.5	0.7	0.7	0.2	0.7	0.5	0.7	0.9	0.9	0.5	7.5	10.4	9.8	9.3	6.7	5.7	8	
Knodlers Lane	Monitor	-	-	0.1	0.2	0.3	0.4	0.6	0.8	1.5	1.4	1.0	0.8	0.6	0.2	1.6	1.6	1.4	1.2	1.3	0.9	7.7	8.0	7.8	7.7	6.9	6.2	8	
Jerrys Plains	Monitor	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.4	0.3	0.3	0.3	0.4	0.1	0.5	0.5	0.7	0.7	0.9	0.7	5.9	6.0	6.3	6.3	6.3	5.9	8	
Cheshunt East	Monitor	-	-	0.3	0.6	1.2	1.5	1.9	2.4	0.8	0.7	0.5	0.4	0.3	0.1	1.1	1.3	1.7	2.0	2.2	2.5	8.3	8.8	9.2	9.4	9.0	7.8	8	
HVGC	Monitor	-	-	0.1	0.1	0.2	0.3	0.5	0.6	2.7	1.9	2.9	3.0	3.0	1.0	2.7	2.0	3.1	3.3	3.5	1.6	9.0	10.4	11.0	10.6	9.2	6.8	8	
Long Point	Monitor	-	-	0.1	0.1	0.2	0.3	0.3	0.4	0.6	0.5	0.5	0.4	0.1	0.6	0.7	0.7	0.7	0.7	0.5	6.5	6.7	6.8	6.8	6.3	5.7	8		
Kilburnie South	Monitor	-	-	0.1	0.1	0.3	0.3	0.4	0.5	0.7	0.4	0.4	0.5	0.7	0.3	0.7	0.5	0.7	0.8	1.1	0.7	6.6	6.9	6.9	8.2	7.1	5.9	8	
Kilburnie South	Monitor	-	-	0.1	0.1	0.3	0.3	0.4	0.5	0.7	0.3	0.4	0.5	0.7	0.3	0.7	0.5	0.7	0.8	1.1	0.7	6.6	6.9	6.9	8.2	7.1	5.9	8	
Maison Dieu	Monitor	-	-	0.1	0.2	0.5	0.7	0.9	1.1	0.6	0.5	0.4	0.3	0.3	0.1	0.7	0.8	0.9	1.0	1.2	1.2	6.8	7.1	7.2	7.3	6.9	6.4	8	
Maison Dieu	Monitor	-	-	0.1	0.3	0.5	0.7	0.9	1.1	0.5	0.5	0.4	0.3	0.3	0.1	0.7	0.8	0.9	1.0	1.2	1.2	6.8	7.1	7.2	7.3	6.9	6.5	8	
Knodlers Lane	Monitor	-	-	0.1	0.2	0.4	0.5	0.7	0.8	0.8	0.7	0.5	0.4	0.3	0.1	0.9	0.9	0.9	0.9	1.1	0.9	7.0	7.3	7.2	7.2	6.7	6.2	8	
17	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	5.5	5.6	5.6	5.4	5.3	8		
19	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	5.5	5.6	5.7	5.7	5.4	5.3	8	
37	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	5.6	5.7	5.7	5.4	5.3	8		
102	Private - Subject to Acquisition Rights	Warkworth (Noise & AQ) [SSD6464]	Warkworth (Noise & AQ) [SSD6464]	0.0	0.1	0.1	0.2	0.2	0.3	0.7	0.4	0.6	0.8	0.7	0.3	0.7	0.5	0.7	0.9	0.9	0.5	7.5	10.6	9.9	9.4	6.7	5.7	8	
120	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.2	0.4	0.5	0.7	0.9	0.8	0.7	0.5	0.4	0.3	0.1	0.9	0.9	0.9	0.9	1.1	1.0	7.0	7.3	7.2	7.2	6.7	6.2	8	
121	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.2	0.4	0.5	0.7	0.8	1.0	0.9	0.7	0.5	0.4	0.1	1.1	1.1	1.0	1.1	1.0	1.1	6.9	7.2	7.5	7.4	7.3	6.7	6.2	8
122	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.2	0.4	0.5	0.7	0.8	0.9	0.7	0.5	0.4	0.3	0.1	0.8	0.9	0.9	0.9	1.0	1.0	6.9	7.2	7.2	7.2	6.7	6.2	8	
123	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.2	0.4	0.5	0.7	0.8	0.9	0.8	0.6	0.5	0.4	0.1	1.0	1.0	0.9	0.9	1.1	0.9	7.0	7.3	7.3	7.3	6.7	6.2	8	
124	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.2	0.4	0.5	0.7	0.9	0.7	0.7	0.5	0.4	0.3	0.1	0.8	0.9	0.9	0.9	1.0	1.0	6.9	7.2	7.2	7.2	6.7	6.2	8	
126	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.0	0.1	0.2	0.2	0.3	0.3	0.5	0.4	0.5	0.5	0.5	0.2	0.6	0.5	0.7	0.7	0.4	6.6	6.9	7.0	7.1	6.2	5.7	8		
127	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.1	0.2	0.3	0.4	0.5	0.6	0.6	0.6	0.5	0.4	0.3	0.1	0.7	0.7	0.8	0.8	0.8	0.7	6.9	7.1	7.2	7.2	6.6	5.9	8	
128	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.1	0.1	0.2	0.2	0.3	0.4	0.6	0.6	0.6	0.5	0.5	0.1	0.7	0.7	0.8	0.8	0.8	0.5	6.6	6.9	7.0	7.0	6.3	5.7	8	
130	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.1	0.1	0.2	0.3	0.3	0.4	0.6	0.6	0.5	0.5	0.4	0.1	0.7	0.7	0.8	0.8	0.8	0.5	6.5	6.8	6.9	6.9	6.3	5.7	8	
134	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.1	0.1	0.2	0.3	0.3	0.4	0.6	0.6	0.5	0.5	0.4	0.1	0.7	0.7	0.7	0.7	0.8	0.5	6.5	6.7	6.8	6.8	6.3	5.7	8	
139	Private - Dwelling	Warkworth (Noise) [SSD6464]	-	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.5	0.5	0.4	0.1	0.6	0.6	0.7	0.7	0.7	0.5	6.4	6.6	6.7	6.7	6.2	5.7	8	
141	Private - Dwelling	-	-	0.1	0.2	0.3	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.1	0.5	0.6	0.6	0.7	0.7									

Modelled annual average PM2.5 concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)						Project (HVO S)						Project (HVO Complex)						Cumulative						Criteria
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	
619	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.3	0.4	0.7	0.6	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.5	0.8	0.6	0.4	0.4	8.7	9.6	9.9	9.5	7.5	5.9	8
621	Private - Subject to Acquisition Rights	Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]; Ashton (AQ) [DA309-11-2001-1]	0.3	0.5	0.8	0.7	0.5	0.5	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.6	0.9	0.8	0.6	0.5	9.6	10.5	10.8	10.6	8.5	5.9	8
623	Community Infrastructure	-	-	0.3	0.5	0.9	0.7	0.5	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.5	0.7	1.0	0.8	0.5	8.6	9.4	9.7	9.3	7.7	5.9	8	
624	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to all 9 contiguous lots 1/248748, 2/9/758214, 3/9/758214, 4/9/758214, 5/9/758214, 6/9/758214, 7/9/758214, 8/9/758214, 9/9/758214	0.3	0.5	0.8	0.7	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.5	0.6	0.9	0.8	0.5	0.5	8.8	9.7	9.9	9.5	7.8	5.9	8
626	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 1/8/758214 and 2/8/758214	0.3	0.5	0.8	0.7	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.6	0.9	0.8	0.5	0.4	9.1	10.0	10.2	9.8	7.8	6.0	8
627	Private - Subject to Acquisition Rights	80/952; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.3	0.5	0.8	0.6	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.6	0.8	0.7	0.5	0.4	9.0	9.9	10.1	9.7	7.7	5.9	8
628	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.3	0.5	0.7	0.6	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.6	0.8	0.7	0.5	0.4	8.9	9.8	10.0	9.6	7.6	5.9	8
629	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek North (AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 103/852484 and 104/852484	0.3	0.5	0.7	0.6	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.6	0.8	0.7	0.4	0.4	9.0	9.7	10.0	9.5	7.5	5.9	8
735	Private - Commercial	-	-	0.3	0.5	0.7	0.6	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.5	0.6	0.9	0.7	0.5	0.4	11.2	14.7	15.0	11.7	8.4	6.5	8
797	Community Infrastructure	-	-	0.4	0.6	0.8	0.6	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.5	0.7	0.9	0.7	0.5	0.4	11.5	14.4	14.6	11.6	8.6	6.5	8
799	Community Infrastructure	-	-	0.4	0.6	0.8	0.6	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.5	0.7	0.9	0.7	0.5	0.4	11.5	14.4	14.6	11.6	8.6	6.5	8
800	Private - Commercial	-	-	0.4	0.6	0.8	0.6	0.4	0.4	0.2	0.1	0.1	0.1	0.1	0.0	0.5	0.7	0.9	0.7	0.5	0.4	11.5	14.4	14.6	11.6	8.6	6.5	8
829	Private - Commercial	-	-	0.0	0.1	0.2	0.2	0.3	0.3	0.7	0.5	0.6	0.6	0.6	0.2	0.7	0.6	0.8	0.8	0.5	0.5	7.0	7.5	7.7	7.7	6.3	5.7	8
830	Private - Commercial	-	-	0.0	0.1	0.2	0.2	0.2	0.3	0.6	0.5	0.6	0.6	0.5	0.2	0.6	0.5	0.7	0.8	0.8	0.5	7.3	8.2	8.3	8.4	6.3	5.7	8
833	Private - Commercial	-	-	0.1	0.1	0.2	0.3	0.5	0.6	2.7	1.9	2.9	3.1	3.2	1.1	2.8	2.0	3.1	3.4	3.6	1.7	9.0	10.7	11.1	10.7	9.4	6.9	8
834	Private - Commercial	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.7	0.4	0.5	0.5	0.6	0.2	0.8	0.6	0.8	0.9	1.2	0.8	6.3	6.4	6.6	6.9	6.7	6.0	8
835	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.5	0.5	0.6	0.2	0.7	0.6	0.8	0.9	1.2	0.8	6.2	6.3	6.6	6.8	6.7	6.1	8
836	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.4	0.5	0.6	0.2	0.7	0.6	0.8	0.9	1.2	0.8	6.2	6.3	6.5	6.7	6.6	6.0	8
837	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.4	0.5	0.6	0.2	0.7	0.6	0.8	0.9	1.2	0.8	6.2	6.3	6.5	6.7	6.6	6.0	8
838	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.5	0.6	0.2	0.7	0.6	0.8	0.9	1.2	0.8	6.3	6.3	6.6	6.8	6.7	6.0	8	
839	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.4	0.5	0.6	0.2	0.7	0.6	0.8	0.8	1.1	0.8	6.2	6.3	6.5	6.8	6.6	6.0	8
840	Private - Dwelling	-	-	0.1	0.2	0.4	0.4	0.6	0.6	0.6	0.4	0.4	0.5	0.6	0.2	0.7	0.6	0.8	0.9	1.1	0.8	6.2	6.3	6.5	6.8	6.6	6.0	8
843	Private - Dwelling	-	-	0.1	0.1	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.0	0.4	0.4	0.5	0.5	0.5	0.5	6.2	6.3	6.4	6.4	6.2	5.7	8
846	Private - Dwelling	-	-	0.1	0.2	0.3	0.4	0.4	0.5	0.2	0.2	0.2	0.2	0.1	0.0	0.3	0.4	0.5	0.6	0.5	0.5	6.8	6.9	7.0	7.0	6.6	5.8	8
847	Private - Dwelling	-	-	0.1	0.2	0.3	0.4	0.4	0.5	0.3	0.2	0.2	0.2	0.2	0.0	0.4	0.4	0.5	0.6	0.5	0.5	6.6	6.7	6.8	6.8	6.5	5.8	8
852	Private - Dwelling	-	-	0.1	0.2	0.3	0.4	0.5	0.5	0.3	0.3	0.2	0.2	0.2	0.0	0.4	0.4	0.5	0.6	0.6	0.5	6.5	6.6	6.7	6.8	6.4	5.8	8
855	Private - Dwelling	-	-	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.4	0.4	0.3	0.3	0.1	0.5	0.5	0.6	0.6	0.6	0.5	6.3	6.5	6.5	6.5	6.2	5.7	8
856	Private - Dwelling	-	-	0.1	0.2	0.3	0.3	0.4	0.5	0.3	0.3	0.2	0.2	0.2	0.1	0.4	0.4	0.5	0.6	0.5	0.5	6.4	6.6	6.6	6.7	6.3	5.7	8
860	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	0.3	0.4	0.7	0.6	0.4	0.4	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.5	0.8	0.7	0.5	0.4	9.1	10.6	10.8	10.5	7.8	5.9	8
861	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	0.2	0.4	0.5	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.4	0.6	0.5	0.4	0.3	9.1	11.1	11.3	10.8	7.4	5.9	8
862	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	0.3	0.4	0.7	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.5	0.7	0.6	0.4	0.3	10.2	11.1	11.3	10.6	7.8	6.0	8
863	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	0.3	0.4	0.6	0.5	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.0	0.4	0.5	0.7	0.6	0.4	0.3	10.0	11.2	11.4	10.7	7.7	6.0	8
869	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.2	0.4	0.8	0.9	0.9	1.0	0.3	0.2	0.2	0.2	0.1	0.0	0.5	0.6	1.0	1.1	1.1	1.1	7.3	7.6	7.9	8.0	7.4	6.4	8
870	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.2	0.4	0.8	0.9	0.9	1.0	0.3	0.2	0.2	0.2	0.1	0.0	0.5	0.6	0.9	1.0	1.0	1.0	7.2	7.6	7.9	8.0	7.4	6.3	8
947	Private - Subject to Acquisition Rights	Rav Ops (AQ) [DA 09_0176]; HVOs (Noise) [06_0281]	Rav Ops (AQ) [DA 09_0176]	0.1	0.3	0.6	0.7	1.0	1.1	0.4	0.4	0.3	0.3	0.2	0.1	0.6	0.7	0.9	1.0	1.2	1.2	6.7	7.1	7.2	7.3	7.0	6.5	8
949	Private - Dwelling	-	-	0.1	0.3	0.6	0.7	1.0	1.1	0.4	0.4	0.3	0.3	0.2	0.1	0.6	0.7	0.9	1.0	1.2	1.2	6.7	7.1	7.2	7.3	7.0	6.5	8
950	Private - Dwelling	-	-	0.1	0.3	0.6	0.7	1.0	1.1	0.4	0.4	0.3	0.3	0.2	0.1	0.6	0.7	0.9	1.0	1.2	1.2	6.7	7.1	7.2	7.3	7.0	6.5	8

Ashton = Ashton Coal Project, HVO S = Hunter Valley Operations (South), HVO N = Hunter Valley Operations (North), MOCO = Mt Owen Continued Operations, IUG = Integra Underground, UWJV = United Wambo JV, Rav Ops = Ravensworth Surface Operations

Modelled annual average TSP concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria					
				2014	2025	2029	2033	2040	2014	2025	2029	2033	2040	2014	2025	2029	2033	2040	2014	2025	2029	2033	2040						
D119	Monitor	-	-	0.1	0.1	0.3	0.4	0.7	0.8	1.8	1.4	1.5	1.8	2.0	0.6	1.9	1.5	1.8	2.2	2.7	1.4	59	60	60	61	60	58	90	
DL14	Monitor	-	-	0.2	0.4	1.0	1.5	2.4	2.8	1.4	1.6	0.9	0.7	0.5	0.1	1.6	2.1	1.9	2.2	2.8	3.0	59	60	60	60	60	60	90	
Warkworth	Monitor	-	-	0.0	0.1	0.3	0.4	0.6	0.7	6.5	7.2	10.2	11.6	8.7	2.2	6.5	7.3	10.4	12.0	9.4	2.9	63	60	75	73	63	59	90	
D118	Monitor	-	-	0.0	0.1	0.2	0.3	0.3	1.7	0.9	1.5	1.9	2.1	0.1	0.7	0.9	1.5	2.1	0.1	1.7	0.9	60	61	61	62	62	58	90	
Knodlers Lane	Monitor	-	-	0.1	0.3	0.7	1.0	1.6	1.9	3.3	3.6	2.0	1.4	1.0	0.2	3.4	3.9	2.7	2.5	2.6	2.1	61	62	61	60	60	59	90	
DL22	Monitor	-	-	0.1	0.2	0.4	0.7	1.0	1.2	6.1	7.3	5.7	4.5	2.9	0.6	6.2	7.5	6.1	5.2	4.0	1.8	64	66	65	64	61	59	90	
DL21	Monitor	-	-	0.1	0.3	0.7	1.2	1.9	2.3	3.6	4.0	1.9	1.3	0.9	0.2	3.7	4.3	2.7	2.5	2.8	2.5	61	62	61	60	60	59	90	
D122	Monitor	-	-	0.1	0.2	0.4	0.5	0.8	0.8	1.8	2.0	1.7	1.4	1.1	0.3	1.9	2.2	2.0	1.9	1.1	59	60	60	60	59	58	90		
DL30	Monitor	-	-	0.0	0.2	0.6	0.9	1.1	1.7	2.1	6.7	3.8	4.6	6.1	7.5	2.8	6.8	4.1	5.3	7.2	9.3	4.9	64	63	64	67	67	62	90
DL2	Monitor	-	-	0.4	0.9	2.2	3.6	5.4	7.0	2.0	2.2	1.4	1.0	0.6	0.2	2.3	3.1	3.6	4.6	6.0	7.2	60	61	62	63	64	64	90	
Warkworth	Monitor	-	-	0.0	0.1	0.1	0.2	0.2	0.2	1.4	0.8	1.5	3.1	2.1	0.8	1.4	0.9	1.6	3.2	2.4	1.0	63	60	75	73	63	58	90	
Cheshunt East	Monitor	-	-	0.6	1.5	3.2	4.7	5.7	7.4	1.1	1.2	0.9	0.7	0.4	0.2	1.7	2.6	4.1	5.4	6.2	7.6	60	61	63	64	65	65	90	
Long Point	Monitor	-	-	0.1	0.2	0.3	0.5	0.7	0.8	2.2	2.5	2.2	2.0	1.5	0.4	2.3	2.6	2.5	2.4	2.2	1.1	60	61	60	60	59	58	90	
Kilburnie South	Monitor	-	-	0.0	0.1	0.1	0.2	0.3	0.3	1.7	0.9	1.4	1.9	2.2	0.8	1.7	1.0	1.5	2.2	2.5	1.1	60	61	61	66	62	58	90	
Wandewai	Monitor	-	-	0.1	0.3	0.6	1.1	1.7	2.1	6.7	3.8	4.6	6.1	7.5	2.8	6.8	4.1	5.3	7.2	9.3	4.9	64	63	64	67	67	62	90	
Howick	Monitor	-	-	5.3	7.0	8.1	3.9	1.2	1.3	0.3	0.3	0.3	0.2	0.2	0.0	5.6	7.3	8.4	4.1	1.4	1.3	70	73	74	70	66	59	90	
Golden Highway	Monitor	-	-	0.0	0.1	0.1	0.2	0.2	1.1	0.8	1.2	1.7	1.4	0.5	1.1	0.9	1.3	1.8	1.6	0.7	78	91	91	91	59	58	90		
HCl Conveyor	Monitor	-	-	13.9	74.2	103.9	186.8	14.5	17.1	1.5	1.7	1.2	1.2	0.8	0.3	15.4	76.0	105.1	188.0	15.3	17.4	76	210	239	322	148	74	90	
Maison Dieu	Monitor	-	-	0.2	0.4	1.0	1.5	2.3	2.8	1.5	1.7	0.9	0.7	0.5	0.1	1.7	2.1	1.9	2.2	2.8	2.9	59	60	60	60	60	60	90	
Warkworth	Monitor	-	-	0.0	0.1	0.1	0.1	0.2	0.2	1.0	0.6	1.1	1.9	1.5	0.5	1.0	0.7	1.2	2.1	1.7	0.7	64	72	71	70	61	58	90	
Knodlers Lane	Monitor	-	-	0.1	0.2	0.5	0.8	1.3	1.5	6.5	7.3	4.9	3.5	2.3	0.5	6.6	7.6	5.4	4.3	3.5	1.9	64	66	64	63	61	59	90	
Jerrys Plains	Monitor	-	-	0.1	0.2	0.4	0.6	1.1	1.1	1.0	0.8	0.9	1.0	1.0	0.3	1.1	1.0	1.3	1.5	2.1	1.4	58	59	59	59	58	90		
Cheshunt East	Monitor	-	-	0.6	1.5	3.2	4.7	5.7	7.4	1.1	1.2	0.9	0.7	0.4	0.2	1.7	2.6	4.1	5.4	6.2	7.6	60	61	63	64	65	65	90	
HVGC	Monitor	-	-	0.0	0.1	0.2	0.4	0.6	0.6	7.1	5.1	11.0	12.3	11.4	3.6	7.1	5.2	11.2	12.6	11.9	4.2	66	67	73	74	70	61	90	
Long Point	Monitor	-	-	0.1	0.2	0.3	0.5	0.7	0.8	2.2	2.5	2.2	2.0	1.5	0.4	2.3	2.6	2.5	2.4	2.2	1.1	60	61	60	60	59	58	90	
Kilburnie South	Monitor	-	-	0.0	0.1	0.2	0.2	0.3	0.3	1.7	0.9	1.4	1.9	2.2	0.8	1.7	1.0	1.5	2.2	2.5	1.1	60	61	61	66	62	58	90	
Kilburnie South	Monitor	-	-	0.0	0.1	0.1	0.2	0.3	0.3	1.7	0.9	1.4	1.9	2.2	0.8	1.7	0.9	1.5	2.1	2.4	1.1	60	61	61	66	62	58	90	
Maison Dieu	Monitor	-	-	0.2	0.4	1.0	1.5	2.3	2.7	1.5	1.7	0.9	0.7	0.5	0.1	1.7	2.2	1.9	2.2	2.8	2.9	59	60	60	60	60	60	90	
Maison Dieu	Monitor	-	-	0.2	0.4	1.0	1.5	2.3	2.7	1.5	1.7	0.9	0.7	0.5	0.1	1.7	2.1	1.9	2.2	2.8	2.9	59	60	60	60	60	60	90	
Knodlers Lane	Monitor	-	-	0.1	0.3	0.7	1.0	1.6	1.9	3.3	3.6	2.0	1.4	1.0	0.2	3.4	3.9	2.7	2.5	2.6	2.1	61	62	61	60	60	59	90	
17	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	58	58	58	57	57	90		
19	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	58	58	58	57	57	90		
37	Private - Dwelling	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	58	58	59	57	57	90		
102	Private - Subject to Acquisition Rights	Warkworth (Noise & AQ) (SSD6464)	Warkworth (Noise & AQ) (SSD6464)	0.0	0.1	0.1	0.2	0.2	0.2	1.1	0.7	1.2	2.1	1.6	0.6	1.1	0.7	1.3	2.3	1.8	0.8	63	73	71	71	61	58	90	
120	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.3	0.7	1.0	1.6	1.9	3.3	3.6	2.0	1.4	1.0	0.2	3.4	3.9	2.7	2.5	2.6	2.1	61	62	61	60	60	59	90	
121	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.3	0.6	0.9	1.4	1.7	4.2	4.6	2.8	2.0	1.4	0.3	4.3	4.9	3.4	2.9	2.8	2.0	62	63	61	61	60	59	90	
122	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.3	0.7	1.1	1.7	2.0	2.8	3.1	1.7	1.2	0.9	0.2	3.0	3.4	2.5	2.3	2.6	2.2	61	61	60	60	60	59	90	
123	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.3	0.6	1.0	1.5	1.8	3.5	3.9	2.3	1.6	1.2	0.3	3.6	4.2	2.9	2.6	2.7	2.0	61	62	61	61	60	59	90	
124	Private - Dwelling	HVOS (Noise & AQ) [06_0261]	-	0.1	0.3	0.7	1.1	1.7	2.0	2.7	3.0	1.7	1.2	0.9	0.2	2.8	3.3	2.4	2.3	2.5	2.2	60	61	60	60	60	59	90	
126	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.0	0.1	0.2	0.3	0.4	0.4	1.7	1.7	1.9	2.0	1.6	0.5	1.7	1.8	2.1	2.3	2.0	0.9	60	61	61	61	59	58	90	
127	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.3	0.5	0.8	1.1	1.3	2.4	2.7	2.0	1.6	1.2	0.3	2.5	2.9	2.5	2.3	2.3	1.5	60	61	60	60	60	59	90	
128	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.1	0.3	0.4	0.5	0.6	2.2	2.3	2.3	1.8	0.5	2.2	2.5	2.6	2.6	2.4	1.0	60	61	61	61	61	60	58	90	
130	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.2	0.3	0.4	0.6	0.7	2.3	2.6	2.4	2.1	1.7	0.4	2.4	2.7	2.7	2.6	2.3	1.1	60	61	61	61	60	58	90	
134	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.2	0.3	0.5	0.7	0.7	2.3	2.5	2.3	2.0	1.6	0.4	2.3	2.7	2.6	2.5	2.2	1.1	60	61	61	60	59	58	90	
139	Private - Dwelling	Warkworth (Noise) (SSD6464)	-	0.1	0.1	0.3	0.4	0.6	0.7	2.1	2.3	2.1	2.0	1.5	0.4	2.2	2.5	2.4	2.4	2.1	1.0	60	60	60	60	59	58	90	
141	Private - Dwelling	HVOS (Noise) [06_0261]	-	0.1	0.3	0.6	0.8	1.1	1.2	1.6	1.7	1.3	1.0	0.8	0.2	1.7	2.0	1.8	1.8	1.9	1.4	59	60	60	60	59	58	90	
160	Private - Dwelling	HVOS (Noise) [06_0261]	-	0.1	0.4	0.8	1.3	2.0</																					

Modelled annual average TSP concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)					Project (HVO S)					Project (HVO Complex)					Cumulative					Criteria				
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025		2029	2033	2040	2044
368	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.8	0.9	1.7	1.3	1.4	1.6	1.8	0.6	1.8	1.4	1.7	2.1	2.6	1.5	59	59	60	61	60	58	90
369	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.8	0.9	1.7	1.3	1.4	1.6	1.8	0.6	1.8	1.4	1.7	2.1	2.6	1.5	59	59	60	61	60	58	90
370	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.8	0.9	1.7	1.3	1.4	1.6	1.8	0.6	1.8	1.4	1.7	2.1	2.6	1.5	59	59	60	61	60	58	90
371	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.8	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.4	59	59	60	61	60	58	90
372	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.6	1.2	1.3	1.5	1.7	0.6	1.7	1.3	1.6	1.9	2.4	1.3	59	59	60	61	60	58	90
373	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.8	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.4	59	59	60	61	60	58	90
374	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.8	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
375	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.8	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
376	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.7	0.8	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.8	2.1	2.6	1.4	59	59	60	61	60	58	90
377	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.8	0.9	1.7	1.3	1.4	1.6	1.8	0.6	1.8	1.4	1.7	2.1	2.6	1.4	59	59	60	61	60	58	90
380	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.7	1.3	1.4	1.6	1.9	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
381	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.7	1.3	1.4	1.6	1.9	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
382	Community Infrastructure	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.7	1.3	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
383	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.7	1.3	1.4	1.6	1.9	0.6	1.8	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
384	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.7	1.3	1.4	1.6	1.9	0.6	1.8	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
385	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90
386	Community Infrastructure	-	-	0.0	0.1	0.3	0.4	0.6	0.6	1.6	1.2	1.3	1.6	1.8	0.6	1.7	1.3	1.6	1.9	2.4	1.2	59	59	60	61	60	58	90
389	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.4	59	59	60	61	60	58	90
390	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
391	Private - Commercial	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.8	2.1	2.6	1.3	59	59	60	61	60	58	90
392	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.8	2.1	2.6	1.3	59	59	60	61	60	58	90
393	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.8	2.0	0.6	1.9	1.5	1.8	2.1	2.6	1.3	59	59	60	61	60	58	90
394	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.9	1.4	1.8	2.1	2.6	1.3	59	59	60	61	60	58	90
395	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.8	1.4	1.5	1.8	2.0	0.6	1.9	1.5	1.8	2.2	2.7	1.4	59	59	60	61	60	58	90
396	Community Infrastructure	-	-	0.0	0.1	0.2	0.3	0.5	0.6	1.7	1.2	1.4	1.6	1.9	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
397	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
398	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.7	1.2	1.4	1.6	1.9	0.6	1.7	1.4	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
399	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
400	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
401	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
402	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
403	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
404	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.7	1.8	1.3	1.4	1.7	1.9	0.6	1.7	1.4	1.7	2.0	2.5	1.2	59	59	60	61	60	58	90
405	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
406	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.8	1.3	1.5	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90
407	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
408	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
409	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
410	Community Infrastructure	-	-	0.0	0.1	0.3	0.4	0.6	0.6	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	1.9	2.4	1.2	59	59	60	61	60	58	90
411	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90
412	Community Infrastructure	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.3	1.5	1.7	0.6	1.6	1.3	1.6	1.9	2.3	1.2	59	59	60	61	60	58	90
413	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.3	1.6	1.8	0.6	1.6	1.3	1.6	1.9	2.3	1.2	59	59	60	61	60	58	90
414	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.3	1.6	1.8	0.6	1.6	1.3	1.6	1.9	2.3	1.2	59	59	60	61	60	58	90
415	Private - Dwelling	-	-	0.0	0.1	0.2	0.4	0.6	0.6	1.6	1.2	1.3	1.6	1.8	0.6	1.6	1.3	1.6	1.9	2.3	1.2	59	59	60	61	60	58	90
417	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.7	0.8	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.4	59	59	60	61	60	58	90
418	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.6	1.2	1.3	1.5	1.7	0.6	1.6	1.3	1.6	1.9	2.4	1.2	59	59	60	61	60	58	90
419	Private - Dwelling	-	-	0.0	0.1	0.2	0.3	0.5	0.6	1.5	1.1	1.3	1.5	1.7	0.5	1.6	1.2	1.5</										

Modelled annual average TSP concentrations (ug/m3)

ID	Status	Existing mitigation rights	Existing acquisition rights	Project (HVO N)						Project (HVO S)						Project (HVO Complex)						Cumulative						Criteria	
				2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044	2014	2025	2029	2033	2040	2044		
619	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.7	1.3	1.9	1.7	0.9	0.7	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.8	1.4	2.0	1.8	1.0	0.8	64	67	67	67	62	58	90
621	Private - Subject to Acquisition Rights	Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]; Ashton (AQ) [DA309-11-2001-1]	0.7	1.4	2.2	2.2	1.4	1.3	0.2	0.2	0.2	0.1	0.1	0.0	0.9	1.5	2.3	2.3	1.5	1.3	64	66	67	67	64	58	90	
623	Community Infrastructure	-	-	0.9	1.7	2.5	2.3	1.2	1.0	0.2	0.2	0.1	0.1	0.1	0.0	1.1	1.8	2.7	2.4	1.3	1.1	64	66	67	67	63	58	90	
624	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to all 9 contiguous lots 1/248748, 2/9/758214, 3/9/758214, 4/9/758214, 5/9/758214, 6/9/758214, 7/9/758214, 8/9/758214, 9/9/758214	0.9	1.6	2.4	2.2	1.1	1.0	0.2	0.2	0.1	0.1	0.1	0.0	1.0	1.7	2.6	2.3	1.2	1.0	64	67	67	67	63	58	90	
626	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 1/8/758214 and 2/8/758214	0.8	1.5	2.3	2.0	1.1	0.9	0.2	0.1	0.1	0.1	0.1	0.0	1.0	1.7	2.4	2.2	1.2	0.9	65	67	68	67	63	58	90	
627	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.8	1.4	2.2	1.9	1.0	0.8	0.1	0.1	0.1	0.1	0.0	0.9	1.6	2.3	2.0	1.1	0.8	65	67	67	67	63	58	90		
628	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; MOCO (AQ) [SSD-5850]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]	0.8	1.4	2.1	1.8	0.9	0.8	0.1	0.1	0.1	0.1	0.0	0.9	1.5	2.2	1.9	1.0	0.8	65	67	67	67	63	58	90		
629	Private - Subject to Acquisition Rights	MOCO (AQ) [SSD-5850]; Rixs Creek North (AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	MOCO (AQ) [SSD-5850]; Rixs Creek South (AQ) [SSD 6300]. Note - acquisitions apply to both contiguous lots 103/852484 and 104/852484	0.8	1.3	2.0	1.7	0.9	0.7	0.1	0.1	0.1	0.1	0.0	0.9	1.5	2.1	1.8	0.9	0.7	65	67	67	66	62	58	90		
735	Private - Commercial	-	-	0.7	1.1	1.3	1.0	0.6	0.5	0.1	0.1	0.1	0.1	0.0	0.8	1.2	1.4	1.1	0.6	0.5	70	80	80	67	63	58	90		
797	Community Infrastructure	-	-	0.8	1.3	1.6	1.2	0.6	0.5	0.1	0.1	0.1	0.1	0.0	0.9	1.4	1.7	1.3	0.7	0.6	71	78	78	67	64	58	90		
799	Community Infrastructure	-	-	0.8	1.3	1.6	1.2	0.6	0.5	0.1	0.1	0.1	0.1	0.0	0.9	1.4	1.7	1.3	0.7	0.6	71	78	78	67	64	58	90		
800	Private - Commercial	-	-	0.8	1.3	1.6	1.2	0.6	0.5	0.1	0.1	0.1	0.1	0.0	0.9	1.4	1.7	1.3	0.7	0.6	71	78	78	67	64	58	90		
829	Private - Commercial	-	-	0.0	0.1	0.2	0.3	0.4	0.4	2.0	2.0	2.3	2.5	2.0	0.6	2.0	2.1	2.5	2.8	2.4	1.0	61	62	62	63	60	58	90	
830	Private - Commercial	-	-	0.0	0.1	0.2	0.3	0.3	0.3	1.6	1.5	1.9	2.3	1.8	0.6	1.7	1.5	2.1	2.5	2.1	1.0	62	64	65	65	60	58	90	
833	Private - Commercial	-	-	0.0	0.1	0.2	0.3	0.5	0.6	7.2	4.9	11.4	12.5	11.7	3.9	7.3	5.0	11.6	12.8	12.3	4.5	66	67	73	74	70	61	90	
834	Private - Commercial	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.8	1.3	1.5	1.7	2.0	0.6	1.9	1.5	1.8	2.1	2.6	1.4	59	60	60	61	60	58	90	
835	Private - Dwelling	-	-	0.1	0.1	0.3	0.5	0.8	0.9	1.7	1.3	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.1	2.6	1.5	59	59	60	61	60	58	90	
836	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.7	0.8	1.6	1.2	1.4	1.6	1.7	0.6	1.7	1.3	1.6	2.0	2.5	1.3	59	59	60	60	60	58	90	
837	Private - Dwelling	-	-	0.1	0.1	0.3	0.4	0.8	0.8	1.6	1.2	1.4	1.6	1.8	0.6	1.7	1.4	1.7	2.0	2.5	1.4	59	59	60	60	60	58	90	
838	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.7	0.7	1.7	1.3	1.4	1.7	1.9	0.6	1.8	1.4	1.7	2.1	2.6	1.3	59	59	60	61	60	58	90	
839	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.7	1.2	1.4	1.6	1.8	0.6	1.7	1.3	1.6	2.0	2.4	1.2	59	59	60	61	60	58	90	
840	Private - Dwelling	-	-	0.0	0.1	0.3	0.4	0.6	0.7	1.7	1.3	1.4	1.7	1.9	0.6	1.7	1.4	1.7	2.0	2.5	1.3	59	59	60	61	60	58	90	
843	Private - Dwelling	-	-	0.1	0.2	0.5	0.7	0.8	0.9	1.0	1.1	0.8	0.7	0.6	0.1	1.1	1.3	1.3	1.4	1.4	1.1	59	59	59	59	58	58	90	
846	Private - Dwelling	-	-	0.1	0.3	0.6	0.9	1.0	1.1	0.8	0.9	0.6	0.5	0.4	0.1	1.0	1.2	1.3	1.4	1.5	1.2	59	59	59	59	58	58	90	
847	Private - Dwelling	-	-	0.1	0.3	0.6	0.8	1.0	1.2	0.9	0.9	0.7	0.6	0.5	0.1	1.0	1.2	1.3	1.4	1.5	1.3	59	59	59	59	58	58	90	
852	Private - Dwelling	-	-	0.1	0.3	0.6	0.9	1.1	1.2	1.0	1.1	0.8	0.7	0.5	0.1	1.2	1.4	1.4	1.5	1.6	1.4	59	59	59	59	58	58	90	
855	Private - Dwelling	-	-	0.1	0.2	0.4	0.5	0.7	0.8	1.8	2.0	1.6	1.4	1.1	0.3	1.9	2.1	2.0	1.9	1.1	59	60	60	60	59	58	90		
856	Private - Dwelling	-	-	0.1	0.3	0.6	0.7	1.0	1.1	1.1	0.9	0.7	0.6	0.1	1.2	1.4	1.4	1.5	1.5	1.2	59	59	59	59	58	58	90		
860	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise & AQ) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	0.7	1.3	1.9	1.8	1.0	0.9	0.1	0.1	0.1	0.1	0.0	0.8	1.4	2.1	1.9	1.1	0.9	64	69	69	69	63	58	90		
861	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Glendell [DA80/952]; Rixs Creek North (Noise) [PA08_0102]	0.6	1.0	1.4	1.2	0.7	0.6	0.1	0.1	0.1	0.1	0.0	0.7	1.1	1.5	1.3	0.7	0.6	65	70	70	69	61	58	90		
862	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	0.7	1.2	1.7	1.5	0.7	0.6	0.1	0.1	0.1	0.1	0.0	0.8	1.3	1.8	1.6	0.8	0.6	67	68	69	67	62	58	90		
863	Private - Subject to Acquisition Rights	Glendell (Noise) [DA 80/952]; Rixs Creek North (Noise) [PA08_0102]; IUG (Noise) [PA08_0101]; Rixs Creek South (AQ) [SSD 6300]	Rixs Creek North (Noise) [PA08_0102]	0.6	1.1	1.6	1.3	0.7	0.6	0.1	0.1	0.1	0.1	0.0	0.7	1.2	1.7	1.4	0.8	0.6	67	69	69	68	62	58	90		
869	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.4	1.0	1.9	2.6	2.7	3.2	0.5	0.5	0.4	0.3	0.2	0.1	0.9	1.4	2.3	2.9	3.0	3.2	60	61	62	62	62	60	90	
870	Private - Subject to Acquisition Rights	Rav Ops (AQ and Noise) [DA 09_0176]; Rixs Creek North (Noise) [PA08_0102]; Rixs Creek South (AQ) [SSD 6300]	Ashton (AQ & Noise) [DA309-11-2001-1]; Rixs Creek North (Noise) [PA08_0102] (acquisition applies to contiguous)	0.4	1.0	1.9	2.5	2.7	3.0	0.5	0.5	0.4	0.3	0.2	0.1	0.9	1.4	2.3	2.8	2.9	3.1	60	61	62	62	62	60	90	
947	Private - Subject to Acquisition Rights	Rav Ops (AQ) [DA 09_0176]; HVOs (Noise) [06_0281]	Rav Ops (AQ) [DA 09_0176]	0.2	0.5	1.1	1.7	2.5	3.0	1.0	1.1	0.7	0.5	0.4	0.1	1.2	1.6	1.8	2.3	2.9	3.1	59	59	60	60	60	60	90	
949	Private - Dwelling	-	-	0.2	0.5	1.1	1.7	2.5	3.0	1.0	1.1	0.7	0.5	0.4	0.1	1.2	1.6	1.8	2.3	2.9	3.1	59	59	60	60	60	60	90	
950	Private - Dwelling	-	-	0.2	0.5	1.1	1.7	2.5	3.0	1.0	1.1	0.7	0.5	0.4	0.1	1.2	1.6	1.8	2.3	2.9	3.1	59	59	60	60	60	60	90	

Ashton = Ashton Coal Project, HVO S = Hunter Valley Operations (South), HVO N = Hunter Valley Operations (North), MOCO = Mt Owen Continued Operations, IUG = Integra Underground, UWJV = United Wambo JV, Rav Ops = Ravensworth Surface Operations

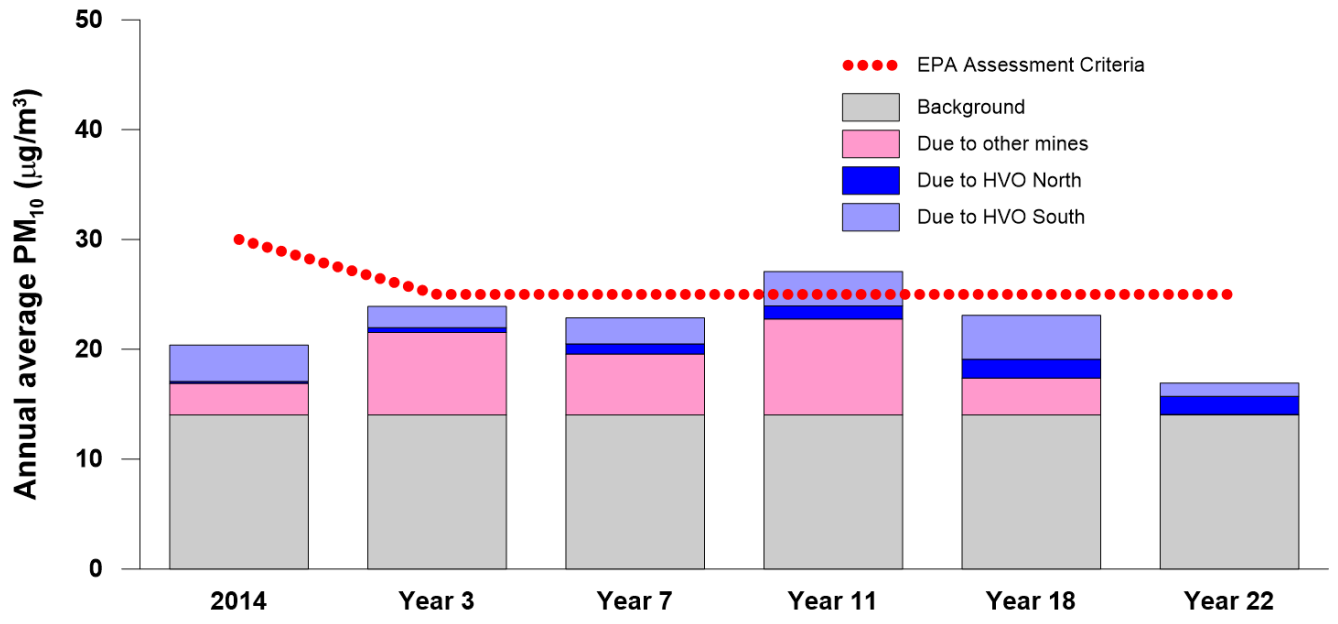


Figure F1 Annual average PM₁₀ concentrations at property 308

Appendix G. Greenhouse gas emissions by activity

Diesel usage										
Year	ROM coal (t)	Usage (kL)	Emission factor (kg CO ₂ -e/kL)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	152,223	2721.3	0	138.96	414,245	-	21,153	435,398	
2024	20,976,889	154,989	2721.3	0	138.96	421,771	-	21,537	443,308	
2025	18,177,901	170,141	2721.3	0	138.96	463,005	-	23,643	486,648	
2026	28,173,230	191,719	2721.3	0	138.96	521,726	-	26,641	548,367	
2027	30,409,148	197,755	2721.3	0	138.96	538,152	-	27,480	565,632	
2028	31,213,520	188,921	2721.3	0	138.96	514,111	-	26,252	540,364	
2029	30,710,095	220,002	2721.3	0	138.96	598,693	-	30,572	629,264	
2030	31,500,000	213,819	2721.3	0	138.96	581,866	-	29,712	611,578	
2031	29,370,406	222,720	2721.3	0	138.96	606,088	-	30,949	637,037	
2032	30,057,815	232,237	2721.3	0	138.96	631,987	-	32,272	664,259	
2033	30,797,847	235,155	2721.3	0	138.96	639,926	-	32,677	672,603	
2034	31,500,000	228,460	2721.3	0	138.96	621,707	-	31,747	653,454	
2035	31,012,508	217,713	2721.3	0	138.96	592,462	-	30,253	622,715	
2036	31,500,000	227,300	2721.3	0	138.96	618,553	-	31,586	650,138	
2037	31,433,780	227,502	2721.3	0	138.96	619,100	-	31,614	650,714	
2038	29,452,270	246,653	2721.3	0	138.96	671,216	-	34,275	705,491	
2039	34,000,894	270,140	2721.3	0	138.96	735,131	-	37,539	772,669	
2040	38,263,102	271,303	2721.3	0	138.96	738,297	-	37,700	775,997	
2041	29,996,243	260,402	2721.3	0	138.96	708,633	-	36,186	744,819	
2042	29,500,000	240,862	2721.3	0	138.96	655,457	-	33,470	688,927	
2043	28,830,479	209,323	2721.3	0	138.96	569,630	-	29,087	598,718	
2044	27,723,390	203,260	2721.3	0	138.96	553,132	-	28,245	581,377	
2045	24,318,601	144,884	2721.3	0	138.96	394,272	-	20,133	414,405	
2046	19,310,031	146,836	2721.3	0	138.96	399,585	-	20,404	419,990	
2047	18,626,435	134,543	2721.3	0	138.96	366,132	-	18,696	384,828	
2048	16,291,191	96,075	2721.3	0	138.96	261,450	-	13,351	274,800	
2049	9,742,001	56,302	2721.3	0	138.96	153,215	-	7,824	161,039	
2050	3,789,709	22,030	2721.3	0	138.96	59,951	-	3,061	63,013	
Average									549,913	
Total									15,397,551	

Fugitive emissions										
Year	ROM coal (t)	Emission factor (t CO ₂ -e/t ROM)			Emissions (t CO ₂ -e/year)			Total		
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3			
2023	19,908,276	-	-	-	182,625	-	-	182,625		
2024	20,976,889	-	-	-	249,818	-	-	249,818		
2025	18,177,901	-	-	-	235,235	-	-	235,235		
2026	28,173,230	-	-	-	450,007	-	-	450,007		
2027	30,409,148	-	-	-	413,873	-	-	413,873		
2028	31,213,520	-	-	-	527,872	-	-	527,872		
2029	30,710,095	-	-	-	365,237	-	-	365,237		
2030	31,500,000	-	-	-	590,284	-	-	590,284		
2031	29,370,406	-	-	-	422,105	-	-	422,105		
2032	30,057,815	-	-	-	451,025	-	-	451,025		
2033	30,797,847	-	-	-	534,789	-	-	534,789		
2034	31,500,000	-	-	-	538,123	-	-	538,123		
2035	31,012,508	-	-	-	408,494	-	-	408,494		
2036	31,500,000	-	-	-	604,714	-	-	604,714		
2037	31,433,780	-	-	-	452,705	-	-	452,705		
2038	29,452,270	-	-	-	469,173	-	-	469,173		
2039	34,000,894	-	-	-	667,179	-	-	667,179		
2040	38,263,102	-	-	-	1,071,195	-	-	1,071,195		
2041	29,996,243	-	-	-	544,341	-	-	544,341		
2042	29,500,000	-	-	-	946,518	-	-	946,518		
2043	28,830,479	-	-	-	1,207,940	-	-	1,207,940		
2044	27,723,390	-	-	-	1,464,963	-	-	1,464,963		
2045	24,318,601	-	-	-	1,508,445	-	-	1,508,445		
2046	19,310,031	-	-	-	856,297	-	-	856,297		
2047	18,626,435	-	-	-	1,010,945	-	-	1,010,945		
2048	16,291,191	-	-	-	926,548	-	-	926,548		
2049	9,742,001	-	-	-	722,712	-	-	722,712		
2050	3,789,709	-	-	-	352,944	-	-	352,944		
Average									649,147	
Total									18,176,106	

Blasting emissions										
Year	ROM coal (t)	Explosives (t)	Emission factor (t CO ₂ -e/t Explosives)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	57,611	0.17	0	0	9,794	-	-	9,794	
2024	20,976,889	57,902	0.17	0	0	9,843	-	-	9,843	
2025	18,177,901	72,419	0.17	0	0	12,311	-	-	12,311	
2026	28,173,230	93,399	0.17	0	0	15,878	-	-	15,878	
2027	30,409,148	91,101	0.17	0	0	15,487	-	-	15,487	
2028	31,213,520	86,683	0.17	0	0	14,736	-	-	14,736	
2029	30,710,095	101,895	0.17	0	0	17,322	-	-	17,322	
2030	31,500,000	100,527	0.17	0	0	17,090	-	-	17,090	
2031	29,370,406	102,253	0.17	0	0	17,383	-	-	17,383	
2032	30,057,815	100,120	0.17	0	0	17,020	-	-	17,020	
2033	30,797,847	100,995	0.17	0	0	17,169	-	-	17,169	
2034	31,500,000	104,756	0.17	0	0	17,809	-	-	17,809	
2035	31,012,508	97,399	0.17	0	0	16,558	-	-	16,558	
2036	31,500,000	95,392	0.17	0	0	16,217	-	-	16,217	
2037	31,433,780	89,672	0.17	0	0	15,244	-	-	15,244	
2038	29,452,270	91,276	0.17	0	0	15,517	-	-	15,517	
2039	34,000,894	105,985	0.17	0	0	18,017	-	-	18,017	
2040	38,263,102	104,638	0.17	0	0	17,789	-	-	17,789	
2041	29,996,243	100,059	0.17	0	0	17,010	-	-	17,010	
2042	29,500,000	95,264	0.17	0	0	16,195	-	-	16,195	
2043	28,830,479	81,685	0.17	0	0	13,886	-	-	13,886	
2044	27,723,390	79,365	0.17	0	0	13,492	-	-	13,492	
2045	24,318,601	64,960	0.17	0	0	11,043	-	-	11,043	
2046	19,310,031	60,148	0.17	0	0	10,225	-	-	10,225	
2047	18,626,435	58,470	0.17	0	0	9,940	-	-	9,940	
2048	16,291,191	44,729	0.17	0	0	7,604	-	-	7,604	
2049	9,742,001	28,270	0.17	0	0	4,806	-	-	4,806	
2050	3,789,709	11,200	0.17	0	0	1,904	-	-	1,904	
Average									13,832	
Total									387,289	

Construction (diesel usage)										
Year	ROM coal (t)	Usage (kL)	Emission factor (kg CO ₂ -e/kL)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	7,070	2721.3	0	138.96	19,241	-	983	20,223	
2024	20,976,889	-	2721.3	0	138.96	-	-	-	-	
2025	18,177,901	2,402	2721.3	0	138.96	6,537	-	334	6,870	
2026	28,173,230	-	2721.3	0	138.96	-	-	-	-	
2027	30,409,148	-	2721.3	0	138.96	-	-	-	-	
2028	31,213,520	-	2721.3	0	138.96	-	-	-	-	
2029	30,710,095	-	2721.3	0	138.96	-	-	-	-	
2030	31,500,000	358	2721.3	0	138.96	974	-	50	1,024	
2031	29,370,406	-	2721.3	0	138.96	-	-	-	-	
2032	30,057,815	362	2721.3	0	138.96	986	-	50	1,036	
2033	30,797,847	-	2721.3	0	138.96	-	-	-	-	
2034	31,500,000	-	2721.3	0	138.96	-	-	-	-	
2035	31,012,508	1,270	2721.3	0	138.96	3,456	-	176	3,633	
2036	31,500,000	-	2721.3	0	138.96	-	-	-	-	
2037	31,433,780	-	2721.3	0	138.96	-	-	-	-	
2038	29,452,270	-	2721.3	0	138.96	-	-	-	-	
2039	34,000,894	-	2721.3	0	138.96	-	-	-	-	
2040	38,263,102	-	2721.3	0	138.96	-	-	-	-	
2041	29,996,243	-	2721.3	0	138.96	-	-	-	-	
2042	29,500,000	-	2721.3	0	138.96	-	-	-	-	
2043	28,830,479	-	2721.3	0	138.96	-	-	-	-	
2044	27,723,390	-	2721.3	0	138.96	-	-	-	-	
2045	24,318,601	-	2721.3	0	138.96	-	-	-	-	
2046	19,310,031	-	2721.3	0	138.96	-	-	-	-	
2047	18,626,435	-	2721.3	0	138.96	-	-	-	-	
2048	16,291,191	-	2721.3	0	138.96	-	-	-	-	
2049	9,742,001	-	2721.3	0	138.96	-	-	-	-	
2050	3,789,709	-	2721.3	0	138.96	-	-	-	-	
Average									1,171	
Total									32,786	

Construction (vegetation clearing)										
Clear, grubbing and mulching to stockpile all vegetation within earthworks areas										
Clearing, grubbing and mulching										
Based on assumption of 100% 'open woodlands'										
Year	ROM coal (t)	Clearing (ha)	Emission factor (kg CO ₂ -e/ha)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	122	311620	0	0	38,018	-	-	38,018	
2024	20,976,889	-	0	0	0	-	-	-	-	
2025	18,177,901	-	0	0	0	-	-	-	-	
2026	28,173,230	-	0	0	0	-	-	-	-	
2027	30,409,148	-	0	0	0	-	-	-	-	
2028	31,213,520	-	0	0	0	-	-	-	-	
2029	30,710,095	-	0	0	0	-	-	-	-	
2030	31,500,000	-	0	0	0	-	-	-	-	
2031	29,370,406	-	0	0	0	-	-	-	-	
2032	30,057,815	-	0	0	0	-	-	-	-	
2033	30,797,847	-	0	0	0	-	-	-	-	
2034	31,500,000	-	0	0	0	-	-	-	-	
2035	31,012,508	-	0	0	0	-	-	-	-	
2036	31,500,000	-	0	0	0	-	-	-	-	
2037	31,433,780	-	0	0	0	-	-	-	-	
2038	29,452,270	-	0	0	0	-	-	-	-	
2039	34,000,894	-	0	0	0	-	-	-	-	
2040	38,263,102	-	0	0	0	-	-	-	-	
2041	29,996,243	-	0	0	0	-	-	-	-	
2042	29,500,000	-	0	0	0	-	-	-	-	
2043	28,830,479	-	0	0	0	-	-	-	-	
2044	27,723,390	-	0	0	0	-	-	-	-	
2045	24,318,601	-	0	0	0	-	-	-	-	
2046	19,310,031	-	0	0	0	-	-	-	-	
2047	18,626,435	-	0	0	0	-	-	-	-	
2048	16,291,191	-	0	0	0	-	-	-	-	
2049	9,742,001	-	0	0	0	-	-	-	-	
2050	3,789,709	-	0	0	0	-	-	-	-	
									Average	1,358
									Total	38,018

Electricity usage										
Year	ROM coal (t)	Usage (kWh)	Emission factor (kg CO ₂ -e/kWh)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	83,322,189	0	0.78	0.07	-	64,991	5,833	70,824	
2024	20,976,889	85,700,030	0	0.78	0.07	-	66,846	5,999	72,845	
2025	18,177,901	73,493,397	0	0.78	0.07	-	57,325	5,145	62,469	
2026	28,173,230	101,368,950	0	0.78	0.07	-	79,068	7,096	86,164	
2027	30,409,148	101,247,116	0	0.78	0.07	-	78,973	7,087	86,060	
2028	31,213,520	101,198,290	0	0.78	0.07	-	78,935	7,084	86,019	
2029	30,710,095	101,981,277	0	0.78	0.07	-	79,545	7,139	86,684	
2030	31,500,000	101,797,185	0	0.78	0.07	-	79,402	7,126	86,528	
2031	29,370,406	103,262,534	0	0.78	0.07	-	80,545	7,228	87,773	
2032	30,057,815	102,089,665	0	0.78	0.07	-	79,630	7,146	86,776	
2033	30,797,847	102,909,897	0	0.78	0.07	-	80,270	7,204	87,473	
2034	31,500,000	102,404,475	0	0.78	0.07	-	79,875	7,168	87,044	
2035	31,012,508	102,830,321	0	0.78	0.07	-	80,208	7,198	87,406	
2036	31,500,000	102,437,642	0	0.78	0.07	-	79,901	7,171	87,072	
2037	31,433,780	102,700,813	0	0.78	0.07	-	80,107	7,189	87,296	
2038	29,452,270	102,339,730	0	0.78	0.07	-	79,825	7,164	86,989	
2039	34,000,894	99,225,771	0	0.78	0.07	-	77,396	6,946	84,342	
2040	38,263,102	100,707,559	0	0.78	0.07	-	78,552	7,050	85,601	
2041	29,996,243	81,301,208	0	0.78	0.07	-	63,415	5,691	69,106	
2042	29,500,000	81,774,492	0	0.78	0.07	-	63,784	5,724	69,508	
2043	28,830,479	85,889,059	0	0.78	0.07	-	66,993	6,012	73,006	
2044	27,723,390	85,139,025	0	0.78	0.07	-	66,408	5,960	72,368	
2045	24,318,601	78,987,777	0	0.78	0.07	-	61,610	5,529	67,140	
2046	19,310,031	66,810,499	0	0.78	0.07	-	52,112	4,677	56,789	
2047	18,626,435	63,788,949	0	0.78	0.07	-	49,755	4,465	54,221	
2048	16,291,191	55,373,364	0	0.78	0.07	-	43,191	3,876	47,067	
2049	9,742,001	33,026,448	0	0.78	0.07	-	25,761	2,312	28,072	
2050	3,789,709	12,896,584	0	0.78	0.07	-	10,059	903	10,962	
									Average	73,343
									Total	2,053,604

Transport (Rail)										
Factor	kg CO2-e/t.km	0.03333 DEFRA 2019 - Freightng goods - Freight train								
Distance	km	150 Assumed distance to port								
Year	Product coal (t)	-	Emission factor (kg CO2-e/t)			Emissions (t CO2-e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	15,621,978	-	0	0	5.00	-	-	78,102	78,102	
2024	16,078,521	-	0	0	5.00	-	-	80,385	80,385	
2025	13,414,902	-	0	0	5.00	-	-	67,068	67,068	
2026	20,405,739	-	0	0	5.00	-	-	102,018	102,018	
2027	22,289,674	-	0	0	5.00	-	-	111,437	111,437	
2028	22,658,842	-	0	0	5.00	-	-	113,283	113,283	
2029	22,302,463	-	0	0	5.00	-	-	111,501	111,501	
2030	22,901,244	-	0	0	5.00	-	-	114,495	114,495	
2031	21,555,507	-	0	0	5.00	-	-	107,767	107,767	
2032	21,953,273	-	0	0	5.00	-	-	109,755	109,755	
2033	22,563,894	-	0	0	5.00	-	-	112,808	112,808	
2034	22,914,206	-	0	0	5.00	-	-	114,560	114,560	
2035	22,581,194	-	0	0	5.00	-	-	112,895	112,895	
2036	22,731,922	-	0	0	5.00	-	-	113,648	113,648	
2037	22,828,564	-	0	0	5.00	-	-	114,131	114,131	
2038	21,286,478	-	0	0	5.00	-	-	106,422	106,422	
2039	24,547,432	-	0	0	5.00	-	-	122,725	122,725	
2040	27,628,923	-	0	0	5.00	-	-	138,131	138,131	
2041	21,866,548	-	0	0	5.00	-	-	109,322	109,322	
2042	21,536,568	-	0	0	5.00	-	-	107,672	107,672	
2043	20,792,448	-	0	0	5.00	-	-	103,952	103,952	
2044	19,984,728	-	0	0	5.00	-	-	99,914	99,914	
2045	17,884,768	-	0	0	5.00	-	-	89,415	89,415	
2046	13,717,221	-	0	0	5.00	-	-	68,579	68,579	
2047	13,222,450	-	0	0	5.00	-	-	66,106	66,106	
2048	11,624,646	-	0	0	5.00	-	-	58,117	58,117	
2049	6,889,746	-	0	0	5.00	-	-	34,445	34,445	
2050	2,715,202	-	0	0	5.00	-	-	13,575	13,575	
								Average	95,794	
								Total	2,682,227	

Transport (Shipping)										
Factor	kg CO2-e/t.km	0.00354 DEFRA 2019 - Freightng goods - Cargo ship, bulk carrier, average								
Distance	km	8000 Assumed distance to market								
Year	Product coal (t)	-	Emission factor (kg CO2-e/t)			Emissions (t CO2-e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	15,621,978	-	0	0	28.31	-	-	442,289	442,289	
2024	16,078,521	-	0	0	28.31	-	-	455,215	455,215	
2025	13,414,902	-	0	0	28.31	-	-	379,803	379,803	
2026	20,405,739	-	0	0	28.31	-	-	577,727	577,727	
2027	22,289,674	-	0	0	28.31	-	-	631,065	631,065	
2028	22,658,842	-	0	0	28.31	-	-	641,517	641,517	
2029	22,302,463	-	0	0	28.31	-	-	631,427	631,427	
2030	22,901,244	-	0	0	28.31	-	-	648,380	648,380	
2031	21,555,507	-	0	0	28.31	-	-	610,280	610,280	
2032	21,953,273	-	0	0	28.31	-	-	621,541	621,541	
2033	22,563,894	-	0	0	28.31	-	-	638,829	638,829	
2034	22,914,206	-	0	0	28.31	-	-	648,747	648,747	
2035	22,581,194	-	0	0	28.31	-	-	639,319	639,319	
2036	22,731,922	-	0	0	28.31	-	-	643,586	643,586	
2037	22,828,564	-	0	0	28.31	-	-	646,322	646,322	
2038	21,286,478	-	0	0	28.31	-	-	602,663	602,663	
2039	24,547,432	-	0	0	28.31	-	-	694,987	694,987	
2040	27,628,923	-	0	0	28.31	-	-	782,230	782,230	
2041	21,866,548	-	0	0	28.31	-	-	619,086	619,086	
2042	21,536,568	-	0	0	28.31	-	-	609,743	609,743	
2043	20,792,448	-	0	0	28.31	-	-	588,676	588,676	
2044	19,984,728	-	0	0	28.31	-	-	565,808	565,808	
2045	17,884,768	-	0	0	28.31	-	-	506,354	506,354	
2046	13,717,221	-	0	0	28.31	-	-	388,362	388,362	
2047	13,222,450	-	0	0	28.31	-	-	374,354	374,354	
2048	11,624,646	-	0	0	28.31	-	-	329,117	329,117	
2049	6,889,746	-	0	0	28.31	-	-	195,062	195,062	
2050	2,715,202	-	0	0	28.31	-	-	76,873	76,873	
								Average	542,477	
								Total	15,189,362	

Energy Production										
Year	ROM coal (t)	Thermal coal (t)	Emission factor (kg CO ₂ -e/t)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	12,582,126	0	0	2436.48	-	-	30,656,098	30,656,098	
2024	20,976,889	13,396,152	0	0	2436.48	-	-	32,639,457	32,639,457	
2025	18,177,901	10,173,423	0	0	2436.48	-	-	24,787,341	24,787,341	
2026	28,173,230	17,015,120	0	0	2436.48	-	-	41,456,999	41,456,999	
2027	30,409,148	14,690,022	0	0	2436.48	-	-	35,791,945	35,791,945	
2028	31,213,520	18,899,806	0	0	2436.48	-	-	46,048,999	46,048,999	
2029	30,710,095	19,516,743	0	0	2436.48	-	-	47,552,154	47,552,154	
2030	31,500,000	19,749,740	0	0	2436.48	-	-	48,119,846	48,119,846	
2031	29,370,406	18,291,832	0	0	2436.48	-	-	44,567,683	44,567,683	
2032	30,057,815	19,033,258	0	0	2436.48	-	-	46,374,152	46,374,152	
2033	30,797,847	20,167,165	0	0	2436.48	-	-	49,136,893	49,136,893	
2034	31,500,000	20,658,743	0	0	2436.48	-	-	50,334,615	50,334,615	
2035	31,012,508	20,389,938	0	0	2436.48	-	-	49,679,677	49,679,677	
2036	31,500,000	21,289,234	0	0	2436.48	-	-	51,870,792	51,870,792	
2037	31,433,780	21,524,431	0	0	2436.48	-	-	52,443,846	52,443,846	
2038	29,452,270	19,995,997	0	0	2436.48	-	-	48,719,846	48,719,846	
2039	34,000,894	21,943,323	0	0	2436.48	-	-	53,464,468	53,464,468	
2040	38,263,102	25,038,592	0	0	2436.48	-	-	61,006,029	61,006,029	
2041	29,996,243	18,934,786	0	0	2436.48	-	-	46,134,226	46,134,226	
2042	29,500,000	19,592,396	0	0	2436.48	-	-	47,736,480	47,736,480	
2043	28,830,479	18,653,635	0	0	2436.48	-	-	45,449,209	45,449,209	
2044	27,723,390	18,133,210	0	0	2436.48	-	-	44,181,203	44,181,203	
2045	24,318,601	17,713,169	0	0	2436.48	-	-	43,157,781	43,157,781	
2046	19,310,031	12,708,649	0	0	2436.48	-	-	30,964,369	30,964,369	
2047	18,626,435	11,926,052	0	0	2436.48	-	-	29,057,588	29,057,588	
2048	16,291,191	10,610,491	0	0	2436.48	-	-	25,852,248	25,852,248	
2049	9,742,001	6,054,636	0	0	2436.48	-	-	14,751,998	14,751,998	
2050	3,789,709	2,483,592	0	0	2436.48	-	-	6,051,222	6,051,222	
Average									40,999,542	
Total									1,147,987,168	

Coking coal use										
Year	ROM coal (t)	Coking coal (t)	Emission factor (kg CO ₂ -e/t)			Emissions (t CO ₂ -e/year)			Total	
			Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3		
2023	19,908,276	3,039,852	0	0	2760.9	-	-	8,392,726	8,392,726	
2024	20,976,889	2,682,368	0	0	2760.9	-	-	7,405,751	7,405,751	
2025	18,177,901	3,241,479	0	0	2760.9	-	-	8,949,399	8,949,399	
2026	28,173,230	3,390,619	0	0	2760.9	-	-	9,361,160	9,361,160	
2027	30,409,148	7,599,652	0	0	2760.9	-	-	20,981,880	20,981,880	
2028	31,213,520	3,759,036	0	0	2760.9	-	-	10,378,322	10,378,322	
2029	30,710,095	2,785,720	0	0	2760.9	-	-	7,691,095	7,691,095	
2030	31,500,000	3,151,504	0	0	2760.9	-	-	8,700,989	8,700,989	
2031	29,370,406	3,263,675	0	0	2760.9	-	-	9,010,682	9,010,682	
2032	30,057,815	2,920,015	0	0	2760.9	-	-	8,061,870	8,061,870	
2033	30,797,847	2,396,730	0	0	2760.9	-	-	6,617,132	6,617,132	
2034	31,500,000	2,255,463	0	0	2760.9	-	-	6,227,108	6,227,108	
2035	31,012,508	2,191,256	0	0	2760.9	-	-	6,049,838	6,049,838	
2036	31,500,000	1,442,688	0	0	2760.9	-	-	3,983,117	3,983,117	
2037	31,433,780	1,304,132	0	0	2760.9	-	-	3,600,579	3,600,579	
2038	29,452,270	1,290,481	0	0	2760.9	-	-	3,562,889	3,562,889	
2039	34,000,894	2,604,109	0	0	2760.9	-	-	7,189,684	7,189,684	
2040	38,263,102	2,590,331	0	0	2760.9	-	-	7,151,645	7,151,645	
2041	29,996,243	2,931,762	0	0	2760.9	-	-	8,094,303	8,094,303	
2042	29,500,000	1,944,172	0	0	2760.9	-	-	5,367,665	5,367,665	
2043	28,830,479	2,138,812	0	0	2760.9	-	-	5,905,047	5,905,047	
2044	27,723,390	1,851,518	0	0	2760.9	-	-	5,111,857	5,111,857	
2045	24,318,601	171,599	0	0	2760.9	-	-	473,768	473,768	
2046	19,310,031	1,008,572	0	0	2760.9	-	-	2,784,567	2,784,567	
2047	18,626,435	1,296,398	0	0	2760.9	-	-	3,579,224	3,579,224	
2048	16,291,191	1,014,156	0	0	2760.9	-	-	2,799,983	2,799,983	
2049	9,742,001	835,111	0	0	2760.9	-	-	2,305,657	2,305,657	
2050	3,789,709	231,610	0	0	2760.9	-	-	639,453	639,453	
Average									6,442,050	
Total									180,377,386	

Appendix H. Modelling of alternative meteorological year

The potential effects of using an alternative meteorological dataset have been considered. Meteorological data from 2020 were subsequently used to simulate the potential contributions of the Project to local air quality. **Figure H1** shows the modelled annual average PM₁₀ concentrations due to the Project using 2014 and 2020 meteorological data. The contribution of the Project to local air quality (that is, PM₁₀) is expected to be similar from year-to-year and the conclusions of the assessment will not change from this information.

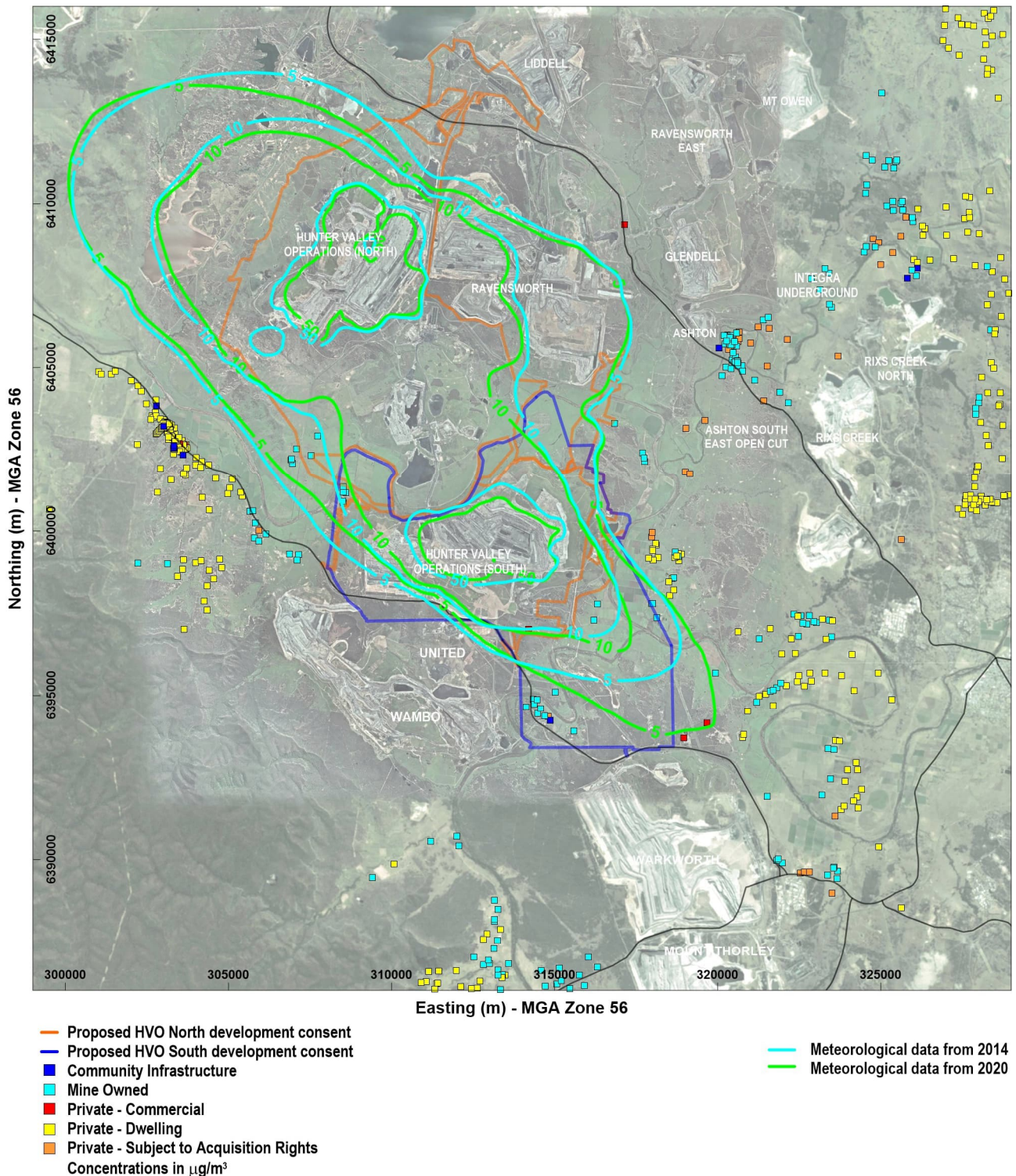


Figure H1 Comparison of modelled annual average PM₁₀ for different meteorological datasets